www.e-chnr.org

ISSN(Print) 2287-9110
ISSN(Online) 2287-9129

CHNR

Child Health Nursing Research

Vol.31, No.4, October 2025

Child Health Nursing Research

Vol.31, No.4, October 2025

www.e-chnr.org

CHNR

Child Health Nursing Research

Vol.31, No.4, October 2025

www.e-chnr.org

Korean Academy of Child Health Nursing

CHNR
Child Health Nursing Research

pISSN 2287-9110
eISSN 2287-9129

About the Journal

Child Health Nursing Research (CHNR) is the official peer-reviewed research journal of the Korean Academy of Child Health Nursing. CHNR is a multidisciplinary, double-blind peer-reviewed, open-access journal that publishes original research, theory, and review papers on health care and nursing from the beginning of life to young adulthood, including both children and their families. It is devoted to all fields of child health, including global and cultural issues, aimed at both domestic and international healthcare professionals. The journal is published quarterly (Jan 31, Apr 30, July 31, and Oct 31) in English. The journal welcomes submissions from healthcare professionals around the world, and encourages the submission of papers dealing with cultural issues and those studied by international research teams.

- Indexed in major databases: PubMed Central, PubMed, Scopus, CINAHL, DOAJ, Crossref Metadata, Google Scholar, ScienceCentral, KCI (Korea Citation Index), RISS, KoreaMed, and KoMCI.
- Its abbreviated title is Child Health Nurs Res.
- Open access: All articles published in the journal are freely available with an open access license for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

Aims and Scope

Child Health Nursing Research aims to promote the health, development, and well-being of children and their families in Korea and all over the world by providing research on evidence-based practices.
Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal deals with articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues. Its regional scope is mainly Korea, but it welcomes submissions from researchers and nurses worldwide.
The primary readers of this journal are healthcare professionals, administrators and scientists serving newborns, infants, children, adolescents, young adults, and their families, including nurses, midwives, physicians, developmental specialists, public health workers, scientists, educators, epidemiologists, and other health caregivers.
The ultimate goal of *Child Health Nursing Research* is to develop a body of knowledge on the health of newborns, infants, children, adolescents, young adults, and their families while improving the clinical field and community with evidence-based practices to promote the health of children and families all over the world.

Manuscripts should be submitted via the online Manuscript Central website (http://www.e-chnr.org). Other correspondences can be sent by an e-mail to the Editor, Dr. Yunsoo Kim, Department of Nursing, Catholic Kwandong University, Gangneung, Korea (Tel: +82-33-649-7614, Fax: +82-33-649-7620, e-mail: agneskim@cku.ac.kr).

Correspondence concerning business matters should be addressed to Treasurer, Sangmi Lee, Department of Nursing, Dongyang University, Yeongu, Korea (Tel: +82-54-630-1712, Fax: +82-54-630-1371, e-mail: lsm95@dyu.ac.kr). The subscription price of this journal is Korean Won, 200,000 (US$ 187.00 or equivalent) annually. Back issues are available. Please contact the office of the Korean Academy of Child Health Nursing.

© 2025 Korean Academy of Child Health Nursing
Printed October 31, 2025 Published October 31, 2025

Published by the Korean Academy of Child Health Nursing

College of Nursing, Daegu Catholic University, Korea
Tel: +82-53-650-4829, Fax: +82-53-650-4392, e-mail: hykoo@cu.ac.kr

Printed by M2PI

#805, 26 Sangwon 1-gil, Seongdong-gu, Seoul 04779, Korea
Tel: +82-2-6966-4930, Fax: +82-2-6966-4945, E-mail: support@m2-pi.com

It is identical to Creative Commons Non-Commercial License.
This paper meets the requirements of KS X ISO 9706, ISO 9706-1994 and ANSI/NISO Z.39.48-1992 (Permanence of Paper).

Editorial Board

pISSN 2287-9110
eISSN 2287-9129

Editor in Chief

Yunsoo Kim [RN, PhD]
Associate Professor, Department of Nursing, Catholic Kwandong University, Republic of Korea

Editorial Board

Young Mee Ahn [RN, PhD]
Professor, Department of Nursing, Inha University, Republic of Korea

Bernie Carter [RN, PhD]
Professor, Faculty of Health and Social Care, Edge Hill University, UK

Eunji Cho [RN, PhD]
Assistant Professor, Connell School of Nursing, Boston College, USA

Eun Kyoung Choi [RN, PhD, CPNP]
Associate Professor, College of Nursing, Yonsei University, Republic of Korea

Yeo-Jin Im [RN, PhD]
Professor, College of Nursing Science, Kyung Hee University, Republic of Korea

Noriyo Kaneko [RN, PhD]
Associate Professor, School of Nursing, Nagoya City University, Japan

HyunJu Kang [RN, PhD]
Professor, College of Nursing, Kangwon National University, Republic of Korea

Donghee Kim [RN, PhD]
Professor, College of Nursing, Sungshin Womens University, Republic of Korea

Gaeun Kim [RN, PhD]
Assistant Professor, College of Nursing, Keimyung University, Republic of Korea

Shin-Jeong Kim [RN, PhD]
Professor, School of Nursing, Hallym University, Republic of Korea

Hyun Young Koo [RN, PhD]
Professor, College of Nursing, Daegu Catholic University, Republic of Korea

Bo Ryeong Lee [RN, PhD]
Assistant Professor, College of Nursing, Daegu Catholic University, Republic of Korea

Jaeyoung Lee [RN, PhD]
Associate Professor, Department of Nursing, Kyungsung University, Republic of Korea

Won-Oak Oh [RN, PhD]
Professor, College of Nursing, Korea University, Republic of Korea

Nguyen Thi Anh Phuong [MD, PhD]
Professor, University of Medicine and Pharmacy, Hue University, Vietnam

Mohammed Nader Shalaby [PhD]
Associate Professor, Biological Sciences and Sports Health Department, Faculty of Physical Education, Suez Canal University, Egypt

Min Sohn [RN, PhD]
Professor, Department of Nursing, Inha University, Republic of Korea

Lai Har WU [RN, PhD]
Professor, School of Nursing, The Hong Kong Polytechnic University, Hong Kong

Ethics Editor

Kyung-Ah Kang [RN, PhD]
Professor, College of Nursing, Sahmyook University, Republic of Korea

Statistics Editors

Seongyong Kim [RN, PhD]
Assistant Professor, Department of Big Data and AI, Hoseo University, Republic of Korea

Eunmi Lee [RN, PhD]
Associate Professor, Department of Nursing, Hoseo University, Republic of Korea

Yong-Gyu Park [PhD]
Emeritus Professor, Department of Medical Lifescience, College of Medicine, Catholic University of Korea, Republic of Korea

Manuscript Editor

Hyun Joo Kim
InfoLumi Co.,Republic of Korea

Jihye Jang [RN]

English Editor

Andrew Dombrowski [PhD]
Compecs, Inc. Republic of Korea

Layout Editor

In A Park
M2PI, Republic of Korea

Website and JATS XML File Producer

Min Young Choi
M2PI, Republic of Korea

Manuscript Reviewers

pISSN 2287-9110
eISSN 2287-9129

Hye Young Ahn RN, PhD
College of Nursing, Eulji University, Republic of Korea

Sung Yun Ahn RN, PhD
Department of Nursing, Pai Chai University, Republic of Korea

Young Mee Ahn RN, PhD
Department of Nursing, Inha University, Republic of Korea

Kyung-Sook Bang RN, PhD
College of Nursing, Seoul National University, Republic of Korea

Robin Bartlett RN-BC, PhD
Capstone College of Nursing, The University of Alabama, USA

Bernie Carter RN, PhD
Faculty of Health and Social Care, Edge Hill University, UK

Sun-Mi Chae RN, PhD, CPNP-PC
College of Nursing, Seoul National University, Republic of Korea

Eunji Cho RN, PhD
Connell School of Nursing, Boston College, USA

Haeryun Cho RN, PhD
Department of Nursing, Wonkwang University, Republic of Korea

Hun-Ha Cho RN, PhD
College of Nursing, Kosin University, Republic of Korea

In Young Cho RN, PhD
College of Nursing, Chonnam National University, Republic of Korea

In-Sook Cho RN, PhD
Department of Nursing, Kwangju Women's University, Republic of Korea

Kyungmi Cho RN, PhD
Department of Nursing, Kyung-In Women's College, Republic of Korea

Eun Kyoung Choi RN, PhD, CPNP
College of Nursing, Yonsei University, Republic of Korea

Hye Sun Choi RN, PhD
Department of Nursing, Woo Suk University, Republic of Korea

Jihea Choi RN, CPNP, PhD
Department of Nursing, Yonsei University Wonju College of Medicine, Republic of Korea

Mi-Young Choi RN, PhD
Department of Nursing, Chungbuk National University, Republic of Korea

Linda S. Franck RN, PhD, FRCPCH, FAAN
Department of Family Health Care, Nursing University of California, San Francisco, USA

Nirmal Gautam RN, MS
Department of Medical and Allied Science, Faculty of Public Health, Karnali College of Health Science, Nepal

Sungsil Hong RN, PhD
Department of Nursing, College of Health Science, Kangwon National University, Republic of Korea

Kyung-Hye Hwang RN, PhD
Department of Nursing, Suwon Science College, Republic of Korea

Mihae Im RN, PhD
Department of Nursing, Choonhae College of Health Sciences, Republic of Korea

Yeo-Jin Im RN, PhD
College of Nursing Science, Kyung Hee University, Republic of Korea

Yu-Mi Im RN, PhD
College of Nursing, Dankook University, Republic of Korea

Gun-Ja Jang RN, PhD
College of Nursing, Daegu University, Republic of Korea

Eun Sun Ji RN, PhD
Department of Nursing, Konkuk University Glocal Campus, Republic of Korea

Juhye Jin RN, PhD
Department of Nursing, Korea National University of Transportation, Republic of Korea

Hyeon-Ok Ju RN, PhD
Department of Nursing, Dong-A University, Republic of Korea

Hyang-Mi Jung RN, PhD
Department of Nursing, Dongeui University, Republic of Korea

So Young Jung RN, PhD, CHNP
Department of Nursing, Ansan University, Republic of Korea

Noriyo Kaneko RN, PhD
School of Nursing, Nagoya City University, Japan

Hyunju Kang RN, PhD
College of Nursing, Kangwon National University, Republic of Korea

Kyung-Ah Kang RN, PhD
Department of Nursing, Sahmyook University, Republic of Korea

So Ra Kang RN, PhD
College of Nursing, Sungshin Women's University, Republic of Korea

Dong-Hee Kim RN, PhD
College of Nursing, Sungshin Women's University, Republic of Korea

Dong Yeon Kim RN, PhD
The Catholic University of Korea, Seoul St. Mary's Hospital, Republic of Korea

Eunjung Kim RN, PhD
Department of Family & Child Nursing Faculty and Administration, University of Washington, USA

Gaeun Kim RN, PhD
College of Nursing, Keimyung University, Republic of Korea

Geun Myun Kim RN, PhD
Department of Nursing, Gangneung-Wonju National University, Republic of Korea

Hyun-Ok Kim RN, PhD
College of Nursing, Chonebuk National University, Republic of Korea

Jeong-Mi Kim RN, PhD
Department of Nursing, Kaya University, Republic of Korea

Ji-Soo Kim RN, PhD
College of Nursing, Gachon University, Republic of Korea

Jin Sun Kim RN, PhD
Department of Nursing, Chosun University, Republic of Korea

Shin-Jeong Kim RN, PhD
School of Nursing, Hallym University, Republic of Korea

Sujeong Kim RN, PhD
College of Nursing, The Catholic University of Korea, Republic of Korea

Sunghee Kim RN, PhD
Red Cross College of Nursing, Chung-Ang University, Republic of Korea

Tae-Im Kim RN, PhD
Department of Nursing, Daejeon University, Republic of Korea

Yae Young Kim RN, PhD
(Former) Department of Nursing, Kyungil University, Republic of Korea

Youngjoo Kim RN, PhD
Department of Nursing Science, U1 University, Republic of Korea

Yunsoo Kim RN, PhD
Department of Nursing, Catholic Kwandong University, Republic of Kore

Hyun Young Koo RN, PhD
College of Nursing, Daegu Catholic University, Republic of Korea

Anna Lee RN, PhD
College of Nursing, Yonsei University, Republic of Korea

Bo Ryeong Lee RN, PhD
College of Nursing, Daegu Catholic University, Republic of Korea

Eun Jee Lee RN, PhD
College of Nursing, Jeonbuk National University, Republic of Korea

Hye-Jung Lee RN, PhD
College of Nursing, Yonsei University, Republic of Korea

In-Sook Lee RN, PhD
Department of Nursing, Hannam University, Republic of Korea

Jaeyoung Lee RN, PhD
Department of Nursing Science, Kyungsung University, Republic of Korea

Ji-Won Lee RN, PhD
Department of Nursing, Catholic University of Pusan, Republic of Korea

Joo Hyun Lee RN, PhD
College of Nursing, Eulji University, Republic of Korea

Meen Hye Lee RN, PhD
Department of Nursing, Gangneung-Wonju National University, Republic of Korea

Sangmi Lee RN, PhD
Department of Nursing, Dongyang University, Republic of Korea

Soo-Yeon Lee RN, PhD
Department of Nursing, Koje College, Republic of Korea

Sunhee Lee RN, PhD
College of Nursing, The Catholic University of Korea, Republic of Korea

Young-Eun Lee RN, PhD
College of Nursing, Kosin University, Republic of Korea

Yu-nah Lee RN, PhD
College of Nursing, Chodang University, Republic of Korea

Ji-Young Lim RN, PhD
College of Nursing, CHA University, Republic of Korea

Hyeon-Ah Nam RN, PhD
Department of Nursing, Howon University, Republic of Korea

Mi-Jung Nam RN, PhD
Department of Nursing, Daejeon Health Sciences College of Korea, Republic of Korea

Jina Oh RN, PhD
Department of Nursing, Inje University, Republic of Korea

Sang-Eun Oh RN, PhD
College of Nursing, Chonnam National University, Republic of Korea

Sumi Oh RN, PhD
College of Nursing, Jeju National University, Republic of Korea

Won-Oak Oh RN, PhD
College of Nursing, Korea University, Republic of Korea

Il Tae Park RN, PhD
College of Health and Welfare, Woosong University, Republic of Korea

Jiyoung Park RN, PhD
Department of Nursing, College of Medicine, Inje University, Republic of Korea

Sunghee Park RN, PhD
Department of Nursing, Kunsan National University, Republic of Korea

Sun-Nam Park RN, PhD
Seoul Women's College of Nursing, Republic of Korea

Jin Suk Ra RN, NNP, PhD
College of Nursing, Chungnam National University, Republic of Korea

Kaka Shim RN, PhD
Department of Nursing, Sang Myung University, Republic of Korea

Hyewon Shin RN, PhD
College of Nursing, Ewha Womans University, Republic of Korea

Hyunsook Shin RN, APN, CPNP, PhD
College of Nursing Science, Kyung Hee University, Republic of Korea

Hyun-Mi Sohn RN, PhD
College of Nursing, Pusan National University, Republic of Korea

Min Sohn RN, PhD
Department of Nursing, Inha University, Republic of Korea

Young Ran Tak RN, PhD
Department of Nursing, Hanyang University, Republic of Korea

Kyeongra Yang RN, PhD, MPH
School of Nursing, Rutgers, The State University of New Jersey, USA

Ji-Young Yeo RN, PhD
Department of Nursing, Hanyang University, Republic of Korea

Hana Yoo RN, PhD
Department of Nursing, Daejeon University, Republic of Korea

Juyoun Yu RN, PhD
Department of Nursing, Changwon National University, Republic of Korea

Mi Yu RN, PhD
College of Nursing, Gyeongsang National University, Republic of Korea

The Board of Directors

pISSN 2287-9110
eISSN 2287-9129

President

Hyun Young Koo RN, PhD
College of Nursing, Daegu Catholic University, Republic of Korea

Vice-president

Won-Oak Oh RN, PhD
College of Nursing, Korea University, Republic of Korea

Director of General Affairs

Sun-Nam Park RN, PhD
Seoul Women's College of Nursing, Republic of Korea

Editor-in-Chif, Child Health Nursing Research

Yunsoo Kim RN, PhD
Department of Nursing,Catholic Kwandong University, Republic of Korea

Director of Academic affairs

Eun Sun Ji RN, PhD
Department of Nursing, Konkuk University Glocal Campus, Republic of Korea

Treasurer

Sangmi Lee RN, PhD
Department of Nursing, Dongyang University, Republic of Korea

Director of Public Relations

Gun-Ja Jang RN, PhD
College of Nursing, Daegu University, Republic of Korea

Director of Educational Affairs

Sunhee Lee RN, PhD
College of Nursing, The Catholic University of Korea, Republic of Korea

Director of Publication

So Young Jung RN, PhD
Department of Nursing, Ansan University, Republic of Korea

Director of Secretary Affairs

Il Tae Park RN, PhD
College of Health and Welfare, Woosong University, Republic of Korea

Regional Committee

Eun Jee Lee RN, PhD
College of Nursing, Jeonbuk National University, Republic of Korea

Jiyoung Park RN, PhD
College of Nursing, Inje University, Republic of Korea

Advisory Committee

Kyung-Sook Bang RN, PhD
College of Nursing, Seoul National University, Republic of Korea

Hyunju Kang RN, PhD
College of Nursing, Kangwon National University, Republic of Korea

CHNR
Child Health Nursing Research

pISSN 2287-9110
eISSN 2287-9129

Vol.31, No.4, October 2025

Review Article

187 Factors influencing the family management of children with atopic dermatitis: an integrative review
Sunyeob Choi, Hyewon Shin

Original Articles

198 Effectiveness of a virtual reality nursing simulation for pediatric pneumonia care: a Korean pilot study using a single-group pre-post test design
Eun Joo Kim, Seong Kwang Kim, Sung Sook Song

211 Exploring perception types regarding the effects of energy drink consumption among South Korean male adolescents: a Q-methodology study
Sun Jung Park, Eun Ju Choi

221 Perceptions of newborn care among North Korean refugee women in South Korea: a qualitative study using focus group interview: comparison between pregnant and non-pregnant groups
In-Sook Lee

237 Effects of a case-based simulation fever management education program for parents of hospitalized children in South Korea: a quasi-experimental study
Bora Nam, Hyunju Kang

248 Mediating role of parental alienation and moderating effect of subjective health in the link between parental and adolescent depression in South Korea: a cross-sectional study
Shinil Lim, Yunmi Kim

257 Development of an artificial intelligence-based nursing simulation scenario evaluation tool: a methodological study using the Real-Time Delphi method in South Korea
Eun Joo Kim, Bitna Park, Geun Myun Kim, Ji Young Lim, Seong Kwang Kim

272 Nurses' perceptions of end-of-life care in neonatal and pediatric intensive care units in Korea: a qualitative descriptive study using thematic analysis
Hyo Jeong Lee, Hyejin Kim

284 Comparative effectiveness of DistrACTION Cards and Buzzy for pain relief during intravenous infusion in preschool children in Korea: a quasi-randomized controlled trial
MinJi Lee, Euna Park

296 Effects of a virtual reality program and simulation training for nursing students on the measurement of vital signs in children: a mixed-methods study in South Korea
Sun Nam Park, Hyun Young Koo, Hye Young Hwang

REVIEW ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):187-197
https://doi.org/10.4094/chnr.2025.027

pISSN 2287-9110
eISSN 2287-9129

CHNR

Factors influencing the family management of children with atopic dermatitis: an integrative review

Sunyeob Choi[1], Hyewon Shin[2]

[1]Assistant Professor, College of Nursing, Dongguk University WISE, Gyeongju, Korea
[2]Associate Professor, College of Nursing, Ewha Womans University, Seoul, Korea

Corresponding author
Hyewon Shin
College of Nursing, Ewha Womans University, 52 Ewhayeodae-gil, Seodaemun-gu, Seoul 03760, Korea
Tel: +82-2-3277-3305
Fax: +82-2-3277-2850
E-mail: hyeshin@ewha.ac.kr

Received: July 30, 2025
Revised: August 26, 2025
Accepted: September 3, 2025

Purpose: Atopic dermatitis (AD) is prevalent among children and often requires family members to assume significant management responsibilities. Family management affects the child's disease prognosis and health as well as the family's functioning and overall quality of life. This integrative study aimed to identify the impact of AD on children and their families and examine child- and family-related factors that influence family management.

Methods: Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), a systematic search was conducted across five electronic databases (Cumulative Index to Nursing and Allied Health Literature, PubMed, Web of Science, Research Information Sharing Service, and Korean Information Service System) for studies published between 2000 and May 2024. Studies were screened using predefined inclusion and exclusion criteria, and the Mixed Methods Appraisal Tool was used to evaluate methodological quality.

Results: In total, 1,144 records were identified, and 14 studies met the inclusion criteria. The findings indicate that the impact of AD extends to both children, who experience psychological distress, sleep disturbances, impaired academic performance, and negative self-image, and families, who face treatment challenges, disrupted routines, and economic burden. Factors influencing family management were categorized into child-related factors (developmental stage and disease severity) and family-related factors (family burden, social support, coping strategies, and concerns regarding topical steroid use).

Conclusion: Family management of pediatric AD is shaped by a complex interplay of child- and family-related factors. Therefore, interventions should be designed to strengthen coping resources, enhance social support, and reduce the management burden, promoting child well-being and family resilience.

Keywords: Atopic dermatitis; Child; Disease management; Family; Review

INTRODUCTION

Atopic dermatitis (AD), commonly known as atopic eczema, is a chronic inflammatory skin condition that affecting all age groups, including infants, children, and adults [1]. AD is characterized by severe pruritus and lichenification, in which both the epidermis and portions of the dermis thicken from persistent scratching [2]. Globally, approximately 20% of children are diagnosed with AD [2], with notable prevalence in infancy, preschool, and school-age years [3]. It often coincides with early immune development and greater exposure to external antigens [4].

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

AD challenges multiple aspects of a child's development and functioning, affecting their physical, emotional, and social well-being [5]. Pruritus, the primary symptom of AD, causes sleep-related issues, such as poor sleep quality, frequent awakenings, and reduced sleep duration, which contribute to daytime fatigue, impaired cognition, and lower academic achievement [6]. Children with AD often experience anxiety, depression, and feelings of powerlessness, because of its chronic nature [7]. These findings emphasize the importance of family management in mitigating the broader effects of AD on a child's life.

Given that most affected children are infants or young school-age, they depend on parents for treatment, daily care, and emotional regulation [3,8]. Therefore, family management, rather than child self-management, has become the central framework for addressing the multifaceted impact of AD in this population.

Managing AD requires a holistic approach that involves the family in daily treatment and broader lifestyle adjustments. Family involvement is crucial because AD affects not only the child's physical symptoms, but also the family's emotional and psychological well-being [9]. According to Knafl et al. [8], family management is the family's recognition of the chronic disease and adherence to treatment, reducing stress and supporting long-term adaptation. Effective family management helps children cope by controlling symptoms, fostering adaptation, and improving quality of life [10].

The complex nature of managing AD, especially in infants and young children, places a considerable burden on families. Inadequate family management can exacerbate the child's condition, resulting in greater emotional stress and healthcare costs [10]. An AD diagnosis often shifts in family dynamics, causing role overload, tension, and parental conflicts over the child's management [11]. As families focus on managing their children's symptoms, their attention to other aspects of family functioning may decline, further complicating relationships [12].

Addressing AD from a family-systems perspective is crucial, because it affects the child's overall wellbeing and development; managing it requires families to adapt to medical, emotional, and environmental challenges.

Accordingly, this integrative study aimed to identify the impact of AD on children and their families, and to examine the child- and family-related factors influencing family management. This study seeks to provide a comprehensive understanding of how AD affects family dynamics and clarify the factors that facilitate or hinder effective family management by synthesizing the available literature.

METHODS

Ethical statements: This literature review was exempt from Institutional Review Board approval.

1. Study Design

The results of this integrative study were based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [13]. This study followed the interview review guidelines by Whittemore and Knafl [14], comprising: (1) problem identification, (2) literature search, (3) data evaluation, (4) data analysis, and (5) presentation of findings.

2. Problem Identification

This integrative review aimed to (1) identify the impact of AD on children and their families and (2) examine the child- and family-related factors influencing family management.

3. Literature Review

We followed PRISMA guidelines to search for relevant literature [13]. The following five databases were used for the literature search: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science, Research Information Sharing Service (RISS), and Korean Studies Information Service (KISS). Data were collected from studies published between 2000 and May 2024. Search terms included ("pediatric" OR "child" OR "childhood"), ("parents" OR "family" OR "caregiver"), ("atopic dermatitis" OR "eczema"), and ("care" OR "management" OR "treatment"). The search was limited to articles published in English or Korean. Because AD management typically falls under family responsibility during early childhood and school years, the age range was restricted to under 12 years. Systematic and literature reviews, opinion pieces, editorials, conference proceedings, books, dissertations, and studies published in languages other than English and Korean were excluded. The first author conducted the search, which was reviewed for

suitability by other researchers. The literature search process followed the PRISMA flow diagram [13]. In total of 1,144 studies were identified: PubMed (n=53), CINAHL (n=353), Web of Science (n=706), RISS (n=8), KISS (n=22), and a manual search (n=2). Two researchers independently screened the titles and abstracts of 599 articles to identify those addressing AD's impact and family management. As a result, 14 studies were selected for final inclusion. Articles were excluded based on the following criteria: studies not related to AD (19 articles), studies not focused on children (15 articles), studies not addressing family management (eight articles), and studies specifically targeting adolescents (six articles). The final 14 studies are shown in Figure 1.

4. Data Evaluation

Quality assessment of the literature was conducted using the Mixed Methods Appraisal Tool (MMAT) [15]. The MMAT is a validated tool for assessing qualitative, quantitative non-randomized, quantitative descriptive, quantitative randomized controlled trials and mixed-methods studies [15,16]. The MMAT begins with two questions: "Is the research question clearly stated?" and "Do the collected data align with the research question?" Quality assessment items varied depending on the research method used.

Of the selected articles, eight were quantitative descriptive studies employing a cross-sectional design. Evaluation criteria included sampling strategy, sample representativeness, measurement validity, response bias, and statistical analysis. Two articles (A3 and A11) were quasi-experimental studies using non-randomized study designs. Three articles (A5, A10, and A12) were qualitative studies assessed with qualitative tools. One article (A8) used a mixed methods study evaluation tool. The inter-rater agreement was 98.9% with discrepancies in items related to between-group differences and statistical analysis. Discrepancies were resolved through researcher discussions.

After independently using the MMAT, two researchers scored items as 1 for "yes" and 0 for "no" or "cannot tell". The researchers then discussed the quality assessment results. The results of the quality appraisal are presented in Table 1.

5. Data Analysis

The selected articles were summarized in terms of research design, participants, key variables, strengths, and limitations, as shown in Table 2.

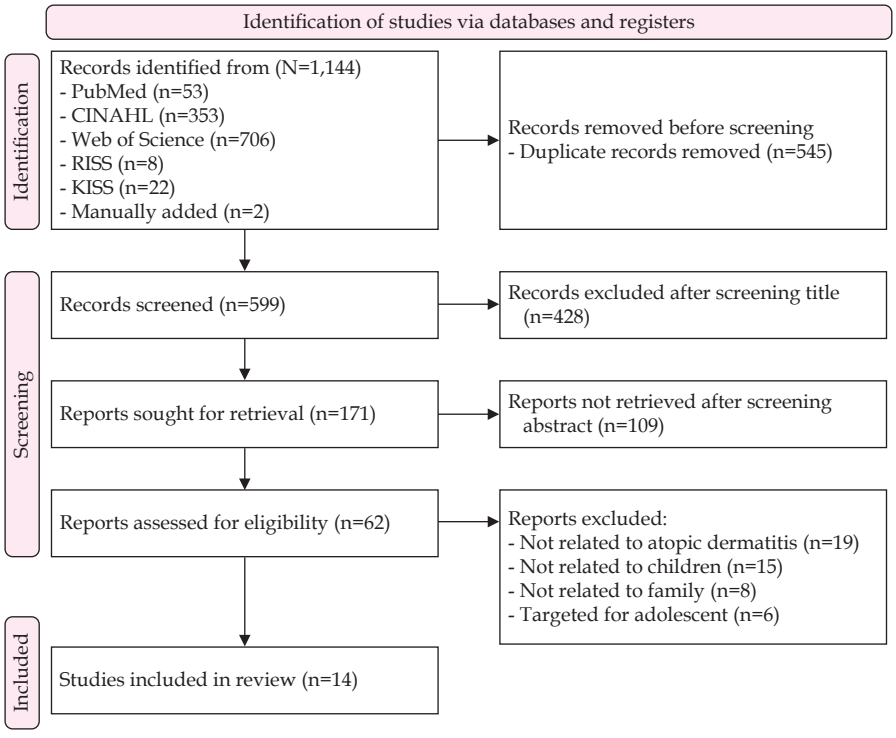


Figure 1. Flow diagram of literature review.

Table 1. Results of quality appraisal using Mixed Methods Appraisal Tool

Article no.	1. Qualitative studies					2. Non-randomized studies					3. Quantitative descriptive studies					4. Mixed method studies					Total score
	Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q2.1	Q2.2	Q2.3	Q2.4	Q2.5	Q3.1	Q3.2	Q3.3	Q3.4	Q3.5	Q4.1	Q4.2	Q4.3	Q4.4	Q4.5	
A1											Yes	Yes	Yes	Yes	Yes						5
A2											Yes	Yes	Yes	Yes	Yes						5
A3						Yes	Yes	Yes	No	Yes											4
A4											Yes	Yes	Yes	Yes	Yes						5
A5	Yes	Yes	Yes	Yes	Yes																5
A6											Yes	Yes	Yes	Yes	Yes						5
A7											Yes	Yes	Yes	Yes	Yes						5
A8																Yes	Yes	Yes	Yes	Yes	5
A9											Yes	Yes	Yes	Yes	Yes						5
A10	Yes	Yes	Yes	Yes	Yes																5
A11						Yes	Yes	Yes	Can't tell	Yes											4
A12	Yes	Yes	Yes	Yes	Yes																5
A13											Yes	Yes	Yes	Yes	Yes						5
A14											Yes	Yes	Yes	Yes	Yes						5

Table 2. Summary of selected studies

Article	First author (year)	Design	Participant	Aim	Factors	Strength/limitation
A1	Barbarot (2022)	Cross-sectional study	7,465 Pairs of pediatric participants with AD and their parents or caregivers	To evaluate the impact of AD on families of pediatric patient	- Severity of AD - Age of children - Geographic regions	S: Conducting the study across multiple countries L: No control group, participation in the study was limited to those with online access
A2	Barlkrishman (2003)	Cross-sectional study	49 Parents of children (6 months –12 years old) with AD	To assess how parent caregivers are affected by their child's AD, and how certain parent caregiver characteristics and perceptions affect the family	- Severity of AD - Financial concern about the child's condition	S: Addresses an important aspect of AD by examining its impact on the family unit L: Small sample size, conducted the study in a single region
A3	Beattei (2006)	Quasi-experimental study	Parents of 203 infants (mean age 19.8 months) with AD attending pediatric dermatology	To examine the impact of an initial consultation with a dermatology team on AD severity and QoL impairment from the parent's perspective	- Severity of AD	S: The usefulness of these measures in routine clinical management of AD L: No control group
A4	Im (2020)	Cross-sectional study	146 Familes of atopic disease	To propose clusters of family management styles in the Korean families of children with chronic atopic disease	- Family functioning - Social support	S: Provided strong evidence linking how families manage chronic atopic diseases in children and the overall functioning of the family unit. L: Convenience sampling from a limited location
A5	Kim (2017)	Qualitative study	9 Mothers of children with AD	To understand the experience of family management style in mothers who have children with AD	- Age of children - Parental method of grandparents of children - Burden of management	S: In-depth exploration of the lived experiences L: Conducted with mothers, the majority of children had mild AD

(Continued on the next page)

Table 2. Continued

Article	First author (year)	Design	Participant	Aim	Factors	Strength/limitation
A6	Kobusiewicz (2023)	Cross-sectional study design	88 Mothers of children with AD and 57 mothers of children without AD as controls	To compare strategies for coping with stress in mothers of children with and without AD, as well as to investigate the relationship between coping strategies of mothers of affected children and AD variables, stress intensity, and quality of life.	- Severity of AD - Burden of family - Perceived stress level - Coping strategies	S: Have compare group L: Only mothers were involved
A7	Mitchell (2016)	Cross-sectional study design	64 Parent-child dyads	To examine relationships between child, parent, and family variables, parent-reported and directly observed child and parent behavior, parents' self-efficacy with managing difficult child behavior, self-reported parenting strategies, and disease severity.	- Severity of AD - Child behavior problem - Parent depression - Parenting stress - Parenting conflict - Relationship satisfaction	S: Conducted both children and parents L: Small sample size
A8	O'connor (2021)	Mixed methods study	168 Parents of children with AD	To assess the burden of treatment of AD on children and caregivers using mixed methods	- Family coping - Family burden	S: Use of mixed methods, sampled from mild to severe, the adequate sample sizes in both methods L: Morbidities such as food allergy, airways disease, and neuropsychiatric disease was not explored
A9	Ricci (2007)	Cross-sectional study	Parents of 45 children aged 3–84 months with AD	To determine the ways in which AD affects the lives of young Italian children and their families	- Severity of AD	S: Focusing on cultural relevance L: Small sample size
A10	Santer (2012)	Qualitative study	31 Caregivers carers of children aged ≤5 years with AD	To explore parents' and carers' views of childhood eczema and its treatment	- Worry about corticosteroid - Confidence of management - Severity of AD	S: Despite its qualitative nature, the study involved a substantial number of participants. L: Lack of objective data
A11	Shin (2013)	Quasi-experimental study	12 Families of children aged 5–11 years old diagnosed with AD	To test the effect of family participated Healing Camps with the application of family life habit improvement on AD	- Healing camps: education, tracking, counseling	S: The first attempt at a long-term camp in Korea, regular check-ups were conducted. L: The low attendance rate

(Continued on the next page)

Table 2. Continued

Article	First author (year)	Design	Participant	Aim	Factors	Strength/limitation
A12	Sivyer (2022)	Qualitative study	32 Studies and interviews with 30 parents/carers	To develop an online behavioral intervention to help parents/carers manage and co-manage their child's AD	- Incomplete knowledge and skills around managing AD - Concerns and doubts about the management	S: Use of a theory-, evidence-, and person-based approach L: Most of participants were mothers
A13	Son (2016)	Cross-sectional study	109 Korean mothers caring for a child with AD	To compare family management style according to severity in children with AD	- Severity of AD	S: Identifying family management according to severity of AD L: Self-report questionnaire, conducted the study in a single region
A14	Son (2018)	Cross-sectional study	168 Korean mothers caring for a child with atopic dermatitis under the age of 13	To identify the variables that affect family management of childhood AD and establish a prediction model based on Bandura's self-efficacy theory	- Management effort - Self-efficacy	S: Theory-based research L: Low reliability of measurement

AD, atopic dermatitis; S, strength; L, limitation; QoL, quality of life.

RESULTS

This study revealed two major domains (Figure 2): (1) the impact of AD on children and families, which constitutes the foundation for understanding family management and (2) factors influencing family management of AD. Extracted data encompassed children's developmental status, AD severity, family burden, social support, and coping strategies. These variables were analyzed to identify recurring patterns and key determinants of family management in families of children with AD.

1. Family Management of Children with AD

Family management in the context of AD involves recognizing the chronic nature of the condition and adhering to treatment plans to cope with associated stress [8,17].

AD, an allergic skin condition exacerbated by excessive immunoglobulin E response to antigens, often coexists with food allergies and necessitates dietary management [18]. Dust and pollen can worsen symptoms, prompting parents to control humidity, temperature, and ventilation. Comprehensive management of detergents, clothing, and other daily-life factors is essential [19].

Recent treatment guidelines for AD have emphasized the importance of family management [2]. Families often struggle with complex AD management [20], including skin moisturization, dietary control, outpatient visits, and associated psychological burdens [21]. Inadequate family management may require additional healthcare support, increasing economic burdens [10]. Stress caused by a child's AD can create a vicious cycle, impairing family functioning and management [10,22].

2. Factors Affecting Family Management of Children with AD

1) Children-related factors

(1) Developmental status of children

The level of management required for chronic conditions, such as AD, varies according to the child's developmental stage [23]. Younger children with AD require more time and effort to manage [24]. Families of preschool children with chronic conditions spend considerable time on management and experience difficulties in performing caregiving roles [11,25]. Recognizing symptoms in preschool children is difficult due to limited language and cognitive abilities [24].

As children develop, self-management abilities improve, reducing caregiving difficulties [26]. Family perceptions and coping abilities vary with the child's developmental stage

Family management of children with atopic dermatitis			
Impact of atopic dermatitis		Factors affecting family management	
Children aspect:	• Powerlessness, anxiety, depression • Sleep-related issues • Impaired academic achievement • Prejudice from peers • Negative body image	Children factors:	• Developmental status of children • Severity of atopic dermatitis
Family aspect:	• Difficulties related to the treatment • Changes in family roles and role overload • Family relationships and functioning • Work disruption • Economic difficulties	Family factors:	• Burden of family • Social support • Family coping

Figure 2. Summary of the review.

[25]. Families tend to perceive younger children as more vulnerable to diseases and emotional difficulties [27].

(2) Severity of AD

AD severity influence disease management, with families spending more time and resources as severity rises [28]. The degree to which families reorganize their daily lives is determined by the severity of their children's chronic conditions [24]. Severe AD, with frequent allergy outbreaks, requires 1.4 to 1.7 times more management time than mild cases due to outpatient visits and medication needs [29]. The management requirements for clothing, environment, and food also increase with the severity of AD, resulting in management costs that are 2–3 times higher than those for mild cases [29,30].

Chronic condition severity also impacts family functioning, social support, and coping resources. Families face management difficulties due to uncertainties regarding treatment and psychological issues, increasing the need for more social support [31]. Severe AD significantly burdens family health management, reducing social and economic functioning [32].

2) Family-related factors

(1) Burden of family

A family experiences physical, psychological, social, and financial burdens when a child is diagnosed with a chronic condition [12,30]. The primary caregiver manages the child's symptoms, dietary needs, and environmental factors, whereas other family members typically perform household duties to support the primary caregiver and often experience physical and mental challenges [12,30].

The emotional burden and challenges experienced by parents of children with chronic conditions can impair parental and child treatment adherence [22]. Additionally, this can lead to disappointment and frustration and reduce their confidence in managing the child's illness, thereby negatively affecting disease management [22,28,31]. They face dilemmas related to balancing the child's autonomy with disease management [33], creating an imbalance between the disease's demands and the family's capabilities, which negatively affects family management [34].

Additionally, parents face challenges resulting from the added role of disease management along with their existing parenting roles, leading to increased stress and difficulty [31]. As the family focuses on children with chronic conditions, marital cohesion may decrease, and interaction with other siblings may become challenging [35].

(2) Social support

Social support acts as a buffer against the negative effects of stress and enhances family flexibility, adaptability, problem-solving skills, and overall coping abilities during crises [36].

Families of children with chronic illnesses often experience social isolation, leave their jobs, and have limited interpersonal relationships when managing their children's conditions [37]. Support from family and friends has been shown to alleviate emotional difficulties in families of children with chronic illnesses [38]. Information provision and emotional support from healthcare professionals enhance a family's understanding of their child's chronic condition, improving their ability to make treatment decisions [34,38]. Families receiving support from healthcare professionals tend to perceive a child's prognosis optimistically, demonstrating higher levels of management skills and overall care [3]. However, social support is crucial for sustaining family care, particularly for long-term management, which requires extended support [32].

(3) Family's coping mechanisms

The families of children with chronic illnesses adapt to challenges through coping mechanisms [32,39]. The coping abilities of families of children with chronic illnesses have been shown to contribute to the improvement of the children's disease course and overall health status [40]. Coping skills alleviate difficulties experienced by families of children with chronic illnesses, enhance their ability to overcome challenges [30,32], help maintain balance while managing illnesses [30], and improve confidence in disease management, leading to higher levels of care [41].

In situations involving children with chronic illnesses, families with strong coping abilities are more likely to sustain their management efforts, positively influence their children's prognoses [35], perceive their illness positively, and respond actively [41]. In the context of managing a child's AD, the coping abilities of the family have a more significant impact than disease severity or challenges experienced by the family [32,42].

(4) Concerns about topical steroid use

Despite the effectiveness of basic skin care and topical corticosteroids (TCS) in managing mild-to-moderate AD in children, many parents struggle to adhere to the prescribed treatment plans [43]. The primary obstacle to consistent adherence is a pervasive fear of corticosteroids [20]. This fear is often rooted in misconceptions and misinformation regarding corticosteroids, such as the belief that they are addictive or can cause long-term side effects, like skin thinning [20]. Additionally, parents may be concerned about the possibility of systemic absorption and adverse effects on their child's growth and development [20]. These concerns can lead to hesitation or outright refusal to use TCS as prescribed, even when they are the most effective treatment option [3,20].

DISCUSSION

This study highlights the multifaceted effects of AD on children and their families. AD affects the physical, emotional, and social well-being of children, thereby hindering their growth and development [2,44]. Children with AD often lack self-management skills, and responsibilities for medication, diet, and environmental management typically fall to their parents [9]. Families managing children with AD face significant challenges due to the complexity of dietary, environmental, and medication interventions [45], which can reduce treatment adherence, family confidence, and coping capacity.

Drawing upon this theoretical framework, this study aimed to identify the factors influencing family management among families with children with AD. The results indicate that both child- and family-related characteristics contribute to family management of AD. Among child-related attributes, developmental stage and disease severity were identified as influential factors. Younger children require more family time and effort for management, and families experience difficulties before establishing a stable socioeconomic foundation [24].

Family-related attributes influencing AD management, include family burden, perceived social support, coping strategies, and fear of steroid use. Meanwhile, AD diagnosis broadly impacts the entire family, causing physical, psychological, and social challenges. Daily challenges negatively affect treatment adherence reduce families' confidence in managing the condition. Social support alleviates the emotional difficulties experienced by families, enhances problem-solving abilities, and positively contributes to disease management [38]. Family coping mechanisms foster positive responses, alleviating difficulties, enhance coping abilities, and support effective disease management [32]. Misconceptions about steroids and concerns regarding potential side effects lead to parental reluctance and consequently suboptimal treatment adherence [20,46].

Interventions targeting family support are essential to address these challenges. Counseling and education can enhance family resilience and coping skills, whereas support group meetings provide opportunities for interaction and experience sharing among families. Family-centered activities, such as AD camps, help alleviate psychological burdens and foster supportive networks. For example, the American Academy of Dermatology Association provides free camp programs for children with chronic skin conditions [47]. Programs such as rest assistance and after-school care can mitigate physical exhaustion associated with disease management. A multidisciplinary team of nurses, physicians, family specialists, and psychological counselors can provide guidance to promote family functioning and effective disease management. Broader initiatives, such as public campaigns, educational programs, and policy expansions, can further raise awareness about AD and create a more supportive environment for affected families.

This study has several limitations. As an integrative study, a quantitative meta-analysis to measure the magnitude of the

impact of family management on children with AD was not possible. Therefore, future meta-analysis studies should quantify the effect of family management and identifying influencing factors through outcome evaluation. Second, all studies included in this study were cross-sectional. Longitudinal studies are needed to understand changes in family management and its influencing factors over time.

CONCLUSION

AD is a chronic condition that affects both children and their families. It involves recurring cycles of exacerbation and remission, and can progress to allergic rhinitis, asthma, and other related conditions, thereby necessitating ongoing management. Since AD is most prevalent in children, much of the responsibility for its management lies with the family. Thus, the influencing factors must be identified to enhance family management. The review results indicate that family management is influenced by children's characteristics, including their developmental stage, severity and duration of the illness, and family-related factors, such as family functioning, resilience, social support, coping strategies, and concerns about topical steroid use. Therefore, interventions to enhance the family management of AD should consider child- and family-related attributes. Thus, these interventions may include counseling and education, family activities, strengthening social support, and the promotion of social awareness through campaigns and policy expansion.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: SC, HS. Methodology: SC. Data collection: SC. Formal analysis: SC. Validation: SC, HS. Investigation: SC. Supervision: HS. Project administration: SC. Writing–original draft: SC. Writing–review and editing: SC, HS. Final approval of published version: SC, HS.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

No funding was received for this study.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

We used part of the first author's doctoral thesis for this study.

ORCID and ResearcherID

Sunyeob Choi https://orcid.org/0000-0001-9879-2947
https://researcherid.com/ITT-9426-2023
Hyewon Shin https://orcid.org/0000-0003-1831-3710
https://researcherid.com/ITU-5631-2023

REFERENCES

1. Szalus K, Trzeciak M. The role of collagens in atopic dermatitis. Int J Mol Sci. 2024;25(14):7647. https://doi.org/10.3390/ijms25147647
2. Kulthanan K, Tuchinda P, Nitiyarom R, Chunharas A, Chantaphakul H, Aunhachoke K, et al. Clinical practice guidelines for the diagnosis and management of atopic dermatitis. Asian Pac J Allergy Immunol. 2021;39(3):145-155. https://doi.org/10.12932/AP-010221-1050
3. Son HK, Kim DH, Lee H, Kim H, Chung K, Kim HS. Family management of childhood atopic dermatitis. J Adv Nurs. 2018;74(6):1371-1379. https://doi.org/10.1111/jan.13551
4. Seité S, Kuo AM, Taieb C, Strugar TL, Lio P. Self-reported prevalence of allergies in the USA and impact on skin: an epidemiological study on a representative sample of American adults. Int J Environ Res Public Health. 2020;17(10):3360. https://doi.org/10.3390/ijerph17103360
5. Ali F, Vyas J, Finlay AY. Counting the burden: atopic dermatitis and health-related quality of life. Acta Derm Venereol. 2020;100(12):adv00161. https://doi.org/10.2340/00015555-3511
6. Rangel SM, Kim T, Sheth A, Blumstein A, Lai JS, Cella D, et al. Prevalence and associations of fatigue in childhood atopic dermatitis: a cross-sectional study. J Eur Acad Dermatol Venereol. 2023;37(4):763-771. https://doi.org/10.1111/jdv.18819
7. Barilla S, Felix K, Jorizzo JL. Stressors in atopic dermatitis. Adv Exp Med Biol. 2024;1447:83-90. https://doi.org/10.1007/978-3-031-54513-9_8
8. Knafl KA, Deatrick JA, Knafl GJ, Gallo AM, Grey M, Dixon J. Patterns of family management of childhood chronic conditions and their relationship to child and family functioning. J Pediatr Nurs. 2013;28(6):523-535. https://doi.org/10.1016/j.pedn.2013.03.006
9. Ezzedine K, Shourick J, Merhand S, Sampogna F, Taïeb C. Impact of

atopic dermatitis in adolescents and their parents: a French study. Acta Derm Venereol. 2020;100(17):adv00294. https://doi.org/10.2340/00015555-3653
10. Eicher L, Knop M, Aszodi N, Senner S, French LE, Wollenberg A. A systematic review of factors influencing treatment adherence in chronic inflammatory skin disease: strategies for optimizing treatment outcome. J Eur Acad Dermatol Venereol. 2019;33(12):2253-2263. https://doi.org/10.1111/jdv.15913
11. Yang EJ, Beck KM, Sekhon S, Bhutani T, Koo J. The impact of pediatric atopic dermatitis on families: a review. Pediatr Dermatol. 2019;36(1):66-71. https://doi.org/10.1111/pde.13727
12. Kim CB, Kim KS. The convergent of phenomenological methodology of mothers of children with atopic dermatitis: focus on the experience of family management style. J Korea Converg Soc. 2017;8(10):257-271. https://doi.org/10.15207/JKCS.2017.8.10.257
13. Page BF, Hinton L, Harrop E, Vincent C. The challenges of caring for children who require complex medical care at home: 'the go between for everyone is the parent and as the parent that's an awful lot of responsibility'. Health Expect. 2020;23(5):1144-1154. https://doi.org/10.1111/hex.13092
14. Whittemore R, Knafl K. The integrative review: updated methodology. J Adv Nurs. 2005;52(5):546-553. https://doi.org/10.1111/j.1365-2648.2005.03621.x
15. Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. Educ Inf. 2018;34(4):285-291. https://doi.org/10.3233/EFI-180221
16. Pluye P, Robert E, Cargo M, Bartlett G, O'Cathain A, Griffiths F, et al. Proposal: a mixed methods appraisal tool for systematic mixed studies reviews [Internet]. PBWORKS; 2011 [cited 2024 Nov 20]. Available from: http://mixedmethodsappraisaltoolpublic.pbworks.com
17. Knafl K, Deatrick JA, Gallo A, Dixon J, Grey M, Knafl G, et al. Assessment of the psychometric properties of the Family Management Measure. J Pediatr Psychol. 2011;36(5):494-505. https://doi.org/10.1093/jpepsy/jsp034
18. Mitchell AE, Fraser JA, Ramsbotham J, Morawska A, Yates P. Childhood atopic dermatitis: a cross-sectional study of relationships between child and parent factors, atopic dermatitis management, and disease severity. Int J Nurs Stud. 2015;52(1):216-228. https://doi.org/10.1016/j.ijnurstu.2014.09.008
19. Tamagawa-Mineoka R, Katoh N. Atopic dermatitis: identification and management of complicating factors. Int J Mol Sci. 2020;21(8):2671. https://doi.org/10.3390/ijms21082671
20. Capozza K, Schwartz A. Does it work and is it safe?: parents' perspectives on adherence to medication for atopic dermatitis. Pediatr Dermatol. 2020;37(1):58-61. https://doi.org/10.1111/pde.13991
21. Han JW, Lee H. Actor and partner effects of parenting stress and co-parenting on marital conflict among parents of children with atopic dermatitis. BMC Pediatr. 2020;20(1):141. https://doi.org/10.1186/s12887-020-02035-7
22. Weinstein SM, Pugach O, Rosales G, Mosnaim GS, Walton SM, Martin MA. Family chaos and asthma control. Pediatrics. 2019;144(2):e20182758. https://doi.org/10.1542/peds.2018-2758
23. Guz E, Brodowicz-Król M, Kulbaka E, Bartoszuk-Popko M, Lutomski P. Parents' attitudes towards a difficult situation resulting from the chronic disease of their child. Ann Agric Environ Med. 2020;27(3):476-480. https://doi.org/10.26444/aaem/119085
24. Barbarot S, Silverberg JI, Gadkari A, Simpson EL, Weidinger S, Mina-Osorio P, et al. The family impact of atopic dermatitis in the pediatric population: results from an international cross-sectional study. J Pediatr. 2022;246:220-226. https://doi.org/10.1016/j.jpeds.2022.04.027
25. D'Angelo CM, Mrug S, Grossoehme D, Schwebel DC, Reynolds N, Guion Reynolds K. Coping, attributions, and health functioning among adolescents with chronic illness and their parents: reciprocal relations over time. J Clin Psychol Med Settings. 2019;26(4):495-506. https://doi.org/10.1007/s10880-018-9597-0
26. Güngör MC, Özdemir FK. Evaluation of disease related attitudes and quality of life in children with chronic illness. J Pediatr Nurs. 2023;71:e142-e147. https://doi.org/10.1016/j.pedn.2023.05.012
27. Zhang Y, Wei M, Shen N, Zhang Y. Identifying factors related to family management during the coping process of families with childhood chronic conditions: a multi-site study. J Pediatr Nurs. 2015;30(1):160-173. https://doi.org/10.1016/j.pedn.2014.10.002
28. Son HK, Kim HS. A comparative study of family management style according to severity of childhood atopic dermatitis. Child Health Nurs Res. 2016;22(4):309-316. https://doi.org/10.4094/chnr.2016.22.4.309
29. Olsson M, Bajpai R, Wee LW, Yew YW, Koh MJ, Thng S, et al. The cost of childhood atopic dermatitis in a multi-ethnic Asian population: a cost-of-illness study. Br J Dermatol. 2020;182(5):1245-1252. https://doi.org/10.1111/bjd.18442
30. O'Connor C, Dhonncha EN, Murphy M. "His first word was 'cream'.": the burden of treatment in pediatric atopic dermatitis: a mixed methods study. Dermatol Ther. 2022;35(3):e15273. https://doi.org/10.1111/dth.15273
31. Park SY. A structural equation model on quality of life of mothers of children with atopic dermatitis [dissertation]. Busan: Kosin University; 2018.
32. Kobusiewicz AK, Tarkowski B, Kaszuba A, Zalewska-Janowska A. Strategies for coping with stress in mothers of children with atopic

dermatitis: a cross-sectional study. Postepy Dermatol Alergol. 2023;40(5):630-637. https://doi.org/10.5114/ada.2023.127934
33. Huang Y, Pan Y, Chen M, Jiang H, Ren L, Wang Y, et al. The resilient process of the family after diagnosis of childhood chronic illness: a qualitative meta-synthesis. J Pediatr Nurs. 2022;67:e180-e190. https://doi.org/10.1016/j.pedn.2022.07.017
34. Ahmadi B, Sabery M, Adib-Hajbaghery M. Burnout in the primary caregivers of children with chronic conditions and its related factors. J Client Cent Nurs Care. 2021;7(2):139-148. https://doi.org/10.32598/JCCNC.7.2.360.1
35. Kobusiewicz A, Zalewska-Janowska A. The burden of atopic dermatitis: its impact on family psychosocial functioning. Dermatol Rev. 2023;110(4):518-528. https://doi.org/10.5114/dr.2023.128635
36. Çuhadar D, Savaş HA, Ünal A, Gökpınar F. Family functionality and coping attitudes of patients with bipolar disorder. J Relig Health. 2015;54(5):1731-1746. https://doi.org/10.1007/s10943-014-9919-y
37. Batchelor LL, Duke G. Chronic sorrow in parents with chronically ill children. Pediatr Nurs. 2019;45(4):163-183.
38. Im Y, Jung S. Family functioning according to clusters of family management styles in Korean families of children with chronic atopic disease: a cross-sectional study. Int J Nurs Stud. 2020;109:103674. https://doi.org/10.1016/j.ijnurstu.2020.103674
39. Cho Y, Kim H. A predictive model of resilience in mothers of children with developmental disabilities. J Korean Acad Nurs. 2022;52(4):407-420. https://doi.org/10.4040/jkan.21235
40. Ryu HJ, Eom S, Lee YM, Shin YJ. Difficulties in the treatment and perceptions of mental health service interventions by caregivers for those with pediatric chronic intractable diseases. Korean J Infant Ment Health. 2020;13(1):1-18. https://doi.org/10.47801/KJIMH.13.1.1
41. Easterlin MC, Berdahl CT, Rabizadeh S, Spiegel B, Agoratus L, Hoover C, et al. Child and family perspectives on adjustment to and coping with pediatric inflammatory bowel disease. J Pediatr Gastroenterol Nutr. 2020;71(1):e16-e27. https://doi.org/10.1097/MPG.0000000000002693
42. Fairfax A, Brehaut J, Colman I, Sikora L, Kazakova A, Chakraborty P, et al. A systematic review of the association between coping strategies and quality of life among caregivers of children with chronic illness and/or disability. BMC Pediatr. 2019;19(1):215. https://doi.org/10.1186/s12887-019-1587-3
43. Jeon YH, Kim JH. Update on management of pediatric atopic dermatitis. Allergy Asthma Respir Dis. 2021;9(2):59-68. https://doi.org/10.4168/aard.2021.9.2.59
44. Langan SM, Irvine AD, Weidinger S. Atopic dermatitis. Lancet. 2020;396(10247):345-360. https://doi.org/10.1016/S0140-6736(20)31286-1
45. Draelos ZD, Feldman SR, Berman B, Olivadoti M, Sierka D, Tallman AM, et al. Tolerability of topical treatments for atopic dermatitis. Dermatol Ther (Heidelb). 2019;9(1):71-102. https://doi.org/10.1007/s13555-019-0280-7
46. Beattie PE, Lewis-Jones MS. Parental knowledge of topical therapies in the treatment of childhood atopic dermatitis. Clin Exp Dermatol. 2003;28(5):549-553. https://doi.org/10.1046/j.1365-2230.2003.01357.x
47. American Academy of Dermatology Association. About camp discovery [Internet]. American Academy of Dermatology Association; 2025 [cited 2024 Nov 22]. Available from: https://www.aad.org/public/public-health/camp-discovery

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):198-210
https://doi.org/10.4094/chnr.2025.019

pISSN 2287-9110
eISSN 2287-9129

CHNR

Effectiveness of a virtual reality nursing simulation for pediatric pneumonia care: a Korean pilot study using a single-group pre-post test design

Eun Joo Kim[1], Seong Kwang Kim[2], Sung Sook Song[3]

[1]Associate Professor, Department of Nursing, Gangneung-Wonju National University, Wonju, Korea
[2]PhD Student, Department of Nursing, Gangneung-Wonju National University, Wonju, Korea
[3]Assistant Professor, Department of Nursing, Daewon University College, Jecheon, Korea

Corresponding author
Seong Kwang Kim
Department of Nursing, Gangneung-Wonju National University, 150 Namwon-ro, Heungeop-myeon, Wonju 26403, Korea
Tel: +82-33-760-8650
Fax: +82-0504-034-1677
E-mail: ksk1677@naver.com

Received: June 26, 2025
Revised: July 11, 2025
Accepted: July 27, 2025

Purpose: This pilot study aimed to develop a virtual reality (VR) nursing simulation for pediatric pneumonia care tailored to the Korean clinical context and evaluate its educational effectiveness for nursing students.
Methods: A single-group pretest–posttest design was employed with 20 senior nursing students from April to May 2025. The intervention was a 70-minute VR nursing simulation of pediatric pneumonia care, structured with pre-briefing, a main scenario, and debriefing. Data were collected on participants' knowledge of pediatric pneumonia, clinical judgment (Nursing Clinical Judgment Scale), and simulation effectiveness (Simulation Effectiveness Tool-Modified) before and after the intervention. Usability (User Experience Questionnaire) and qualitative feedback were collected after the intervention. Pre-post comparisons were performed using paired t-tests.
Results: The program did not yield a statistically significant change in knowledge scores (p=.893). However, there were significant improvements in the mean scores for clinical judgment (p<.001) and simulation effectiveness (p=.013). A qualitative analysis revealed that, while the participants found the experience immersive and realistic, they also reported operational difficulties, indicating the need for usability improvements.
Conclusion: The VR nursing simulation is a promising pedagogical tool for enhancing nursing students' clinical judgment and perceived learning effectiveness in a Korean pediatric context. The findings suggest that, while the intervention was effective in improving practical reasoning, future iterations should focus on reinforcing knowledge acquisition and optimizing user experience to maximize the educational impact.

Keywords: Nursing student; Pediatrics; Simulation training; Virtual reality

INTRODUCTION

Simulations replicate clinical environments to facilitate critical thinking [1] and bridge the gap between theory and practice in nursing education [2]. This provides an immersive and safe setting for students to develop diverse competencies [3]. With recent advancements in virtual reality (VR) simulations [4], the importance of this educational methodology has been highlighted by the limitations of clinical practicums during the COVID-19 (coronavirus disease 2019) pandemic [5]. Nursing simulation offers a safe learning environment for students to practice without risk to actual patients [6], thereby enhancing their clinical competence by learning from their mistakes [7]. Integrating repetitive task performance with structured debriefing improves clinical outcomes [8], establishing simulations as a core component of nursing educa-

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

tion.

While nursing simulation education in South Korea is continuously advancing, one area requiring further development is the reliance on scenarios developed in foreign countries. This practice can create discrepancies due to cultural and systemic differences that may not fully align with the Korean clinical context. For example, North American-oriented scenarios privilege communication that respects the child's autonomy and directly delivers explanations to the child; conversely, Korean clinical practice places emphasis on family-centered communication competencies that reassure highly anxious caregivers, typically parents, and effectively address their questions [9]. Furthermore, the drug names and medical devices depicted in overseas scenarios, such as certain infusion-pump models, are often absent in domestic practice. Consequently, they hinder learners' immersion and conflict with the guidelines articulated in reports issued by the Korean Health Insurance Review and Assessment Service [10]. Most existing scenarios are centered on adult patients, leading to a scarcity of content for pediatric populations that require specialized skills. Moreover, most commercially available scenarios are adult-focused, resulting in a critical shortage of pediatric content that reflects Korean clinical guidelines, medication names, and caregiver–child communication styles [11,12]. Furthermore, conventional simulations are often constrained by the high costs of equipment and personnel, limiting their accessibility and scalability for many institutions [3,13].

With the recent advancements in VR technology, simulations have emerged as a cost effective solution, unconstrained by time or place [5]. As the technology matures, it is increasingly integrated into medical education to enhance learning outcomes [14]. Particularly in pediatric nursing, VR simulations offer a means of safely experiencing several care situations that are otherwise difficult to practice [5,15]. Despite these benefits, there is a dearth of pediatric VR nursing simulation programs specifically designed for the Korean healthcare context.

To comprehensively evaluate the effectiveness of such a newly developed educational program, appropriate outcome variables must be selected based on prior research. Simulation-based education is recognized as a key strategy for bridging the gap between theoretical knowledge and practical application in complex clinical situations [16]. To evaluate the educational effectiveness of the program, we selected key outcome variables grounded in prior research. Pneumonia was chosen as the clinical scenario because it is a prevalent and high-acuity disease in pediatrics and requires the application of integrated nursing competencies, such as assessment, intervention, and communication. Accordingly, the knowledge of pediatric pneumonia was selected as the primary variable. This is because simulation-based education is a well-established strategy for bridging the gap between theoretical knowledge and practical application, and its effectiveness in enhancing nursing students' knowledge has been demonstrated in numerous studies [16]. Furthermore, because the ultimate goal of the simulation is to enhance practical capabilities, clinical judgment was chosen as the core outcome variable. Several studies have demonstrated that VR and simulation-based learning are effective tools for improving nursing students' clinical reasoning, decision-making, and problem-solving skills [17]. Finally, simulation effectiveness was included to gauge the pedagogical quality and learners' acceptance of the intervention. Perceived effectiveness and satisfaction from the learners' perspective are critical factors that influence learning motivation and the successful integration of new educational technologies [18].

Therefore, this study aimed to develop a pediatric VR nursing simulation program, specifically a scenario involving a child with pneumonia, suitable for the Korean clinical environment. Therefore, we conducted a pilot study to verify the program's educational effectiveness. By developing a pediatric VR simulation program for the Korean nursing education setting, we hoped to overcome the limitations of current simulation practices and leverage the advantages of VR technology to effectively enhance students' pediatric nursing competencies.

The primary objective of this study was to develop a VR nursing simulation program for pediatric patients with pneumonia tailored to the Korean clinical context and evaluate its impact on nursing students' learning outcomes. This study sought to investigate the program's applicability and initial effects, thereby providing guidance for future enhancements and establishing foundational data to validate the educational utility of VR simulations. The specific aims were as follows: (1) to evaluate the effectiveness of the VR simulation program by comparing pre- and post-intervention scores on the knowledge of nursing care for pediatric pneumonia, clinical judgment, and simulation effectiveness; (2) to describe the learners' general characteristics and assess the simulation usability upon the completion of the program; and (3) to analyze the qualitative feedback from learners who participated

in the VR nursing simulation program for pediatric pneumonia.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Gang-neung-Wonju National University (GWNUIRB- 2025-6). Informed consent was obtained from all participants.

1. Study Design

This pilot study adopted a single-group pretest–posttest design to evaluate the effects of a VR nursing simulation program for pediatric patients with pneumonia. The primary outcomes were the nursing students' knowledge of pediatric pneumonia care, clinical judgment, and perceived simulation effectiveness. This manuscript was prepared in accordance with the guidelines of the Transparent Reporting of Evaluations with Non-randomized Designs [19].

2. Study Setting and Sample

The participants were senior students enrolled in a Bachelor of Science in Nursing program at Department of Nursing, Gangneung-Wonju National University in Wonju-si, Gangwon-do, who voluntarily consented to participate. The inclusion criteria required that the students (1) were currently enrolled in or had previously completed the pediatric nursing theory course and (2) had prior clinical practicum experience. Students were excluded if they had previous experience with VR simulation education in pediatric nursing or clinical experience in caring for a child with pneumonia.

Recruitment was conducted via an announcement on the nursing department's online bulletin board, and participants were selected on a first-come-first-serve basis. On the first day of the study, all the participants received a detailed explanation of the research purpose and procedures before they provided written informed consent.

Initially, 21 students applied to participate in the study, and the final sample comprised the first 20 applicants. Following the recommendations of Whitehead et al. [20] for pilot studies, which base the sample size on standardized effect sizes, a target sample size of 20 participants was deemed appropriate for assessing the intervention's feasibility and preliminary efficacy. All 20 enrolled participants completed the study, resulting in a 0% attrition rate.

3. Variables and Measurements

1) General characteristics

Data on the participants' general characteristics were collected using a self-administered questionnaire. The variables included sex, age, academic year, and grade point average (GPA). This demographic information was used to describe the characteristics of the sample and control for potential confounding variables during the interpretation of the results.

2) Pediatric nursing knowledge regarding pneumonia

To assess the core pediatric nursing knowledge regarding pneumonia (PNKP), we developed a 10-item instrument. The items were constructed based on the primary learning objectives of the VR simulation scenario and reviewed for content validity by two pediatric nursing professors on the research team. The instrument items were calibrated to an appropriate level for the undergraduate nursing curriculum. Each item was scored as 1 point for a correct answer and 0 points for an incorrect answer, yielding a total score ranging from 0 to 10. A higher score indicated a greater level of knowledge on the topic.

3) Clinical judgment

Clinical judgment was measured using the Nursing Clinical Judgment Scale (NCJS), an instrument developed by Kwon and Park [21]. This scale consists of 23 items rated on a 5-point Likert scale, with responses ranging from 1 ("not at all") to 5 ("very much so"). It assesses six subdomains of clinical judgment: integrative data analysis, intervention evaluation and reflection, evidence for intervention, interprofessional consultation, patient-centered nursing, and collaboration with peer nurses. A higher total score indicates a higher level of clinical judgment. The scale demonstrated high reliability at the time of development with a Cronbach's α of 0.92. In the present study, the instrument exhibited excellent internal consistency with a Cronbach's α of 0.88.

4) Simulation effectiveness

The effectiveness of the simulation was measured using the Simulation Effectiveness Tool-Modified (SET-M), developed by Leighton et al. [22]. This instrument comprises 19 items designed to assess the effectiveness of simulation-based

learning across three subscales: pre-briefing, learning, and debriefing. Responses are recorded on a 3-point Likert scale (1=disagree, 2=slightly agree, 3=strongly agree). The original instrument demonstrated high reliability (Cronbach's α=0.94), and it maintained high internal consistency in the present study (Cronbach's α=0.89).

5) Simulation usability

The usability of the simulation was assessed using the User Experience Questionnaire (UEQ) developed by Laugwitz et al. [23]. The UEQ is a 26-item instrument that evaluates a user's subjective experience across six dimensions: attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. Each item is rated on a 7-point semantic differential scale across a spectrum between two bipolar adjectives. Higher scores indicate a more positive user experience. The UEQ is a well-established instrument, with prior studies consistently reporting high reliability across its subscales (Cronbach's α>0.70) [24]. In the present study, the scale demonstrated high reliability with a Cronbach's α of 0.90.

4. Procedure

1) Development process

The VR nursing simulation program was developed to address the limitations of conventional education, such as difficulty reflecting on complex clinical situations and a lack of opportunities for integrated learning. The program was commissioned by the researcher and developed through close collaboration between pediatric nursing experts and Newbase (https://medicrew.me/#/home), a professional VR content development company. A view of the VR simulation environment is shown in Figure 1. The development was based on a patented system that utilizes a standardized "Simulation scenario template for child's care" (Korean Patent Publication No. 10-2377113, 2022). This system enabled the creation of VR content by defining initial elements such as target learners, learning objectives, and required competencies. This structured approach ensured that the educational content was systematically designed to align with specific learning goals and learners' educational levels.

2) Scenario content and progression

The developed scenario focused on the nursing care of a 5-year-old male patient, Kim*Byeol, diagnosed with pneumonia who presents with a fever and dry cough. The primary learning objectives were to assess the signs and symptoms of pediatric pneumonia, prioritize and perform appropriate nursing interventions, and identify the essential nursing skills for solving the clinical problems. The simulation was

Figure 1. (A–D) View of the actual virtual reality simulation environment.

composed of four main stages, with the patient's condition and lab results (e.g., C-reactive protein 10.95 mg/dL, total calcium 11.1 mg/dL) changing dynamically based on the learner's actions and predetermined triggers. The scenario began with the initial state in which the learner performed an initial assessment of a relatively stable patient. At this stage, the patient's vital signs were recorded as body temperature 37.8°C and peripheral oxygen saturation 96%, and the learner was expected to conduct a physical assessment, including auscultation of chest sounds. In the secondary state, the patient's condition deteriorated, triggering urgent intervention. The vital signs changed to show a rising body temperature of 38.2°C and a drop in oxygen saturation to 90%. This required the learner to prioritize and perform the necessary interventions, such as applying oxygen, administering a prescribed antipyretic (Acetaphen injections), and using a nebulizer with Ventolin and Mucomyst. Following initial stabilization, the third state required the learner to administer the prescribed intravenous antibiotics, specifically Bactacin injections, and perform an antibiotic skin test while continuing to monitor the patient's vital signs. In the final state, the patient was stable, and the focus shifted to recovery and education. The learner reevaluated the patient's condition and provided comprehensive discharge education to his parent. This included instructions on medication adherence, the importance of fluid intake, and the application of chest physiotherapy at home. Throughout the simulation, the learner had to engage in therapeutic communication with the patient's anxious mother, and the scenario featured a branching logic in which timely and appropriate interventions led to a positive outcome.

5. Data Collection Procedure

Data were collected over approximately 7 weeks from April 18 to May 29, 2025, in a classroom at the university. To ensure an unbiased research environment, the intervention was administered by the corresponding author, who had no conflicts of interest (e.g., academic or evaluative role) with the student participants. Twenty senior nursing students were recruited via an online bulletin board announcement, and written informed consent was obtained from all participants after they received a full explanation of the study.

The procedure was structured into three distinct phases (Table 1). First, in the pretest phase, the participants completed a 15-minute online questionnaire to gather data on general characteristics and establish baseline measures for knowledge, clinical judgment, and simulation effectiveness. Second, in the intervention phase, each participant individually engaged in a 70-minute VR simulation session, which consisted of pre-briefing (20 minutes), the main simulation (30 minutes), and debriefing (20 minutes). To mitigate potential motion sickness, a VR simulation component was administered in two segments. Finally, in the 15-minute posttest phase conducted immediately after the session, the participants anonymously completed a questionnaire to reassess the primary variables and measure user experience. All data were systematically managed to ensure research integrity.

6. Data Analysis

1) Quantitative analysis

All quantitative data were analyzed using IBM SPSS ver. 26.0 (IBM Corp.). The participants' general characteristics were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. The primary variables—knowledge of nursing care for pediatric pneumonia, clinical judgment, behavioral scores, simulation effectiveness, and simulation usability—were treated as continuous variables. The pre- and post-intervention scores were described using means and standard deviations. The Shapiro-Wilk test was used to assess the normality of the data distribution for the primary outcome variables. The results confirmed that the knowledge, clinical judgment, and simulation effectiveness scores were all normally distributed ($p > .05$). Therefore, a paired t-test was used to analyze the differences between pre- and post-intervention scores. This test was appropriate for evaluating the mean changes within a single group when the data were normally distributed, with a statistical significance of $p < .05$.

2) Qualitative analysis

The free-text feedback from participants was first translated into English and subsequently analyzed in a three-stage process: text preprocessing, sentiment and emotion analysis, and visualization and summary. In the preprocessing stage, the text was cleansed by removing unnecessary elements such as special characters and redundancies. The sentences were refined by identifying the root forms of the keywords (lemmatization). Subsequently, a validated natural language processing tool was used to automatically classify each sentence by its sentiment polarity (positive, neutral, or negative)

Table 1. Scenario progression

	Contents of the VR simulation learning module	Time (min)
Learning objectives and expected outcomes	• To assess and interpret pediatric patients' pneumonia and related signs and symptoms.	-
	• To identify and implement appropriate nursing interventions based on the patient's clinical signs and symptoms.	
	• To select and prepare essential basic nursing skills required for solving nursing problems.	
	• To enhance practical clinical competence in the diagnosis, assessment, and management of pediatric respiratory diseases.	
	• To develop the ability to understand and appropriately respond to the complex symptoms and diagnostic features of pneumonia.	
	• To cultivate rapid and accurate decision-making skills in response to real-time changes in a patient's condition.	
Phase		
Pre-test	• Collection of general characteristics: gender, age, year in school, GPA (via self-administered questionnaire): pneumonia knowledge test (10 researcher-developed multiple-choice items based on scenario learning goals); clinical judgment (Nursing Clinical Judgment Scale; 23 items, 5-point Likert; Cronbach's $\alpha = 0.88$); simulation effectiveness (Simulation Effectiveness Tool-Modified; 19 items, 3-point Likert; Cronbach's $\alpha = 0.89$)	15
PreBriefing stage	• Orientation on learning objectives (knowledge of pediatric pneumonia, assessment skills, medication administration, communication, patient safety); introduction of patient case (5-year-old male with fever and dry cough); description of simulation setting and equipment: virtual simulator, monitor, PPE, thermometer, IV lines, infusion pump, oxygen kit, medications (e.g., Bactacin, NS, Ventolin, Mucomyst, Acetaphen); explanation of learner roles, time allocation, and debriefing process	20
Tutorial	• Technical orientation to VR environment and device use	30
VR simulation practice stage	• Simulation scenario based on the case of a 5-year-old male (Kim Hanbyeol) diagnosed with pneumonia; patient with persistent fever and dry cough, transferred to ER after initial outpatient visit; simulation includes clinical assessment, nursing decision-making, and intervention; reference data include patient history, radiologic images, and lab results	30
Debriefing stage	• Video-assisted debriefing in small groups (3–8 learners); structured discussion: recall (reaction), analysis, summary, self-reflection, and group discussion; guided questions: what happened, what went well/poorly, what to improve, what was learned; encourages reflection on nursing knowledge, skills, and attitudes; focus on prioritization, judgment, and clinical reasoning	20
Post-test	• Reassessment of pneumonia knowledge (10-item multiple-choice); clinical judgment (NCJS; 23 items, 5-point Likert; Cronbach's $\alpha = 0.88$); simulation effectiveness (SET-M; 19 items, 3-point Likert; Cronbach's $\alpha = 0.89$); simulation usability (User Experience Questionnaire; 26 items, 7-point semantic differential scale; Cronbach's $\alpha = 0.90$)	15

ER, emergency room; GPA, grade point average; IV, intravenous; NCJS, Nursing Clinical Judgment Scale; PPE, personal protective equipment; SET-M, Simulation Effectiveness Tool-Modified; VR, virtual reality.

and primary emotions (e.g., joy, sadness, and fear). Polarity was categorized on a 3-point scale, whereas emotional intensity was calculated as a score ranging from 0 to 1 and recorded in a data table. The results of this analysis were aggregated into tables and visualized using bar graphs, histograms, and word clouds to summarize the findings.

7. Ethical Considerations

Beyond formal approval, additional measures were taken to safeguard ethical standards. Participants were recruited voluntarily via an online bulletin board, with explicit assurance of their right to withdraw at any time without penalty. To protect confidentiality, all data were anonymized immediately using unique codes, and identifying information was

stored separately in a secure location.

To minimize potential coercion, no faculty members involved in academic evaluation participated in recruitment or intervention. The corresponding author, a doctoral researcher with no prior relationship with the participants, conducted all study procedures. Participant safety was prioritized, with students informed about possible VR-related side effects and advised to stop immediately if discomfort occurred. As a token of appreciation, participants received a 50,000 Korean won mobile gift certificate for stationery.

RESULTS

1. Baseline Characteristics and Pretest Results

The participants comprised 13 females (65.0%) and seven males (35.0%). Their mean age was 23.20±1.32 years. All the participants were senior students, and the most frequent GPA range was 4.0–4.5 (45.0%). At baseline, the mean scores for PNKP, NCJS, and SET-M were 6.60±1.40, 4.15±0.36, and 2.47±0.31, respectively. The Shapiro-Wilk test indicated that the primary outcome variables (PNKP, NCJS, and SET-M) were normally distributed ($p>.05$), justifying the use of parametric tests for pre-post comparisons. The baseline characteristics of the participants are presented in Table 2.

2. Results of the Difference Analysis

The pre-post analysis indicated no significant change in the participants' PNKP scores (t=–0.14, $p=.893$). Conversely, a statistically significant increase was observed in the overall mean NCJS score (t=4.23, $p<.001$). Specifically, significant improvements were observed in the NCJS subdomains of comprehensive data analysis (t=4.34, $p<.001$), evidence for intervention (t=2.54, $p=.020$), and patient-centered nursing (t=3.87, $p=.001$).

The overall mean score for the SET-M also showed a significant increase (t=2.75, $p=.013$). Among the SET-M subdomains, the scores for pre-briefing (t=2.57, $p=.019$) and debriefing (t=2.10, $p=.049$) increased significantly. The change in the scenario subdomain was not statistically significant (t=1.86, $p=.079$). The results of the difference analysis of the primary variables are summarized in Table 3.

3. Simulation Usability Results

The analysis of the UEQ revealed varied results across its dimensions. Under the attractiveness dimension, the scores for the items "pleasant" and "understandable" were relatively low. Under the perspicuity dimension, the "predictable" item was rated particularly low. By contrast, the "good" item under the efficiency dimension received a comparatively high score. However, under the dependability dimension, the "safe" item was rated relatively low. Furthermore, the "innovative" item (1.75±0.97) under the novelty dimension was rated very close to the "conservative" item (1), indicating that participants perceived the VR program as similar to existing methods instead of viewing it as innovative. Similarly, the "boring" (1) versus "interesting" (7) item under the attractiveness dimension received a score of 1.55±0.89, leaning

Table 2. Baseline characteristics and pre-test scores of primary variables

Variable	No. (%)	M±SD	Min	Max	Median	Skew	Kurt	Shapiro-Wilk (*p*)
Sex								
Male	7 (35.0)							
Female	13 (65.0)							
Age (yr)		23.20±1.32	22	26	23	0.75	0.38	0.94 (<.001)
22–23	11 (55.0)							
24–26	9 (45.0)							
Grade: 4th	20 (100.0)							
GPA								
3.0–3.5	5 (25.0)							
3.5–4.0	6 (30.0)							
4.0–4.5	9 (45.0)							
PNKP		6.60±1.40	4	9	7	0.03	0.79	0.95 (.31)
NCJS		4.15±0.36	3.48	4.83	4.13	0.21	0.48	0.97 (.81)
SET-M		2.47±0.31	1.95	3.00	2.42	0.34	0.82	0.95 (.38)

GPA, grade point average; NCJS, Nursing Clinical Judgment Scale; PNKP, pediatric nursing knowledge regarding pneumonia; SD, standard deviation; SET-M, Simulation Effectiveness Tool-Modified; UEQ, User Experience Questionnaire.

Table 3. Pre-post comparison of primary variables

Variable	Pre-test	Post-test	t (*p*)
PNKP	6.60±1.40	6.60±1.64	–0.14 (.893)
NCJS	4.15±0.36	4.40±0.44	4.23 (<.001)
Comprehensive data analysis	4.21±0.53	4.50±0.44	4.34 (<.001)
Intervention evaluation and reflection	4.23±0.46	4.32±0.44	0.75 (.460)
Intervention evidence	4.08±0.46	4.34±0.46	2.54 (.020)
Interprofessional consultation	4.17±0.63	4.40±0.74	1.73 (.100)
Patient-centered nursing	4.00±0.60	4.38±0.52	3.87 (.001)
Peer nurse collaboration	4.27±0.59	4.40±0.74	0.95 (.352)
SET-M	2.47±0.31	2.67±0.31	2.75 (.013)
Prebriefing	2.40±0.45	2.70±0.47	2.57 (.019)
Scenario	2.42±0.37	2.61±0.41	1.86 (.078)
Debriefing	2.63±0.36	2.81±0.29	2.10 (.049)

Values are presented as mean±standard deviation unless otherwise stated.
NCJS, Nursing Clinical Judgment Scale; PNKP, pediatric nursing knowledge regarding pneumonia; SET-M, Simulation Effectiveness Tool-Modified.

toward "boring," which suggested a need for improving engagement. Conversely, under the efficiency dimension, the "good" (1) versus "bad" (7) item obtained a score of 1.75±0.85, in favor of "good." Additionally, the "difficult" (1) versus "easy" (7) item received a score of 5.15±1.04, leaning toward "easy," which indicated positive evaluations of efficiency. A detailed breakdown of the UEQ results is presented in Table 4.

4. Sentiment Analysis Results

1) Distribution of text sentiment polarity

The analysis of sentiment polarity in the participant responses showed that positive sentiments were the most frequent, accounting for approximately 35 instances (Figure 2A). This was followed by neutral (approximately 25 instances) and negative (approximately 20 instances) sentiments, suggesting that the participants generally held a positive perception of the VR simulation experience. Positive comments were primarily focused on the realism of the educational content, such as "It was good because it was similar to the actual clinical environment"; however, negative comments tended to relate to usability issues, such as "Movement was difficult, and operation was not easy."

2) Distribution of primary emotions

The analysis of the primary emotions expressed in the text revealed that "neutral" was the most predominant emotion, with approximately 30 instances (Figure 2B). "Sadness," "fear," and "joy" were present in high proportions, with approximately 15 instances each. By contrast, "surprise" (approximately five instances), "anger" (approximately two instances), and "disgust" (approximately one instance) were minimal. The prevalence of neutral responses indicated that participants often provided objective, factual feedback, such as "I was able to understand the tutorial." Simultaneously, the results revealed complex emotional states. Feelings of pressure related to learning performance (sadness and fear), as in "I was disappointed that I couldn't learn properly," were mixed with positive feelings from a new experience (joy), such as "It was good to experience a new type of simulation."

3) Distribution of emotion intensity scores

A histogram analysis of the emotion intensity scores revealed a bimodal distribution, with distinct peaks in the 0.3–0.4 range (approximately 6–7 instances) and the 0.9–1.0 range (approximately 9–10 instances) (Figure 2C). This suggested that participants' experiences were divided into two distinct types. Neutral experiences with low emotional arousal, such as "I learned the controls without much difficulty," corresponded to lower intensity scores. By contrast, experiences that elicited a strong emotional reaction, such as "I was flustered when the alarm sounded on the patient monitor," were associated with high intensity scores. This implied that the intensity of emotion varied according to the participants' level of immersion and perceived difficulty of the tasks.

4) Word cloud analysis

The word cloud analysis, which visualized key terms from the text data, showed that "patient," "simulation," "nursing," and "VR" were the most prominent words (Figure 2D). This clearly reflected this study's central theme of patient care simulation using VR technology. Furthermore, words such

Table 4. Result of user experience questionnaire

Dimension	Item no.	Left (1)	M±SD	Right (7)
Attractiveness	1	Annoying	2.65±1.53	Pleasant
	2	Incomprehensible	2.50±1.53	Understandable
	3	Novel	2.10±1.86	Conventional
	4	Easy to use	4.85±1.31	Complex to use
	5	Beneficial	2.15±1.42	Not beneficial
	6	Boring	1.55±0.89	Interesting
Perspicuity	7	Not fun	1.55±0.83	Fun
	8	Unpredictable	4.65±1.14	Predictable
	9	Fast	2.95±1.00	Slow
	10	Creative	2.05±1.00	Conventional
Efficiency	11	Difficult	5.15±1.04	Easy
	12	Good	1.75±0.85	Bad
	13	Complex	5.30±1.03	Simple
	14	Unpleasant	2.10±1.17	Attractive
Dependability	15	Conventional	2.70±1.17	Modern
	16	Not enjoyable	1.95±1.00	Enjoyable
	17	Safe	2.65±1.27	Unsafe
	18	Stimulating	2.65±0.93	Dull
Stimulation	19	Meets expectations	2.40±1.47	Does not meet expectations
	20	Inefficient	2.40±1.14	Efficient
	21	Clear	2.65±1.14	Unclear
	22	Not practical	2.50±1.28	Practical
Novelty	23	Concise	4.00±1.26	Confusing
	24	Fascinating	2.30±1.17	Difficult to understand
	25	Familiar	3.15±1.04	Absolute
	26	Conservative	1.75±0.97	Innovative

SD, standard deviation.

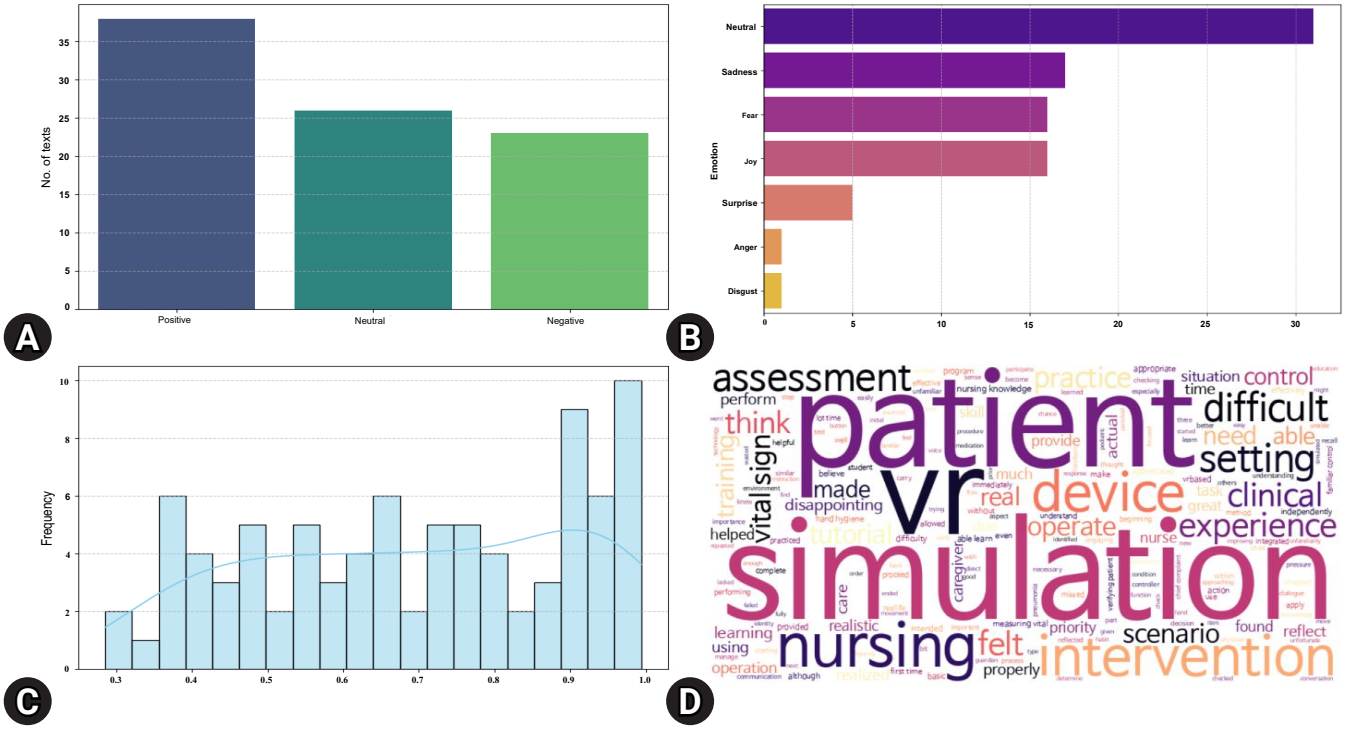


Figure 2. Sentiment analysis results. (A) Polarity distribution. (B) Primary emotion distribution. (C) Emotion intensity score distribution. (D) Main keywords word cloud.

as "difficult," "learn," "operate," and "realistic" appeared with high frequency. This finding indicated that the participants' core perceptions involved the opportunity for a realistic learning experience and the challenges of operating the system. This trend was consistent with the results of the sentiment and emotion analyses.

DISCUSSION

This study demonstrated that, although VR simulation is a promising tool for enhancing nursing students' clinical judgment and perceived effectiveness, it involves the challenge of translating immersive experiences into measurable knowledge gains. The improvement in practical decision-making skills suggested that VR can effectively supplement clinical training. However, the lack of knowledge gain underscores the need for robust instructional design to ensure cognitive consolidation.

This lack of knowledge gain was likely multifactorial. The intervention—a single session with brief pre-briefing and debriefing periods—might have provided an insufficient dose of content exposure and structured reflections for knowledge acquisition. Educational theory posits that, for experiential learning to consolidate into long-term memory, robust conceptual framing is required before the experience and structured metacognitive reflection afterward [25]. This aligns with findings from other VR-based education studies, suggesting that multiple exposures are often necessary to achieve significant knowledge improvement [26]. Furthermore, this finding should be interpreted with caution owing to the nature of the measurement instrument. As the 10-item knowledge test was developed by the researcher and its psychometric properties, such as validity and reliability, were not formally established, its capacity to accurately detect changes in knowledge may be limited. Therefore, to ensure that VR-based learning enhances both practical skills and knowledge, we recommend a three-stage design: comprehensive e-learning to build a conceptual foundation, VR simulation for application, and a final stage of debriefing paired with quizzes to foster consolidation and integration.

In contrast to the findings on knowledge, the VR simulation had a positive influence on learners' NCJS. The improvement in NCJS scores after the VR session can be interpreted as an enhancement of students' critical thinking and clinical reasoning abilities gained through the experience of practicing decision-making in virtual patient care scenarios. As VR provided a realistic clinical environment in which students could attempt various judgments without risk, they had several opportunities to consider the rationale for their judgments and practice decision-making in complex situations.

However, conflicting findings have been reported regarding the improvements in clinical judgment. According to Ha et al. [27], VR education did not show a statistically significant advantage over traditional teaching methods in enhancing critical thinking. This discrepancy may be attributable to factors such as the sensitivity of the assessment instrument, learners' baseline competency levels, and the specific design of the scenarios. Although the single-group design of this study, which lacked a control group, limited the ability to determine its absolute effectiveness, the magnitude of the pre-post improvement suggested that the VR learning experience was beneficial for developing students' clinical judgment. Particularly, when accompanied by sufficient feedback and debriefing, VR simulations can demonstrate high potential as a tool for developing clinical judgment.

The significant increase in simulation effectiveness scores indicated an overall improvement in student satisfaction with VR learning. As the SET-M is an instrument that assesses learners' perceptions of how effective a simulation experience is in achieving learning objectives, the increase in scores signified that students perceived the VR scenario as a "beneficial experience that was helpful for achieving practice objectives" [22]. The participants most likely experienced an improvement in their nursing performance capabilities through a more immersive VR experience. This finding is consistent with those of previous studies. For example, Choi et al. [28] reported that VR-based education facilitates learning, with students stating a preference for it and a desire to use it in diverse scenarios.

Thus, introducing a VR simulation led to significant improvements in learning satisfaction and positive perceptions of the learning experience. This can be attributed to VR's high degree of presence and interactivity, stimulating learning motivation and enhancing a sense of achievement. Taken together, our quantitative results suggested that VR nursing simulation can positively affect multiple learning domains, providing evidence for its use as an innovative pedagogical strategy to enhance learning outcomes in future nursing education.

The data on the experience of using the VR simulation, collected through qualitative analysis, were also largely positive. The results for the UEQ indicated that students general-

ly rated the VR learning system favorably across dimensions such as attractiveness, perspicuity, efficiency, and novelty. This signified that the students perceived VR-based learning as an engaging experience that provided a novel stimulus for their studies. Nursing students who experienced the VR simulation provided positive feedback, with comments such as "It felt like learning in a completely new way" and "I was so immersed it felt like I was caring for a real patient."

Such positive user experiences are critical factors in enhancing learning effectiveness as they increase learners' immersion and motivation. Prior studies have also reported that students participating in nursing education using fully immersive VR demonstrated high levels of immersion by learning in realistic situations and showed a generally favorable attitude toward the learning experience. In their qualitative analysis of nursing students' experiences with a VR simulation, Saab et al. [29] concluded that "VR learning authentically reproduces real nursing care and is enjoyable, immersive, memorable, and inclusive." This corroborates our findings that the participants gained a quasi-realistic clinical experience through VR learning and that their overall user experience was favorable.

Furthermore, the sentiment analysis results identified numerous positive affective expressions. For instance, words such as "fun," "interesting," and "vivid" were frequently mentioned, demonstrating the enjoyment and satisfaction derived from the VR learning experience. This affective immersion is linked to a sense of learning efficacy, which can be considered a desirable educational outcome.

Despite the positive feedback, the qualitative data revealed areas for improvement, primarily related to usability issues such as operational difficulties and a lack of haptic feedback. These findings highlight key considerations for designing future VR educational programs. Technical aspects such as cybersickness must be mitigated through content optimization to maximize learning effectiveness [30]. From a pedagogical standpoint, providing a thorough orientation and adaptation period is crucial for reducing learners' cognitive load and facilitating immersion [31]. Finally, the instructional design should be iterative, incorporating user feedback to enhance interface intuitiveness and interactivity, such as by incorporating conversational scenarios or multimodal interactions [32].

Nevertheless, this study has a significant strength in that it illuminated the effects of VR nursing education from multiple perspectives. By objectively measuring changes in learning outcomes through quantitative metrics while integrating qualitative data such as user experience and sentiment analysis, the study provided deep insights into why and how the learning experience was formed. Thus, this study is crucial for its use of a mixed-methods design to elucidate the pedagogical value of VR at multiple levels within a specific clinical context (pediatric pneumonia nursing). The findings provide empirical foundational data for the future development and application of VR educational programs.

However, several limitations must be carefully considered when interpreting and applying these results. First, the single-group pretest–posttest design, which lacked a control group, made it difficult to definitively attribute the observed positive changes solely to the independent effect of the VR program. Second, the instrument used to measure knowledge change was researcher-developed. While the items were reviewed by content experts, formal psychometric testing, such as calculating a content validity index from external experts or assessing internal consistency reliability, was not performed. The lack of established validity and reliability for the knowledge assessment tool is a clear limitation of this study and must be considered when interpreting the results. Therefore, future studies should use fully validated instruments. These limitations highlight the need for future research that incorporates randomized controlled trial designs, utilizes standardized measurement instruments, and conducts longitudinal studies to track the persistence of learning outcomes.

CONCLUSION

This pilot study was conducted to develop a VR nursing simulation program for pediatric patients with pneumonia tailored to the Korean clinical context and validate its effectiveness. The findings indicated that the program yielded positive effects, significantly enhancing nursing students' clinical judgment and simulation effectiveness. Although the short-term intervention did not lead to a significant improvement in nursing knowledge, it highlighted the necessity of reinforcing future versions of the program with repetitive learning and systematic debriefing. Furthermore, while learners reported high overall satisfaction and immersion, some noted operational challenges, confirming the importance of enhancing the user experience.

Therefore, the significance of this study lies in its empirical confirmation of the pedagogical potential of the VR simula-

tion in Korean pediatric nursing education. It also proposes specific directions for improvement such as reinforcing learning content through repetition, enhancing debriefing, and optimizing the user interface to ensure effective program design and application. Future refinement of the program based on these findings and follow-up studies with more rigorous research designs can help VR simulation become a key pedagogical strategy in nursing education.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: EJK. Methodology: EJK, SKK. Funding Acquisition: EJK. Project Administration: EJK. Investigation: SKK. Data Curation: SKK. Formal Analysis: SKK. Validation: EJK, SKK, SSS. Writing – Original Draft: EJK, SKK, SSS. Writing – Review & Editing: EJK, SKK, SSS. Supervision: EJK.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

This study was supported by a National Research Foundation of Korea (NRF) grant funded by the Korean government (No. 2021R1A2C1095530).

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Eun Joo Kim https://orcid.org/0000-0002-1554-3927
https://researcherid.com/KIB-8989-2024
Seong Kwang Kim https://orcid.org/0000-0002-8029-2722
https://researcherid.com/MVU-4257-2025
Sung Sook Song https://orcid.org/0000-0002-8061-5659
https://researcherid.com/OGQ-5813-2025

REFERENCES

1. Malya RM, Mahande MJ, Urstad KH, Rogathi JJ, Bø B. Perception of simulation-based education among nursing and midwifery students in Tanzania: a qualitative study. Adv Simul (Lond). 2025;10(1):8. https://doi.org/10.1186/s41077-025-00339-1
2. Tong LK, Li YY, Au ML, Ng WI, Wang SC, Liu Y, et al. The effects of simulation-based education on undergraduate nursing students' competences: a multicenter randomized controlled trial. BMC Nurs. 2024;23(1):400. https://doi.org/10.1186/s12912-024-02069-7
3. Alharbi A, Nurfianti A, Mullen RF, McClure JD, Miller WH. The effectiveness of simulation-based learning (SBL) on students' knowledge and skills in nursing programs: a systematic review. BMC Med Educ. 2024;24(1):1099. https://doi.org/10.1186/s12909-024-06080-z
4. Sihnas MA, Sujendran S, Sathaananthan T. The effectiveness of simulation-based learning in nursing education: a review. Int J Sci Res Publ. 2024;14(1):550-555. https://doi.org/10.29322/IJSRP.14.01.2024.p14565
5. Yeo JY, Nam H, Park JI, Han SY. Multidisciplinary design-based multimodal virtual reality simulation in nursing education: mixed methods study. JMIR Med Educ. 2024;10:e53106. https://doi.org/10.2196/53106
6. Elendu C, Amaechi DC, Okatta AU, Amaechi EC, Elendu TC, Ezeh CP, et al. The impact of simulation-based training in medical education: a review. Medicine (Baltimore). 2024;103(27):e38813. https://doi.org/10.1097/MD.0000000000038813
7. Shahzeydi A, Dianati M, Kalhor F. Clinical simulation in nursing students' safe medication administration: a systematic review. Iran J Nurs Midwifery Res. 2024;29(5):522-529. https://doi.org/10.4103/ijnmr.ijnmr_323_23
8. El Hussein MT, Hirst SP. High-fidelity simulation's impact on clinical reasoning and patient safety: a scoping review. J Nurs Regul. 2023;13(4):54-65. https://doi.org/10.1016/s2155-8256(23)00028-5
9. Cheon J, Kim H, Kim DH. Healthcare providers' communication experience in the pediatric intensive care unit: a phenomenological study. BMC Health Serv Res. 2024;24(1):956. https://doi.org/10.1186/s12913-024-11394-1
10. Health Insurance Review & Assessment Service. Research on improvement of reimbursement for expansion of pediatric emergency medical care: final report. Health Insurance Review & Assessment Service; 2020.
11. Hong CM, Whang SA. Simulation practice in pediatric nursing: a scoping review. Heal Nurs. 2021;33(2):35-45. https://doi.org/10.29402/HN33.2.4
12. Kim E, Song S, Kim S. Development of pediatric simulation-based education: a systematic review. BMC Nurs. 2023;22(1):291. https://doi.org/10.1186/s12912-023-01458-8
13. Ayaz O, Ismail FW. Healthcare simulation: a key to the future of medical education: a review. Adv Med Educ Pract. 2022;13:301-308.

https://doi.org/10.2147/AMEP.S353777
14. Sung H, Kim M, Park J, Shin N, Han Y. Effectiveness of virtual reality in healthcare education: a systematic review and meta-analysis. Sustainability. 2024;16(19):8520. https://doi.org/10.3390/su16198520
15. Del Castillo Miranda JC, Oweidat M, Abady E, Shehadeh MH, Aziz MM, Onyejesi CD, et al. Enhancing pediatric emergency care in low-resource settings through simulation-based training: a narrative review. Sage Open Pediatr. 2025;12:30502225251319883. https://doi.org/10.1177/30502225251319883
16. Al-Ghareeb AZ, Cooper SJ. Barriers and enablers to the use of high-fidelity patient simulation manikins in nurse education: an integrative review. Nurse Educ Today. 2016;36:281-286. https://doi.org/10.1016/j.nedt.2015.08.005
17. Foronda CL, Fernandez-Burgos M, Nadeau C, Kelley CN, Henry MN. Virtual simulation in nursing education: a systematic review spanning 1996 to 2018. Simul Healthc. 2020;15(1):46-54. https://doi.org/10.1097/SIH.0000000000000411
18. Jallad ST. Effectiveness of simulation-based education on educational practices of communication skills, satisfaction, and self-confidence among undergraduate nursing students. Creat Nurs. 2025;31(2):135-143. https://doi.org/10.1177/10784535241301115
19. Des Jarlais DC, Lyles C, Crepaz N. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: the TREND statement. Am J Public Health. 2004;94(3):361-366. https://doi.org/10.2105/ajph.94.3.361
20. Whitehead AL, Julious SA, Cooper CL, Campbell MJ. Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. Stat Methods Med Res. 2016;25(3):1057-1073. https://doi.org/10.1177/0962280215588241
21. Kwon SN, Park H. Development of Nursing Clinical Judgment Scale. J Korean Acad Nurs. 2023;53(6):652-665. https://doi.org/10.4040/jkan.23042
22. Leighton K, Ravert P, Mudra V, Macintosh C. Updating the simulation effectiveness tool: item modifications and reevaluation of psychometric properties. Nurs Educ Perspect. 2015;36(5):317-323. https://doi.org/10.5480/15-1671
23. Laugwitz B, Held T, Schrepp M. Construction and evaluation of a user experience questionnaire In: Holzinger A, editor. HCI and usability for education and work. Springer; 2008. p. 63-76. https://doi.org/10.1007/978-3-540-89350-9_6
24. Schrepp M. User Experience Questionnaire Handbook. UEQ Team; 2017.
25. Merkebu J, Veen M, Hosseini S, Varpio L. The case for metacognitive reflection: a theory integrative review with implications for medical education. Adv Health Sci Educ Theory Pract. 2024;29(4):1481-1500. https://doi.org/10.1007/s10459-023-10310-2
26. Hamilton D, McKechnie J, Edgerton E, Wilson C. Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. J Comput Educ. 2021;8(1):1-32. https://doi.org/10.1007/s40692-020-00169-2
27. Ha YO, Kwon SJ, Kim J, Song JH. Effects of nursing skills practice using VR (virtual reality) on competency and confidence in nursing skills, learning self-efficacy, and satisfaction of nursing students. J Ind Converg. 2022;20(4):47-55. https://doi.org/10.22678/JIC.2022.20.4.047
28. Choi J, Thompson CE, Choi J, Waddill CB, Choi S. Effectiveness of immersive virtual reality in nursing education: systematic review. Nurse Educ. 2022;47(3):E57-E61. https://doi.org/10.1097/NNE.0000000000001117
29. Saab MM, Landers M, Murphy D, O'Mahony B, Cooke E, O'Driscoll M, et al. Nursing students' views of using virtual reality in healthcare: a qualitative study. J Clin Nurs. 2022;31(9-10):1228-1242. https://doi.org/10.1111/jocn.15978
30. Biswas N, Mukherjee A, Bhattacharya S. "Are you feeling sick?": a systematic literature review of cybersickness in virtual reality. Acm Comput Surv. 2024;56(11):1-38. https://doi.org/10.1145/3670008
31. Poupard M, Larrue F, Sauzéon H, Tricot A. A systematic review of immersive technologies for education: learning performance, cognitive load and intrinsic motivation. Br J Educ Technol. 2025;56(1):5-41. https://doi.org/10.1111/bjet.13503
32. Kiourexidou M, Kanavos A, Klouvidaki M, Antonopoulos N. Exploring the role of user experience and interface design communication in augmented reality for education. Technol Interact. 2024;8(6):43. https://doi.org/10.3390/mti8060043

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):211-220
https://doi.org/10.4094/chnr.2025.020

pISSN 2287-9110
eISSN 2287-9129

CHNR

Exploring perception types regarding the effects of energy drink consumption among South Korean male adolescents: a Q-methodology study

Sun Jung Park[1], Eun Ju Choi[2]

[1]Assistant Professor, Department of Nursing, Sahmyook Health University, Seoul, Korea
[2]Associate Professor, Department of Nursing, Cheongam University, Suncheon, Korea

Corresponding author
Eun Ju Choi
Department of Nursing, Cheongam University, 1641 Noksaekro, Suncheon, 57997, Korea
Tel: +82-61-740-7223
Fax: +82-61-740-7180
E-mail: cej1998@nate.com

Received: July 3, 2025
Revised: August 8, 2025
Accepted: August 25, 2025

Purpose: This study aimed to identify distinct subjective viewpoints regarding the perceived effects of energy drink consumption among South Korean male high school students.
Methods: Using Q methodology, a concourse of statements was developed through interviews and literature reviews, and refined into 35 Q samples. Forty male high school students were recruited via snowball sampling to reflect diverse consumption patterns and attitudes. Participants sorted the Q samples using a forced distribution procedure. Data were analyzed using the PC-QUANL program.
Results: Four distinct groups of male adolescents were identified based on their perceived effects of energy drink consumption: (1) effect-oriented experience sharers, (2) ambivalent recognizers of experience, (3) alternative-seeking evaluators, and (4) emotionally reactive responders. These groups' perceptions were shaped by peer influence, personal consumption experiences, and levels of self-regulation.
Conclusion: By typifying the subjective perceptions of Korean male high school students regarding energy drink consumption, this study provides a foundational understanding of how adolescents interpret and respond to such health behaviors. These insights can guide the development of tailored health education programs that address the unique needs and attitudes of each group.

Keywords: Adolescent; Behavior; Consumption; Energy drinks; Qualitative research

INTRODUCTION

Adolescence is a period of rapid physical, emotional, and cognitive development, during which adequate nutrition, sufficient sleep, and balanced lifestyle habits are essential to maintaining health. However, intense academic competition and rigid school schedules in South Korea often result in reduced physical activity, sleep deprivation, and irregular meals, all of which negatively affect adolescents' overall well-being [1].

In recent years, the consumption of high-caffeine energy drinks among adolescents has increased significantly. These beverages are often used for combating fatigue, enhancing concentration, and relieving stress—especially during exam periods. This pattern reflects the growing normalization of energy drink use as a coping mechanism for academic pressure [2]. Energy drinks typically contain stimulants such as caffeine, guarana, taurine, ginseng, and vitamins, and are classified as high-caffeine beverages when they contain more than 0.15 mg of caffeine per 1 mL [3-5]. According to the Korea Consumer Agency, the caffeine content in commonly sold energy drinks ranges from 1.0 to 162.4 mg per can, with

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

an average of 58.1 mg [6].

Caffeine stimulates the central and peripheral nervous systems, thereby reducing fatigue and increasing alertness and performance [7]. Due to these perceived benefits, energy drinks are widely consumed not only by adults but also by adolescents. However, excessive intake can lead to health problems such as palpitations, insomnia, nervousness, and mood instability. These side effects pose particular risks for adolescents, whose developing bodies and minds are more vulnerable to external stimuli [8,9].

Although research has examined the physiological and behavioral effects of high-caffeine beverages, much of it focuses on adults, with relatively limited investigation into adolescents' consumption patterns. Moreover, existing studies tend to highlight behavioral outcomes—such as increased impulsivity, sleep disorders, and depressive symptoms—without adequately exploring how adolescents themselves subjectively understand and interpret their energy drink use [10-16].

Importantly, energy drink consumption among adolescents is not just a matter of individual behavior but is shaped by a broader socio-cultural context. Media advertising, peer influence, and a performance-oriented academic environment contribute to a "culture of energy drink consumption," encouraging habitual use [17-21]. Despite these dynamics, most existing research has relied on quantitative methods, which often fail to capture the nuanced attitudes, values, and contextual meanings behind adolescents' choices.

To address these gaps, the present study collects original data using Q methodology, a mixed-methods approach uniquely suited to exploring the diversity of subjective perspectives. Unlike purely quantitative designs, Q methodology enables the systematic classification of shared viewpoints and reveals the complex thought structures underlying individual behaviors. This method is especially appropriate for examining how adolescents perceive and rationalize energy drink use within their personal and social contexts.

Accordingly, this study aims to (1) identify and classify distinct subjective viewpoints on energy drink consumption among South Korean male high school students and (2) analyze the behavioral and attitudinal characteristics associated with each perception type. By doing so, it provides a deeper understanding of adolescent perceptions and offers a practical foundation for developing targeted health interventions.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Cheongam University (IRB number: CA-17-250326-HR-002-01). Informed consent was obtained from all participants.

1. Study Design

This study is an exploratory investigation utilizing Q methodology, designed to systematically identify and categorize the subjective perceptions of energy drink consumption among South Korean male high school students. This paper was composed according to the guidelines outlined in the Standards for Reporting Qualitative Research reporting guidelines [22].

2. Study Setting and Participants

1) Selection of Q samples

To generate the Q population (concourse), data were collected from 16 male high school students from two schools (A and S) in Seoul between January 3 and February 6, 2025. Participants responded to four open-ended questions: (1) "What positive effects do you think energy drinks have?", (2) "What negative effects do you think energy drinks have?", (3) "What are your thoughts on energy drinks?", and (4) "What effects do you think occur in the body if you don't consume energy drinks?" Based on their responses, in-depth interviews were conducted with all 16 students to explore their subjective experiences and perceptions in greater detail. These interviews continued until data saturation was reached—when no new insights were emerging. Each session lasted 1–2 hours and was recorded and transcribed with participants' consent.

In parallel, approximately 350 preliminary Q statements were extracted through a comprehensive review of domestic and international literature, professional reports, and academic sources. Following iterative refinement involving three nursing faculty members with expertise in Q methodology, a Q population of 150 statements was finalized.

To select the final Q samples, the statements were reviewed, categorized by thematic relevance, and reduced with the aim of capturing diverse yet coherent perspectives. The categorization process was conducted to ensure coverage of

different content domains, not to predefine participant types. Care was taken to balance positive and negative phrasing, ensure conceptual clarity, and tailor the wording to the cognitive level of adolescents. After additional expert review, 35 Q samples were selected, representing a comprehensive range of attitudes toward energy drink consumption.

2) Selection of P samples

Q methodology does not require large sample sizes, as its purpose is to explore the range of subjectivity rather than generalize across populations. Increasing the number of P samples beyond necessity may dilute distinct factor structures. Accordingly, this study followed the conventionally recommended range: 20–60 [23]. The P sample consisted of 40 male high school students in Seoul, Suwon, Yeoju, recruited via snowball sampling through health teachers in seven schools (two in Seoul, three in Suwon, two in Yeoju). The inclusion criteria were: male students without diagnosed chronic illnesses or physical/mental developmental conditions, and deemed by school health records to be in good health. The 16 students who participated in the Q statement generation phase were included in the final P sample. Diversity was ensured across age, grade level, birth order, and self-reported health status. The researchers had no prior relationship with the participating students, and the recruitment was facilitated through school health teachers to minimize potential bias and ensure voluntary participation.

3. Q-Sorting Procedure

The Q sorting process was conducted from April 2 to April 30, 2025. Each participant received the 35 Q samples and was instructed to sort them using a quasi-normal forced distribution grid across a 9-point scale ranging from –4 (most disagree) to +4 (most agree). Initially, they grouped the statements into three broad categories: positive, neutral, and negative. They then assigned individual cards to specific slots within the forced distribution, starting from the extremes.

After completing the sort, participants were asked to explain their reasoning for the two most agreed (+4) and two most disagreed (–4) items. These qualitative responses were recorded, transcribed, and analyzed to support the interpretation of each identified factor. The Q-sorting and follow-up interviews were conducted in a quiet and private setting (e.g., a separate classroom space, school health room, meeting room, or lounge) to ensure participants' comfort and minimize external distractions.

4. Data Analysis

The Q-sort data were entered into the PC-QUANL program for analysis. Factor extraction was based on centroid factor analysis, followed by varimax rotation. Factors were retained if their eigenvalues exceeded 1.0, and solutions with varying numbers of factors were compared. A four-factor solution was selected based on interpretability and explained variance.

Analysis included examining Z-scores (standardized scores) and factor loadings for each item across the four types. The interpretation of each factor was informed by: (1) the distinguishing statements (items with high or low Z-scores), (2) the consensus statements (similar scores across types), and (3) the qualitative comments provided by participants on their extreme item choices.

Participants with the highest factor loadings for a given type—known as exemplars or defining sorts—were used to construct the narrative and interpret the subjective meaning behind each viewpoint [24,25].

RESULTS

1. Formation of Perception-Based Types

Q factor analysis identified four distinct participant types reflecting different perceptions regarding the effects of energy drink consumption among Korean male high school students. These four types explained a cumulative 43.1% of the total variance, with the following distribution: Type I, 17.8%; Type II, 10.7%; Type III, 8.3%; and Type IV, 6.3% (Table 1). Correlation coefficients between types ranged from .12 to .52, with the highest correlation observed between Type I and Type II, and the lowest between Type I and Type IV (Table 2).

2. Characteristics of Participants and Factor Loadings

The P sample included 40 male high school students. Among them, 17-year-olds constituted the largest group

Table 1. Eigen value, explained variance, and cumulative variance of Q factors (N=40)

Variable	Type I	Type II	Type III	Type IV
Eigen value	7.18	4.27	3.32	2.52
Variance (%)	17.8	10.7	8.3	6.3
Cumulative variance (%)	17.8	28.5	36.8	43.1

(n=16; 40.0%), and the most common age of first energy drink consumption was 13–15 years (n=19; 47.5%). Based on factor loadings, participants were classified as follows: Type I (n=7), Type II (n=10), Type III (n=10), Type IV (n=3). The characteristics and factor weights (defining sorts) are presented in Table 3.

Table 2. Correlation coefficients between types (N=40)

Variable	Type I	Type II	Type III	Type IV
Type I	1.00			
Type II	.52	1.00		
Type III	.28	.36	1.00	
Type IV	.12	.22	.15	1.00

3. Description of Participant Types

Defining statements for each type were selected based on Z-scores ≥+1.00 or ≤–1.00. Statements with statistically distinct Z-scores across types were also examined to clarify defining viewpoints. Table 4 summarizes these defining state-

Table 3. Demographic characteristics and factor weight for P-sample (N=40)

Type	Sample no.	Factor weight	Age (yr)	Age at first energy drink consumption (yr)	Average daily intake (# of bottles)	Has disease
Type I (n=7)	3	0.06	19	16–17	2	N
	8	0.36	17	12–10	1	N
	14	1.01	19	16–17	2	N
	16	0.62	17	16–17	3	N
	28	0.34	18	16–17	1	N
	29	0.09	17	18–19	3	N
	36	1.42	17	13–15	2	N
Type II (n=20)	2	0.56	17	16–17	2	N
	4	0.37	18	13–15	2	N
	5	0.13	19	16–17	2	N
	10	0.62	17	18–19	2	N
	11	0.27	18	13–15	1	N
	12	0.22	18	13–15	1	N
	13	0.28	19	16–17	2	N
	19	0.33	18	13–15	<1	N
	20	0.37	17	13–15	<1	N
	21	0.12	19	13–15	2	N
	23	0.28	17	16–17	3	N
	24	0.19	17	18–19	3	N
	25	0.24	18	13–15	1	N
	26	0.24	17	18–19	2	N
	30	0.38	18	13–15	1	N
	31	0.96	19	13–15	2	N
	32	0.09	19	13–15	1	N
	35	0.50	19	13–15	2	N
	37	0.07	19	13–15	2	N
	38	1.13	17	16–17	3	N
Type III (n=10)	1	0.53	19	16–17	2	N
	9	0.74	19	16–17	2	N
	15	0.10	17	16–17	2	N
	17	0.06	19	16–17	2	N
	18	0.45	18	13–15	1	N
	22	0.24	18	13–15	2	N
	27	0.20	17	13–15	2	N
	34	0.14	17	16–17	3	N
	39	0.63	19	13–15	2	N
	40	0.57	18	16–17	2	N
Type IV (n=3)	6	0.31	18	13–15	1	N
	7	0.46	18	13–15	1	N
	37	0.07	17	10–12	<1	Y

ments by type, and consensus items are shown in Table 5.

1) Type I: effect-oriented experience sharers

This group predominantly perceived positive functional effects of energy drinks. They described experiences of increased concentration and stimulation, often reinforced by peer influence. They showed strong agreement with statements "Q6. Drinking energy drinks helps me stay focused for longer (Z=1.25)" and "Q30. I experienced an unusual sensation the first time I drank an energy drink (Z=1.23)." Peer influence was also evident through high agreement with "Q5. I get information about energy drinks from friends (Z=1.19)" and "Q4. Since my friends drink it, I do too ? without really thinking about it (Z=1.14)."

Participant #36, who showed the highest factor loadings (1.42) in Type I, most strongly agreed with "Q6. Drinking energy drinks helps me stay focused for longer" and "Q4. Since my friends drink it, I do too—without really thinking about it." Conversely, they most strongly disagreed with "Q35. Cold water, gum, or vitamins can also help fight drowsiness instead of energy drinks" and "Q18. I habitually reach for energy drinks." These findings indicate that this group perceives significant positive effects from energy drink consumption and is influenced by their social environment, but demonstrates low awareness of potential health risks—highlighting the need for targeted educational interventions.

Table 4. Q sample (N=40)

No.	Q statements	Z-score			
		I (n=7)	II (n=20)	III (n=10)	IV (n=3)
1	Drinking energy drinks during exam periods is considered normal.	2.99	0.48	4.78	5.99
2	I seek out energy drinks to stay awake.	1.28	2.06	1.12	3.49
3	It's convenient because I can easily purchase it anywhere.	0.51	0.14	–0.52	–0.16
4	Since my friends drink it, I do too—without really thinking about it.	1.57	–1.50	1.76	0.16
5	I get information about energy drinks from friends.	–0.51	0.14	–0.52	–0.16
6	Drinking energy drinks helps me stay focused for longer.	–1.61	1.32	–2.33	–2.04
7	I feel like I'm more awake when I drink energy drinks.	2.30	1.32	3.94	5.78
8	I feel less tired.	2.47	–0.16	3.20	3.88
9	I can stay focused and study for extended hours.	–3.67	–0.63	–5.84	–7.37
10	My activity level improves.	0.48	2.19	1.33	3.35
11	I experience side effects like stomachache, heart palpitations, and dizziness.	0.91	1.15	1.43	2.25
12	I feel mentally exhausted, but I still can't fall asleep.	–0.88	–0.99	–1.27	–2.83
13	My daily routine is disrupted by staying up at night.	1.18	–1.21	1.31	0.21
14	I struggle to stay awake in class the next day.	4.76	–0.01	6.78	7.95
15	I have trouble focusing late at night.	–0.06	0.09	–1.12	–1.09
16	I get more emotionally sensitive and easily irritated.	3.68	–1.05	4.29	4.14
17	My emotional ups and downs become more extreme.	0.37	–0.06	–0.71	–0.01
18	I habitually reach for energy drinks.	–2.90	0.85	–4.26	–4.54
19	Energy drinks actually make it harder for me to concentrate.	1.66	–1.37	2.54	1.35
20	I feel mentally foggy and can't concentrate, even though I'm awake.	0.46	1.53	0.33	2.60
21	I feel like my blood circulation is poor.	–0.69	0.55	–1.06	–1.39
22	I've experienced symptoms like headache, stomach pain, increased heart rate, and hand tremors.	0.72	–0.11	2.51	2.25
23	I struggle to speak smoothly all the way through a sentence.	0.45	1.22	0.44	2.20
24	I've felt strong palpitations like my heart would explode.	0.38	0.85	–0.53	0.46
25	I learned about the dangers of energy drink overuse from the news or online articles.	–0.60	1.04	–1.71	–0.81
26	I learned about the risks for teens from energy drinks via social media platforms.	–0.11	3.24	0.04	3.14
27	I learned about the negative effects of energy drinks through parents or teachers.	–1.45	0.40	–2.20	–2.83
28	I heard about physical side effects from friends.	2.36	–0.30	2.30	2.83
29	Compared to other supplements (gum, vitamins, etc.), energy drinks are more effective.	0.68	-0.11	1.10	0.06
30	I experienced an unusual sensation the first time I drank an energy drink.	2.29	1.33	3.38	4.98
31	I didn't try to limit how much I consumed.	–0.72	–2.78	–1.68	–4.83
32	I missed the right moment to stop.	0.22	–0.43	–0.87	–0.88
33	I drink energy drinks without much thought, like a regular beverage.	3.64	0.75	5.08	7.27
34	I feel anxious that my focus and energy will drop if I don't drink energy drinks.	0.95	0.35	1.52	1.91
35	Cold water, gum, or vitamins can also help fight drowsiness instead of energy drinks.	–0.44	1.90	–0.41	1.29

Table 5. Representative Q-samples and Z-scores in types (N=40)

Type	Sample no.	Q-statement	Z-score	Average	Difference
Type I. Effect-oriented experience sharers (n=7)	6	Drinking energy drinks helps me stay focused for longer.	1.25	1.35	2.17
	30	I experienced an unusual sensation the first time I drank an energy drink.	1.23	1.33	0.80
	5	I get information about energy drinks from friends.	1.19	1.19	0.68
	29	Compared to other supplements (gum, vitamins, etc.), energy drinks are more effective.	1.18	1.18	0.59
	7	I feel like I'm more awake when I drink energy drinks.	1.15	1.15	1.36
	4	Since my friends drink it, I do too—without really thinking about it.	1.14	1.05	1.30
	8	I feel less tired.	1.13	–1.30	0.24
	3	It's convenient because I can easily purchase it anywhere.	1.11	–1.13	–0.60
	35	Cold water, gum, or vitamins can also help fight drowsiness instead of energy drinks.	1.05	–1.58	–0.63
	2	I seek out energy drinks to stay awake.	–1.01	–1.75	–0.56
	18	I habitually reach for energy drinks.	–1.23	–1.60	–0.35
	25	I learned about the dangers of energy drink overuse from the news or online articles.	–1.40	–0.75	–0.63
	19	Energy drinks actually make it harder for me to concentrate.	–1.58	0.90	0.22
	24	I've felt strong palpitations like my heart would explode.	–1.73	0.82	0.19
	20	I feel mentally foggy and can't concentrate, even though I'm awake.	–1.75	0.93	0.25
	26	I learned about the risks for teens from energy drinks via social media platforms.	–2.00	–1.16	–1.72
Type II. Ambivalent recognizers of experience (n=20)	10	My activity level improves.	2.10	–1.10	1.57
	9	I can stay focused and study for extended hours.	2.07	–1.90	–0.92
	11	I experience side effects like stomachache, heart palpitations, and dizziness.	1.99	–0.43	0.33
	12	I feel mentally exhausted, but I still can't fall asleep.	1.21	–0.11	1.33
	8	I feel less tired.	1.10	–1.14	0.25
	3	It's convenient because I can easily purchase it anywhere.	–1.02	–1.20	0.18
	33	I drink energy drinks without much thought, like a regular beverage.	–1.10	–1.20	–1.23
	27	I learned about the negative effects of energy drinks through parents or teachers.	–1.15	0.10	–0.84
	30	I experienced an unusual sensation the first time I drank an energy drink.	–1.28	0.40	–0.37
	2	I seek out energy drinks to stay awake.	–1.74	0.45	–0.39
Type III. Alternative-seeking evaluators (n=10)	35	Cold water, gum, or vitamins can also help fight drowsiness instead of energy drinks.	2.10	0.33	0.27
	34	I feel anxious that my focus and energy will drop if I don't drink energy drinks.	1.60	0.20	0.17
	29	Compared to other supplements (gum, vitamins, etc.), energy drinks are more effective.	1.37	–1.08	1.54
	33	I drink energy drinks without much thought, like a regular beverage.	1.32	–0.60	0.10
	28	I heard about physical side effects from friends.	1.09	–1.53	–0.57
	31	I didn't try to limit how much I consumed.	1.00	–1.13	0.27
	12	I feel mentally exhausted, but I still can't fall asleep.	–1.13	–1.45	–0.15
	9	I can stay focused and study for extended hours.	–1.42	–0.50	–0.30

(Continued on the next page)

Table 5. Continued

Type	Sample no.	Q-statement	Z-score	Average	Difference
	27	I learned about the negative effects of energy drinks through parents or teachers.	–1.46	0.60	–0.18
	2	I seek out energy drinks to stay awake.	–1.55	0.30	–0.50
Type IV. Emotionally reactive responders (n=3)	17	My emotional ups and downs become more extreme.	1.85	0.40	–0.45
	16	I get more emotionally sensitive and easily irritated.	1.47	0.20	0.09
	15	I have trouble focusing late at night.	1.36	0.15	0.10
	32	I missed the right moment to stop.	1.20	–1.10	0.14
	33	I drink energy drinks without much thought, like a regular beverage.	1.13	–0.55	0.17
	6	Drinking energy drinks helps me stay focused for longer.	1.10	–1.20	–0.13
	31	I didn't try to limit how much I consumed.	1.06	–1.30	0.04
	19	Energy drinks actually make it harder for me to concentrate.	–1.00	–1.10	0.32
	2	I seek out energy drinks to stay awake.	–1.01	–0.24	–1.51
	21	I feel like my blood circulation is poor.	–1.27	–0.59	–1.01

2) Type II: ambivalent recognizers of experience

These participants held mixed views, acknowledging both performance benefits and physical/mental side effects. These participants exhibited high agreement with statements indicating perceived functional advantages, such as "Q10. My activity level improves (Z=2.10)" and "Q9. I can stay focused and study for extended hours (Z=2.07)," suggesting they view energy drinks as helpful for boosting physical energy and study endurance. At the same time, they also acknowledged drawbacks, showing strong agreement with "Q11. I experience side effects like stomachache, heart palpitations, and dizziness (Z=1.15)," Q12. I feel mentally exhausted, but I still can't fall asleep (Z=1.21)," and "Q8. I feel less tired (Z=1.10)," highlighting a balanced awareness of both relief from fatigue and resulting discomfort.

Participant #38, who had the highest factor weight (1.13) in Type II, agreed with both the positive effects of energy drinks on study performance and activity level (Q9, Q10) and with their physical side effects and impact on sleep (Q11, Q12). They most strongly disagreed with Q2. I seek out energy drinks to stay awake and Q27. I learned about the negative effects of energy drinks through parents or teachers.

Overall, Type II acknowledges the functional benefits of energy drinks while maintaining a clear awareness of their side effects. This suggests a cautious use pattern and a greater likelihood of being receptive to educational messages or health warnings.

3) Type III: alternative-seeking evaluators

This group evaluated energy drinks critically, acknowledging temporary effects while expressing openness to alternatives. They showed the highest agreement with "Q35. Cold water, gum, or vitamins can also help fight drowsiness instead of energy drinks (Z=2.10)," indicating a willingness to consider non-caffeinated substitutes. However, they also expressed a degree of psychological reliance, agreeing with "Q34. I feel anxious that my focus and energy will drop if I don't drink energy drinks (Z=1.60)," and acknowledged effectiveness through "Q29. Compared to other supplements (gum, vitamins, etc.), energy drinks are more effective (Z=1.37, difference=1.54)," suggesting that psychological dependence and high expectations coexist.

Participant #9, who showed the highest factor weight (0.74) in Type III, agreed with statements on effectiveness (Q29), alternative options (Q35), unconscious consumption (Q33), and psychological anxiety (Q34), while showing relatively low awareness of sleep-related side effects (Q12).

Taken together, this suggests that Type III acknowledges the partial effectiveness of energy drinks while recognizing alternative options and shows signs of habitual consumption and performance-related anxiety. Therefore, health education for this group should focus on self-regulation strategies and promoting clear, practical alternatives.

4) Type IV: emotionally reactive responders

Participants in this group clearly recognized emotional instability and negative aftereffects of energy drinks. They

strongly agreed with "Q17. My mood swings become more severe (Z=1.85)" and "Q16. I become more sensitive and easily irritated (Z=1.47)" indicating that they experience emotional instability and reduced concentration after consumption. Interestingly, they showed contradictory responses to "Q6. My concentration lasts longer when I drink energy drinks (Z=1.10)" and "Q19. I can't concentrate better even after drinking energy drinks (Z=–1.00)," indicating an ambivalent perception of the effects. This reflects a complex attitude in which, despite recognizing the side effects, they still expect temporary effects within the context of psychological habituation through repeated consumption.

Participant #7, who showed the highest factor loading (0.46) in Type IV, agreed with the concentration-enhancing effect (Q6), while also recognizing mood swings (Q17) and nervous sensitivity (Q16). However, they showed low agreement with items related to self-regulation (Q31) and physical discomfort (Q21).

Taken together, this data suggests that Type IV is exposed to emotional instability and habitual consumption issues, indicating the need for future health education focused on stress management and self-regulation strategies. They are experiencing emotional instability and habituation problems caused by energy drink consumption, suggesting the need for psychological counseling or concurrent stress management education.

4. The Items Agreed or Disagreed upon by Every Type

The statement commonly disagreed upon across all types was "Q2. I seek out energy drinks to stay awake (Z=–0.41)." This indicates that male high school students tend not to use energy drinks as a means of relieving drowsiness, suggesting that they consume them for other purposes or due to different factors.

DISCUSSION

This study employed Q methodology to classify adolescents' subjective perceptions of energy drink consumption into four distinct types. Unlike earlier quantitative investigations that mainly focused on consumption frequency, adverse effects, or risk awareness [1,2,10,16], the present study sought to capture how adolescents themselves interpret and rationalize their use within social and psychological contexts. In doing so, it provides a more nuanced understanding of the motivations underlying energy drink consumption, moving beyond simple prevalence or outcome-based descriptions.

The four perception types identified here show that adolescents' use of energy drinks is far from uniform; rather, it reflects a multifaceted interplay of peer influence, functional ambivalence, openness to alternatives, and emotional reactivity. These findings are consistent with prior research suggesting that consumption is often reinforced by peer culture [17,19], but they go a step further by illuminating the diverse subjective meanings attached to this behavior. Notably, the recognition of alternative-seeking attitudes and emotionally reactive responses represents an extension of the literature, as earlier work has tended to focus more narrowly on physiological or behavioral risks [4,8,14].

From a practical perspective, the results underscore the importance of tailored health education. Adolescents who emphasize performance and peer approval may benefit from peer-led and experiential programs, while those with ambivalent views could be supported through case-based learning that promotes informed decision-making [26-28]. For those open to alternatives but still experiencing anxiety about reduced focus, interventions should reinforce self-regulation and encourage sustainable substitute behaviors [7,20]. Meanwhile, adolescents who report emotional instability in relation to energy drink use may require programs that integrate stress management, emotional awareness training, and, where appropriate, psychological counseling [9,18].

The key contribution of this study lies in its interpretive approach: energy drink consumption among adolescents is not simply an issue of knowledge deficit or individual choice, but rather one embedded in broader socio-cultural contexts, lifestyle routines, and psychological expectations. By identifying distinct perception types, this research expands the scope of adolescent health studies and offers a practical foundation for the development of perception-based educational and policy interventions that better reflect the lived realities of youth.

Several limitations should be noted. The study involved only male high school students from a limited number of regions, which restricts the generalizability of its findings. In addition, factors such as family dynamics, media exposure, and school environments were not fully addressed. Finally, given its cross-sectional design, this study was unable to track changes in perceptions over time. Future research would benefit from including more diverse populations, in-

corporating female adolescents, and employing longitudinal approaches to better capture the evolving dynamics of energy drink consumption.

CONCLUSION

This study employed Q methodology to classify Korean male high school students' perceptions of energy drink consumption into four distinct types and to identify the defining characteristics of each. The perceptions were categorized as follows: (1) effect-oriented experience sharers, (2) ambivalent recognizers of experience, (3) alternative-seeking evaluators, and (4) emotionally reactive responders. The findings indicate that these perception types are shaped by a range of factors, including peer relationships, individual consumption experiences, and varying levels of self-regulation ability.

Based on the findings of this study, the following implications are proposed. First, the development of tailored health education programs is essential, taking into account the distinct characteristics and motivational patterns of each identified perception type related to energy drink consumption. Second, for adolescents exhibiting challenges in self-regulation and emotional control, comprehensive intervention programs should be designed. These should incorporate components such as emotional awareness training, stress management techniques, and behavioral monitoring specifically targeting energy drink use. Future research is needed to refine and validate the structure and effectiveness of such programs. Third, a multisystemic approach involving coordinated support from schools, families, and peer networks is recommended through health promotion initiatives. This approach would help foster and maintain healthy dietary behaviors as a part of adolescents' everyday lives.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: SJP, EJC. Methodology: SJP, EJC. Data collection: SJP, EJC. Formal analysis: SJP. Investigation: SJP, EJC. Validation: SJP. Visualization: EJC. Software: SJP. Resources: SJP, EJC. Writing–original draft: SJP, EJC. Writing–review and editing: SJP, EJC. Supervision: EJC. Funding acquisition: EJC. Final approval of published version: SJP, EJC.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

This research was supported by the Cheongam University research grants in 2025.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Sun Jung Park https://orcid.org/0000-0003-3947-5436
https://researcherid.com/IUO-8492-2023
Eun Ju Choi https://orcid.org/0000-0001-6629-2876
https://researcherid.com/IUO-8098-2023

REFERENCES

1. Oh YJ. Consumption status and experience of adverse effects of high-caffeine energy drink among high school students. J Converg Inf Technol. 2019;9(6):35-43. https://doi.org/10.22156/CS4SMB.2019.9.6.035
2. Park SH, Lee SH, Chang KJ. Intake-related factors and educational needs regarding energy drinks in female high school students in the Incheon area. J Nutr Heal. 2017;50(5):460-471. https://doi.org/10.4163/jnh.2017.50.5.460
3. Choi J. Influence of psychosocial factors on energy drink consumption in Korean nursing students: never-consumers versus ever-consumers. Child Health Nurs Res. 2019;25(1):48-55. https://doi.org/10.4094/chnr.2019.25.1.48
4. Curran CP, Marczinski CA. Taurine, caffeine, and energy drinks: reviewing the risks to the adolescent brain. Birth Defects Res. 2017;109(20):1640-1648. https://doi.org/10.1002/bdr2.1177
5. Kwak HK, Sa J, Choe S, Chaput JP, Chung J, Cummings G, et al. Prevalence and correlates of highly caffeinated beverage consumption among Korean adolescents. Osong Public Health Res Perspect. 2021;12(6):374-384. https://doi.org/10.24171/j.phrp.2021.0013
6. Jeong HH, Kim KB. Comparison information of energy drink. Consumer 24; 2016.
7. Souza DB, Del Coso J, Casonatto J, Polito MD. Acute effects of caf-

feine-containing energy drinks on physical performance: a systematic review and meta-analysis. Eur J Nutr. 2017;56(1):13-27. https://doi.org/10.1007/s00394-016-1331-9
8. Li P, Haas NA, Dalla-Pozza R, Jakob A, Oberhoffer FS, Mandilaras G. Energy drinks and adverse health events in children and adolescents: a literature review. Nutrients. 2023;15(11):2537. https://doi.org/10.3390/nu15112537
9. Maraqa B, Fasfoos A, Alami M, Banat N, Amr O, Saraheen A. Energy drinks, depression, insomnia, and stress in Palestinian adolescents: a cross-sectional study. Int J Adolesc Med Health. 2025;37(1):35-43. https://doi.org/10.1515/ijamh-2024-0178
10. Park JS, Lee EJ, Lee CY, Jung HS. Consumption status, risk awareness, and experience of adverse effects of high-caffeine energy drink among university students. J Heal Nurs. 2015;29(1):102-114. https://doi.org/10.5932/JKPHN.2015.29.1.102
11. Ministry of Food and Drug Safety. Survey on safety of energy drink. Ministry of Food and Drug Safety; 2013.
12. Kim SD, Yun ES, Chang MS, Park YA, Jung SO, Kim DG. Survey of daily caffeine intakes from children's beverage consumption and the effectiveness of nutrition education. J Soc Sci Nutr. 2009;38(6):709-720. https://doi.org/10.3746/jkfn.2009.38.6.709
13. Giles GE, Mahoney CR, Brunyé TT, Kanarek RB. Cautiously caffeinated: does caffeine modulate inhibitory, impulsive, or risky behavior? J Caffeine Res. 2017;7(1):7-17. https://doi.org/10.1089/jcr.2016.0018
14. Kristjansson AL, Kogan SM, James JE, Sigfusdottir ID. Adolescent caffeine consumption and aggressive behavior: a longitudinal assessment. Subst Abus. 2021;42(4):450-453. https://doi.org/10.1080/08897077.2021.1876810
15. Seo EJ, Choi HS. High caffeine drink intake reduces sleep duration in high school students. Asiapac J Multimed Serv Converg Art Humanit Sociol. 2016;6(12):69-78. https://doi.org/10.35873/ajmahs.2016.6.12.007
16. Ryu SH. Energy drink consumption status and associated factors among male and female high school students in the Daejon area. J Nutr. 2016;29(6):899-910. https://doi.org/10.9799/ksfan.2016.29.6.899
17. Jin MJ, Yoon CH, Ko HJ, Kim HM, Kim AS, Moon HN, et al. The relationship of caffeine intake with depression, anxiety, stress, and sleep in Korean adolescents. Korean J Fam Med. 2016;37(2):111-116. https://doi.org/10.4082/kjfm.2016.37.2.111
18. Ali F, Rehman H, Babayan Z, Stapleton D, Joshi DD. Energy drinks and their adverse health effects: a systematic review of the current evidence. Postgrad Med. 2015;127(3):308-322. https://doi.org/10.1080/00325481.2015.1001712
19. Buchanan L, Yeatman H, Kelly B, Kariippanon K. Digital promotion of energy drinks to young adults is more strongly linked to consumption than other media. J Nutr Educ Behav. 2018;50(9):888-895. https://doi.org/10.1016/j.jneb.2018.05.022
20. Costa BM, Hayley A, Miller P. Young adolescents' perceptions, patterns, and contexts of energy drink use: a focus group study. Appetite. 2014;80:183-189. https://doi.org/10.1016/j.appet.2014.05.013
21. Yun HS. Analysis of relationship between physical activity and energy drinks consumption in Korean adolescents. J Soc Sch Heal. 2018;31(3):196-202. https://doi.org/10.15434/kssh.2018.31.3.196
22. Giorgi A. The theory, practice, and evaluation of the phenomenological method as a qualitative research procedure. J Phenomenol Psychol. 1997;28(2):235-260. https://doi.org/10.1163/156916297X00103
23. Cox C. Custodial grandparents: policies affecting care. J Intergener Relat. 2009;7(2-3):177-190. https://doi.org/10.1080/15350770902851221
24. Kim HG. Understanding of Q-methodology for the study of subjectivity. Seoul J Nurs. 1992;6(1):1-11.
25. Kim HG. Concept of Q methodology and data collection. In: Kim HG, editor. Q methodology: philosophy, theories, analysis, and application. Communication Books; 2008. p. 78-191.
26. Yang YM, Huh E, Jeong E, Lee JJ, Choi EJ. An analysis of consumption patterns of high-caffeinated energy drinks and adverse effects by surveys from students at middle and high schools in Korea. Yakhak Hoeji. 2014;58(6):387-396.
27. Yoo HS, Sim KH. Survey on the high-caffeine energy drink consumption status of university students in Seoul. J Soc Diet Life. 2014;24(3):407-420.
28. Ra JS, Yoon HK, Kim HS, Ryu JL. Associated factors on energy drink consumption among Korean high school students. J Soc Sch Heal. 2017;30(1):48-58. https://doi.org/10.15434/kssh.2017.30.1.48

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):221-236
https://doi.org/10.4094/chnr.2025.017

pISSN 2287-9110
eISSN 2287-9129

CHNR

Perceptions of newborn care among North Korean refugee women in South Korea: a qualitative study using focus group interview: comparison between pregnant and non-pregnant groups

In-Sook Lee

Professor, Department of Nursing, Hannam University, Daejeon, Korea

Corresponding author
In-Sook Lee
Department of Nursing, Hannam University, 70 Hannam-ro, Daedeok-gu, Daejeon 34430, Korea
Tel: +82-42-629-8472
Fax +82-42-629-8472
E-mail: is2009@hnu.kr

Received: June 4, 2025
Revised: June 25, 2025
Accepted: September 3, 2025

Purpose: The purpose of this study was to explore the in-depth perceptions of newborn care among North Korean refugee women through focus group interviews. This research aims to provide foundational data for developing newborn care education programs tailored for North Korean refugee women preparing for motherhood.
Methods: This qualitative study employed focus groups to investigate perceptions of neonatal care among North Korean refugee women of childbearing age (20–45 years old). Conducted from August to September 2022, the sessions included five non-pregnant women and four who were currently pregnant.
Results: Both pregnant and non-pregnant women expressed ambivalent feelings, characterized by a blend of expectation and fear regarding childrearing. Pregnant women articulated specific parenting strategies and viewed childrearing as a more tangible responsibility in light of physical changes and social isolation. In contrast, non-pregnant women expressed vague aversion and anxiety about the lack of information and support systems, stating that they could only endure childrearing with adequate external support. Notably, pregnant women emphasized the psychological conflict stemming from disrupted self-realization and shifts in their identities as mothers.
Conclusion: This study revealed differences in childrearing perceptions among North Korean refugee women based on their pregnancy status. It underscores the necessity for developing customized education programs that consider life stages and psychological readiness, as well as the importance of establishing social support systems.

Keywords: Democratic People's Republic of Korea; Newborn infant; Perception; Refugees

INTRODUCTION

Taking on the role of a parent without preparation while still adapting socio-culturally to a new society increases the psychological and mental stress of raising a child [1]. In particular, North Korean refugee women are receiving attention as a group that experiences care on multiple levels: at the intersection of their political identity as "North Korean refugees" and their biological roles as women and mothers [1]. These women experience economic difficulties and unstable employment in the process of adapting to life in South Korea, psychosocial stress in the process of fleeing North Korea, insufficient social activities or formation of social networks, and a lack of a support system where they can obtain help or information [2-5]. These factors contribute to the psychological burden of being a parent and can cause withdrawal from

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

care activity [2,3]. Furthermore, they face a three-way problem of having to perform the role of a parent with no knowledge of parenting methods or the educational system in South Korea [4].

North Korean female defectors often lack education on contraception, sexual health, and women's health management due to the conservative sexual ethics and rigid patriarchal norms in North Korean society. Furthermore, the strenuous labor, pregnancy, and childbirth they experience during the defection process, as well as while in China or other third countries before entering South Korea, can negatively impact their health and the care of their newborns [5]. Reportedly, North Korean refugee women experience a high psychosocial burden due to inadequate knowledge about newborn care, a lack of social support systems, and low parenting self-confidence, and there are concerns that this could negatively affect their children's development [6-8]. Moreover, reports indicate that their access to medical services and support systems during childbirth and postpartum care is limited, hindering their ability to provide adequate care for their infants and promote women's health [9,10].

Lee [6] noted that North Korean refugee women have poor basic health knowledge required for newborn care and low infection management competency, which causes them to experience high anxiety and low self-efficacy in caring. Lee and Jeon [7] directly related poor social support and low psychological resilience to increased parenting stress among North Korean refugee women, highlighting the need to systematize emotional interventions and parental education for them. Han and Oh [8] reported that these women complain repeatedly of loneliness, isolation, and social withdrawal after childbirth, and that this, combined with lack of cultural/institutional knowledge in South Korea, exacerbates isolation and instability in practicing parenting.

Qualitative research has highlighted that North Korean refugee women encounter various challenges during pregnancy, childbirth, and infant care, such as economic difficulties, social isolation, lack of access to medical care, and cultural differences. Notably, the absence of information and social support for newborn care complicates their ability to fulfill maternal roles [10]. This situation can delay the physical and psychological recovery of North Korean refugee women after childbirth and, coupled with social isolation and insufficient information, significantly inhibits their health management behaviors [11]. Additionally, differences in postpartum care and parenting cultures between North and South Korea impose further psychosocial burdens on their maternal roles [12]. These studies underscore the necessity of establishing an integrated and culturally appropriate support system [3].

Research on parenting among North Korean female defectors has primarily focused on early migration issues, such as settlement support, family breakdown, and cultural adaptation [1-8,10,12]. However, there is a lack of in-depth qualitative studies specifically examining newborn care within domestic research. Given that newborn care is crucial for maternal confidence and infant health outcomes, there is an increasing demand for comprehensive, experience-based research in this area.

As of March 2025, there were 34,352 North Korean defectors residing in South Korea, with women comprising 72.1% (24,783). Among them, approximately 19,457 (78.5%) were women of childbearing age (20–49 years old) [13]. It is crucial to emphasize the need for timely and appropriate maternal health education and newborn care support for North Korean refugee women in the pregnancy preparation and early motherhood stages, given their significant representation in this population. While some women may not have yet experienced childbirth or parenting, those contemplating pregnancy or motherhood show a strong interest in and concern about future parenting. Therefore, providing accurate information and support to this group is essential for fostering healthy motherhood and effective newborn care practices. In recognition of this need, this study conducted focus group interviews (FGIs) with North Korean refugee women who are either preparing for pregnancy or are currently pregnant, aiming to explore their perceptions of newborn care.

Providing fertile and pregnant North Korean refugee women with educational support regarding pregnancy, childbirth, and newborn care to enable even limited self-care may reduce the likelihood of high-risk pregnancy and childbirth in terms of women's health and could have positive effects on childbearing by inspiring confidence in newborn care. Recognizing these needs, the present study conducted FGIs with North Korean refugee women who were either non pregnant or currently pregnant. The aim was to explore their perceptions, challenges, and needs related to newborn care. By examining the unique psychosocial and cultural factors that influence how these women approach early motherhood, this study seeks to generate foundational data to support the development of culturally sensitive, life-stage-specific educational programs and practical policy interventions. Ultimately, this research aims to improve the quality of new-

born care and strengthen maternal role fulfillment among North Korean refugee women in South Korea.

The purpose of this study was to explore the in-depth perceptions of newborn care among North Korean refugee women via FGIs to provide basic data for the development of newborn care education programs for North Korean refugee women preparing for motherhood.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of the University of Hannam (IRB no., 202104-0002-03). Informed consent was obtained from all participants (or their parent legal guardians).

1. Study Design

This qualitative study, which collected data through FGIs, aimed to analyze the perceptions of newborn care of North Korean refugee women. FGIs are a research methodology used to collect qualitative data through focused conversations about the shared characteristics of a group of people. The data collected is effective in understanding and gaining insights into a specific research topic [14]. Therefore, we conducted FGIs to investigate the understanding of North Korean refugee women of newborn care and identify their educational needs. The reporting of this study was based on the methodology of the COREQ (consolidated criteria for reporting qualitative studies) [15].

2. Study Setting and Participants

To recruit participants, after obtaining approval from the leaders of centers or civilian organizations for North Korean refugee women, we explained the study purpose and participant conditions to representatives from North Korean women refugee groups. People who fit the study objectives, methods, and criteria were recruited and given contact details. If they contacted the researcher directly to indicate their intention to participate in the study, phone interviews were conducted to verify that they met the inclusion criteria. Snowball sampling was performed, focusing on the already recruited participants, until the required sample size had been satisfied. The criterion for the number of participants is that 4 to 5 are needed to achieve thematic saturation, as the group of North Korean defector mothers is homogeneous and discusses sensitive internal experiences and emotions [16]. Therefore, we recruited no more than five participants per group.

The participants are North Korean refugee women of childbearing age. Specifically, the criteria include: (1) adult women aged 20 to 45 or women who are currently pregnant (from the time of diagnosis until delivery); (2) those who can communicate effectively in Korean; and (3) the exclusion of individuals with high-risk pregnancy-related conditions (such as diabetes, hypertension, severe pre-eclampsia, or placenta previa) or other chronic illnesses, as well as women who have previously given birth.

Focus groups provide more information when participants do not know one another. However, participants who know one another can be included to improve the feasibility of the study. Thus, in the Seoul metropolitan area, participants from the target population were recruited through recruitment announcements and snowball sampling among acquaintances. Each group interview lasted between 1.5 and 2 hours, with 4–5 participants per group. Based on the dropout rate of 10% [17], a total of 10 participants were recruited: five unmarried non-pregnant women and five married pregnant women. However, one pregnant participant voluntarily withdrew from the study due to poor health condition during the research process, resulting in nine participants. Krueger and Casey [14] suggest that 1–2 focus groups may suffice for in-depth exploration, particularly when participants share similar backgrounds and the research topic is clearly defined. The FGIs were conducted in August and September 2022, and participants were joined by a lead and an assistant moderator. Efforts were made to maximize group dynamics to encourage all participants to contribute to the interview, and snacks and tea were prepared to encourage them to converse comfortably. They were informed that they might be contacted by telephone or for online interviews if content required further explanation during data analysis.

3. Data Collection

A study participation explanation sheet was handed out for participants to read before the interviews. A simple general characteristics survey was administered to gather information and if required, participants were consulted about personal issues. The interviews were conducted at a quiet café chosen by the participants at their preferred time, and

measures were taken to ensure that their privacy was fully protected. At the start of the FGI, the study purpose and procedures were explained to the participants, and their written consent was obtained before beginning. During the FGIs, to identify participants' different perceptions and perspectives, they were informed of the rules for debate to ensure a permissive, unthreatening environment and to encourage them all to actively contribute to the interview. The lead and assistant moderator participated in the FGIs. The lead moderator guided the discussion, while the assistant moderator took notes and observed participants' nonverbal cues. Both moderators had prior experience in qualitative research with vulnerable populations, including North Korean refugees, and had received training in qualitative interviewing and focus group facilitation.

After the group had introduced themselves to one another, they were informed of methods for sharing their opinions, and the interview started with a question from the lead moderator. The whole interview process was recorded with participants' prior consent and continued until data saturation was reached, when participants' responses became repetitive and no new themes emerged [18]. Each group interview was conducted only once, as data saturation was reached within the single session. During the interviews, time was allocated for the researchers to ask questions and verify that they had accurately understood participants' statements. Before concluding the interview, the researchers verified that the participants' experiences had been appropriately summarized. The interview content was transcribed for analysis as soon as possible.

To develop questions for this study, the research problem was first clarified, and then draft questions were composed. The draft questions were inspected and reviewed by an expert panel to construct the final questions. The expert criterion was at least 10 years of research or work experience at a center or office for North Korean refugees. The selected experts were a nurse at the Ministry of Unification's Settlement Support Center for North Korean Refugees (Hanawon), who was judged to have a strong understanding of North Korean refugee women, and a professor who has delivered lectures for more than 5 years on nursing for children and women's health.

The questions were organized into the opening question, key questions, and closing question. The questions used in the study are listed below.

Opening question: (1) Could you describe how you feel about babies?

Key questions: (1) What do you think are the most important aspects of newborn care?; (2) What can mothers do for their children in South Korean society?; (3) Could you describe how you feel about newborn care?; (4) What do you think are the conditions for pregnancy, childbirth, and childrearing?; (5) What do you think is required to care well for a baby in South Korean society?; (6) What factors do you think could interfere with pregnancy, childbirth, and childrearing?

Closing question: (1) Is there anything else you would like to say about caring for a baby?

The group non-pregnancy (NP) interview was conducted on August 17, 2022, and the group pregnancy (P) interview on September 18. The interview lasted 120 minutes for Group NP and 110 minutes for Group P. Before starting, participants were informed that the interviews would be recorded.

To prevent data loss, the interview content was recorded and transcribed using the Naver Clover Note program (Naver Corp.), with key words noted down. The researcher listened to the interview multiple times and transcribed it again. To ensure the reliability and validity of the data, the researcher reviewed the entire recording to confirm that nothing was omitted during transcription and completed the final transcript. The accuracy of the transcribed data was verified through a member checking process with the participants, which continued until December 2022 after the transcription was completed. The final transcript was compiled on A4 paper in 10-point Batangche font with line spacing of 160%. The total volume was 59 pages: 32 pages for the interview with Group NP and 27 for the one with Group P.

4. Data Analysis

During the analysis process, the researcher maintained a research journal to document the interpretation and decision-making processes, enhancing transparency and reliability. Additionally, a member check process was conducted to share some research findings with participants and gather feedback on whether the interpretations accurately reflected their perceptions. All data analysis was conducted independently by the researcher, and the data were analyzed using a method tailored for FGI results, following a structured approach to ensure rigor and consistency.

1) Initial coding

The researcher repeatedly read the transcripts to understand the overall flow and context. Codes were assigned based on meaningful sentences or phrases within the transcribed text. Significant statements were underlined in relation to the main research questions, and open-ended codes were used to capture important expressions. Similar concepts were grouped and labeled to reflect the core ideas conveyed in the interviews.

2) Code categorization and theme derivation

The researcher classified the main contents of meaningful statements and expressions, repeatedly reviewing the analysis units for categorization. Codes with similar meanings were integrated into higher-level categories, ultimately leading to the derivation of core themes.

3) Data interpretation and meaning construction

Based on the derived categories, the researcher interpreted North Korean women's perceptions of newborn care and examined the relevant sociocultural contexts that shape their perspectives.

5. Methodological Rigor

To ensure the rigor and credibility of the results, the researcher referred to the four criteria of trustworthiness for qualitative research suggested by Guba and Lincoln [19]. Accordingly, the quality of the analytical process and results was reviewed systematically across four dimensions: credibility, fittingness, confirmability, and auditability. First, to ensure credibility and confirmability, the whole interview process was conducted in a controlled environment, and during data collection, the researcher minimized their own interpretation by directly quoting participants' expressions. Additionally, during the analysis process, this researcher tried to enhance validity by recording subjective thoughts and interpretation in a research log. This researcher also conducted a member-checking process, where shared some research results with participants and received feedback on the accuracy of subjective interpretations. Fittingness was assessed based on whether the data sufficiently reflected the perceptions of newborn care among a specific group of North Korean refugee women. By including members of diverse ages, marital and childbirth experiences, and settlement periods, two groups were formed: one consisting of five women who were not currently pregnant but planning to become pregnant, and another of four women who were currently pregnant. This approach captured a range of perceptions and needs related to newborn care at different stages of the maternal experience, aligning with the research objective of identifying life-cycle support strategies for North Korean refugee women. Confirmability was ensured by systematically recording and reviewing all stages of data collection and analysis, including original transcripts, coding notes, and theme development. Participants reviewed the interview transcripts to confirm the accuracy of the content, ensuring their perspectives were faithfully reflected. For auditability, we explicitly recorded the whole data collection, analysis, and interpretation process, and the generated categories and themes were repeatedly compared and refined during the research process. An audit trail was systematically recorded, including transcribed data, analysis notes, and code tables. Through these processes to ensure rigor, we made efforts to analyze in greater depth the meaning and structure within participants' experiences and perceptions of newborn care.

RESULTS

In the first stage, interviews were conducted with non-pregnant (Table 1) and pregnant (Table 2) North Korean refugee women, and specific themes for their perceptions of childrearing were identified. Next, the themes for the results for pregnant and non-pregnant women, separately, were unified to derive categories and subcategories. In the second stage, shared regions in the perceptions of child-rearing between pregnant and non-pregnant women were derived. The researcher then identified differences within the shared regions in perceptions of childrearing between pregnant and non-pregnant women.

1. Childrearing and Conditions for Pregnancy, Childbirth, and Parenting for Non-pregnant Women

1) Participant characteristics

Group NP consisted of five unmarried, non-pregnant North Korean refugee women. They had no prior experience of pregnancy or childbirth and thus expressed uncertainty about future maternal and parenting roles (Table 3).

2) Themes identified from the data

From the interview data, we derived 15 themes, which we

Table 1. Perceptions of newborn care by non-pregnant women

Themes	Subcategory	Category
Vague difficulties (raising a child is difficult, I don't know)	Vague negative attitudes toward care, self-sacrifice	Ambivalence
Giving up one's own life		
Hard labor		
Depression	Feeling lost	
Burdensome		
Recalling the image of mothers crying together when their babies cry		
Worrying that I might care for my baby even a little incorrectly		
Mixed feelings (difficulty and joy)	Difficult to accept but also joyous	
Liking babies but not wanting to give birth		
Idealistic perceptions of babies (they're beautiful)		
Surety of becoming a mother	Sense of responsibility	Role expectations
Understanding the feelings of one's parents		
Self-doubt and desire to be a good parent (I want to be a good mother)		
Embarrassment due to acquaintances who were unaware of the physical changes during pregnancy	Pregnancy as an enormous challenge	
Recalling acquaintances who did not recognize pregnancy and were surprised at the diagnosis thereof		

Table 2. Conditions for pregnancy, childbirth, and childrearing by non-pregnant women

Themes	Subcategory	Category
Preparations for childbirth (several), necessity of preparing for childrearing	Perceptions of childbirth and parenting	Preparing to accept motherhood
The burden of childbirth		
The responsibility of pregnancy, the importance of planned pregnancy	Sense of responsibility	
Perceptions of insufficient sex education and differences in sex culture between North and South Korea (characteristics of North Korean refugees): contraception and abortion	Accurate sex knowledge and cultural understanding	
Knowing the human rights of women and babies / Preventing abuse	Awareness of human rights	
Thinking care will be very difficult due to the absence of one's mother (an especially important characteristic of North Korean refugee women, who are separated from their parents)	Care support resources	Ensuring support systems (practical support-based environment)
Desire for real and simulated education	Educational support	

combined into five subcategories and two categories (Table 1). Categories of ambivalence and role expectations were derived. These participants, since they were unmarried and had no clear plans yet for pregnancy or childbirth, perceived vague difficulties regarding something they had not experienced themselves. They expressed conflicting emotions regarding childrearing due to the negative aspects of self-sacrifice and having to give up on one's own life, but also the great joy that newborns bring. However, they felt that basic newborn care could be a huge burden due to their lack of experience, and showed concerns that they might accidentally harm their child. Furthermore, they felt a sense of responsibility regarding the expectation of accepting their role as a mother and wanting to care well for their child. Participants mentioned that childrearing could not be managed alone and required cooperation with nearby support. However, for North Korean refugee women especially, the absence of their mothers emerged as a vulnerability.

Regarding conditions for pregnancy and childbirth, nine themes were derived, which were combined into six subcategories and two categories (Table 2). The two categories were preparing to accept motherhood and ensuring support systems. North Korean refugee women are often separated from their mothers and have no close acquaintances after fleeing North Korea, meaning they need a support system to provide help when they become pregnant or give birth. Participants also discussed differences in sex culture between North and South Korea and the unhappiness of children born from unplanned pregnancies as a result of insufficient sex education. They were afraid of undesired pregnancies, and thought

Table 3. Information about the participants

Group	Age (yr)	Period of residency in South Korea	Education (after entry)	Occupation
Non-pregnancy group				
Mean total	30.2	5 yr 8 mo		
A	30	4 yr 10 mo	University graduate	Office worker
B	29	6 yr 1 mo	University student	Office worker
C	28	4 yr 4 mo	University student	Office worker
D	29	8 yr 2 mo	University student	Student
E	35	6 yr 0 mo	High school graduate	Office worker
Pregnancy group				
Mean total	34.5	10 yr 1 mo		
1	33	4 yr 8 mo	University student	Student
2	39	14 yr 2 mo	High school graduate	Head of a civilian organization
3	38	15 yr 11 mo	University graduate	Housewife
4	28	5 yr 8 mo	High school graduate	Housewife

importantly of responsible pregnancy based on proper education. They also discussed the sense of responsibility of being a parent who recognized certain North Korean-style parenting methods as abuse, and did not inherit these parenting styles.

2. Childrearing and Conditions for Pregnancy, Childbirth, and Parenting for Pregnant Women

1) Participant characteristics

Group P consisted of four pregnant North Korean refugee women. They were currently preparing for childbirth and faced more immediate concerns regarding balancing motherhood with personal and social life (Table 3).

2) Themes identified from the data

From the interview data, 29 themes related to childrearing were identified, which were combined into eight subcategories and three categories (Table 4). The three categories for pregnant North Korean refugee women's perspectives of childrearing were ambivalence, role expectations, and life imbalance. These pregnant women showed similar ambivalence regarding childrearing as their non-pregnant peers. However, in addition to the realistic difficulties of parenting they would soon face, they also perceived the birth of their child as a new life through which they would shed their old life alone. However, they perceived themselves as a separate entity to that of their child, as well as the surety of themselves as a mother who must care for a baby. They perceived a sense of responsibility as a mother who rather than what they want to do right now, comforts themselves as they establish plans for after their child has grown. Participants had significant worries about social life and work while currently pregnant, expressed major yearning due to the understanding of childrearing as sacrifice and discontinuation of work experience, and recognized childrearing as a life imbalance.

Regarding conditions for pregnancy and childbirth, 20 themes were derived, which were combined into six subcategories and two categories (Table 5). The two categories were preparing to accept motherhood and a realistic support-based environment. Pregnant North Korean refugee women showed will and effort to obtain information related to pregnancy, childbirth, and parenting via the internet such as on YouTube or online communities. They discussed fetal education, the education they had received in their own youth, and importance of the environment one grows up in for parenting. They expressed concerns that the different parenting methods in North and South Korea could cause their baby harm in South Korea. They also expressed their concern about whether they could follow private education in South Korea. They discussed the limitations of information gathering through books and the internet as first-time mothers, and indicated the need to know methods of caring for the baby in advance through accurate and detailed information about newborn care. Participants felt a sense of regret about leaving North Korea because they had no mother or acquaintances who could help after childbirth. They felt homesick and required help from their husband.

3. Overarching Themes Derived from Both Groups

When the results from both groups were synthesized, four overarching themes emerged: ambivalence toward motherhood, reflecting the simultaneous feelings of joy and burden

Table 4. Perceptions of newborn care by non-pregnant women

Themes	Subcategory	Category
• Depression	Confusion (physical changes and confusion, unexpected physical/emotional difficulties)	Ambivalence
• Vagueness, feeling lost		
• Fear		
• Difficulty (morning sickness, etc.)		
• Perceptions of differences in parenting methods		
• Difficulty of the first-time experience		
• Regret	Another life (yearning and comparisons due to changes in life before and after childbirth, confusion in one's new role [as a mother])	
• Sorrow at leaving behind a daily life alone (envy or yearning for life before pregnancy)		
• Struggling with social life, withdrawal, and depression		
• Natural but unfamiliar acceptance of oneself as a mother		
• Happiness given by babies (it just feels good)	Positive perceptions (similar to a non-pregnant woman), affection and assigning significance to one's child, an attitude of accepting a child as a positive turning point in one's life	
• Babies are a gift, even if they are difficult and require effort		
• Babies are a marvel		
• Grateful for the presence of a baby (to oneself, who is unprepared)		
• Perception of the baby and myself as separate entities	Perceptions of identity (new perceptions of oneself and one's life through childbirth and parenting, the process of past and present emotions intermixing)	Role expectations
• Inalterability, adaptation over time		
• Vicarious satisfaction through one's baby (comparison with one's own life—thinking about the process of growing up in North Korea)		
• Difficulty handling one's baby because of their tiny size, caution	Sense of responsibility (worrying about how to handle one's baby)	
• Fear about parenting (that I might not be able to raise them well)		
• Lack of preparation		
• Necessity of effort		
• Surety	Baby's existence and perceived value	
• Children are important and must be respected		
• The right of a mother		
• Change in values prioritizing family over work	Enduring sacrifice	Life imbalance
• Disconnection of social life		
• Disappointment at having to put aside many things, e.g., self-improvement		
• Depression due to discontinuity of work experience	Discontinuity of work experience	
• Worries about performing work and parenting in parallel		
• Worries about finding employment again		

associated with childrearing; role expectations and responsibility, indicating a strong awareness of maternal duty despite inexperience or limited resources; lack of supportive systems, highlighting how separation from mothers and limited social networks heightened vulnerability; and life imbalance, particularly pronounced among pregnant women, related to concerns about discontinuing work and social activities.

Together, these findings show that both pregnant and

Table 5. Conditions for pregnancy, childbirth, and childrearing by pregnant women

Themes	Subcategory	Category
• Mindset and preparations for becoming a mother (physical and psychological)	Acceptance and preparation for the roles of motherhood	Process of accepting motherhood
• Acceptance of the process of becoming a parent		
• Feeling the importance of fetal education		
• Importance of the will to learn about parenting, will to participate in parenting programs	Growth through learning and information-seeking	
• Finding childbirth products and information on YouTube or online communities		
• Recognizing the importance of education through parenting programs		
• Learning through indirect experience		
• Perception of the importance of early education	Importance of parenting philosophy and environment	
• Effects of family and environment on childrearing		
• Inheritance of parenting methods		
• Comparison with others, one's own unique parenting philosophy		
• Concerns about the different parenting methods in North and South Korea	Social support: difficulties accessing education and information (environmental barriers)	Practical support-based environment
• Difficulties with realistic education in South Korea/worries about private education in South Korea		
• Discomfort acquiring information from books or the internet (I don't know)	Educational support	
• Unfamiliarity with methods of obtaining information		
• Limits of searching for data (YouTube, self-learning)		
• Potential for using inaccurate data/difficulties obtaining accurate data		
• Some regret about leaving North Korea due to the lack of support systems	Psychological support: psychological challenges and need for emotional support	
• Desire for husband's support		
• Homesickness and recognition of the need for emotional stability		

non-pregnant North Korean refugee women experienced ambivalence and a strong sense of maternal responsibility while grappling with the absence of supportive systems. For pregnant women, childrearing was especially linked to feelings of imbalance among personal, social, and maternal roles.

4. Shared Regions and Differences in Perceptions of Newborn Care between Pregnant and Non-pregnant Women

Building on these overarching themes, further analysis was conducted to explore the similarities and differences in perceptions of childrearing, pregnancy, and parenting between the two groups. While the integrated themes offer a general understanding of North Korean refugee women's maternal experiences, examining areas of convergence and divergence enables a more nuanced comparison. Consequently, shared aspects among both pregnant and non-pregnant participants, as well as unique differences specific to each group, were identified and are presented in the following section.

1) Ambivalence

Two shared areas emerged in the perceptions of newborn care of both pregnant and non-pregnant North Korean refugee women. These were (1) ambivalence between positive and negative perceptions of childrearing and (2) sense of responsibility. This ambivalence was not only emotional but also culturally shaped, reflecting women's experiences of transition between North and South Korean parenting norms. Non-pregnant women exhibited ambivalence, characterized by vague expectations about their baby. However, the sense of burden was greater, as this event had not yet re-

alistically impacted their lives. In contrast, pregnant women experienced heightened ambivalence at the intersection of their sense of responsibility for actual care and the challenges of maintaining life balance. They viewed childrearing as an impending reality, leading to a mix of joy and expectation, yet they also felt a stark contrast between the burdens and expectations associated with parenting as they underwent the physiological changes of pregnancy.

Thus, the nature of ambivalence differed: non-pregnant women anticipated hypothetical challenges based on past experiences and cultural memories, while pregnant women faced immediate, reality-based concerns shaped by their current transition into motherhood.

> "First, because I've never had a child... I think, won't it be difficult? (tilting their head)... Still, I have idealistic notions. I want to care for them while treating them like a princess." (Non-pregnant woman A)
> "Isn't it difficult to raise a child?... I still haven't thought about it, but… You can love them and love them and wouldn't there be no end to it?" (Non-pregnant woman B)
> "Babies are so beautiful... They're beautiful and lovely and delicate, so of course you have to care for them no matter what, but... Um... I feel like it's hard labor... It must be very difficult... I feel like you become a slave to your baby." (Non-pregnant woman C)

Conversely, for pregnant women, this ambivalence was further emphasized at the interface between the sense of responsibility for actual care and problems of life balance. Pregnant women perceived childrearing as an impending reality, and so while there were joy and a sense of expectation, the sense of burden and expectation regarding childrearing were starkly contrasted as they experienced the physiological changes of pregnancy. Pregnant women also discussed negative aspects such as yearning and sadness for their life that was changing, envy toward unmarried women without children, the efforts and difficulties involved in childrearing, and discontinuation of their work experience.

> "I keep thinking, where did you come from? And when I pray for my child, I'm so grateful to this child for trusting me and coming into this harsh world. That overwhelming feeling sometimes makes me cry, and I wonder if it's not depression." (Pregnant woman 1)
> "Of course, people who aren't married and don't have children can spend time on and enjoy themselves, but you know there's also a happiness that only children can give you." (Pregnant woman 2)
> "Childrearing is our natural right as a mother. I think it's a gift given by God. But in reality, won't it be very difficult?" (Pregnant woman 2)
> "(Sighing) Originally, I wanted to work right away, but I got pregnant sooner than I expected... I had to give up on work (hehehe)." (Pregnant woman 3)
> "I don't have any family, and so I have to raise them all by myself. Because I have to do it all myself, when it's difficult, I'm sometimes a little envious when I look at my unmarried friends. I wonder how it would be if I could do my own things a little in life...I still haven't been able to do things like self-improvement, and in that regard, I think I feel a strong sense of longing. When I think that I haven't gone out into society, a person feels a sense of depression, you know." (Pregnant woman 2)
> I had the thought that maybe, in my heart, there's a sadness that I'm going in this direction now, and I might not be able to do all the things I want." (Pregnant woman 1)

The perceptions of pregnant and non-pregnant women were similarly ambivalent in describing babies as a blessing and gift, and as a marvel and joy. Non-pregnant women had a perception of mutually dependent care, while pregnant women had a perception of care as imbalance in life. As soon as they thought of childrearing, non-pregnant women recalled how they were raised by their own mothers and noted the strong influence from their surroundings. On the other hand, pregnant women reported that with the start of childrearing, their family was a greater priority than their own work, discussing this as a process of having to endure the sacrifice of giving up on much of themselves. They also expressed a sense of depression at the discontinuation of social life, and perceived childrearing as an imbalance in life, such as worrying about the discontinuation of their work experience, whether work and parenting could be performed in parallel, or whether they could find employment again.

> "I think the influence of the environment or people helping alongside me is important. When I see someone having a hard time raising their child, I think, will I be like that too? (tilting head)... (omitted) I think the surrounding circumstances have a major influence." (Non-pregnant woman B)

"Another woman I know got pregnant recently, and they're having a really difficult time. (omitted) But another person I know, their child is around 3 years old now, and they're raising them so beautifully. She tells me if I have children, she'll raise them for me. She likes it so much. So I realized [people's experiences can be] completely opposite... and I become a little confused. Information in your environment is really important, and I think acquaintances truly have a major influence." (Non-pregnant woman C)

2) Role expectations

The second shared area was role expectations, where women perceived a sense of duty and burden regarding childrearing, and worried about what they had to do to fulfil their role. Regarding role expectations, non-pregnant women perceived a sense of responsibility for childrearing. Among non-pregnant women, role expectations were more anticipatory and framed as preparation for future motherhood. Specifically, due to the lack of knowledge about basic concepts and care relating to babies, they felt fear and worry that they would not be able to care well for a child, felt certainty as a mother, self-doubt about parenting, and a sense of responsibility, perceiving the need to prepare to become a mother. Pregnant women expressed that role expectations were an urgent responsibility they were already enacting, accompanied by heightened anxiety about their ability to provide care in the present moment. They perceived babies as fragile beings and described motherhood as a responsibility that demanded sacrifice. These differences reflect how cultural adaptation and lived pregnancy status shaped distinct experiences of maternal responsibility.

"When I see those things (abuse), I think you shouldn't have had a child if you won't take responsibility. Why are they like that?" (Non-pregnant woman D)
"When I raise [a child] now it's okay, and I can choose, but when the child gets bigger, I have to become a person who can guide them to make the right choice for themselves." (Pregnant woman A)

3) Conditions for pregnancy, childbirth, and parenting

The two shared perceptions for conditions for pregnancy and childbirth were acceptance of motherhood and a realistic support environment. For non-pregnant women, perceptions were largely anticipatory and conditional, characterized by a need for knowledge, preparation, and reliable support before committing to pregnancy or childbirth.

In contrast, pregnant women described these conditions as immediate and experiential, emphasizing their current physical and psychological readiness. They rejected certain North Korean parenting practices and actively sought accurate, practical information to aid their impending childbirth. They underscored the importance of husbands and surrounding support in coping with the challenges of actual childrearing.

In summary, while both groups shared similar thematic areas, their perceptions diverged in terms of temporal and experiential orientation. Non-pregnant women viewed childrearing and motherhood as potential future challenges, whereas pregnant women experienced them as pressing realities within the cultural transition of resettlement.

"Actually, I'm a bit sorry, but... I wish someone like a social worker would come and teach me directly. In fact, if they did that, I feel like next time I could do a little better myself. If they would visit directly and help bathe the baby or in a given state [check] whether they have a fever or where they're hurting." (Non-pregnant woman C)
"In the education I received and environment I grew up in, mothers just said no and hit [their children] (makes a hitting gesture)." (Non-pregnant woman A)
"Although you can study everything on YouTube here, if there is a limit there, then you're limited to doing what your parents did. Here, they can come to your house and show you an example of what to do, and help directly... Because I think that helps a lot. Regardless of the [differences between] North and South Korea, I think that [having someone to help] would be especially helpful for North Korean refugees. Most people who flee North Korea don't have family. So that's something that's really necessary." (Pregnant woman D)
"Raising a child isn't something you do alone. When in Rome, do as the Romans do. So to do well here, shouldn't we raise children the way they're raised here? To do that, I think receiving education on how to be a mother or father is important." (Pregnant Woman C)
"It's still not easy to raise children in our society. And if you have a child, some places you go, they still treat you like a sinner, you know. Like if you've brought a baby somewhere, and because they're a baby of course they might cry, and if they cry, people criticize you, and so mothers feel really sorry." (Pregnant woman B)

DISCUSSION

The present study explored the perceptions of North Korean refugee women regarding newborn care through FGIs. The aim was to establish a foundation for developing educational programs tailored to women at different life stages, including pre-pregnancy and pregnancy. The findings revealed that participants had limited knowledge and experience related to newborn care, facing challenges in child-rearing due to cultural adaptation and insufficient social support. Although the participants were expectant mothers without prior childcare experience, differences emerged in their perceptions of newborn care and the conditions surrounding pregnancy, childbirth, and parenting—particularly between single women planning future pregnancies and married women currently pregnant. These differences appear to be influenced by marital status and length of residence in South Korea, averaging 5 years among non-pregnant women and 10 years among pregnant women. Therefore, it is crucial to identify the specific perceptions and needs of North Korean refugee women and to develop structured, needs-based educational interventions that promote healthy experiences in pregnancy, childbirth, and childcare.

Common areas in the perception of newborn care among North Korean refugee women were ambivalence toward care and role expectations. These perceptions originated from expectations and fears of childrearing, confusion caused by changes in self-identity, and psychological conflict occurring at a transition point in their lifecycle.

Both pregnant and non-pregnant women described childrearing as a complex experience involving a mixture of joy, expectation, burden, and a sense of responsibility. However, the two groups showed differences in their ambivalence. Non-pregnant women perceived childrearing as mutually dependent care, whereas pregnant women viewed it as a source of imbalance in life.

Non-pregnant women expressed vague expectations about motherhood, accompanied by fear of mistakes, lack of information, and insufficient support systems. Similarly, Borovoi et al. [20] reported that non-pregnant women experience both vague expectations and emotional burden regarding childrearing. In other words, they hold complex emotions between idealized expectations and a realistic sense of distance.

This finding aligns with Rasmussen et al. [21], who found that women experience both positive feelings about childrearing and a "loss of control in life and changes in identity," making ambivalence more prominent.

Pregnant women, on the other hand, more intensely experienced the realistic burden of impending childrearing. Hormonal changes, physical discomfort, and anxiety about childbirth can lead to emotional swings, resulting in conflicting feelings of expectation and burden. According to Hamzavi et al. [22], pregnant women's negative perceptions of childrearing decrease when they receive higher levels of social support.

This highlights the importance of providing community-based education before pregnancy to help women understand the realities of childrearing, reduce anxiety, and develop a positive attitude. Therefore, strategies to strengthen social support are essential.

Furthermore, Cutler et al. [23] found that higher levels of depression among fertile women were associated with greater ambivalence, while stronger social support reduced ambivalence. A stronger identification as a mother and greater preparedness for the parental role also decreased ambivalence.

In conclusion, customized support that considers the internal emotions, social support levels, and pregnancy preparedness of North Korean refugee women is necessary.

In this study, both pregnant and non-pregnant North Korean refugee women showed role expectations as a mother, but the patterns differed. Non-pregnant women expressed fear due to a lack of parenting knowledge, which is related to perceptions of responsibility in a state of unpreparedness. Pitso and Kheswa [24] noted that for women before pregnancy or those pregnant aged 10–19 years, lack of psychological preparation and anxiety about other's views negatively affect care responsibility. Furthermore, pregnant women went beyond the simple perception of "having to care well for their baby" and also discussed internalization of values in the process of growth and specific plans for parenting. These perceptions are part of a process of integrating their identity during pregnancy with their role as a mother, highlighting the important role of self-awareness in healthy prenatal psychological development [25]. The comment made by non-pregnant woman C, "in that case, it's better not to have a child," can be understood as signaling hesitation or doubt about taking on parental roles, which aligns with observations, as Kanku and Mash [26] also found. In their study, non-pregnant women felt vague fear and aversion toward childrearing more strongly in situations with no direct rela-

tion to responsibility and that they were unprepared. Pregnant woman A's statement, "I have to guide my child," goes beyond simple newborn care and includes the perception of a mother's role as someone who raises a child and gives direction. Ediz and Uzun [27] emphasize that pregnant women tend to experience both internalization of values and reconstitution of their identity between social responsibility and changes in their own lives.

The two groups of North Korean refugee women demonstrated different perceptions regarding the conditions for pregnancy, childbirth, and parenting. Non-pregnant women repeatedly emphasized that they "want to give birth only when they have a support system" and underscored "the importance of having people to help." They believed that the role of a parent could only be sustained when an "environment of education and support" was established before marriage and pregnancy.

This perspective is consistent with Al-Mutawtah et al. [28], who reported that even non-pregnant women anticipate anxiety and information gaps as prospective parents and hold expectations of social support.

In South Korea, the pregnancy and childbirth support system is relatively comprehensive. It includes health infrastructure and policy-based assistance such as antenatal services, postnatal care subsidies, and newborn health education [29]. Moreover, as the importance of postnatal care continues to grow, the latest WHO recommendations [30]—aimed at enhancing continuous health services for maternal and newborn well-being—align with Korea's postnatal care framework.

Even during the COVID-19 (coronavirus disease 2019) pandemic, the Korean government maintained maternal and newborn health through rapid response measures and national cohort management programs [31]. These efforts contributed to the overall stability of the maternal and newborn health management system.

Despite this, participants in the study reported limited awareness of how to access and use these available resources. This finding is particularly significant for North Korean refugees, who often face challenges navigating public systems due to limited legal rights, social networks, and emotional stability during their adjustment to life in South Korea.

The need for a robust support system is therefore critical. Refugees with insufficient social capital, cultural understanding, and emotional resilience may struggle to benefit from existing services. Similarly, Hamzavi et al. [22] found that social support enhances psychological stability even before pregnancy, whereas the absence of such support negatively affects decision-making and attitude formation related to pregnancy.

Non-pregnant participants also expressed a preference for practical and personalized education. One woman stated, "It would be good to be taught directly by a social worker next to me," and another added, "Simulated education is more important than YouTube." These remarks reflect a desire for interactive, experience-based learning rather than passive information consumption.

Among non-pregnant women, decisions regarding childbirth often involved conditional readiness. Many indicated that they would consider pregnancy only once they felt fully informed and emotionally prepared. This demonstrates a cautious and context-dependent approach to family planning.

Pregnant women, by contrast, expressed emotional distress and psychological withdrawal. Comments such as "I'm depressed because I can't participate in social life" and "I can't do what I want because I have to care for my baby" reveal feelings of frustration and loss of autonomy. They also described physical and psychological limitations, lack of information, and insufficient support systems.

Additionally, pregnant women shared feelings of yearning and internal conflict regarding the changes in their life direction after childbirth. According to Talbot et al. [32], pregnant women often suffer from social isolation, sleep disturbances, and emotional loneliness, all of which are closely linked to long-term depression. This corresponds with participant B's statement: "I have to raise my baby alone" and "I can't meet people and I become depressed."

Furthermore, Smorti et al. [33] reported that pregnant women experience greater emotional fatigue when "motherhood is unwelcome," particularly in societies where childrearing activities or children's crying in public are stigmatized.

These findings collectively highlight the importance of fostering a more socially tolerant and supportive culture toward childrearing, especially for vulnerable populations such as North Korean refugee women.

The differences in perception of pregnancy, childbirth, and parenting between pregnant and non-pregnant women are consistent with Tani and Castagna [34]. Specifically, "because pregnant women are directly exposed to psychological stress and role change, information accessibility and lack of social

support present as real crises." Non-pregnant women tend to form perceptions of motherhood based on imagined experiences rather than direct engagement, often viewing the prospect of motherhood favorably contingent upon the presence of a supportive environment. This conditional acceptance aligns with the emphasis on contextual factors influencing pregnancy and parenting decisions found in previous qualitative analyses. Moreover, the unique nature of North Korean refugees is an obstacle for both pregnant and non-pregnant women, and the absence of one's mother or acquaintances who can help demonstrates the reality of a severe lack of support within South Korea society. Many North Korean refugee women face a breakdown in family structures, making the absence of mothers or female relatives who can offer guidance, especially during pregnancy and the postpartum period, particularly noticeable. The lack of intergenerational support and unfamiliar cultural backgrounds in early motherhood can intensify feelings of isolation and anxiety among North Korean refugee women. In addition to institutional support, there is an urgent need for realistic, intimate assistance accompanied by psychological and emotional support. To this end, it would be helpful to enable realistic emotional support through mentoring programs between older and newer mothers, as well as connecting childcare helpers or mentors with mothers-to-be. The need for support should be recognized as more urgent than that of general South Korean pregnant women.

This study examined the perceptions of newborn care among North Korean female defectors who were either preparing for pregnancy or currently pregnant. A key finding was the emotional ambivalence commonly observed among participants. This ambivalence reflected structural and cultural trends shaped by specific challenges faced during their adaptation to Korean society, including a lack of experience, information, and social support, alongside hope and affection for their future children.

The study recruited participants residing in Seoul and the surrounding metropolitan area, considering accessibility and interview scheduling, which ensured a degree of consistency in service accessibility and infrastructure. However, this approach also introduced limitations. The results may not fully represent the perceptions of North Korean defector women living in rural or marginalized areas with weak institutional support and insufficient community resources [35]. Additionally, the low utilization rate of available services among participants suggests that even with sufficient resources, accessibility may still be inadequate. Therefore, it is essential to provide culturally sensitive information and relationship-centered support tailored to participants' characteristics. In the new system, their perceptions of infant care cannot be separated from the broader context of adaptation and survival, as they must learn motherhood while also reconstructing their identities and confronting loss, trauma, and alienation. Consequently, efforts to support them must extend beyond practical education to include emotional recognition, culturally rooted mentoring, and trust-based support within the community.

CONCLUSION

In this study, we analyzed differences in perceptions of newborn care and conditions for pregnancy, childbirth, and parenting between pregnant and non-pregnant North Korean refugee women preparing to become first-time mothers, and demonstrated the need for customized support measures. By analyzing their expressed concerns, emotional states, and expectations, it became clear that their experiences of motherhood are deeply intertwined with broader social and structural challenges, including unfamiliar healthcare systems, disrupted family support networks, and limited cultural alignment with mainstream parenting norms in South Korea. While both pregnant and non-pregnant women expressed ambivalent perceptions including a mixture of expectation and fear regarding childrearing, pregnant women mentioned specific parenting strategies and perceived childrearing as a more realistic responsibility amidst physical changes and social isolation. Non-pregnant women expressed more vague aversion and anxiety about the lack of information and support systems, and that they could only endure childrearing if they received sufficient external support. In particular, pregnant women highlighted the psychological conflict of discontinued self-realization and changes in their identity as a mother. This study demonstrated differences in perceptions of childrearing among North Korean refugee women depending on whether or not they were pregnant, and suggests the need to develop customized education depending on life cycle and psychological preparedness, and to construct social support systems.

To effectively address these multifaceted needs, community health workers and health service providers should actively engage in early identification, culturally appropriate education, and building trust-based relationships with North

Korean refugee women facing challenges related to pregnancy, childbirth, and childcare. Through these initiatives, South Korea can enhance the health and well-being of North Korean refugee women and their children, as well as promote their social integration.

ARTICLE INFORMATION

Authors' contribution

All the work was done by ISL.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

This study was supported by a National Research Foundation of Korea (NRF) grant funded by the Korean government (No. NRF-2022R1H1A2005288, No. NRF-2023R1A2C1006197).

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

In-Sook Lee https://orcid.org/0000-0003-4156-9685
https://researcherid.com/JHT-0304-2023

REFERENCES

1. Lee IS, Jeon JH. Influence of parenting efficacy, parenting stress, and acculturation stress on parent-child relations among North Korean refugee mothers. Child Health Nurs Res. 2021;27(2):171-180. https://doi.org/10.4094/chnr.2021.27.2.171
2. Shin G, Lee SJ. Mental health and PTSD in female North Korean refugees. Health Care Women Int. 2015;36(4):409-423. https://doi.org/10.1080/07399332.2013.817412
3. Kim J, Park SH, Youn YS, Han A, Kim M. Stress and coping associated with acculturation among North Korean defectors. J Humanist Psychol. 2019;59(2):211-231. https://doi.org/10.1177/0022167816631107
4. Shin N. Cultural understanding of group activity and conflicts of North Korean migrant women. J Korean Stud. 2017;(61):215-250.
5. Shin H, Kim Y. A study on policy support measures for North Korean female defectors from a migration perspective. Seoul Foundation of Women and Family; 2019. Report No.: 2019-PolicyResearch-16.
6. Lee IS. Knowledge, confidence, and educational needs of newborn care among North Korean refugee women: a descriptive study. Child Health Nurs Res. 2023;29(1):72-83. https://doi.org/10.4094/chnr.2023.29.1.72
7. Lee IS, Jeon JH. Influence of hardiness, mother-child interactions, and social support on parenting stress among North Korean refugee mothers: a cross-sectional study. Child Health Nurs Res. 2022;28(4):269-279. https://doi.org/10.4094/chnr.2022.28.4.269
8. Han JJ, Oh SJ. North Korean women's reproductive health experience. Public Health Nurs. 2021;38(5):751-759. https://doi.org/10.1111/phn.12894
9. Yamashita T, Suplido SA, Ladines-Llave C, Tanaka Y, Senba N, Matsuo H. A cross-sectional analytic study of postpartum health care service utilization in the Philippines. PLoS One. 2014;9(1):e85627. https://doi.org/10.1371/journal.pone.0085627
10. Yu S, Jang J, Noh JW, Kwon YD, Park H, Woo JM. What is it to be mentally healthy from the North Korean refugees' perspective?: qualitative research on the changes in mental health awareness among the North Korean refugees. Psychiatry Investig. 2018;15(11):1019-1029. https://doi.org/10.30773/pi.2018.09.10
11. Chung BY, Yu K, Kim JS. Pregnancy and postpartum experiences of immigrant in a Vietnam. Fam Cult. 2014;26(2):221-244. https://doi.org/10.21478/family.26.2.201406.007
12. Chung S, Seo JY. A study on posttraumatic stress disorder among North Korean defectors and their social adjustment in South Korea. J Loss Trauma. 2007;12(4):365-382. https://doi.org/10.1080/15325020701296836
13. Ministry of Unification. Current status of North Korean defectors [Internet]. Ministry of Unification; 2024 [cited 2024 Jun 24]. Available from: https://www.unikorea.go.kr/unikorea/business/NKDefectorsPolicy/status/lately/
14. Krueger RA, Casey MA. Focus groups: a practical guide for applied research. Sage; 2009.
15. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-357. https://doi.org/10.1093/intqhc/mzm042
16. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: a systematic review of empirical tests. Soc Sci Med. 2022;292:114523. https://doi.org/10.1016/j.socscimed.2021.114523
17. Choi JS, Park BI. Photovoice: cognitive restructuring for the recov-

ery of injured athletes. Korea J Sport [Internet]. 2019 [cited 2025 Sep 20];17(2):863-880. Available from: https://www.earticle.net/Article/A355790

18. Morse JM. Theoretical coalescence: a method to develop qualitative theory: the example of enduring. Nurs Res. 2018;67(2):177-187. https://doi.org/10.1097/NNR.0000000000000263
19. Guba EG, Lincoln YS. Epistemological and methodological bases of naturalistic inquiry. Educ Technol Res Dev. 1982;30(4):233-252. https://doi.org/10.1007/BF02765185
20. Borovoi L, Shiloh S, Alidu L, Vlaev I. The latent perception of pregnancy. Front Psychol. 2022;13:589911. https://doi.org/10.3389/fpsyg.2022.589911
21. Rasmussen B, Hendrieckx C, Clarke B, Botti M, Dunning T, Jenkins A, et al. Psychosocial issues of women with type 1 diabetes transitioning to motherhood: a structured literature review. BMC Pregnancy Childbirth. 2013;13:218. https://doi.org/10.1186/1471-2393-13-218
22. Hamzavi ZN, Nazari M, Shayeghian Z, Shahmohammadi S. Social support in the pregnant and non-pregnant women and its associated dimensions. J Nurs Midwifery Sci. 2016;3(2):11-18. https://doi.org/10.18869/acadpub.jnms.3.2.11
23. Cutler A, McNamara B, Qasba N, Kennedy HP, Lundsberg L, Gariepy A. "I just don't know": an exploration of women's ambivalence about a new pregnancy. Womens Health Issues. 2018;28(1):75-81. https://doi.org/10.1016/j.whi.2017.09.009
24. Pitso T, Kheswa JG. The vicious cycle of teenage motherhood: a case study in Eastern Cape, South Africa. Mediterr J Soc Sci. 2014;5(10):536-540. https://doi.org/10.5901/mjss.2014.v5n10p536
25. Isaacs NZ, Andipatin MG. A systematic review regarding women's emotional and psychological experiences of high-risk pregnancies. BMC Psychol. 2020;8(1):45. https://doi.org/10.1186/s40359-020-00410-8
26. Kanku T, Mash R. Attitudes, perceptions and understanding amongst teenagers regarding teenage pregnancy, sexuality and contraception in Taung. S Afr Fam Pract. 2010;52(6):563-572. https://hdl.handle.net/10520/EJC80556
27. Ediz Ç, Uzun S. Psychosocial dimension of adolescent pregnancy: a phenomenological study on life experiences. J Reprod Infant Psychol. 2024 Jun 3 [Epub]. https://doi.org/10.1080/02646838.2024.2362342
28. Al-Mutawtah M, Campbell E, Kubis HP, Erjavec M. Women's experiences of social support during pregnancy: a qualitative systematic review. BMC Pregnancy Childbirth. 2023;23(1):782. https://doi.org/10.1186/s12884-023-06089-0
29. Kim MK, Lee SM, Bae SH, Kim HJ, Lim NG, Yoon SJ, et al. Socioeconomic status can affect pregnancy outcomes and complications, even with a universal healthcare system. Int J Equity Health. 2018;17(1):2. https://doi.org/10.1186/s12939-017-0715-7
30. Wojcieszek AM, Bonet M, Portela A, Althabe F, Bahl R, Chowdhary N, et al. WHO recommendations on maternal and newborn care for a positive postnatal experience: strengthening the maternal and newborn care continuum. BMJ Glob Health. 2023;8(Suppl 2):e010992. https://doi.org/10.1136/bmjgh-2022-010992
31. Oh J, Lee W, Kim CJ, Kim YJ, Park H, Lee JH, et al. COVID-19, maternal, and neonatal outcomes: National Mother-Child Cohort (NMCC) of K-COV-N cohort in South Korea. PLoS One. 2023;18(4):e0284779. https://doi.org/10.1371/journal.pone.0284779
32. Talbot J, Charron V, Konkle AT. Feeling the void: lack of support for isolation and sleep difficulties in pregnant women during the COVID-19 pandemic revealed by Twitter data analysis. Int J Environ Res Public Health. 2021;18(2):393. https://doi.org/10.3390/ijerph18020393
33. Smorti M, Gemignani A, Bonassi L, Mauri G, Carducci A, Ionio C. The impact of COVID-19 restrictions on depressive symptoms in low-risk and high-risk pregnant women: a cross-sectional study before and during pandemic. BMC Pregnancy Childbirth. 2022;22(1):191. https://doi.org/10.1186/s12884-022-04515-3
34. Tani F, Castagna V. Maternal social support, quality of birth experience, and post-partum depression in primiparous women. J Matern Fetal Neonatal Med. 2017;30(6):689-692. https://doi.org/10.1080/14767058.2016.1182980
35. Song SO, Jung CH, Song YD, Park CY, Kwon HS, Cha BS, et al. Background and data configuration process of a nationwide population-based study using the Korean national health insurance system. Diabetes Metab J. 2014;38(5):395-403. https://doi.org/10.4093/dmj.2014.38.5.395

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):237-247
https://doi.org/10.4094/chnr.2025.024

pISSN 2287-9110
eISSN 2287-9129

CHNR

Effects of a case-based simulation fever management education program for parents of hospitalized children in South Korea: a quasi-experimental study

Bora Nam[1], Hyunju Kang[2]

[1]Registered Nurse, Pediatric Ward, Kangwon National University Hospital, Chuncheon, Korea
[2]Associate Professor, College of Nursing, Kangwon National University, Chuncheon, Korea

Corresponding author
Hyunju Kang
College of Nursing, Kangwon National University, 1 Kangwondaehak-gil, Chuncheon 24341, Korea
Tel: +82-33-250-8878
Fax: +82-33-259-5636
E-mail: hjkang@kangwon.ac.kr

Received: July 23, 2025
Revised: August 19, 2025
Accepted: September 3, 2025

Purpose: Because fever is a common symptom in children, parents must have accurate knowledge and management ability about it to be able to provide appropriate management. This study aimed to develop a fever management education program, incorporating case-based simulation practice for parents of hospitalized children, and examine its effects on knowledge of fever in children, anxiety related to fever, and self-efficacy in child fever management.
Methods: A quasi-experimental, non-equivalent control group pretest-posttest design was employed. A total of 50 parents participated, with 24 and 26 in the experimental and control groups, respectively. The experimental group received both theoretical lectures and case-based simulation practice, whereas the control group received only theoretical lectures.
Results: No statistically significant differences were observed between the groups regarding knowledge of fever or anxiety related to fever immediately after the intervention or at the 4-week follow-up. However, the experimental group showed a significant improvement in self-efficacy in fever management from pre- to post-intervention.
Conclusion: The findings suggest that fever management education incorporating case-based simulation practice, in addition to theoretical instruction, could potentially enhance parents' confidence in managing childhood fever. Developing simulation-based educational interventions that enhance long-term effectiveness, can be feasibly integrated into hospital settings, and provide practical and accessible approaches is essential to support parents in effectively managing fever in real-life situations.

Keywords: Child; Fever; Parents; Simulation training

INTRODUCTION

Fever in childhood is a common symptom. Among children who visit the emergency room due to high fever, the actual body temperature measurement values did not fall into the high fever category medically, or only a part of them required hospitalization [1,2]. This means that in the case of children without underlying conditions, fever can be managed at home with symptomatic supportive care. However, it also highlights the lack of appropriate home care is, with parents' fear of fever causing excessive use of medical services, leading to inappropriate fever management [1,3].

Previous studies have revealed parents' low level of knowledge regarding childhood fever [4,5]. They lack not only accurate awareness of the normal body temperature range or the threshold for fever in children but also proper understanding of at-home fever management, including how to measure body temperature, administer antipyretics, and

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

use non-pharmacological methods [6,7]. In addition, despite current fever management guidelines recommending environmental cooling, dressing the child in light clothing, and ensuring adequate hydration over tepid sponging—which may cause crying and discomfort in children—parents still primarily use tepid sponging as the first-line symptomatic treatment [7,8].

Such inappropriate fever management by parents stems from difficulties in acquiring the knowledge necessary to effectively assess and address the severity of children's fever [9]. In particular, despite the importance of obtaining accurate, evidence-based information aligning with evolving fever management, parental misconceptions and excessive fear regarding fever in children continue to be reported [9]. This highlights the importance of imparting education on child fever management to enhance parents' understanding, reduce their anxiety about fever, and promote safe and appropriate fever management behaviors.

Many studies have reported the positive effects of educational interventions on child fever management targeting parents and caregivers. These interventions have been shown to improve not only knowledge, attitudes, self-efficacy, and fever management skills but also satisfaction and the use of healthcare services [10]. Some parental education interventions on child fever management consist of group-based education involving accessible methods such as lectures and discussions. However, parents have continued to experience difficulties in managing their children's fever with these traditional training approaches, prompting a demand for more effective educational strategies [11]. Consequently, methods incorporating demonstrations, videos, or online media—often combined with face-to-face instruction—have been suggested as more effective than standalone approaches [12,13]. In response, recent international studies have begun to apply simulation-based educational methods in parental education on child fever management [14-16]. Case-based simulation is effective for training individuals to develop fundamental skills and coping abilities in realistic settings [17,18]. In health education, where enhancing self-efficacy and promoting actual behavioral change are critical, scenarios that incorporate health-related content can improve memory retention, thereby enhancing the effectiveness of education compared to theoretical instruction alone [19].

This study aims to develop a child fever management education program that combines traditional theoretical lectures with case-based simulation practice. The program targets parents of hospitalized children, and its effects on knowledge of fever, anxiety related to fever, and self-efficacy in managing fever in children are evaluated. The three research hypotheses (H1–H3) are as follows:

H1. The experimental group provided with the child fever management education program applying case-based simulation practice will have a higher "knowledge of fever" score compared to the control group immediately after program and 4 weeks later.

H2. The experimental group provided with the child fever management education program applying case-based simulation practice will have a lower "anxiety related to fever" score compared to the control group immediately after program and 4 weeks later.

H3. The experimental group provided with the child fever management education program applying case-based simulation practice will have a higher "self-efficacy in managing fever in children" score compared to the control group immediately after program and 4 weeks later.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Kangwon Natinoal University Hospital (IRB no., 2024-07-008-003). Informed consent was obtained from all participants.

1. Study Design

This study employed a quasi-experimental, non-equivalent control group pretest-posttest design to examine the effects of a child fever management education program on parents of hospitalized children, specifically focusing on their knowledge of fever, anxiety related to fever, and self-efficacy in managing fever in children. This study followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) reporting guidelines [20].

2. Study Setting and Sample

The study setting was the pediatric ward of Kangwon National University Hospital, a general hospital located in Chuncheon. The participants were parents of children admitted to this ward who agreed to participate in the study. The specific inclusion criteria were as follows: fathers or mothers

of children aged between 3 months and 3 years who were admitted for less than 7 days to the pediatric ward for acute respiratory infections, gastroenteritis, or otitis media; those who are primary caregivers for their child while living together at home; those whose children have had a fever; and those who have sufficient understanding and communication skills in Korean to comprehend the educational content without difficulty.

The number of participants was calculated using G*Power ver. 3.1.9 program (Heinrich-Heine-Universität Düsseldorf) based on a significance level (α) of .05, a power (1–β) of .80, and effect size of 0.8, with reference to previous studies [10] for t-test. Considering a dropout rate of 30%, the control group consisted of the parents of the first 30 hospitalized children. After all the children in the control group had been discharged, the next 30 hospitalized children's parents were assigned to the experimental group. Four and six participants dropped out of the control and experimental groups, resulting in a final sample size of 26 and 24 participants, respectively (Figure 1).

3. Variables and Measurements

1) Knowledge of fever

The tool for measuring parents' knowledge about fever in children was developed by Jeong et al. [21]. It comprises 20 items, including five on the physiology of fever, two on febrile seizures, three on assessment during fever, three on antipyretics, and seven on fever management. Each item can be answered with the options "yes," "no," or "I don't know." The scores range from 0 to 20, with higher scores indicating greater parental knowledge about fever in children. Cronbach's α was .64 in Jeong et al. [21] and Kuder-Richardson 20 (KR-20) was .64 in this study.

2) Anxiety related to fever

The tool for measuring parents' anxiety related to fever in children was developed by Kim [6]. It comprises 10 items, rated on 5-point Likert scale ranging from "strongly disagree" to "strongly agree." The scores range from 5 to 50, with higher scores indicating greater anxiety related to fever. Cronbach's α was .83 in Kim [6] and .81 in this study.

3) Self-efficacy in managing fever in children

The tool used to measure parents' self-efficacy in managing their children's fever was the perceived behavioral control scale for child fever management, developed by Walsh et al. [22] and translated by Jeong [23]. It comprises three items that assess parents' self-efficacy in fever management, decision-making abilities during a fever, and the use of antipyretics. On a 10-point Likert scale ranging from "not at all capable" to "very capable," the scores range from 3 to 30, with

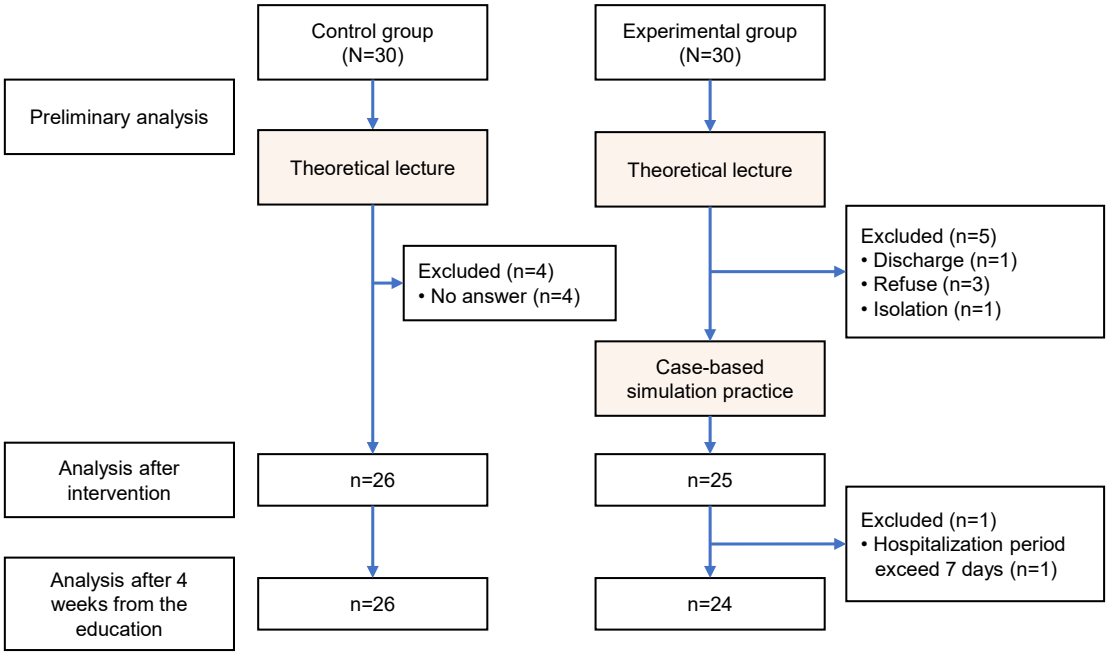


Figure 1. Flowchart of the study.

higher scores indicating greater self-efficacy. Cronbach's α was .95 in Jeong [23] and .86 in this study.

4. Procedure

The case-based simulation practice education for parents, which was as the intervention employed in this study, involved presenting parents with scenarios of fever in children and allowing them to perform fever assessment and management using a high-fidelity newborn simulator (Newborn HAL; Gaumard). The child's condition was altered according to each scenario and parents were instructed to respond accordingly. After each case, the researcher provided feedback. Newborn HAL is capable of simulating changes in vital signs and physiological conditions, allowing for realistic practice in a near clinical environment. During the practice, symptoms such as crying, tachypnea, cyanosis, limb stiffness, and tremors were simulated to help parents experience potential signs of fever in children and practice appropriate responses. Five pediatric fever cases were developed, all of which were utilized for simulation practice and feedback (Table 1). Case 1 presented a scenario of a child with a high fever accompanied by chills. Following the simulation of chill symptoms, parents practiced temperature measurement and appropriate administration of antipyretics and were instructed to articulate situations where medical consultation would be necessary. Case 2 presented a scenario of a child with a high fever accompanied by tachypnea. The simulator demonstrated symptoms of tachypnea, and parents practiced recognizing abnormal breathing, measuring body temperature, and ad-

Table 1. Overview of the child fever management education program incorporating case-based simulation practice for parents of hospitalized children

Day & case	Contents
Day 1 (admission day)	Provision of leaflet materials and lecture (for 10 minutes)
Key contents	Definition of fever, measuring body temperature, symptoms that require medical attention, how to use antipyretics, non-pharmacological interventions, febrile seizure
Day 2 (the second day of hospitalization)	Case-based simulation practice and feedback (for 30 minutes)
Case 1	18-month-old child (11 kg) with a body temperature of 39.2°C, experiencing chills, decreased activity, reduced urine output, and abnormal urine odor
Simulator operation	Chills
Key practice components	• Temperature measurement techniques using tympanic and axillary thermometers
	• Antipyretic administration: calculating dose by weight, dosing intervals
	• Identifying when to seek medical care
Case 2:	2-month-old infant (5 kg) with a body temperature of 38.3°C, showing signs of rapid breathing and pale appearance
Simulator operation	Tachypnea, abnormal breathing sound, chest retraction
Key practice components	• Temperature measurement techniques using tympanic and axillary thermometers
	• Antipyretic administration: calculating dose by weight, dosing intervals
	• Identifying when to seek medical care
Case 3:	22-month-old child (12 kg) with a body temperature of 38.9°C, presenting with limb rigidity and upward eye deviation. Limb stiffness resolves after 1 minute
Simulator operation	Limb rigidity
Key practice components	• Temperature measurement
	• Managing febrile seizures: ensuring a safe environment, timing the seizure, observing the child's condition, video recording the episode if possible
Case 4:	12-month-old child (10 kg) with a body temperature of 38.7°C, took acetaminophen suspension 1 hour ago. No other significant symptoms are observed
Simulator operation	None
Key practice components	• Temperature measurement
	• Non-pharmacological interventions: tepid sponging, environmental management (e.g., removing clothes, using light blankets, ventilation, and room temperature control)
Case 5:	4-year-old child (18 kg), previously had a fever of 38.9°C and was given ibuprofen 3 hours ago. Upon rechecking, the body temperature is 39.1°C.
Simulator operation	None
Key practice components	• Temperature measurement
	• Alternating antipyretics

ministering antipyretics. Case 3 presented a scenario of a child with a high fever accompanied by convulsions and limb stiffness. The simulator reproduced symptoms of limb rigidity, and parents practiced temperature measurement along with appropriate management strategies during and after a seizure episode. Cases 4 and 5 described scenarios where children exhibited persistent high fever despite the administration of antipyretics. Parents practiced alternating antipyretic administration and non-pharmacological management strategies, including tepid sponging and environmental control. This education program was developed based on recent guidelines by Paul et al. [8] and the pediatric textbook by Ahn and Shin [24], with reference to previous studies [8,23,25-27]. The cases for the simulation practice were reviewed for content validity by an expert panel constituting one pediatrician, one head nurse of a pediatric ward, one child health nursing professor, and two nurses with 8 years of experience in the pediatric ward. Each of these five experts assessed the appropriateness of the items on a 4-point scale, all of which were rated 3 or higher, implying high content validity.

The program was delivered by the researcher—a pediatric ward nurse who has cared for children with fever and was responsible for admitting and imparting education to parents. The participants were parents of hospitalized children, and the number of each program attendees was limited from one to two. The program was conducted in the education or conference room within the pediatric ward.

For the experimental group, brief educational session using a leaflet was conducted for approximately 10 minutes following the pretest on the day of hospitalization. On the second day, a 30-minute case-based simulation session was conducted, followed by a feedback session (Table 1). In contrast, the control group only received brief education on child fever management using a leaflet. The educational leaflet provided to the experimental and control groups contained information on the definition of fever, methods of temperature measurement, symptoms necessitating medical attention, appropriate administration of antipyretics, non-pharmacological interventions, and management of febrile seizures.

5. Data Collection and Analysis

Data were collected from November 30, 2023, to April 27, 2024. The researcher directly explained the purpose and methods of the study to the parents who met the inclusion criteria, and written consent was obtained from those who agreed to participate. A pretest was conducted before the brief educational session using a leaflet on the day of hospitalization and the first posttest was conducted after the case-based simulation practice. A second follow-up posttest was conducted at 4 weeks after the completion of the first posttest using an online survey.

Data were analyzed using the IBM SPSS Statistics ver. 29 program (IBM Corp.). General participant characteristics of were analyzed using percentages, means, and standard deviations. Chi-square tests, Fisher's exact tests, and independent t-tests were performed to test the homogeneity of study variables between the experimental and control groups. Differences over time regarding knowledge of fever, anxiety about fever, and self-efficacy for fever management between the two groups after implementing the program were analyzed using independent t-test and repeated measures analysis of variance (ANOVA). The number of hospitalizations as a covariate was applied. Homogeneity of variances was verified using Mauchly's test of sphericity in the repeated-measures ANOVA, and when the assumption of sphericity was not met, the Greenhouse-Geisser correction was applied. The reliability of the study variables was calculated using Cronbach's alpha and KR-20, with the significance level set at .05.

RESULTS

1. Homogeneity Test of General Characteristics and Study Variables

Except for the number of hospitalizations (p=.029), no significant differences in general characteristics were observed between the experimental and control groups. Further, no significant differences in the study variables were observed between the two groups (Table 2).

2. Effects of Child Fever Management Education Program

For H1, the experimental group did not show a significantly higher knowledge score than the control group immediately after the program (t=0.05, p=.962) and 4 weeks later (t=–0.08, p=.936). In addition, the interaction between group and time was not significant (F=0.151, p=.860). Therefore, H1 was rejected.

Table 2. Homogeneity test of general characteristics and study variables between the experimental and control groups (N=50)

Characteristic	Exp. (n=24)	Cont. (n=26)	χ^2 or t or Z	*p*
Age (yr)			2.09	.616
≤30	8 (33.3)	5 (19.2)		
31–35	8 (33.3)	11 (42.3)		
≥36	8 (33.3)	10 (38.5)		
Relationship with child				.602[a]
Mother	22 (91.7)	25 (96.2)		
Father	2 (8.3)	1 (3.8)		
Education			4.44	.867
≤High school	6 (25.0)	7 (26.9)		
College (3 yr)	4 (16.7)	6 (23.1)		
Bachelor (≥4 yr)	14 (58.4)	13 (50.0)		
Occupation			1.43	.757[a]
Ofiice worker	7 (29.2)	5 (19.2)		
Service job	5 (20.8)	4 (15.4)		
Profession	5 (20.8)	6 (23.1)		
Housewife	7 (29.2)	11 (42.3)		
No. of children			1.97	.131
1	14 (58.3)	10 (38.5)		
≥2	10 (41.7)	16 (61.5)		
Experience of febrile convulsions				
Yes	0 (0.0)	3 (11.5)		.236[a]
No	24 (100.0)	23 (88.5)		
Congenital disease				.491[a]
Yes	0 (0.0)	0 (0.0)		
No	24 (100.0)	26 (100)		
Child's age (mo)			1.40	.550
≤11	9 (37.5)	6 (23.1)		
12–23	10 (41.7)	12 (46.2)		
≥24	5 (20.8)	8 (30.7)		
Child's sex			0.70	.572
Male	11 (45.8)	15 (57.7)		
Female	13 (54.2)	11 (42.3)		
Current fever status			1.24	.358
Yes	15 (62.5)	21 (80.8)		
No	9 (37.5)	5 (19.2)		
Experience of fever				.661[a]
Yes	24 (100.0)	26 (100.0)		
No	0 (0.0)	0 (0.0)		
No. of hospitalizations			7.29	.029
1	14 (58.3)	11 (42.3)		
2	9 (37.5)	6 (23.1)		
≥3	1 (4.2)	9 (34.6)		
Child's health status			2.65	.474[a]
Very good	2 (8.3)	0 (0.0)		
Good	12 (50.0)	11 (42.3)		
Fair	7 (29.2)	10 (38.5)		
Poor	3 (12.5)	5 (19.2)		
Fever knowledge	10.67±2.26	10.23±2.60	–0.63	.531
Anxiety about fever	38.08±6.26	35.85±5.56	–1.34	.187
Self-efficacy for fever management	15.79±3.89	17.27±4.53	1.23	.224

Values are presented as number (%) or mean±standard deviation unless otherwise stated.
Cont., control group; Exp., experimental group.
[a]By Fisher's exact test.

For H2, the experimental group did not show a significantly lower anxiety score than the control group immediately after the program (t = 0.24 p = .814) and 4 weeks later (t = 0.70, p = .486). In addition, the interaction between group and time was not significant (F = 0.749, p = .476). Therefore, H2 was rejected.

For H3, the experimental group showed a significantly higher self-efficacy score than the control group immediately after the program (t = –2.06, p = .046). But there was no significant difference 4 weeks after the program (t = –1.35, p = .183). The interaction between group and time was not significant (F = 1.473, p = .236). Therefore, H3 was partially supported (Table 3).

DISCUSSION

This study developed and implemented a child fever management education program incorporating case-based simulation practice for parents of hospitalized infants and toddlers. It aimed to assess the program's effects on parents' knowledge of fever, anxiety related to fever, and self-efficacy in managing fever in children. Notably, this education program differs from previous interventions by combining theoretical lectures with case-based simulation practice. To evaluate its effectiveness, the experimental group received both the lecture and the case-based simulation practice, while the control group received only the former. The outcomes of the two groups were then compared.

First, there was no statistically significant difference in fever knowledge between the experimental and control groups immediately after the education program, and no interaction effect between group and time was observed at the 4-week follow-up. In a study by Tavan et al. [16], parents participated in four 30-minute sessions using a child model for practice. During later sessions, they practiced responses to various fever-related scenarios. In the study, the experimental group showed a significant increase in knowledge compared to the control group, which only received a fever management booklet at the end of the study [16]. In contrast, our study included a 30-minute session comprising a brief theoretical lecture using a leaflet and simulation practice based on five different cases for the experimental group. The control group only received the former. However, no significant differences in the improvement of fever knowledge were found between the two groups. It is assumed that both groups showed improved knowledge of fever because the

Table 3. Differences in study variables between the experimental and control groups (N=50)

Group	T_1	T_2	T_3	T_2–T_1		T_3–T_1		T_3–T_2		S	F	p
	M±SD	M±SD	M±SD	M±SD	t (p)	M±SD	t (p)	M±SD	t (p)			
Knowledge of fever					.05 (.962)		–.08 (.936)		–.16 (.876)			
Exp.	10.67±2.26	15.21±2.26	14.92±2.50	4.54±2.84		4.25±2.79		–.29±1.73		G	0.343	.561
Cont.	10.23±2.60	14.81±2.14	14.42±1.96	4.58±2.39		4.19±2.25		–.38±2.43		T	24.981	< .001
										G×T	0.151	.860
Anxiety related to fever					.24 (.814)		.70 (.486)		.54 (.594)			
Exp.	38.08±6.26	34.67±6.86	32.54±7.48	–3.42±4.52		–5.54±5.36		–2.13±5.80		G	0.964	.331
Cont.	35.85±5.56	32.73±8.29	31.38±7.11	–3.12±4.48		–4.46±5.51		–1.35±4.28		T	2.028	.137
										G×T	0.749	.476
Self-efficacy for fever management					–2.06 (.046)		-1.35 (.183)		.58 (.563)			
Exp.	15.79±3.89	20.67±3.82	21.88±3.25	4.88±2.85		6.08±3.31		1.21±3.18		G	0.014	.906
Cont.	17.27±4.53	20.04±4.71	21.73±4.88	2.77±4.29		4.46±5.05		1.69±2.65		T	20.006	< .001
										G×T	1.473	.236

Cont., control group; Exp., experimental group; G, group; M, mean; S, sources; SD, standard deviation; T, time; T_1, pre-test; T_2, post-test; T_3, 4-week follow-up.

control group also received basic theoretical education on its management. In addition, the fever management education program may have limitations, as a single 30-minute practice session may be insufficient for participants to apply and retain the knowledge acquired through the theoretical lecture. This is presumed to have influenced the absence of differences between the two groups in the follow-up assessment conducted 4 weeks later. Therefore, future studies should consider the number and duration of training sessions to maximize the effectiveness of the education program. Moreover, re-education schedules should be designed aligned with the timing of memory decay. Additional research is also needed to determine whether the theoretical knowledge acquired is internalized as practical knowledge and whether the effects of knowledge acquisition are sustained over the long term. Since the internal consistency of the fever knowledge scale was relatively low in this study, future research should improve or supplement the instrument to ensure greater reliability.

Second, there was no statistically significant difference in fever-related anxiety between the experimental and control groups immediately after the education program, and no interaction effect between group and time was observed at the 4-week follow-up. Although this study hypothesized that the experimental group receiving case-based simulation practice would more effectively internalize fever management knowledge and acquire coping skills, thereby leading to a greater reduction in anxiety compared to the control group, this hypothesis was not supported. A possible reason for the lack of a significant difference in anxiety scores between the two groups is that the cases presented—which included common pediatric conditions such as urinary tract infections, tachypnea, and febrile seizures—may have introduced new sources of anxiety unrelated to fever itself. Furthermore, both parents who did and did not experience febrile seizures expressed confusion and fear when observing a seizure demonstration on the simulator. The febrile seizure simulation scenario indicates the potential to inadvertently heighten anxiety among parents who are unfamiliar with such clinical situations. Furthermore, parents' lack of familiarity with the educational environment may have constrained their comfort and engagement in learning and practice. As such, its one-time application may not have been sufficient for effective real-world application. Therefore, future educational programs must aim to provide accurate information on diseases related to childhood fever while being mindful not to induce new anxieties. Furthermore, anxiety scores between the two groups showed little change even at the 4-week follow-up, suggesting that a single education program may not be sufficient to produce a sustained reduction in parents' anxiety related to fever. Accordingly, future programs should incorporate preparatory guidance and instruction for unfamiliar scenarios, as well as provide emotional support that enables parents to express their anxiety and acquire concrete coping strategies. Repeated sessions should be implemented to facilitate participants' adaptation to the learning environment and simulation tools. It may also be effective to present the cases in video format, followed by Q&A sessions and targeted feedback to support active learning. Moreover, parents' hypersensitive reactions and responses to their children's fever have been associated with low levels of knowledge about fever management [4,21], which consequently leads to fear of fever and difficulties in its management [28]. Therefore, educating parents on accurate knowledge and appropriate responses to childhood fever may help reduce their anxiety related to fever.

Third, the experimental group showed a significantly higher improvement in fever management self-efficacy immediately after the program than the control group. This result suggests that the case-based simulation practice—in which parents provided nursing care to Newborn HAL, a high-fidelity neonatal model capable of displaying changes in vital signs and physiological conditions—allowed them to translate abstract theoretical concepts into practical application, thereby positively influencing self-efficacy immediately after the intervention. A study by Park [29] revealed that parents who received simulation-based education on pediatric first aid demonstrated a significant increase in self-efficacy, reflecting enhanced confidence in performing emergency care. Similarly, in a study by Chang et al. [14], participants in the experimental group engaged in a 30-minute fever management simulation session, practiced caregiving behaviors, and then received a brochure summarizing key information. The total education time was approximately 65 minutes. In contrast, the control group received only the brochure and a 35-minute explanation of its content. Follow-up surveys conducted at 6 and 12 months revealed that the experimental group demonstrated more effective long-term fever management behaviors than did the control group. In the present study, although self-efficacy scores showed an increase even 4 weeks after the intervention, there was no statistically significant interaction effect between the two groups and time.

To ensure the lasting effects of simulation practice for parents, it is necessary to consider follow-up strategies such as online feedback and reminder sessions following the initial short-term education. Thus, further research is needed to examine the long-term sustainability of self-efficacy improvements. Nevertheless, scenario-based simulation remains a valuable educational approach, as it allows participants to develop fundamental skills and coping abilities in settings that closely resemble real-life situations [17,18]. Therefore, simulation-based training may be a beneficial strategy to help parents enhance their self-efficacy and effectively manage their children's fever. The self-efficacy measurement tool used in this study comprised only three items, which may be insufficient to fully measure self-efficacy regarding fever management. Therefore, future research should consider employing or developing a more valid instrument to appropriately measure parents' self-efficacy in managing child fever.

The results of this study revealed that the fever management education program for parents of hospitalized children, which combined theoretical lectures with case-based simulation practice, did not demonstrate superior effects on parents' knowledge of fever or anxiety related to fever compared to theoretical lectures alone. This study was conducted in a pediatric ward with parents of children hospitalized for short-term stays, during which parents were primarily responsible for direct caregiving. Within this context, the educational intervention was restricted to a single 30-minute simulation session, which may have been insufficient to produce measurable effects on outcomes related to knowledge or anxiety. However, it did significantly improve their self-efficacy for fever management immediately after the intervention. Given that simulation-based education requires more resources—including facilities, personnel, time, equipment, and cost—than does theoretical education, its implementation in pediatric wards for parents of acutely ill, hospitalized children must consider environmental and time constraints. Nevertheless, there remains a need to develop more practical and appropriate fever management interventions that go beyond simple theoretical lectures and help parents respond effectively in real-life situations.

This study has some limitations. First, it confirmed only the short-term effects on self-efficacy improvement, while long-term effects were not observed. The generalizability of the findings is limited, as the study employed a convenience sample of parents of children hospitalized in the pediatric ward of a single university hospital in Korea. Furthermore, owing to the short duration of hospitalization, the time to conduct the full case-based simulation practice may have been insufficient, which could have influenced the study's outcomes. Despite these limitations, this study is significant in that it is the first to develop and evaluate the effects of a childhood fever management education program incorporating case-based simulation practice for parents of hospitalized children in Korea. However, since self-efficacy improvement was only transient immediately after the intervention, we suggest follow-up education or reminder interventions to maintain long-term effects. We also propose the use of practical, feasible adaptations such as video-based scenarios or hybrid models for implementing simulation education, considering the limited personnel, time, and space in hospital settings. Future studies should aim to develop and assess various educational methods tailored to the hospital environment, while also expanding fever management programs for infants and young children to home and community settings.

CONCLUSION

This study developed a fever management education program incorporating case-based simulation practice for parents of hospitalized children and examined its effects on parents' knowledge of fever in children, anxiety related to fever, and self-efficacy in child fever management by comparing a control group that received only theoretical lectures with an experimental group that received both theoretical lectures and case-based simulation practice. The results revealed no statistically significant differences between the two groups in knowledge of fever and anxiety related to fever immediately after the education and 4 weeks later. However, parents' self-efficacy in fever management demonstrated a significant improvement between pre- and post-intervention. Therefore, the educational program developed in this study could serve as foundational material for future fever management education for children, contributing to more appropriate fever management behaviors at home and in the community. Follow-up education or reminder interventions should be considered to enhance the long-term effects of self-efficacy. Moreover, practical strategies—such as hybrid models or video-based scenarios—that can be feasibly integrated into hospital environments with constraints in personnel, time, and space should be explored for implementing case-based simulation education for parents. Future research should expand the target population to include parents of healthy chil-

dren in the community or those attending outpatient clinics, and the educational program's effectiveness should be validated through objective assessments of actual fever management skills.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors. Data collection: BN. Formal analysis: BN. Writing–original draft: BN. Writing–review and editing: HK. Final approval of published version: all authors.

Conflict of interest

Hyunju Kang has been an editor of *Child Health Nursing Research* since 2024. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported. This article was adapted from a thesis by Bora Nam in partial fulfillment of the requirements for the master's degree at Kangwon National University.

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Bora Nam https://orcid.org/0009-0002-4887-181X
https://researcherid.com/rid/NVM-6271-2025
Hyunju Kang https://orcid.org/0000-0002-2129-1658
https://researcherid.com/rid/KVZ-3932-2024

REFERENCES

1. Göbekli A, Güney R. Experiences and practices of mothers with children 0-5 age group on fever management: a mixed methods study. J Clin Nurs. 2023;32(13-14):3757-3774. https://doi.org/10.1111/jocn.16593
2. Kang TS, Kim SC, Jung SM, Lee SB, Kim DH, Park IS, et al. Usefulness of blood cultures in children aged under 3 years with fever at the emergency department. J Korean Soc Emerg Med. 2013;24(1):77-82.
3. Yıldırım M, Akın HY, Kaya A, Gündüz B. Determination of factors affecting fever management of parents who bring their children to the emergency department with high fever. J Pediatr Emerg Intensive Care Med. 2025;12(1):7-13. https://doi.org/10.4274/cayd.galenos.2024.66487
4. Gulcan MK, Sahiner NC. Determining the fever-related knowledge and practices of mothers with children aged 1-5 years presenting to a child emergency service with fever complaints in Turkiye. J Pediatr Nurs. 2023;69:e13-e20. https://doi.org/10.1016/j.pedn.2022.11.024
5. Kim HJ, Koo HY. Correlations between obtaining fever management information from the internet and knowledge and practices of fever management by mothers of infants and toddlers. Child Health Nurs Res. 2020;26(2):190-200. https://doi.org/10.4094/chnr.2020.26.2.190
6. Kim SH. Parental knowledge, anxiety and management of children's fever [master's thesis]. Seoul: Ewha Womans University; 2008.
7. Hamideh Kerdar S, Himbert C, Martin DD, Jenetzky E. Cross-sectional study of parental knowledge, behaviour and anxiety in management of paediatric fever among German parents. BMJ Open. 2021;11(10):e054742. https://doi.org/10.1136/bmjopen-2021-054742
8. Paul SP, Kini PK, Tibrewal SR, Heaton PA. NICE guideline review: fever in under 5s: assessment and initial management (NG143). Arch Dis Child Educ Pract Ed. 2022;107(3):212-216. https://doi.org/10.1136/archdischild-2021-321718
9. Kim JS. Childhood fever management: current practice vs evidence. Child Health Nurs Res. 2016;22(2):126-136. https://doi.org/10.4094/chnr.2016.22.2.126
10. Arias D, Chen TF, Moles RJ. Educational interventions on fever management in children: a scoping review. Nurs Open. 2019;6(3):713-721. https://doi.org/10.1002/nop2.294
11. Kelly M, Sahm LJ, Shiely F, O'Sullivan R, McGillicuddy A, McCarthy S. Parental knowledge, attitudes and beliefs regarding fever in children: an interview study. BMC Public Health. 2016;16:540. https://doi.org/10.1186/s12889-016-3224-5
12. Hu F, Zhang J, Shi S, Zhou Z. Fever management in the emergency department of the Children's Hospital of Fudan University: a best practice implementation project. JBI Database System Rev Implement Rep. 2016;14(9):358-366. https://doi.org/10.11124/JBISRIR-2016-003072
13. Abbey M, Bartholomew LK, Pappoe M, van den Borne B. Treating fever in children under 5 years of age: caregiver perceptions of

community health worker services in Dangme West district, Ghana. Int Health. 2015;7(6):455-463. https://doi.org/10.1093/inthealth/ihv027
14. Chang LC, Lee PI, Guo NW, Huang MC. Effectiveness of simulation-based education on childhood fever management by Taiwanese parents. Pediatr Neonatol. 2016;57(6):467-473. https://doi.org/10.1016/j.pedneo.2015.10.011
15. Chang LC, Huang MC. Efficacy of scenario simulation-based education in relieving parental anxiety about fever in children. J Pediatr Nurs. 2021;61:102-108. https://doi.org/10.1016/j.pedn.2021.03.024
16. Tavan A, Monemi E, Keshavarz F, Kazemi B, Nematollahi M. The effect of simulation-based education on parental management of fever in children: a quasi-experimental study. BMC Nurs. 2022;21(1):168. https://doi.org/10.1186/s12912-022-00938-7
17. Reilly A, Spratt C. The perceptions of undergraduate student nurses of high-fidelity simulation-based learning: a case report from the University of Tasmania. Nurse Educ Today. 2007;27(6):542-550. https://doi.org/10.1016/j.nedt.2006.08.015
18. Chernikova O, Heitzmann N, Stadler M, Holzberger D, Seidel T, Fischer F. Simulation-based learning in higher education: a meta-analysis. Rev Educ Res. 2020;90(4):499-541. https://doi.org/10.3102/0034654320933544
19. Lv K, Zhao J, Zhang P. The effect of community comprehensive nursing using scenario-based health education on the infant and young child immunization rates. Am J Transl Res. 2021;13(8):9663-9670.
20. Des Jarlais DC, Lyles C, Crepaz N. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: the TREND statement. Am J Public Health. 2004;94(3):361-366. https://doi.org/10.2105/ajph.94.3.361
21. Jeong YS, Oh HE, Kim JS. Parents' perception, knowledge and self-efficacy in management of childhood fever. J Korean Acad Child Health Nurs. 2010;16(4):324-333. https://doi.org/10.4094/jkachn.2010.16.4.324
22. Walsh A, Edwards H, Fraser J. Attitudes and subjective norms: determinants of parents' intentions to reduce childhood fever with medications. Health Educ Res. 2009;24(3):531-545. https://doi.org/10.1093/her/cyn055
23. Jeong YS. Development and effects of a parent education program for childhood fever management [dissertation]. Seoul: Ewha Womans University; 2011.
24. Ahn H, Shin H. Pediatrics. Seoul: Mirae N; 2016.
25. Jeong YS, Kim JS. Fever and fever management in children: a literature review. J Korean Acad Child Health Nurs. 2010;16(1):30-40. https://doi.org/10.4094/jkachn.2010.16.1.30
26. Jang SS. Effect of the fever education program on the pediatric nurses' knowledge, attitudes and nursing practice [master's thesis]. Gwangju: Gwangju Womans University; 2016.
27. Kim HR, Choi EJ. Development of a scenario and evaluation for SimBaby simulation learning of care for children with fever in emergency units. J Korea Contents Assoc. 2011;11(6):279-288. https://doi.org/10.5392/JKCA.2011.11.6.279
28. Toksoz F, Acikgoz A. Randomized controlled study: the effect of video-based distance education for approaching children with fever on parents' knowledge levels and fever management. J Pediatr Nurs. 2024;76:e42-e49. https://doi.org/10.1016/j.pedn.2024.01.017
29. Park MH. The development and effects of children first aid simulation education program for mothers of preschool children [dissertation]. Seoul: Korea University; 2022.

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):248-256
https://doi.org/10.4094/chnr.2025.028

pISSN 2287-9110
eISSN 2287-9129

CHNR

Mediating role of parental alienation and moderating effect of subjective health in the link between parental and adolescent depression in South Korea: a cross-sectional study

Shinil Lim[1], Yunmi Kim[2]

[1]Professor, College of Nursing, Jesus University, Jeonju, Korea
[2]Assistant Professor, College of Nursing, Jesus University, Jeonju, Korea

Corresponding author
Yunmi Kim
College of Nursing, Jesus University, 383 Seowon-ro, Wansan-gu, Jeonju 54989, Korea
Tel: +82-63-230-7577
Fax: +82-63-230-7790
E-mail: anyway777@jesus.ac.kr

Received: August 1, 2025
Revised: August 19, 2025
Accepted: September 3, 2025

Purpose: This study aimed to examine whether perceived parental alienation mediates the relationship between parental and adolescent depressive symptoms, and, if so, whether parents' subjective health moderates this indirect effect.
Methods: This cross-sectional study utilized secondary data from the 2021 wave of the Panel Study on Korean Children, enrolling 541 parent–child dyads. Parental depression was measured using the Kessler Psychological Distress Scale-6, a self-rated health item, the Korean version of the Center for Epidemiological Studies Depression Scale for Children, and a 6-item perceived alienation scale. Descriptive statistics, Pearson correlations, and variance inflation factor checks were conducted, followed by mediation and moderated mediation analyses using PROCESS Models 4 and 7 with 10,000 bootstraps in IBM SPSS ver. 27.0.
Results: Parental depression did not directly predict adolescent depression (B=.02, t=.87) but was significantly related to perceived alienation (B=.16, p<.001), which in turn predicted higher adolescent depression (B=.20, p<.001). The indirect effect of alienation was also significant (B=.039; 95% confidence interval, 0.005–0.066). Subjective health moderated the depression–alienation link (interaction B=.19, p<.001), with stronger indirect effects observed among parents with better health.
Conclusion: Parental depression symptoms indirectly increase adolescent depression through perceived alienation, particularly when parents viewed their health positively. These results suggest that interventions targeting parental mental health and fostering open-family communication may help reduce adolescent depression.

Keywords: Adolescent; Depression; Health status; Mental health; Parent-child relations

INTRODUCTION

Middle school represents a transitional stage characterized by rapid physical and mental changes, during which adolescents are prone to emotional instability [1]. According to the 2022 Mental Health Survey (Children and Adolescents), the prevalence of mental disorders among Korean adolescents (aged 12–17 years) is 9.5%, which is nearly twice as high as that among children (aged 6–11 years, 4.7%) [2], thus underscoring the gravity of adolescent mental health problems. Furthermore, adolescent depression is caused by complex interactions between both personal (self-esteem, aggression, perfectionism, self-control, etc.) and environmental factors [1,3]. Family level influences include parenting attitudes,

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

family conflict/economic stress, and parent–child relationship quality [3,4]; school-level influences include relationships with teachers, academic stress, and academic adaptation [1]; and social/contextual influences include peer relationships and the online/digital environment [5,6]. Therefore, to more precisely understand the onset and escalation of adolescent depression, research that comprehensively examines these multilevel factors is essential [3].

Consequently, research is needed to comprehensively examine the pathways by which parental depression leads to depression in children, with particular attention paid to emotional mediators within the family system, such as relational alienation [6,7]. The physical and psychological health of parents are critical factors that both directly and indirectly influence child-rearing environment [4,8]. The extent to which parents perceive their own health as "good" can shape the quality of emotional exchanges within the family, thereby altering the level of bonding or alienation between parents and their children [8,9]. Recent international research has demonstrated that parental emotional support can alleviate both psychological and somatic symptoms in adolescents by enhancing self-efficacy and that this pathway is moderated by socioeconomic status [10]. Moreover, perceived parental conflict during online learning has been shown to intensify the comorbidity network of anxiety and depression among Chinese adolescents [5]. However, limited research has investigated whether parental subjective health (PSH)—beyond emotional support itself—moderates the "parental depression → parent–child relationship" pathway. As such, it is necessary to analyze moderating variables to better understand how parental health awareness influences emotional interactions within the family and, in turn, adolescent depression [11,12].

In large-scale social crises, such as the coronavirus disease 2019 (COVID-19) pandemic, interactions among family members may be restricted or distorted, thereby exacerbating adolescents' emotional and behavioral problems [4,13]. Changes in family communication during disasters can also negatively affect adolescent mental health [5,13]. Parental psychological stress and health perceptions can alter the emotional climate at home, thereby increasing adolescents' emotional vulnerability [4,8]. Adolescents who experience alienation in their parental relationships report higher levels of loneliness and depression, whereas close relationships enhance emotional stability and resilience [6,14]. During the pandemic, increased family stress and reduced parent–child communication were found to be associated with poorer adolescent mental health [13,15]. Meta-analytic evidence has indicated that the quality of parental educational involvement, home-based support, school-based engagement, and academic socialization all show a protective association with adolescent depressive symptoms [16]. Since middle school involves profound physical and psychological changes, developmentally tailored interventions are required to prevent the onset of depression [1,3]. Poor parental health perception can undermine the parent–child relationship, increase perceived relational alienation, and ultimately heighten adolescents' depressive symptoms [4,6]. Consequently, it is necessary to investigate the indirect effects of parental mental health on adolescent depression, focusing on the mediating role of perceived parent–child alienation [11].

METHODS

Ethical statements: The Panel Study on Korean Children (PSKC) was conducted by the Korea Institute of Child Care and Education (KICCE) with approval from the Institutional Review Board (IRB) of KICCE (approval number: KICCEIRB-2021-05). For the present study, which performed secondary analyses of PSKC Wave 14 data, ethical approval was obtained from the Institutional Review Board of Presbyterian Medical Center, Jeonju, Korea (IRB no., PMC 2025-06-001-001).

1. Study Design

This cross-sectional secondary analysis of the nationally representative PSKC Wave 14 (2021) tested a moderated mediation from parental depression to adolescent depression via adolescent-perceived relationship alienation, moderated by PSH. Reporting followed the Strengthening the Reporting of Observational Studies in Epidemiology statement [17].

2. Study Sample

This study was a secondary data analysis using data from the PSKC, which has been conducted by the KICCE since 2008. The PSKC is a nationally representative longitudinal study designed to track the growth and development of children in Korea and to collect national-level data on developmental characteristics, parenting environments, and parental needs across various stages of childhood. We used PSKC Wave 14 (fieldwork: June–November 2021).

The original sample consisted of households with newborns born between April and July 2008. The sampling frame included medical institutions across South Korea that recorded more than 500 deliveries per year as of 2006. A stratified multistage sampling method was used to select the sample, resulting in a final panel of 2,150 children. For the current study, we analyzed data from Wave 14 (2021), when the cohort reached their first year of middle school (Grade 7 in Korea). At that time, 1,328 children remained in the panel. Among them, 541 participants (283 boys and 258 girls) were included in the final analysis based on complete responses from both the parent and the adolescent, with no missing data on the key study variables (listwise deletion). PSKC cross-sectional sampling weights were applied in all analyses.

3. Variables and Measurements

1) Adolescent depression

Adolescent depression was assessed using the 11-item Korean short form of the Center for Epidemiological Studies Depression Scale for Children (CES-DC). The original 20-item CES-DC was developed by Faulstich et al. [18] in 1986 for children and adolescents, based on the adult Center for Epidemiologic Studies Depression Scale (CES-D) developed by Radloff [19]. The Korean version was translated and culturally adapted by Hoe et al. [20], who shortened the scale to 11 items for use with Korean children and adolescents. Example items include "I didn't sleep well" and "I felt sad." Each item was rated on a 4-point Likert scale ranging from 0 (rarely or none of the time) to 3 (most of the time), with higher scores indicating more severe depressive symptoms. The Korean short form has demonstrated strong concurrent validity with the original CES-DC and high internal consistency reliability (Cronbach's α=.85) in prior research [20]. In the present study, Cronbach's α was .83.

2) Parental depression

Parental depression was measured using the Kessler Psychological Distress Scale-6 (K6) [21], a short form of the K10 developed for the National Health Interview Survey in the United States. The K6 consists of six items, and in this study, both fathers and mothers responded to the same six items separately, resulting in a total of 12 items. Example items include "During the past 30 days, how often did you feel hopeless?" and "During the past 30 days, how often did you feel nervous?" Each item was rated on a 5-point Likert scale from 1 (none of the time) to 5 (all the time), with higher scores indicating greater levels of depressive symptoms. In the current study, Cronbach's α was .90.

3) Parental relationship alienation (child-perceived)

Parental relationship alienation, as perceived by adolescents, was assessed using a modified version of the parent subscale of the Inventory of Parent and Peer Attachment (IPPA) [22]. The IPPA was adapted and validated for Korean children by Yoo et al. [23] and further revised by the PSKC research team to suit the 12th wave of the panel study. The scale includes six items: three for the father and three for the mother. Each item was rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater perceived alienation in the parent–child relationship. Example items include "My father often doesn't notice when I'm upset" and "My mother doesn't understand the difficulties I'm experiencing these days." Cronbach's α for this scale in the present study was .72.

4) Parental subjective health status

PSH status was assessed using two single-item questions, one for the father and one for the mother. Each parent rated their own health on a 5-point Likert scale ranging from 1 (very poor) to 5 (very good), with higher scores indicating better perceived health. A sample item is, "How would you rate your current health status?" The use of a single-item self-rated health measure has been shown to have good reliability and predictive validity for various health outcomes in Korean adult populations [8,9]. For analysis, we created a family-level parental health index by averaging the two ratings (higher scores indicate better perceived health).

4. Data Analysis

All analyses were performed with IBM SPSS ver. 27.0 (IBM Corp.). Mediation and moderated-mediation models were estimated within a conditional-process framework and implemented with the PROCESS macro for SPSS (mediation: Model 4; first-stage moderated mediation: Model 7). This study tested a cross-sectional moderated-mediation model in which parental relationship alienation (M), as perceived by adolescents, mediates the association between parental depression (X) and adolescent depression (Y), while PSH (W)

moderates the X→M path. All models controlled for adolescent age, gender, household income, and parental education.

These analytic steps are as follows: (1) We inspected distributional properties (means, standard deviations [SDs], skewness, kurtosis) and multicollinearity (variance inflation factors [VIFs]) to evaluate model assumptions. (2) Pearson correlations were computed among X, M, and Y. (3) A simple mediation model (X→M→Y) was estimated to test the indirect effect via M (paths *a* and *b*; direct effect *c*′ adjusted). (4) A first-stage moderated-mediation model was then estimated in which W moderates the X→M path; conditional indirect effects a(W) × ba(W) × ba(W) × b were derived across the observed range of W. Johnson–Neyman probing was used to identify the region(s) of significance for the conditional effect of X on M and to visualize the J–N threshold [24].

For inference on indirect and conditional indirect effects, we used bias-corrected bootstrap 95% confidence intervals (CIs) with 10,000 resamples; effects were considered statistically significant when the 95% CI excluded zero. All tests were two-tailed with $\alpha = .05$. The Johnson–Neyman technique is a procedure that, in the context of linear interactions (conditional effects), directly computes and visualizes the region(s) of significance, the range of moderator values for which the 95% CI of the simple slope excludes zero, and the corresponding threshold(s), thereby addressing the limitations of the pick-a-point approach that tests only the mean and ±1 SD [11,24].

RESULTS

1. Descriptive Statistics and Correlations of Parental Depression, Parental Relationship Alienation, and Adolescent Depression

Descriptive statistics and correlation coefficients for the major study variables parental depression, parental relationship alienation, and adolescent depression are presented in Table 1. The mean score for parental depression was 1.91 (SD = 0.63), for parental relationship alienation 2.41 (SD = 0.74), and for adolescent depression 1.49 (SD = 0.41). Skewness ranged from 0.25 to 1.64 and kurtosis from 0.13 to 4.05, confirming the normality of the data distribution (criteria: skewness < 2, kurtosis < 7) [25,26]. Additionally, VIF values for all variables were below 10, indicating no issues with multicollinearity.

Pearson correlation analysis revealed a significant positive correlation between parental depression and parental relationship alienation (r = .163, $p < .05$), and between parental relationship alienation and adolescent depression (r = .201, $p < .001$).

2. Mediating Effect of Parental Relationship Alienation in the Relationship between Parental Depression and Adolescent Depression

The results of the mediation analysis are presented in Table 2. Parental depression had a statistically significant effect on parental relationship alienation (B = .16, $p < .01$), and parental relationship alienation significantly predicted adolescent depression (B = .20, $p < .001$). However, the direct effect of parental depression on adolescent depression was not statistically significant (B = .02, $p = .87$).

The indirect effect of parental depression on adolescent depression via parental relationship alienation was statistically significant (B = .039, Boot standard error [SE] = .015; 95% CI, .005–.066). Since the CI did not include zero, the mediating effect was supported. These results suggest that parental depression does not directly influence adolescent depression but rather exerts an indirect effect through adolescents perceived alienation in parent-child relationships.

3. Moderating Effect of Parental Subjective Health on the Association between Parental Depression and Parental Alienation

Table 3 presents the results of the moderate mediation analysis. Parental depression significantly predicted parental relationship alienation (β = .16, $p < .01$), and PSH status signifi-

Table 1. Correlation and descriptive statistics of research variables

Variable	r (*p*)			M ± SD	Skewness	Kurtosis	VIF
	1	2	3				
1. Parental depression	1			1.91 ± 0.63	0.71	0.30	1.01
2. Parental relationship alienation	.11 (.010)	1		2.41 ± 0.74	0.25	–0.13	1.17
3. Adolescent depression	.08 (.063)	.37 (< .001)	1	1.49 ± 0.41	1.64	4.05	1.16

SD, standard deviation; VIF, variance inflation factor.

Table 2. Mediating effect of parental relationship alienation on the relationship between parental depression and adolescent depression

Variable	B	SE	Boot SE	t	*p*	95% CI	95% Boot CI
Parental relationship alienation							
Constant	2.44	0.03		71.45	< .001	2.38 to 2.51	
Parental depression	0.16	0.06		2.76	.006	0.06 to 0.28	
Adolescent depression							
Constant	1.00	0.06		17.83	< .001	0.89 to 1.11	
Parental depression	0.02	0.03		0.87	.385	–0.03 to 0.08	
Parental relationship alienation	0.20	0.02		9.00	< .001	0.16 to 0.24	
Indirect effect							
Parental depression → parental relationship alienation → adolescent depression	0.04		0.02				0.01 to 0.07

Boot CI, bootstrapped confidence interval; Boot SE, bootstrapped standard error; CI, confidence interval; SE, standard error.

Table 3. Examining the moderating effects of subjective health status on the relationship between parental depression and parental relationship alienation

Moderating variable	Variable	B	SE	R^2	t	F	*p*	95% CI
Subjective health status	Constant	2.44	0.03		71.45		< .001	2.38–2.51
	Parental depression	0.16	0.06		2.76		.006	0.05–0.28
	Subjective health status × parental depression	0.19	0.07		2.60		.010	0.05–0.23
	R^2 change of interaction item			.024		4.46	.004	

CI, confidence interval; SE, standard error.

cantly moderated this relationship (interaction term: β = .192, $p < .01$). The inclusion of the interaction term (parental depression × subjective health status) led to a statistically significant increase in the explained variance ($\Delta R^2 = .024$, $p < .01$), confirming that the association between parental depression and parental relationship alienation differed depending on the level of perceived parental health.

Given the significant moderating effect of PSH status, this study further estimated the conditional indirect effects of parental depression on adolescent depression via parental relationship alienation across different levels of parental health. To do this, Model 7 of the PROCESS macro was used with 10,000 bootstrapped resamples and a 95% CI. The Johnson–Neyman technique was applied to determine the regions of significance for the conditional indirect effect.

Figure 1 presents the Johnson–Neyman plot illustrating the moderating effect of PSH on the indirect pathway from parental depression to adolescent depression via relationship alienation [27]. The red vertical line marks the threshold (z = –0.094), which separates the region of nonsignificance (left) from the region of significance (right). The conditional indirect effect was significant only at moderate to high levels of subjective health: it was nonsignificant at −1 SD (Boot B = 0.05, Boot SE = 0.07, $p = .415$) but significant at the mean (Boot B = 0.16, Boot SE = 0.06, $p = .006$) and at +1 SD (Boot B = 0.27, Boot SE = 0.08, $p = .001$) (Table 4). Taken together, these results indicate that higher PSH strengthens the a-path (parental depression → relationship alienation), thereby increasing the conditional indirect effect on adolescent depression; the b-path (relationship alienation → adolescent depression) is not moderated.

DISCUSSION

This study demonstrated that parental depression did not directly predict adolescent depression but exerted an indirect effect through adolescents' perceptions of relational alienation in the parent–child relationship. Furthermore, this indirect effect was moderated by PSH, such that the pathway was stronger when parents rated their health more positively. These findings are consistent with conditional process modeling frameworks [11,24] and underscore the relevance of family systems theory in explaining adolescent psychological adjustment [22].

These findings further suggest that parental emotional distress may lead to increased alienation in the parent-child relationship, which in turn may negatively impact adolescents' emotional well-being [1,4]. However, no significant correlations were found between parental and adolescent depressive symptoms. The present study found that parental de-

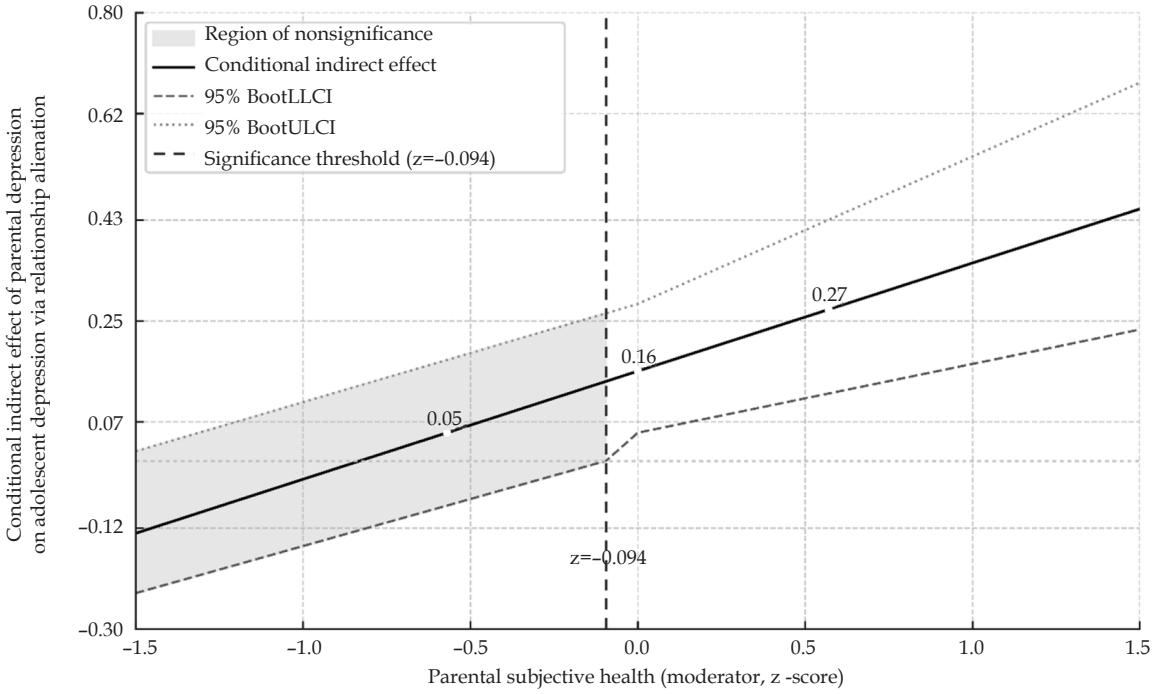


Figure 1. Johnson-Neyman Plot [27]: The indirect effect of parental depression on adolescent depression through alienation moderated by subjective health. LLCI, lower level of confidence interval; ULCI, upper level of confidence interval.

Table 4. Conditional indirect effects of parental depression on adolescent depression at different levels of parental subjective health

Level of moderator (subjective health status)	Boot B	Boot SE	*p*	95% Boot CI
–1SD (–0.57)	0.05	0.07	.415	–.08 to .18
Mean (0)	0.16	0.06	.006	.05 to .28
+1SD (+0.57)	0.27	0.08	.001	.12 to .43

Bootstrapping based on 10,000 samples.
Boot B, bootstrapped indirect effect; Boot CI, bootstrapped confidence interval; Boot SE, bootstrapped standard error; SD, standard deviation.

pression does not directly influence adolescent depression but exerts an indirect effect through adolescents' perceived alienation in the parent–child relationship [11,24]. This aligns with previous findings indicating that excessive psychological control or negative parenting behaviors contribute to shame or self-silencing in children, which in turn exacerbate depressive symptoms [7,14]. Furthermore, alienation in the parent–child relationship may lead to maladaptive peer interactions, thereby reinforcing a negative feedback loop of emotional distress in adolescents [6,28]. This finding further indicates that adolescent depressive symptoms are more strongly influenced by relational dynamics, specifically by perceived alienation from parents, than by parental depressive symptoms alone. These results align with those of prior studies on adolescent depression and parent–child relationships [1,4], indicating that the psychological impact of parental depression may be mediated by the quality of the emotional bond between parents and their children.

One of the key findings of this study is that PSH moderated the association between parental depression and parent–child relational alienation [11,24]. These findings further suggest that the association between parental depression and parental relationship alienation differs depending on parents' perceived health status. Parental health awareness may shape the degree of emotional connectedness with children, as suggested in prior work on parental mental health and the parent–child relationship [4]. Specifically, when parents perceived their health more positively, the adverse impact of depression on their emotional relationships with their children became more pronounced (see the J-N threshold), which is consistent with contextual moderation in family processes [3,22]. This suggests that parents who outwardly feel "un-

healthy" may be less likely to express or acknowledge their internal emotional difficulties, which could inadvertently deepen emotional disconnection and conflict within the parent–child relationship [4,29]. However, when parents perceived their health status as low, the effect of depression on their children's sense of alienation was not statistically significant. This may indicate that emotional exchanges within the family were already restricted due to parents' health difficulties, potentially limiting the variability in parent–child relational quality [4], which is consistent with the conditional-process interpretation [11,24]. This finding indicates that the indirect pathway from parental to adolescent depression may vary depending on PSH [11,24].

Prior research has shown that parental stress and depression tend to affect the entire family system [6,30], and that PSH may either buffer or exacerbate this influence [10,16]. When parents experience high levels of depression, they are less likely to provide emotional support to their children, potentially leading to psychological disconnection and relational alienation [10,16]. This, in turn, may increase adolescents' internalized shame and self-silencing, eventually worsening depressive symptoms [14]. Moreover, previous studies have demonstrated that parental overcontrol or inconsistent parenting is linked to difficulties in peer relationships, while reduced autonomy is associated with increased depressive symptoms [6,7]. Consistent with the family systems theory, this study confirms that the absence of emotional connectedness between parents and children indirectly exacerbates adolescents' depressive symptoms through perceived alienation rather than via direct transmission of depressive symptoms [14,22].

During large-scale social crises such as the COVID-19 pandemic, increased parental psychological stress has been shown to worsen children's sleep, behavior, and emotional well-being [13,31]. In this context, the present study suggests that PSH may further influence the degree of emotional disconnection within the family [8,9]. Adolescence is a period marked by intense emotional and physical development, and both the quality of the parent–child relationship and the emotional climate within the household significantly affect adolescents' vulnerability to depression [1,3].

Overall, these results suggest that adolescent depression is not solely explained by individual factors but is a complex process involving emotional interactions with parents and PSH [8,12]. Prior studies have shown that alienation from parents increases adolescents' emotional distress, and that such effects can be mediated or moderated by psychological or contextual factors [6,7]. Our analyses indicate that PSH moderates the association between parental depression and parent–child relationship alienation, in line with conditional process analysis and standard interaction-probing procedures (e.g., Johnson–Neyman) [11,24]. Given that PSH is validated as a health indicator in Korean populations [8,12], family-centered interventions that address parents' psychological and physical well-being while strengthening emotional bonds within the family are warranted [4,10]. In addition, school-based mental health education and counseling for middle school students should be implemented, and coordinated systems linking schools with family counseling and home-based health supports are recommended [2,13].

This study has some limitations. First, its cross-sectional design precludes causal inference and limits conclusions regarding temporal ordering [11,24]. Second, the perspectives of diverse family members (e.g., grandparents and single parents) were not sufficiently incorporated, which may constrain the ecological validity of the results [30]. Third, socioeconomic and cultural contexts were not explicitly modeled, potentially limiting generalizability across subgroups [32]. Future research should employ longitudinal, qualitative, or mixed-methods designs to trace changes in parent–child emotional dynamics and clarify temporal ordering [29,33]. It is also important to design and test family centered intervention models tailored to diverse structures (e.g., single-parent, grandparent-led, and multicultural families) to ensure cultural and contextual relevance [6]. To better probe the link between parental and adolescent depression, studies should prioritize long-term longitudinal designs and analytic strategies appropriate for conditional processes (e.g., moderated mediation/J–N probing) [11,24]. A family centered integrative agenda may ultimately inform prevention and intervention by addressing parents' psychological and physical health along with adolescents' emotional well-being [34].

CONCLUSION

This study confirmed that parental depression indirectly increases adolescents' depressive symptoms through perceived parent–child relational alienation. The magnitude of this indirect effect varied according to parents' subjective health perception, indicating that health awareness shapes the quality of emotional interactions within families. These findings indicate that adolescent depression should be ad-

dressed within the family context, emphasizing both parental mental health and emotional connectedness. Family centered interventions that promote parental well-being and strengthen parent–child relationships are recommended as key strategies for preventing adolescent depression.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: SL, YK. Methodology: SL, YK. Data collection: SL, YK. Formal analysis: SL, YK. Validation: SL, YK. Investigation: SL, YK. Writing–original draft: SL, YK. Writing–review and editing: SL, YK. Supervision: YK. Project administration: none. Final approval of published version: SL, YK.

Conflict of interest

The authors declare no competing interests.

Funding

This study was supported by the research fund of Jesus University (2025-1-6).

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Shinil Lim https://orcid.org/0000-0004-6448-2555
https://researcherid.com/NVM-7304-2025
Yunmi Kim https://orcid.org/0000-0002-2912-8927
https://researcherid.com/NTQ-5147-2025

REFERENCES

1. Yang MJ, Lee EK, Lee HW. A study on psychosocial characteristics, environmental variables and mental health variables of adolescents. Korean J Youth Couns [Internet]. 2006 [cited 2025 Jun 11];14(1):63-76. Available from: https://www.kci.go.kr/kciportal/ci/sereArticleSearch/ciSereArtiView.kci?sereArticleSearchBean.artiId=ART001019417
2. Ministry of Health and Welfare, National Center for Mental Health, Seoul National University, Gallup Korea. 2022 Mental Health Survey (children and adolescents) [Internet]. Ministry of Health and Welfare; 2024 [cited 2025 Jun 11]. Available from: https://www.mohw.go.kr/
3. Kim S, Ko H, Park S, Yang E. Factors related to depression of children and adolescents in South Korea: a meta-analysis. Korean Psychol J Cult Soc Issues [Internet]. 2012 [cited 2025 Jun 11];18(4):533-555. Available from: https://www.kci.go.kr/kciportal/ci/sereArticleSearch/ciSereArtiView.kci?sereArticleSearchBean.artiId=ART001717376
4. Cho HS, Han YJ, Won SD, Kim HS, Yoo JH, Choi JW, et al. Parent-child relationship during the COVID-19 pandemic. Korean J Health Psychol. 2021;26(5):943-959. https://doi.org/10.17315/kjhp.2021.26.5.006
5. Tao Y, Niu H, Tang Q, Wang S, Zhang L, Liu G, et al. The association between online learning, perceived parental relationship, anxiety, and depression symptoms among secondary school students: insight from symptom network and cross-lagged panel network approach. BMC Public Health. 2024;24(1):2133. https://doi.org/10.1186/s12889-024-19675-4
6. Park S, Chung H. Longitudinal mediating effects of peer relationship on the links between adolescents' perceived negative parenting experience and depression. Forum Youth Cult. 2020;(64):57-82. https://doi.org/10.17854/ffyc.2020.10.64.57
7. Choi JA. The role of grit and social withdrawal in the relationship between parental autonomy support and depression in early adolescence : a serial multiple mediation model. GRI Res J. 2023;25(3):29-54. https://doi.org/10.23286/gri.2023.25.3.002
8. Kim SH, Cho B, Won CW, Hong YH, Son KY. Self-reported health status as a predictor of functional decline in a community-dwelling elderly population: nationwide longitudinal survey in Korea. Geriatr Gerontol Int. 2017;17(6):885-892. https://doi.org/10.1111/ggi.12797
9. Ahn BC, Joung HJ. Self-rated health and its indicators: a case of the 2001 Korean National Health and Nutrition Examination Survey. J Community Nutr. 2006;8(1):38-43.
10. Qian M, Jin R, Lu C, Zhao M. Parental emotional support, self-efficacy, and mental health problems among adolescents in Hong Kong: a moderated mediation approach. Front Psychiatry. 2024;15:1458275. https://doi.org/10.3389/fpsyt.2024.1458275
11. Hayes AF. Partial, conditional, and moderated moderated mediation: quantification, inference, and interpretation. Commun Monogr. 2018;85(1):4-40. https://doi.org/10.1080/03637751.2017.1352100
12. Park G, Chung W. Self-rated health as a predictor of mortality according to cognitive impairment: findings from the Korean Longitudinal Study of Aging (2006-2016). Epidemiol Health. 2021;43:e2021021. https://doi.org/10.4178/epih.e2021021

13. Jo E, Seo K, Nam B, Shin D, Kim S, Jeong Y, et al. Deterioration of mental health in children and adolescents during the COVID-19 pandemic. J Korean Acad Child Adolesc Psychiatry. 2023;34(1):21-29. https://doi.org/10.5765/jkacap.220041
14. Im MH, Ha JH. The mediating effects of internalized shame and self-silencing in the relationship between parental psychological control and adolescent's depression. Korean J Couns. 2021;22(2):135-158. https://doi.org/10.15703/kjc.22.2.202104.135
15. Bell IH, Nicholas J, Broomhall A, Bailey E, Bendall S, Boland A, et al. The impact of COVID-19 on youth mental health: a mixed methods survey. Psychiatry Res. 2023;321:115082. https://doi.org/10.1016/j.psychres.2023.115082
16. Liu Y, Song Y, Wu Y, Lu H, Gao Y, Tang J, et al. Association between parental educational involvement and adolescent depressive symptoms: a systematic review and meta-analysis. BMC Psychol. 2024;12(1):538. https://doi.org/10.1186/s40359-024-02039-3
17. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Ann Intern Med. 2007;147(8):573-577. https://doi.org/10.7326/0003-4819-147-8-200710160-00010
18. Faulstich ME, Carey MP, Ruggiero L, Enyart P, Gresham F. Assessment of depression in childhood and adolescence: an evaluation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC). Am J Psychiatry. 1986;143(8):1024-1027. https://doi.org/10.1176/ajp.143.8.1024
19. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1(3):385-401. https://doi.org/10.1177/014662167700100306
20. Hoe M, Lee SH, Kim YS. Developing the Korean version of the 11-item CES-DC. Ment Health Soc Work. 2017;45(1):255-285. https://doi.org/10.24301/MHSW.2017.03.45.1.255
21. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med. 2002;32(6):959-976. https://doi.org/10.1017/s0033291702006074
22. Armsden GC, Greenberg MT. The inventory of parent and peer attachment: individual differences and their relationship to psychological well-being in adolescence. J Youth Adolesc. 1987;16(5):427-454. https://doi.org/10.1007/BF02202939
23. Yoo SK, Park SL, Hwang MH. Validation of Korea inventory of parent and peer attachment. Korean J Elem Couns. 2010;9(1):21-39.
24. Hayes AF, Matthes J. Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. Behav Res Methods. 2009;41(3):924-936. https://doi.org/10.3758/BRM.41.3.924
25. Curran PJ, West SG, Finch JF. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. Psychol Methods. 1996;1(1):16-29. https://doi.org/10.1037/1082-989X.1.1.16
26. Hancock GR, Mueller RO. Structural equation modeling: a second course. 2nd ed. Information Age Publishing; 2013.
27. Lee IH. Easy Flow Statistics Macro (Johnson-Neyman 95% CI Graph) [Internet]. StatEdu; 2020 [cited 2025 Sep 10]. Available from: https://doi.org/10.22934/StatEdu.2020.01
28. Kim HJ, Cui RN, Nho CR. The effects of child abuse by parents on depression in early adolescents: double-mediating effects by social withdrawal and peer alienation. J Sch Soc Work. 2021;53:27-53. https://doi.org/10.20993/jSSW.53.2
29. Soh SY, Ju JS, Cho EH, Son YM, Baik JW. A qualitative study exploring adolescents' experiences of anxiety and depression and the recovery process. Korea J Youth Couns. 2021;29(1):229-254. https://doi.org/10.35151/kyci.2021.29.1.011
30. Kang K, Kim J, Kim J, Jeong H, Han J. Factors affecting early school-age children's subjective happiness: using the actor-partner interdependence model of parental variables. J Korean Acad Nurs. 2017;47(6):854-863. https://doi.org/10.4040/jkan.2017.47.6.854
31. Li W, Zhang H, Zhang C, Luo J, Wang H, Wu H, et al. The prevalence of psychological status during the COVID-19 epidemic in China: a systemic review and meta-analysis. Front Psychol. 2021;12:614964. https://doi.org/10.3389/fpsyg.2021.614964
32. Park HY, Heo J, Subramanian SV, Kawachi I, Oh J. Socioeconomic inequalities in adolescent depression in South Korea: a multilevel analysis. PLoS One. 2012;7(10):e47025. https://doi.org/10.1371/journal.pone.0047025
33. Chung JY, Kang HS, Park EJ. The disease and treatment experiences of adolescent with depression. Forum Youth Cult. 2014;38:91-123. https://doi.org/10.17854/ffyc.2014.04.38.91
34. Choi MK, Lee YH. Depression, powerlessness, social support, and socioeconomic status in middle aged community residents. J Korean Acad Psychiatr Ment Health Nurs. 2010;19(2):196-204. https://doi.org/10.12934/jkpmhn.2010.19.2.196

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):257-271
https://doi.org/10.4094/chnr.2025.022

pISSN 2287-9110
eISSN 2287-9129

CHNR

Development of an artificial intelligence-based nursing simulation scenario evaluation tool: a methodological study using the Real-Time Delphi method in South Korea

Eun Joo Kim[1], Bitna Park[2], Geun Myun Kim[3], Ji Young Lim[4], Seong Kwang Kim[5]

[1]Associate Professor, Department of Nursing, Gangneung-Wonju National University, Wonju, Korea
[2]Professor, Department of Nursing, Gangdong University, Eumseong, Korea
[3]Professor, Department of Nursing, Gangneung-Wonju National University, Wonju, Korea
[4]Professor, Department of Nursing, Inha University, Incheon, Korea
[5]PhD Student, Department of Nursing, Gangneung-Wonju National University, Wonju, Korea

Corresponding author
Bitna Park
Department of Nursing, Gangdong University, 278 Daehak-gil, Gamgok-myeon, Eumseong 27600, Korea
Tel: +82-43-879-3043
Fax: +82-43-879-3021
E-mail: bnabark@hanmail.net

Received: July 15, 2025
Accepted: September 8, 2025

Purpose: Simulation-based education plays a critical role in nursing by allowing students to acquire clinical competencies in a safe and controlled environment. However, current evaluation tools for simulation scenarios often lack standardization, resulting in inconsistencies when assessing the effectiveness of such programs.
Methods: This study aimed to develop a comprehensive Nursing Simulation Scenario Evaluation Tool using the Real-Time Delphi method. A panel of 10 experts in nursing and simulation education participated in two rounds of surveys. The evaluation criteria were derived from the International Nursing Association for Clinical Simulation and Learning Standards of Best Practice and relevant literature. Survey items were refined through expert consensus using content validity ratios and coefficient of variation values. The finalized tool was further enhanced with artificial intelligence (AI)–based evaluation capabilities to support objective and systematic assessment. The tool was registered and patented in the Republic of Korea (Korean Intellectual Property Office Registration No. 10-2024-0051234) to acknowledge its innovation and technical merit.
Results: The process resulted in an evaluation tool comprising eight key domains and 36 items, covering scenario structure, learning objectives, preparation, script development, debriefing, facilitation, expected outcomes, and scenario validity. A Kendall's coefficient of concordance of 0.739 indicated strong agreement among the experts.
Conclusion: This study successfully developed a standardized and validated tool to improve the reliability and effectiveness of simulation-based education in nursing. The tool addresses a key gap in current educational practices and enhances consistency in evaluating nursing simulation scenarios. Future studies should focus on validating its application across diverse educational environments.

Keywords: Clinical competence; Delphi technique; Educational measurement; Nursing; Simulation training

INTRODUCTION

Despite the continuous development and increasing complexity of the medical field in the 21st century, the basic structure and format of medical education have remained largely unchanged since the late 19th century [1]. This is par-

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

ticularly significant in nursing, where nurses play a crucial role in ensuring patient safety and health. Nurses must acquire the necessary competencies across various situations before engaging in clinical practice with patients [2]. Traditional knowledge tests play an important role in the prelearning phase of simulation-based education, but are insufficient on their own. In simulation-based education, learners apply previously acquired knowledge and skills to realistic scenarios that better prepare them for the complexities of real-world clinical practice [1].

Moreover, clinical practice involving patients fails to measure the diverse competencies required for effective patient care, imposes significant stress on learners, and increases concerns about patient safety [2]. Accordingly, the importance of simulation education (SE) in nursing has been emphasized. It enables learners to experience various clinical scenarios in a safe environment, thereby enhancing their clinical performance. The introduction and utilization of SE in nursing help students acquire the clinical reasoning skills required to navigate complex, unpredictable clinical situations, meet the varied requirements of modern medical services, and ensure patient safety through educational innovation [3].

However, several important factors must be considered to ensure the effectiveness of SE. Currently, the validity and reliability of simulation scenarios are primarily determined through evaluations by a small group of experts. Moreover, adherence to the International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of Best Practice—which provide internationally recognized guidelines for simulation-based education, including Simulation Design, Outcomes and Objectives, Facilitation, Debriefing, and Evaluation—has often been found to be insufficient, particularly in the areas of Simulation Design and Participant Evaluation [4]. A previous study developed a pediatric nursing simulation scenario template to standardize practices in pediatric nursing education [5]. Although it provides a useful framework for scenario development, its focus on pediatric contexts limits its applicability across diverse nursing disciplines [5]. In addition, the absence of a robust evaluation system highlights the need for a more comprehensive and reliable approach to effectively assess simulation scenarios [5]. This undermines the consistency and reproducibility of SE, making it difficult to compare and evaluate educational outcomes. Therefore, setting goals that match learners' levels, ensuring scenario authenticity and expert validity, and specifying debriefing procedures are necessary [4]. This requires systematic collection and analysis of expert opinions to formulate effective scenario development and evaluation protocols.

The development of a Nursing Simulation Scenario Evaluation Tool (NS-SET) is crucial for ensuring the quality and effectiveness of simulation-based education. NS-SETs are essential for accurately measuring learners' clinical capabilities and providing a structured framework for evaluating the acquisition of the necessary knowledge, skills, and attitudes [6]. By using these tools, educators can objectively assess learners' performance, offer personalized feedback, and enhance educational outcomes, thereby supporting educational objectives [2].

Current evaluation tools (ETs) in simulation-based education often rely on limited practical exercises and focus predominantly on knowledge-based assessments. However, this approach does not comprehensively evaluate learners' clinical skills, such as responsiveness to real patient scenarios [7]. Moreover, the inconsistency and limited reliability of these ETs can undermine the credibility of the evaluation results [6]. Although these tools primarily assess simulation-based education outcomes, there remains a pressing need for standardized tools and methodologies that specifically evaluate the validity and quality of simulation scenarios.

To address these issues, the Real-Time Delphi (RTD) method integrates the opinions of diverse experts to determine the components and structure of the ET scenario [8]. This approach helps balance educational value and practical feasibility by building a broad expert consensus. The RTD method facilitates the collection and analysis of panel members' opinions through iterative rounds of real-time feedback based on initial responses [8]. Additionally, the Delphi method can enhance data reliability by applying predefined criteria [9]. This process ultimately leads to more precise decision-making and plays a pivotal role in nursing NS-SET development.

Consequently, this study aimed to use the RTD method to assemble a panel of experts, including nursing and simulation specialists, to develop an NS-SET. This endeavor sought to produce a self-checklist for the direct application of the developed scenarios in education, enabling self-evaluation. Through this process, we expect to construct the foundational components for nursing simulations systematically and establish a basis for scenario development.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Gangneung-Wonju National University (IRB no., GWNUIRB-2023-18). Informed consent was obtained from all participants.

1. Study Design

This study employed the RTD survey method to gather expert panel opinions and derive consensus on the development of an ET for nursing simulation scenarios. This study followed the Guidelines for Conducting and Reporting Delphi Studies (CREDES) [10].

2. Survey Development

The research team developed a nursing simulation scenario template based on the INACSL Standards of Best Practice, specifically the Simulation Design and Evaluation standards, along with findings from previous studies [4]. This template specifies the criteria that must be included in a nursing education simulation scenario. The study also aimed to develop a self-assessment checklist for the direct application of the developed scenarios to education. The review examined previous studies on developing an ET for self-assessment after the development of simulation scenarios. The questionnaire was developed from INACSL content and prior studies and integrated with the guidelines on evidence-based clinical simulation scenarios by Waxman [11] in 2010, the five themes that must be included in nursing simulation programs described by Page-Cutrara [12], and the Colorado Hospital Association's guidance on how to write a simulation scenario. A total of 35 items were derived to create an ET for simulation scenarios, focusing on eight key areas: overview of the scenario, learning objectives, preparation and pre-briefing plan, creating the script and case information, debriefing, facilitation, expected outcomes and evaluation, and development of the scenario. The overview included four items assessing adherence to the scenario template standards, completeness of the scenario, plausibility of the case, and whether the materials were evidence-based. Learning objectives were assessed to determine whether they were specific, measurable, attainable, relevant, and timely. The preparation and pre-briefing plan consisted of eight items that assessed participants' physical, mental, and prior-knowledge preparedness, as well as the simulation lab environment, materials, and simulators, including two items related to pre-briefing preparation. Creating the script and case information included 10 items that required checking the scenario algorithm and flowsheet. The debriefing section assessed whether the questions were specific and verifiable by the educator. One item in the facilitation section asked whether the questions were clearly presented. The expected outcomes and evaluation section asked whether the ETs were clear and whether their reliability was reported. Finally, the development of the scenario assessed whether developers presented theoretical bases and frameworks and verified scenario validity. This tool includes elements of patient-centered care assessment, evidence-based nursing interventions, clinical judgment, communication, teamwork, and safety, as suggested by Page-Cutrara [12], and it incorporates proposals from Kim et al. [4] that the validity and reliability of the scenario must be verified.

3. Study Participants

An expert panel was carefully selected to include individuals with extensive expertise and experience in this topic. The criteria for selection included more than 10 years of nursing education and practice experience or more than 5 years of experience in simulation teaching or research. Ten experts participated in this study.

4. The Real-Time Delphi Survey Process

1) Development of Real-Time Delphi tool

We developed a dedicated website using the RTD technique (https://k-realtimedelphi.net/app/home). Using the open-source low-code development platform Budibase (https://github.com/Budibase/budibase), we built a website that was hosted on Amazon Web Services. Automated tasks on the site (such as collecting responses from the expert panel, survey coding, and statistical analysis) had previously been performed manually, which now allows researchers and the expert panel to participate more efficiently. Furthermore, by integrating features that ensure the anonymity of the expert panel and enable the real-time exchange of opinions, we implemented the core elements of the RTD technique.

2) Survey through Real-Time Delphi

This study was conducted in five phases. In Phase 1, the researchers explained the research objectives to the recruited experts, obtained their consent, and conducted the survey simultaneously. Phase 2 involved providing a survey link to the expert panel for the preliminary investigation of the NS-SET and conducting the survey. Phase 3 involved closing the initial results and modifying the ET based on the expert panel's responses and opinions. In Phase 4, the survey link for the modified and enhanced ETs, based on the expert panel's opinions, was provided again to conduct the survey. Phase 5 involved completing the survey, summarizing the results, and finalizing the ET. The RTD survey was conducted in two rounds: the first survey took place from December 26, 2023, to January 10, 2024, and the second survey was conducted from February 14, 2024, to February 27, 2024. Ten experts participated in this survey.

5. Data Collection

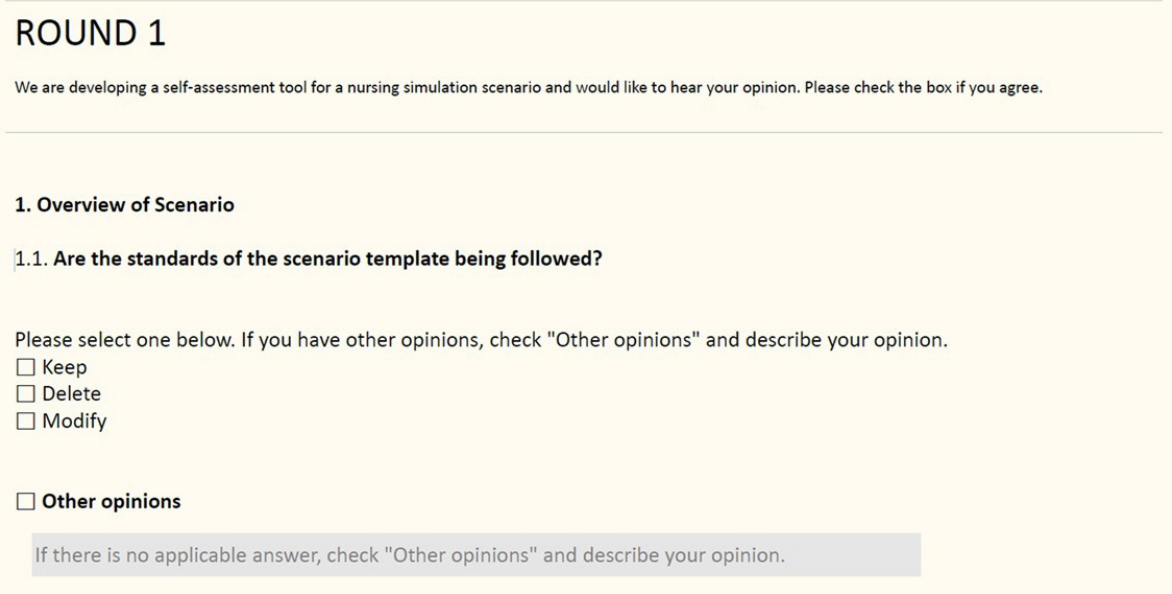
To derive the objectives of the NS-SET, a preliminary investigation was conducted based on a draft ET developed from a literature review [4]. A Phase I Delphi survey was conducted as an initial step in this preliminary investigation. The nursing NS-SET was surveyed and divided into the following parts: 1. Overview of the scenario; 2. Learning objectives, 3. Preparation and pre-briefing plan; 4. Script creation and case information; 5. Debriefing plan; 6. Facilitation; 7. Expected outcomes and evaluation, and 8. Scenario development. Subsequently, based on the Phase 1 RTD survey findings, the opinions of the expert panel were collected, and the template was modified and enhanced before conducting Phase 2.

1) Round 1 Real-Time Delphi survey

The Phase 1 RTD survey consisted of an initial template divided into eight parts, and experts were asked to review the retention of each part and the items and content within each part. Examples of detailed survey questions were structured as follows: Item 1, "Are the standards of the scenario template being followed?" and Item 2, "Has all content of the template been completed?" The survey responses were categorized as "keep," "delete," "modify," or "additional comments." The experts could indicate their opinion by selecting "keep" if they felt the contents were suitable for the part, "delete" if they were inappropriate, "modify" if adjustments were necessary, or provide "additional comments" for further input (Figure 1).

2) Round 2 Real-Time Delphi survey

Following the first RTD survey on the development of the nursing simulation scenario template and considering expert opinions, the content validity ratio (CVR) and the coefficient of variation (CV) were evaluated. Based on these findings,


ROUND 1

We are developing a self-assessment tool for a nursing simulation scenario and would like to hear your opinion. Please check the box if you agree.

1. Overview of Scenario

1.1. **Are the standards of the scenario template being followed?**

Please select one below. If you have other opinions, check "Other opinions" and describe your opinion.
☐ Keep
☐ Delete
☐ Modify

☐ **Other opinions**

If there is no applicable answer, check "Other opinions" and describe your opinion.

Figure 1. Example of round 1 Real-Time Delphi survey.

the template was revised and enhanced. While maintaining the structure of the template, some content within each part was added or modified based on the panelists' comments or the CVR values. Unlike the initial survey, the second round had two questions focused on whether each part and its content within the template could be used appropriately. Responses were recorded on a 4-point scale ranging from "perfect agreement" to "perfect disagreement," and an optional "other" section was provided for additional comments.

6. Data Analysis

Data collected through the two rounds of RTD surveys were analyzed by calculating the CVR and CV for each item using Excel (Microsoft 365; Microsoft Corp.). Interpretation of the CVR values followed predefined criteria [13]. Figure 2 shows a flowchart of the decision-making process based on the analysis results.

The CVR depends on the number of panel members. For the first Delphi survey with 10 panel members, a CVR value of 0.60 or higher was required to consider the content valid. Therefore, items with a CVR value less than 0.60 in the first survey were considered to have low content validity and were subject to deletion or modification. The CVR formula is as follows: CVR = (N_e–N/2)/(N/2), where N is the total number of expert panel members, and N_e is the number of panelists who rated the item as "appropriate". Stability was calculated using the CV, defined as the standard deviation (SD) of each item divided by its mean. A CV less than 0.5, indicating high consistency in expert responses, was considered stable and reliable [14].

Kendall's W (KW) was used to assess the consistency of responses among the experts [15]. The KW values were analyzed using Python ver. 3.9.0 (https://www.python.org/downloads/release/python-390/). The KW value ranges from 0 to 1, where a value closer to one indicates a high de-

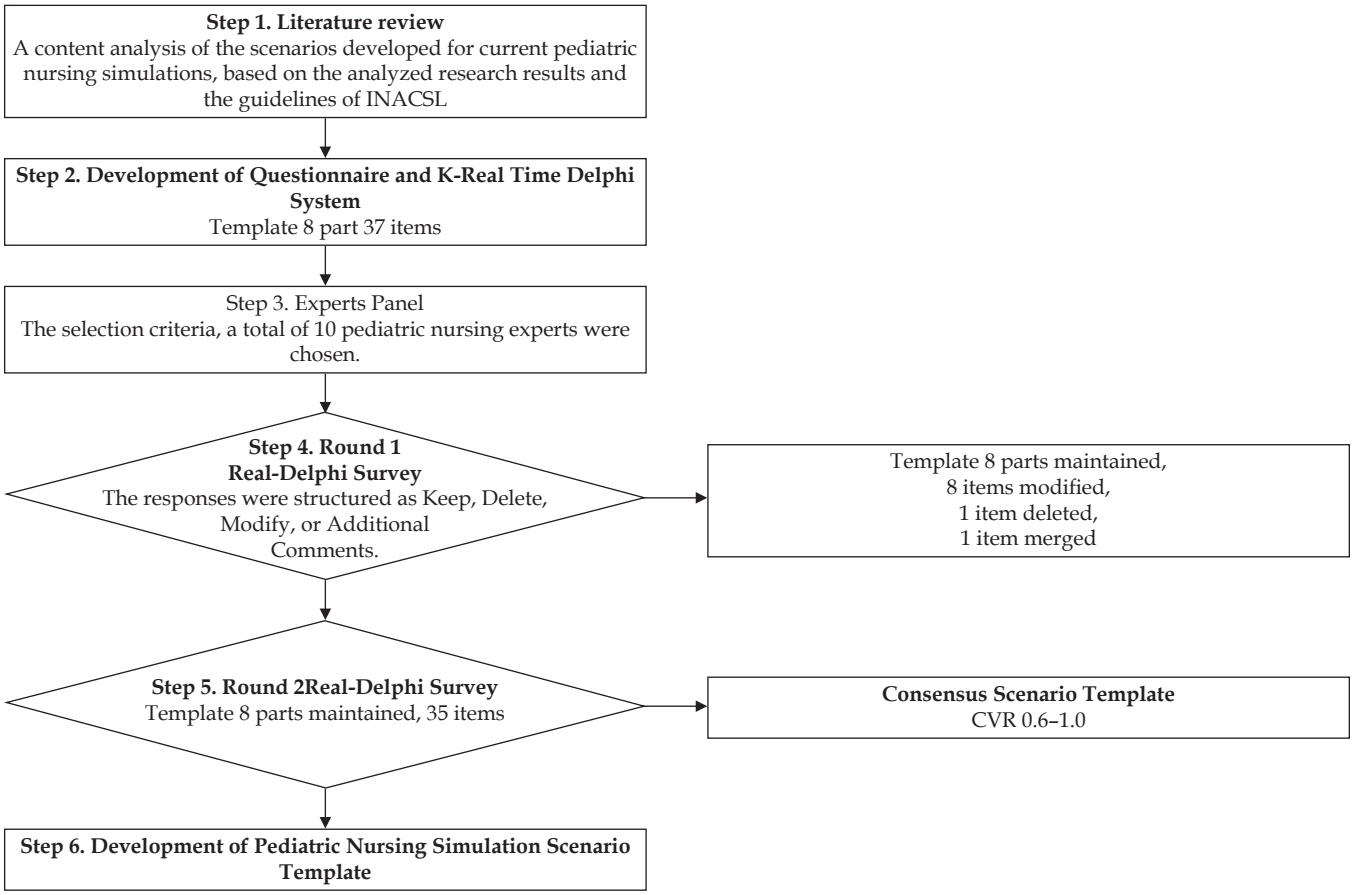


Figure 2. Flowchart of real time Delphi survey. CVR, content validity ratio; INACSL, International Nursing Association for Clinical Simulation and Learning.

gree of agreement among the evaluators, whereas a value closer to zero indicates little or no agreement. According to conventional criteria, values below 0.3 indicate low agreement, values between 0.3 and 0.7 indicate moderate agreement, and values above 0.7 indicate strong agreement. These findings highlight the diversity of opinions among the experts and suggest that there may be no consensus on this topic.

7. AI-Based Evaluation Process

Artificial intelligence (AI) technology was utilized to automate scenario evaluation. The AI system analyzes scenario texts, applies predefined evaluation criteria, and generates scores with justifications for each item. This process enhances the consistency and objectivity of the evaluation results by reducing human subjectivity and fatigue. Instant feedback was also provided, allowing evaluation results to be obtained within seconds to minutes. Google Gemini (Google LLC) was employed as the underlying AI platform to perform natural language analysis and generate automated evaluation outputs.

RESULTS

1. Round 1 Real-Time Delphi Survey Results

In Round 1 of the RTD survey, expert panel opinions were collected for 37 items evaluated using the CVR and CV. CVR values ranged from 0.20 to 1.00, and CV values ranged from 0.00 to 0.38. Several items did not meet the validity and consistency thresholds, indicating the need for further revision and review.

For item 4 (Part 1. Overview of scenario: use of evidence-based data), the question was, “Did you use evidence-based data?” Experts emphasized the importance of referencing “evidence-based data” and recommended broadening the question. This item recorded a CVR of 0.60 and a CV of 0.24, indicating the need to clarify the definition of evidence-based guidelines.

For Item 10 (Part 2. Learning objectives: timeliness of objectives presentation), which asked, “Were the objectives presented in a timely manner?” Experts expressed that the definition of “timeliness” was ambiguous, leading to varying interpretations. They questioned whether timeliness refers to synchronization with simulation events or the overall timing of training. This item recorded a CVR of 0.40 and a CV of 0.38, highlighting the need to refine this definition.

For Item 11 (Part 3. Preparation & pre-briefing plan: consideration of participants’ physical and psychological aspects), which assessed, “Were participants' physical and psychological aspects considered in the design?” Experts raised concerns about when these aspects should be addressed. This item showed a CVR of 0.60 and a CV of 0.31, emphasizing the need for more concrete criteria.

Item 19 (Part 4. Make script and case information: prediction of learner scenarios before simulation starts) asked, “Could the learner predict the scenarios before the simulation started?” Some experts suggested modifying the question to assess whether the learner had sufficient information about the scenarios rather than focusing on prediction. This item recorded a CVR of 0.60 and a CV of 0.31.

For Item 24 (Part 4. Make script and case information: planning for simulator [patient] reactions based on learner assessments and critical decision-making), the question was, “Is the simulator (patient) programmed to respond based on the learner’s assessment and critical decision-making?” This item showed a CVR of 0.60 and a CV of 0.31.

Item 32 (Part 6. Facilitation: clarity of facilitator’s role) asked, “Was the facilitator’s role clearly defined?” Experts indicated that the description of the facilitator’s role was vague and recommended clarifying the terminology. This item recorded a CVR of 0.40 and a CV of 0.38.

For Item 34 (Part 7. Expected outcomes and evaluation: indication of evaluation tool reliability), which asked, “Was the reliability of the evaluation tool indicated?” Experts stated that reliability is important; however, the item does not sufficiently define the methods to ensure and demonstrate reliability. They recommended clearer explanations and criteria to validate the reliability of the evaluation tools. In addition, some experts expressed concerns about the difficulty of presenting objective reliability within the scenario and questioned whether it was necessary to indicate the reliability of the scenario. This item recorded a CVR of 0.20 and a CV of 0.33. For Item 35 (Part 8. Development of scenario: identification of scenario developers), which asked, “Were the scenario developers identified?” No additional feedback was given, but this item recorded a CVR of 0.40 and a CV of 0.38, indicating the need for further actions. Based on expert opinions and a follow-up meeting among the researchers, we decided to retain Item 35 as an optional section rather than delete it.

Finally, Item 36 (Part 8. Development of scenario: presenta-

tion of the scenario's foundation and theoretical framework), which asked, "Is the foundation and theoretical framework of the scenario presented?" showed a moderate level of agreement among experts. However, an additional opinion was raised suggesting that "it would be sufficient to present the scenario's foundation based on clinically frequent occurrences or evidence-based knowledge of the task." After a meeting among the research team members, it was concluded that "it is not necessary to present the theoretical framework," leading to the deletion of this item.

This analysis revealed that certain items exhibited deficiencies in validity and consistency according to expert opinions, highlighting the need for further review and adjustment. In Round 1, the KW among expert responses was very low at 0.019 (chi-square [χ^2] = 94.26, p = .040) (Table 1).

2. Round 2 Real-Time Delphi

In the Round 2 RTD survey, expert panel opinions were collected for 36 items, which were evaluated using the CVR and CV. In this survey, CVR values ranged from 0.60 to 1.00, and CV values ranged from 0.00 to 0.13. Most items showed improvements compared with Round 1, reflecting revisions made to the nursing simulation scenario template based on expert feedback. However, one item did not fully meet the validity and consistency criteria, indicating the need for further refinement.

For instance, Item 35 (Part 8. Development of scenario: identification of scenario developers), which stated, "The scenario developers were identified," had a CVR of 0.60 and a CV of 0.13. Although this item displayed an improved CVR compared with Round 1, the relatively low agreement indicates that further action is needed to reach a higher level of expert consensus. Based on expert feedback, we decided, through internal meetings among the researchers, to keep Item 35 as an optional item rather than remove it.

The improvements in Round 2, as demonstrated by the increased agreement and alignment for most items, indicate that the revisions made to the template after Round 1 were effective in addressing many initial concerns. In Round 2, KW among expert responses was significantly higher at 0.739 (χ^2 = 377.022, p < .001), indicating a substantial increase in agreement compared to Round 1 (Table 1).

The final version of the completed Nursing Simulation Scenario Evaluation Tool is provided in the Appendix 1.

The boxplots in Figure 3 and Figure 4 illustrate the distribution of responses for each item across the two rounds of the Delphi survey. The first set of boxplots visualized the experts' responses to 37 items on a 3-point scale, while the second set represented 36 items on a 4-point scale in the second round of the survey. Both boxplots highlight key statistical features, including the mean (black dots), SD (red lines), and interquartile range (IQR, orange boxes), which capture the central tendency and variability of the responses.

In the first round (Figure 3), items with broader IQRs, larger SDs, and lower mean values indicated areas with potential discrepancies in expert consensus or item clarity, particularly items 10, 32, 34, and 35. For some items, the absence of orange IQR boxes indicates a very high level of agreement among experts, where the first and third quartile values are identical. This pattern suggests strong consensus among panel members for those items (Figure 3).

In comparison, the second-round (Figure 4) boxplots reveal a reduction in the SD and IQR for most items. This indicates improved consensus and greater alignment among the experts' opinions between the two rounds. Thus, it can be inferred that the modifications made after the first round contributed to narrowing the variability and achieving stronger agreement in the second round (Figure 4).

Although the number of visible IQR boxplots increased compared with that in the first round, this does not indicate lower agreement. Rather, it reflects the use of a more detailed 4-point scale in the second round, which allowed experts to express their opinions more precisely.

DISCUSSION

This study aimed to develop a tool to evaluate simulation scenarios in nursing programs. The initial ET was developed based on the INACSL Standards of Best Practice, specifically focusing on Simulation Design and Participant Evaluation standards, as well as a comprehensive review of the existing literature. Using the RTD technique, eight key areas and 36 items were identified.

This study is significant because a consensus was reached on the content and tools that could be used to evaluate the validity of scenarios used in nursing simulation programs.

To date, the evaluation of simulation practice programs has primarily been used to measure learning effects regarding students' knowledge, skills, and attitudes, as well as to analyze qualitative data such as student satisfaction and practice experience revealed during the debriefing process

Table 1. Results of the round 1 and 2 Real-Time Delphi for the development of nursing simulation scenario evaluation tool

Comments	Order in round 1			Order in round 2	
	CVR	CV	Decision	CVR	CV
Part 1. Overview of scenario					
1. Format conformity with scenario template	1.00	0.00	Retained	1.00	0.13
2. Completeness of content in template	0.80	0.21	Retained	1.00	0.13
3. Case plausibility	1.00	0.00	Retained	1.00	0.13
4. Use of evidence-based data	0.60	0.24	Revised	1.00	0.13
5. Consideration of patient safety in scenarios	1.00	0.00	Retained	1.00	0.00
Part 2. Learning objectives					
6. Specificity of learning objectives	1.00	0.00	Retained	1.00	0.13
7. Measurability of specific skills and behaviors	1.00	0.00	Retained	1.00	0.13
8. Attainability considering participants' knowledge and experience	0.80	0.10	Retained	1.00	0.13
9. Relevance to participants' knowledge and experience	0.60	0.24	Retained	0.80	0.13
10. Timeliness of objectives presentation	0.40	0.38	Revised	0.80	0.13
Part 3. Preparation & pre-briefing plan					
11. Consideration of participants' physical and psychological aspects	0.60	0.31	Revised	0.80	0.13
12. Inclusion of pre-existing knowledge and attitudes of participants	1.00	0.00	Retained	1.00	0.13
13. Appropriate type of simulators	1.00	0.00	Retained	1.00	0.13
14. Suitable environment and settings	1.00	0.00	Retained	1.00	0.13
15. Adequate equipment and tools for simulation education	0.80	0.21	Retained	1.00	0.13
16. Clear delineation of roles for both simulator and participants	1.00	0.00	Retained	1.00	0.13
17. Provision of pre-briefing plan checklist	0.80	0.21	Retained	1.00	0.13
18. Techniques for establishing psychological environment in pre-briefing plan	0.60	0.24	Retained	0.80	0.13
Part 4. Make script & the case information					
19. Prediction of learner scenarios before simulation starts	0.60	0.31	Revised	1.00	0.13
20. Providing a realistic starting point	1.00	0.00	Retained	1.00	0.13
21. Providing learner nursing interventions based on patient condition	0.80	0.10	Retained	1.00	0.13
22. Planning for positive/negative changes in simulator situation by learner interventions	0.80	0.10	Retained	1.00	0.13
23. Facilitating when learner interventions do not occur	1.00	0.00	Retained	1.00	0.13
24. Planning for simulator (patient) reactions based on learner assessments and critical decision-making	0.60	0.31	Revised	1.00	0.13
25. Confirmation of patient stability	1.00	0.00	Retained	1.00	0.13
26. Explanation of team roles for learners	0.80	0.21	Retained	1.00	0.13
27. Realism and adequacy of patient situation, data, and records	0.80	0.21	Retained	1.00	0.13
28. Is the patient's situation, data, and records sufficient to perform interventions?	1.00	0.00	Retained	1.00	0.13
Part 5. Debriefing plan					
29. Debriefing questions that confirm objectives and expected outcomes	1.00	0.00	Retained	1.00	0.13
30. Planned debriefing methods	1.00	0.00	Retained	1.00	0.13
31. Debriefing content easily accessible to educators	0.80	0.21	Retained	1.00	0.13
Part 6. Facilitation					
32. Clarity of facilitator's role	0.40	0.38	Revised	1.00	0.13
Part 7. Expected outcomes & evaluation					
33. Clarity of evaluation tools for assessing goal achievement	1.00	0.00	Retained	1.00	0.13
34. Indication of evaluation tool reliability	0.20	0.33	Revised	1.00	0.13
Part 8. Development of scenario					
35. Identification of scenario developers	0.40	0.38	Revised	0.60	0.13
36. Presentation of scenario's foundation and theoretical framework	0.80	0.21	Deleted	-	-
37.Scenario validity	1.00	0.00	Retained	1.00	0.13
W value		0.019		0.73926	
X^2 value		94.26		377.022	
p		.040		< .001	

CV, coefficient of variation; CVR, content validity ratio.

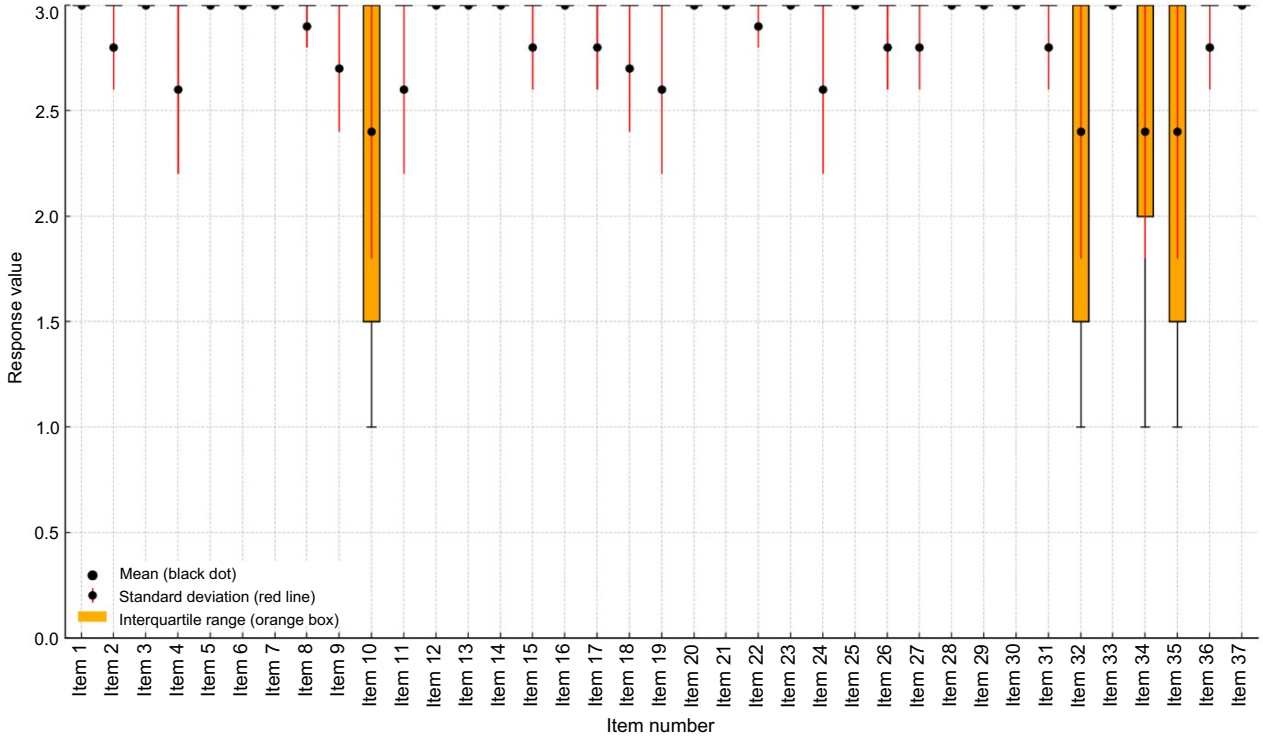


Figure 3. Boxplot of experts' responses (round 1).

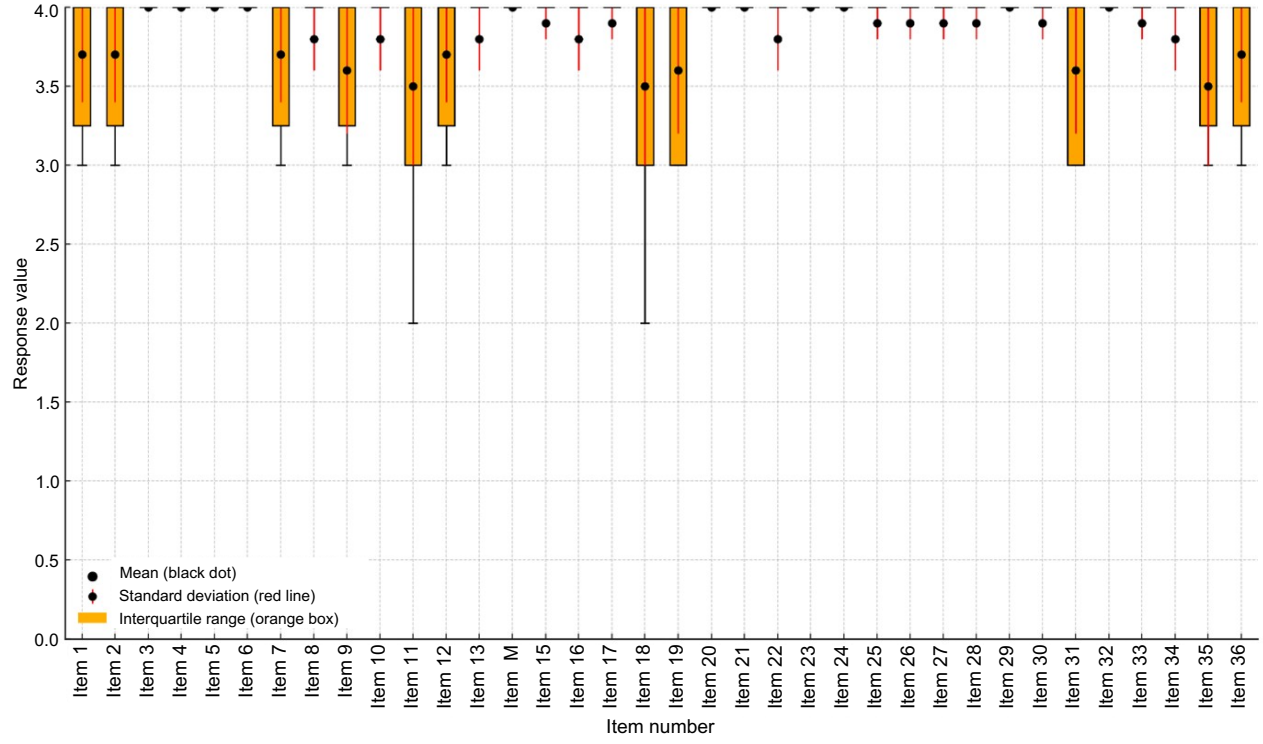


Figure 4. Boxplot of experts' responses (round 2).

[2,6,16,17].

It is challenging to establish a scientific basis for evaluating the validity of an entire simulation program based solely on its effects on learning and experience. Simulation-based learning involves the development of applicable knowledge, skills, and attitudes through experiences in environments similar to real situations. The most critical influence on this process is the scenario. However, no commonly used ET exists for the simulation scenarios.

The tool was designed as a self-assessment instrument to allow simulation educators and scenario developers to independently evaluate the completeness, clarity, and validity of their simulation scenarios. A self-assessment approach offers several advantages: it enables continuous quality improvement without the need for external reviewers, fosters reflective practices among educators, and enhances practicality and accessibility in diverse educational environments. During development, the clarity, objectivity, and ease of interpretation of each item were carefully considered to minimize bias and ensure consistent application across various simulation contexts.

Therefore, reaching a consensus among experts on the tool used to assess simulation scenarios is significant. SE utilizes various methods, including low-fidelity and high-fidelity modalities, standardized patients (SPs), and virtual reality (VR). Universities often use scenarios developed by faculty within each discipline, sometimes bundled with commercial simulation programs. Although scenarios packaged with simulators apply the teaching method presented by the INACSL, they are limited when applied across different learning environments. According to Waxman [11], educators must develop scenarios that imitate real-life situations in controlled environments to cultivate optimal competencies. Developed scenarios require standardization using tools that evaluate usefulness and feasibility. These standards are essential for applying scenarios to various situations and cases, particularly in the context of interprofessional education (IPE). IPE involves collaborative learning among students from different healthcare professions, which is crucial for preparing them to work effectively in interdisciplinary teams. Thus, the scenario ET derived in this study serves as a foundational step toward establishing standardized criteria for simulation scenarios, ensuring that they are beneficial across multiple disciplines.

The scenario ET constructed in this study integrates INACSL and existing research [11,12] and includes sections such as "overview of scenario," "learning objectives," "preparation and pre-debriefing," and "script creation and care information." A total of eight areas and 36 items were developed, including "debriefing plan," "facilitation," "expected outcomes and evaluation," and "development of scenario." Page-Cutrara [12] reviewed existing simulation ETs and categorized "patient-centered care and assessment," "evidence-based nursing intervention and clinical judgment," "communication and teamwork," and "safety" as elements to be included in the simulation scenario. The guidelines for scenario development by Waxman [11] include "learning objectives," "assessment plan and instrument," "evidence base for objectivity and assessment," "prescenario learner activities," "general debriefing plan," and "validation." The areas of "testing," "facilitation," and "debriefing" were also presented. In this study, overlapping areas were integrated based on the literature and INACSL standards.

The evaluation area presented by Page-Cutrara [12] was biased toward scenario-centered evaluations. The guidelines for developing simulation scenarios by Waxman [11] are valuable because they demonstrate not only the scenarios in the study, but also the process guidelines that can be used when developing simulation programs. Additionally, a checklist consisting of four areas was presented to evaluate the feasibility of the scenario: curricular integration, scenario script, simulation team information, and debriefing. However, these standards are not sufficiently specific for use as ETs, and they are difficult to apply universally to various methods and situations, such as low-fidelity, high-fidelity, SPs, and IPE.

In this study, two Delphi surveys led to the deletion and revision of one item with overlapping content and two items judged inappropriate, resulting in a final set of 36 items.

Of the original 37 items, 33 achieved a CVR of 0.80 or higher, indicating a strong expert consensus on the tool's component areas and items. However, in the first survey, content validity was low in some subcategories of facilitation, expected outcomes, evaluation, and development scenarios. Specifically, clarification of the facilitator's role within the facilitation area was weak. SE emphasizes self-directed learning and the use of learners' experiences, including shared needs assessment, goal setting, the development and implementation of learning plans, and evaluation of learning outcomes. In this process, the instructor guides adult learners, helping them apply their prior experience to real-world problems and understand the rationale behind learning [11]. Accord-

ingly, evaluation of the facilitation section is essential. Through discussion, the research team revised and clarified this section; in the second survey, it achieved a CVR of 1.0. Retaining this item implies that the instructor's role must be specified in detail when developing future simulation programs and scenarios.

Among items with a CVR of 0.60 or lower, "consideration of patient safety in scenarios" in the "overview of scenario" area and "consideration of participants' physical and psychological aspects" in the "preparation and prebriefing plan" area conveyed duplicative content. This item was revised and integrated into the question "Was the simulation designed considering the physical and mental stability of the participants?" to emphasize the importance of safety and participant well-being in simulation design. The reliability of simulation-based assessments can also be supported by frameworks such as the objective structured clinical examination (OSCE), which allows consistent and objective evaluation of participants' performance, even by assessors without prior program design or field-specific expertise [18]. Therefore, adopting structured evaluation principles similar to those of the OSCE can enhance the objectivity and reproducibility of simulation scenario assessments.

Moreover, Page-Cutrara [12] identified safety as a scenario evaluation area; therefore, in this study, the two aforementioned items were combined into one, the CVR was 0.80, and a second survey was ultimately adopted. In this study, the items were modified and supplemented so that the scenarios of the simulation program could be universally evaluated.

As simulation learning involves generating practical knowledge through experience, the validity of the scenario content must have a scientific basis. Therefore, the tool developed in this study can be used effectively and universally to evaluate simulation scenarios.

This study aims to develop a tool for evaluating simulation scenarios using a Delphi survey involving experts with extensive SE experience. Through this process, the quality of SE can be improved by establishing the validity of simulation practice education and specifying standards through evaluation. This can be used as a standard to determine the level and scope of scenario content when developing simulation programs for each major field.

Although the RTD method has advantages such as anonymity, iterative feedback, and efficiency, it also has limitations. Reliance on a relatively small number of experts may restrict the generalizability of the findings, and repeated surveys can contribute to participant fatigue, potentially influencing the quality of responses. Furthermore, this study was conducted with a limited panel size within a specific national context, which may limit the broader applicability of the results. Future research should therefore expand the diversity and number of expert participants to strengthen the robustness and external validity of the tool.

CONCLUSION

This study aims to develop a simulation program scenario for ET based on consensus from a group of experts. First, an integrated tool was developed by reviewing the existing literature, and eight areas and 36 items were confirmed by gathering experts' opinions. This tool is significant because it improves the quality of SE by ensuring validity in simulation-based practice education and by specifying standards through evaluation. Furthermore, the NS-SET developed in this study integrates the Google Gemini AI to enable intelligent, automated scenario evaluations. This system automates the entire process (from PDF file upload to the AI's in-depth analysis and presentation of evaluation results), substantially increasing evaluation efficiency and objectivity. The AI provides not only an evaluation of each item but also the rationale for each assessment, ensuring transparency and offering concrete insights for scenario improvement. However, because this study confirmed only the content validity of the tool using the Delphi technique, future work should assess the validity and reliability of the ET scenario. Based on this tool, we hope that applied studies of simulation programs and scenarios will continue.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: EJK, BP, GMK, JYL, SKK. Methodology: EJK. Project administration: EJK, BP. Supervision: EJK. Software: SKK. Investigation: SKK. Data curation: SKK. Visualization: SKK. Formal analysis: GMK, SKK. Resources: JYL. Writing–original draft: BP, GMK, JYL. Writing–review and editing: EJK, BP. Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

This study was supported by a National Research Foundation of Korea (NRF) grant funded by the Korean government (No. 2021R1A2C1095530).

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Eun Joo Kim https://orcid.org/0000-0002-1554-3927
https://researcherid.com/rid/KIB-8989-2024
Bitna Park https://orcid.org/0000-0002-6266-1002
https://researcherid.com/rid/KIB-4405-2024
Geun Myun Kim https://orcid.org/0000-0003-1409-395X
https://researcherid.com/rid/ISU-6977-2023
Ji Young Lim https://orcid.org/0000-0001-9561-4678
https://researcherid.com/rid/OOL-1192-2025
Seong Kwang Kim https://orcid.org/0000-0002-8029-2722
https://researcherid.com/rid/MVU-4257-2025

REFERENCES

1. McGaghie WC, Issenberg SB, Petrusa ER, Scalese RJ. Revisiting 'A critical review of simulation-based medical education research: 2003-2009'. Med Educ. 2016;50(10):986-991. https://doi.org/10.1111/medu.12795
2. Park S, Hur HK, Chung C. Learning effects of virtual versus high-fidelity simulations in nursing students: a crossover comparison. BMC Nurs. 2022;21(1):100. https://doi.org/10.1186/s12912-022-00878-2
3. McCaughey CS, Traynor MK. The role of simulation in nurse education. Nurse Educ Today. 2010;30(8):827-832. https://doi.org/10.1016/j.nedt.2010.03.005
4. Kim EJ, Cho KM, Song SS. Child nursing simulation scenario content analysis: a directed qualitative content analysis. Clin Simul Nurs. 2024;87:101488. https://doi.org/10.1016/j.ecns.2023.101488
5. Kim EJ, Lee MH, Park B. Developing a pediatric nursing simulation scenario template in South Korea: applying Real-Time Delphi methods. Child Health Nurs Res. 2024;30(2):142-153. https://doi.org/10.4094/chnr.2024.012
6. Hanshaw SL, Dickerson SS. High fidelity simulation evaluation studies in nursing education: a review of the literature. Nurse Educ Pract. 2020;46:102818. https://doi.org/10.1016/j.nepr.2020.102818
7. Bambini D. Writing a simulation scenario: a step-by-step guide. AACN Adv Crit Care. 2016;27(1):62-70. https://doi.org/10.4037/aacnacc2016986
8. Aengenheyster S, Cuhls K, Gerhold L, Heiskanen-Schüttler M, Huck J, Muszynska M. Real-Time Delphi in practice: a comparative analysis of existing software-based tools. Tech Forecast Soc Chang. 2017;118:15-27. https://doi.org/10.1016/j.techfore.2017.01.023
9. Varndell W, Fry M, Elliott D. Applying Real-Time Delphi methods: development of a pain management survey in emergency nursing. BMC Nurs. 2021;20(1):149. https://doi.org/10.1186/s12912-021-00661-9
10. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: recommendations based on a methodological systematic review. Palliat Med. 2017;31(8):684-706. https://doi.org/10.1177/0269216317690685
11. Waxman KT. The development of evidence-based clinical simulation scenarios: guidelines for nurse educators. J Nurs Educ. 2010;49(1):29-35. https://doi.org/10.3928/01484834-20090916-07
12. Page-Cutrara K. Prebriefing in nursing simulation: a concept analysis. Clin Simul Nurs. 2015;11(7):335-340. https://doi.org/10.1016/j.ecns.2015.05.001
13. Lawshe CH. A quantitative approach to content validity. Pers Psychol. 1975;28(4):563-575. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x
14. Lee J. Delphi method. Kyoyukkwahaksa; 2001.
15. Kendall MG. A new measure of rank correlation. Biometrika. 1938;30(1/2):81-93. https://doi.org/10.2307/2332226
16. Fawaz MA, Hamdan-Mansour AM. Impact of high-fidelity simulation on the development of clinical judgment and motivation among Lebanese nursing students. Nurse Educ Today. 2016;46:36-42. https://doi.org/10.1016/j.nedt.2016.08.026
17. Yuan HB, Williams BA, Fang JB. The contribution of high-fidelity simulation to nursing students' confidence and competence: a systematic review. Int Nurs Rev. 2012;59(1):26-33. https://doi.org/10.1111/j.1466-7657.2011.00964.x
18. García-Mayor S, Quemada-González C, León-Campos Á, Kaknani-Uttumchandani S, Gutiérrez-Rodríguez L, Del Mar Carmona-Segovia A, et al. Nursing students' perceptions on the use of clinical simulation in psychiatric and mental health nursing by means of objective structured clinical examination (OSCE). Nurse Educ Today. 2021;100:104866. https://doi.org/10.1016/j.nedt.2021.104866

Appendix

Appendix 1. Nursing Simulation Scenario Evaluation Tool, for development of an artificial intelligence-based nursing simulation scenario evaluation tool using the Real-Time Delphi method

Nursing Simulation Scenario Evaluation Tool (V2)

This tool is designed to evaluate the validity and reliability of a nursing simulation scenario. Please rate each item accordingly.

I. Overview of scenario

1. The scenario was constructed according to the standard scenario template.
   □ Strongly agree □ Somewhat agree □ Disagree
2. All contents of the scenario template have been completed.
   □ Strongly agree □ Somewhat agree □ Disagree
3. The case in the scenario is appropriate for the learning objectives.
   □ Strongly agree □ Somewhat agree □ Disagree
4. The scenario contents were developed based on practical evidence.
   □ Strongly agree □ Somewhat agree □ Disagree
5. Was patient safety considered in all aspects of the scenario?
   □ Strongly agree □ Somewhat agree □ Disagree

II. Learning objectives

6. The learning objectives were presented specifically.
   □ Strongly agree □ Somewhat agree □ Disagree
7. Specific skills and behaviors were presented to be measurable.
   □ Strongly agree □ Somewhat agree □ Disagree
8. The objectives were made achievable considering the participants' knowledge and experience.
   □ Strongly agree □ Somewhat agree □ Disagree
9. The learning objectives were presented considering the participants' level and experience.
   □ Strongly agree □ Somewhat agree □ Disagree
10. The objectives were planned to be achieved quickly and effectively within the time constraints.
    □ Strongly agree □ Somewhat agree □ Disagree

III. Preparation & pre-briefing plan

11. The simulation was designed considering the physical and psychological stability of the participants.
    □ Strongly agree □ Somewhat agree □ Disagree
12. Information about the participants' prior knowledge and attitudes was included.
    □ Strongly agree □ Somewhat agree □ Disagree
13. The appropriate type of simulators was selected.
    □ Strongly agree □ Somewhat agree □ Disagree
14. A suitable environment and settings were selected.
    □ Strongly agree □ Somewhat agree □ Disagree
15. All appropriate equipment and tools for simulation education were selected.
    □ Strongly agree □ Somewhat agree □ Disagree

16. The roles of both the simulators and participants were clearly defined.
□ Strongly agree □ Somewhat agree □ Disagree
17. A checklist for the pre-briefing plan was prepared.
□ Strongly agree □ Somewhat agree □ Disagree
18. Techniques for establishing a psychological environment in the pre-briefing plan were described.
□ Strongly agree □ Somewhat agree □ Disagree

IV. Make script & the case information

19. Participants can predict the scenario before the simulation begins.
□ Strongly agree □ Somewhat agree □ Disagree
20. A realistic starting point for the nursing intervention was presented.
□ Strongly agree □ Somewhat agree □ Disagree
21. Nursing interventions based on the patient's condition were provided.
□ Strongly agree □ Somewhat agree □ Disagree
22. The scenario was designed to reflect positive or negative changes in the simulator based on participants' interventions.
□ Strongly agree □ Somewhat agree □ Disagree
23. Plans were made to facilitate interventions when participants did not intervene.
□ Strongly agree □ Somewhat agree □ Disagree
24. Plans were made to alter the simulator's (patient's) response based on participants' assessment and critical decision-making.
□ Strongly agree □ Somewhat agree □ Disagree
25. Participants can confirm the simulator's stable condition.
□ Strongly agree □ Somewhat agree □ Disagree
26. The roles of the participants in teams were clearly explained.
□ Strongly agree □ Somewhat agree □ Disagree
27. The patient's situation data and records appeared realistic.
□ Strongly agree □ Somewhat agree □ Disagree
28. The patient's situation data and records were sufficiently presented to perform interventions.
□ Strongly agree □ Somewhat agree □ Disagree

V. Debriefing plan

29. The debriefing questions were designed to confirm objectives and expected outcomes.
□ Strongly agree □ Somewhat agree □ Disagree
30. Specific debriefing methods were planned.
□ Strongly agree □ Somewhat agree □ Disagree
31. Debriefing content was made easily accessible to the participants.
□ Strongly agree □ Somewhat agree □ Disagree

VI. Facilitation

32. The role of the facilitator (instructor) was clearly defined.
□ Strongly agree □ Somewhat agree □ Disagree

VI. Expected outcomes & evaluation

33. The evaluation tool was clearly presented to assess the achievement of the objectives.
□ Strongly agree □ Somewhat agree □ Disagree
34. The evaluation tool accurately assesses the achievement of the scenario's objectives.

VII. Development of scenario

35. The scenario developers were identified (option).
□ Yes □ No
36. The validity of the scenario was confirmed through a process (e.g., content validity index).
□ Yes □ No

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):272-283
https://doi.org/10.4094/chnr.2025.018

pISSN 2287-9110
eISSN 2287-9129

CHNR

Nurses' perceptions of end-of-life care in neonatal and pediatric intensive care units in Korea: a qualitative descriptive study using thematic analysis

Hyo Jeong Lee[1], Hyejin Kim[2]

[1]Registered Nurse, Seoul Samsung Medical Center, Seoul, Korea
[2]Associate Professor, Red Cross College of Nursing, Chung-Ang University, Seoul, Korea

Corresponding author
Hyejin Kim
Red Cross College of Nursing, Chung-Ang University, 84 Heukseok-ro, Dongjak-gu, Seoul 06974, Korea
Tel: +82-2-820-5659
Fax: +82-2-824-7961
E-mail: hkim2019@cau.ac.kr

Received: June 8, 2025
Revised: July 22, 2025
Accepted: October 8, 2025

Purpose: To explore nurses' perceptions of end-of-life care in neonatal and pediatric intensive care units, focusing on the components, facilitators, and challenges of such care in daily practice.
Methods: A qualitative descriptive study was conducted. Data were collected from June to October 2023 through semi-structured individual interviews with 17 nurses from the neonatal and pediatric intensive care units of four tertiary general hospitals in a metropolitan area of South Korea, and were analyzed using thematic analysis techniques.
Results: We identified three themes and nine subthemes: (1) supporting families' emotional and relational closure, (2) perceiving relational and systemic support as enabling end-of-life care, and (3) feeling constrained by systemic and practical challenges. Participants perceived fostering an emotional connection with the child, ensuring opportunities for meaningful farewell, and supporting emotional acceptance of death as ways to support families' emotional and relational closure with their child. Although relational and systemic support, such as collaborative teamwork, clear communication, shared planning, and structured tools, enabled compassionate care, participants also felt unprepared, burdened by heavy workloads, and hindered by environmental barriers.
Conclusion: The findings highlight that delivering quality end-of-life care in neonatal and pediatric intensive care units requires supporting families' emotional needs, strengthening relational and systemic support, and addressing practical challenges. Further research is needed to develop and test practical strategies (e.g., specialized education in compassionate communication, standardized protocols, and supportive care environments) that can improve the quality of end-of-life care for neonatal and pediatric patients and their families.

Keywords: Neonatal intensive care unit; Palliative care; Pediatric intensive care unit; Qualitative research; Terminal care

INTRODUCTION

In Korea, approximately 80% of deaths among children under 15 years of age occur in hospitals [1], with neonatal and pediatric intensive care units (ICUs) being the most common locations of death. Whereas neonatal ICUs provide critical care to seriously ill neonates (or newborns), pediatric ICUs provide care for seriously ill children across all developmental stages, from infants to adolescents [2]. Neonatal and pediatric populations present distinct developmental needs and clinical characteristics (e.g., primary diseases, complications, and children's involvement in decision-making)

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

[2,3]. However, these units are also highly medicalized and emotionally demanding environments, often marked by a child's physiological instability, unpredictable disease trajectories, and separation from family, all of which exacerbate parental stress and anxiety during ICU stay [4]. Furthermore, limited opportunities for physical closeness in these settings may impede the formation of a secure parent-child attachment during a critical developmental period [5]. Prognostication in neonatal and pediatric populations is particularly challenging because end-of-life trajectories are often nonlinear and accompanied by fluctuating signs and symptoms [6]. In this context, nurses in neonatal and pediatric ICUs must provide technically competent and emotionally sensitive care that addresses the multifaceted needs of both ill children and their families.

As primary bedside caregivers in neonatal and pediatric ICUs, nurses strive to provide holistic end-of-life care that addresses the physical, psychosocial, and spiritual needs of children and their families, supporting the possibility of a child's peaceful death [7]. Furthermore, considering that the loss of a child can be an intensely painful and tragic experience for parents and families, nurses should endeavor not only to manage the child's symptoms (e.g., pain) but also to deliver emotional support to parents and families [7]. This indicates that nurses' appropriate end-of-life care attitudes, knowledge, and skills are essential to ensure quality end-of-life care for neonatal and pediatric populations and their families, particularly in ICUs where deaths occur more frequently.

However, neonatal and pediatric ICU nurses often describe end-of-life care as emotionally burdensome, marked by feelings of frustration, guilt, and a sense of professional failure, which can lead to emotional disengagement from patient care or job turnover [8]. Bloomer et al. [9] synthesized three core themes in nurses' post-death experiences in these settings: emotionally charged yet routinized postmortem rituals, challenges in providing culturally sensitive bereavement support to families, and intense personal grief compounded by limited institutional support. Moreover, many nurses feel unprepared to provide neonatal or pediatric end-of-life care owing to insufficient and inadequate relevant education and training [10,11].

End-of-life care for neonatal and pediatric populations is a global research priority [12]. International research has concentrated on end-of-life care components, pediatric palliative care, and ethical and practical issues in neonatal and pediatric ICUs from the perspectives of healthcare providers or bereaved families [9,13-15]. In Korea, studies have largely focused on neonatal ICU nurses' knowledge and attitudes regarding end-of-life and palliative care [16,17], along with their experiences caring for dying infants [18]. However, limited attention has been paid to how nurses in these settings (particularly in pediatric ICUs) perceive and implement end-of-life care in everyday clinical practice, especially within Korea's distinct sociocultural and legal context, where pediatric palliative care remains underdeveloped.

Therefore, the main research question for this study was: How do nurses perceive their end-of-life care practices in neonatal and pediatric ICUs in South Korea? Specifically, we sought to identify similarities and differences in the components, facilitators, and challenges of end-of-life care between these two settings in the context of nurses' daily practices. Our findings may contribute to the development of innovative and practical strategies to provide better end-of-life care for neonatal and pediatric populations and their families.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Chung-Ang University (IRB no., 2023-06-026-001). Informed consent was obtained from all participants.

1. Study Design

This study employed a qualitative descriptive approach with individual semi-structured interviews and thematic analysis to describe nurses' perceptions of end-of-life care in neonatal and pediatric ICU populations. The study was conducted in accordance with the consolidated criteria for reporting qualitative research (COREQ) checklist [19].

2. Study Setting and Participants

We recruited participants from nine neonatal and pediatric ICUs in four tertiary general hospitals located in a metropolitan area of South Korea. Four hospitals had more than 1,700 beds, and their neonatal and pediatric ICUs contained between 64 and 87 beds. Three hospitals were for-profit, and one hospital was non-profit.

To ensure the richness of the collected data on neonatal and pediatric end-of-life care, we employed purposeful sam-

pling. The participants were nurses who had worked in neonatal or pediatric ICUs in the four aforementioned tertiary hospitals for at least 6 months, had provided end-of-life care to neonatal and pediatric populations, and were willing to share their end-of-life care practices, thoughts, and experiences.

The principal investigator (PI), who received qualitative research training during her master's degree, posted a study advertisement in the bulletins of neonatal and pediatric ICUs and on the units' social media platforms. The advertisement included the PI's contact information and a link to the webpage where nurses could access detailed study information and submit their names and contact details. The PI then contacted these nurses to further explain the study and confirm their interest in participating. Informed consent was obtained in person or via email. Subsequently, snowball sampling was used to expand the recruitment, with participants being asked to refer other nurses who met the inclusion criteria.

The final sample consisted of 17 participants (Table 1). Participants were 29.1±2.7 years (range, 24–35 years), the majority were female (n=16), single (n=13), and held a bachelor's degree or higher (n=17). Nine participants reported no religious affiliation, whereas the remaining were either Catholic (n=4) or Christian (n=4). The total clinical experience averaged 6.3±2.7 years (range, 2–15 years), and participants were recruited from neonatal (n=6), pediatric (n=9), and pediatric cardiovascular ICUs (n=2). Most were general nurses (n=14).

3. Data Collection

This study was conducted from June 28 to October 20, 2023. We developed an interview guide based on previous studies on end-of-life care for children [7,8] and the purpose of the current study. The main interview questions were as follows: (1) "Describe the end-of-life care process provided in the current (neonatal or pediatric) ICU"; (2) "What do you believe to be important for end-of-life care provided in the neonatal or pediatric ICU?"; (3) "What helps with the provision of neonatal or pediatric end-of-life care in the ICU?"; (4) "What are the challenges to providing end-of-life care in the current ICU?"; and (5) "What improvements do you suggest to current neonatal or pediatric end-of-life care?" During the interview, the PI asked follow-up questions based on participants' responses. The interview questions were pretested with two peers in a pediatric ICU to assess their clarity and appropriateness.

The individual semi-structured interviews were conducted by the PI in a conference room at the hospital (n=11), a quiet café near the hospital (n=4), or via video conference (n=2) at a time convenient for participants. Each participant was interviewed from 1 to 3 times. After the first interview, the PI conducted second and third interviews to explore topics that required additional information. During the interview, the PI took notes on non-verbal elements, such as participants' behaviors and facial expressions. The first interview took 60–120 minutes, whereas the second and third interviews took

Table 1. Participants' general characteristics

Participant no.	Age (yr)	Gender	Education	Religion	Marital status	Career (yr)	Affiliation	Position
1	28	Female	Bachelor	None	Single	5–10	PICU	General
2	29	Female	Bachelor	None	Single	5–10	PICU	General
3	34	Female	Master	Catholic	Single	10–15	NICU	General
4	26	Female	Bachelor	Christian	Single	Less than 5	PICU	General
5	24	Female	Bachelor	None	Single	Less than 5	PICU	General
6	30	Female	Bachelor	Catholic	Married	5–10	PCCU	General
7	30	Female	Master	None	Married	5–10	NICU	General
8	27	Female	Bachelor	None	Single	Less than 5	PICU	General
9	28	Female	Bachelor	Christian	Single	5–10	PICU	General
10	30	Female	Bachelor	Christian	Single	5–10	NICU	General
11	31	Female	Bachelor	None	Single	5–10	NICU	General
12	27	Female	Bachelor	Christian	Single	5–10	PICU	General
13	35	Female	Bachelor	Catholic	Married	10–15	NICU	Charge
14	32	Female	Bachelor	None	Married	10–15	NICU	Charge
15	30	Male	Bachelor	Catholic	Single	5–10	PICU	General
16	28	Female	Bachelor	None	Single	5–10	PCCU	General
17	26	Female	Bachelor	None	Single	Less than 5	PICU	General

NICU, neonatal intensive care unit; PCCU, pediatric cardiovascular intensive care unit; PICU, pediatric intensive care unit.

up to 30 minutes. All interviews were digitally recorded and transcribed verbatim immediately afterward, resulting in 342 A4-sized pages. Each participant received a gift card (approximately US$40) for their participation in this study.

4. Data Analysis

Data were analyzed using the six-step thematic analysis method by Braun and Clarke [20]. In Step 1 (i.e., "becoming intimate with the data"), the PI repeatedly read the transcripts to gain an overall understanding of the interview content and took notes related to the components, facilitator, challenges, and suggested improvements in neonatal or pediatric end-of-life care. In Step 2 (i.e., "creating initial codes"), meaningful units—phrases or sentences relevant study focus—were systematically coded. In Step 3 (i.e., "identifying themes"), by considering the relationships between codes, the PI reviewed and clustered related codes into subthemes, which were subsequently integrated into themes by identifying patterns and connections across the data. In Step 4 (i.e., "reviewing themes"), the coherence and distinctiveness of the subthemes and themes were evaluated, and iterative revisions were made to ensure conceptual clarity and consistency. This process involved regrouping and refining the codes and subthemes as needed. In Step 5 (i.e., "defining and naming themes"), we identified the core essence of each theme and modified theme names to best reflect the essence. Finally, in Step 6 (i.e., "writing the report"), we sought to present the thematic narratives in a clear, concise, and compelling manner.

Themes were initially derived separately from the neonatal and pediatric ICU data to preserve contextual specificity. We then developed a comparative table to identify the similarities and differences between the two care settings. The process revealed only minor distinctions and guided the final refinement of the theme names. Throughout the analysis process, the PI met weekly with the second author, an expert in palliative care and qualitative research methodology, to review and discuss the coding structure, thematic development, and analytic decisions. All authors reviewed and endorsed the final themes and representation quotes. The quotations, originally in Korean, were translated into English using Google Translate and subsequently reviewed and confirmed by the second author.

5. Trustworthiness

To ensure the quality of this study, the four trustworthiness criteria by Lincoln and Guba [21] were applied. To ensure credibility, the PI conducted all interviews in a consistent manner to obtain participants' experiences and maintained close engagement with the data by repeatedly listening to audio recordings and reviewing transcripts to ensure transcript accuracy. Any unclear statements were clarified through follow-up interviews with participants. To strengthen the accuracy of interpretation, member checking was conducted by sharing preliminary findings with participants, who then confirmed that the findings reflected their experiences. Additionally, the PI discussed coding and thematic development with the second author during weekly meetings to strengthen the credibility of the findings. To enhance transferability (i.e., the applicability of the findings in situations similar to those of the current study), we recruited nurses with extensive experience in end-of-life care in neonatal and pediatric ICUs. Participant characteristics and care settings were also described to facilitate their applicability in similar contexts. Dependability (i.e., whether the study was conducted consistently) was secured by maintaining an audit trail, which included comprehensive and thorough documentation of all study processes from the beginning to the end of the study. Finally, for confirmability (i.e., making efforts to minimize the researcher's bias or influence), the PI documented reflexive notes and regularly discussed the analytical process and findings with the second author to minimize researcher bias. Additionally, an external peer review of the codes, subthemes, and themes by classmates from a qualitative research course and two experts in pediatric nursing and qualitative research methodology provided further validation and helped ensure that the interpretations were grounded in the data rather than in the researchers' assumptions.

RESULTS

Analysis of the interview data yielded three themes and nine subthemes (Table 2): (1) supporting families' emotional and relational closure; (2) perceiving relational and systemic support as enabling end-of-life care; and (3) feeling constrained by systemic and practical challenges. The participants' accounts indicated their efforts to provide families with nursing care that supported emotional and relational

Table 2. Themes and subthemes regarding nurses' perceptions of end-of-life care in neonatal and pediatric intensive care units

Themes	Sub-themes	Codes
Supporting families' emotional and relational closure	Fostering emotional connection with the child	Providing auditory comfort to the child
		Applying attachment-promoting items
		Valuing memory boxes as bereavement support
	Ensuring opportunities for meaningful farewell	Allowing unrestricted visitation
		Fostering a quiet and respectful environment
		Encouraging parents to hold their child
		Addressing fathers' needs
	Supporting emotional acceptance of death	Providing detailed explanation and guidance to the family
		Helping families prepare through the palliative care team
Perceiving relational and systemic supports as enabling end-of-life care	Gaining strength from co-worker support	Collaborating with co-workers for compassionate care
		Learning from emotionally skilled colleagues
		Hoping for emotional support structures
	Valuing communication and shared planning	Engaging families/children in shared care planning
		Ensuring clear communication for unified care
	Deriving reassurance from structured tools	Relying on protocols for safe and coordinated practice
		Gaining confidence through end-of-life care checklists
Feeling constrained by systemic and practical challenges	Feeling unprepared for end-of-life care	Struggling to support families emotionally
		Experiencing anxiety owing to insufficient experience
	Struggling to focus on end-of-life care amid heavy workloads	Feeling strained by post-death administrative tasks
		Being pulled away by competing responsibilities
	Confronting environmental barriers to compassionate care	Experiencing disruption from uncontrollable noises
		Managing limits imposed by precautionary procedures

closure with the child, facilitated by relational and systemic support. However, they also felt constrained by several systemic and practical challenges.

1. Supporting Families' Emotional and Relational Closure

This theme illustrates how nurses support families in achieving emotional and relational closure in the face of a child's death. Participants reported efforts to promote emotional bonding between children and their parents, provide opportunities for meaningful farewells, and facilitate parents' gradual acceptance of their child's dying process. This type of care was viewed as essential within the emotionally intense context of neonatal and pediatric end-of-life care in ICUs.

1) Fostering emotional connection with the child

The participants provided opportunities for families to maintain or strengthen their emotional connections with their children during the end-of-life period. Most participants encouraged using personally meaningful items, such as photographs, clothing, or familiar sounds (e.g., a mother's recorded voice and favorite songs), to support parents in expressing affection, providing comfort, and sustaining a sense of relational closeness. In the neonatal ICU, memory boxes were prepared containing the infant's footprints, handprints, or personal belongings (e.g., used electrodes) to honor the child's life and help families preserve tangible memories. Through these practices, participants helped sustain the parent-child bond as the child's condition worsened, and created meaningful experiences that could bring comfort throughout bereavement.

We created a memory box for children who were expect-

ed to die from rare diseases after birth. We took photos of the child and the child's parents, who accepted that their child was at the end of life, often wrote letters for the child. We placed the photos and letters into the box, along with the clothes and monitoring lines on which the child was placed. The parents appreciated the memory box a lot. (Participant 7, Neonatal ICU)

2) Ensuring opportunities for meaningful farewell

Participants from neonatal and pediatric ICUs worked to ensure that families had the opportunity to say goodbye to their children in meaningful and personalized ways. They reported efforts to allow extended or unrestricted visits, provide private and quiet spaces (e.g., using a separate room or a curtain, managing noise), and encourage physical closeness (e.g., holding or touching the child) during the final moments. Following the child's death, most participants carefully cleansed and prepared the body to appear peaceful and presentable, allowing families to hold their child once more in a dignified state. These practices helped parents feel present and emotionally engaged at the end of their child's life and contributed to a sense of closure.

A baby weighed around 6–7 kg, but still looked so small. The parents just stood at the bedside, not knowing what to do, simply watching the baby. I told them it was okay to hold the baby and gently placed the baby in their arms. They broke down in tears, saying they did not know it was allowed. I believe it is essential for nurses to support and guide parents in those moments, so they feel comfortable holding their child. (Participant 6, Pediatric ICU)

Simultaneously, some participants noted the provision of mother-centered end-of-life care, whereas fathers often assumed the responsibility for supporting other family members and handling administrative matters during this heartbreaking time. This imbalance left fathers and their children overlooked, leading participants to emphasize the importance of acknowledging and addressing fathers' grief as part of creating truly family-centered farewell moments.

3) Supporting emotional acceptance of death

Participants from neonatal and pediatric ICUs supported families in gradually coming to terms with their child's impending death. This involved providing clear and compassionate explanations about the child's condition, engaging in repeated conversations to prepare parents emotionally, and offering a consistent presence and reassurance, often in collaboration with the pediatric palliative care team. Particularly, some participants described the palliative care team's engagement as not only practical support but also as a critical process that helped families gradually accept the reality of impending death and emotionally prepare for bereavement. Through these supportive approaches, participants sought to ease the psychological burden of anticipatory grief and facilitate a more peaceful end-of-life experience for both children and their families.

Our palliative care team visits parents to prepare them for their child's death. The team provides emotional support to parents and takes the initiative to plan for such death by discussing funeral procedures. When a child is about to die, the team visits and cares for the child's parents. (Participant 12, Pediatric ICU)

2. Perceiving Relational and Systemic Support as Enabling End-of-Life Care

End-of-life care for critically ill infants and children is supported by relational and systemic resources. This support helped participants navigate the emotional and procedural complexities of end-of-life care in neonatal and pediatric ICUs.

1) Gaining strength from co-worker support

Interpersonal support within neonatal and pediatric ICUs from colleagues, senior nurses, and interdisciplinary team members helped the participants provide end-of-life care for infants and children in neonatal and pediatric ICUs. Most participants reported that emotional encouragement, collaborative teamwork (e.g., allocating fewer patients and assisting with work), and role modeling provided psychological relief during emotionally demanding situations and practical guidance on how to communicate with families and manage complex care. This support helped them feel less isolated and more capable of delivering compassionate end-of-life care. Additionally, some participants highlighted the need for accessible psychological resources and informal support, such as on-the-spot debriefings and shared grief rituals to address the profound and lasting emotional impact of caring for dying children. These practices are vital for sustaining nurses'

resilience and their capacity to provide compassionate end-of-life care.

> When a baby is dying, senior nurses come and offer words of comfort to the baby's parents, and I am really grateful for that. Since our patients are newborns, emotional support for the parents is especially important. But honestly, I cannot match the communication skills of the senior nurses. The experienced nurses provide support with such calm and grace, which is really moving. (Participant 10, Neonatal ICU)

2) Valuing communication and shared planning

Most participants perceived collaborative communication and shared planning as essential relational supports that enabled quality end-of-life care in neonatal and pediatric ICUs. They emphasized the importance of engaging families—and, when appropriate, older children, particularly adolescents in pediatric ICUs—in care planning to ensure that decisions aligned with their values and needs. Clear and consistent communication among healthcare team members was also described as critical for presenting a unified approach and reducing confusion in care delivery. Through these practices, most participants believed that they could provide end-of-life care tailored to the needs of dying children and their families, while minimizing misunderstandings within the care team.

> When the family is not ready to accept that their child is at the end of life, we [clinicians] have to keep trying aggressive treatments. Thus, at the end of life, clinicians should have open discussions about treatment plans with the child's family. The child's family may then think about what would be best for their child and how to let this child go peacefully. (Participant 12, Pediatric ICU)

3) Deriving reassurance from structured tools

Structured protocols and checklists related to end-of-life care facilitated participants in managing the complex tasks involved in neonatal and pediatric end-of-life care. In both neonatal and pediatric ICUs, some participants emphasized the value of having clearly outlined procedures for tasks such as medication discontinuation, documentation, and postmortem arrangements. These systems helped reduce uncertainty, minimize errors, and ensure consistency in end-of-life care. Some participants also noted that department-level protocol development, often informed by previous challenges, supported safe and coordinated end-of-life care practices.

> Our unit has a protocol that guides us in end-of-life care before and after a child's death. For example, it lists the administrative and nursing duties that nurses should complete, such as how to make a reservation for a hearse and funeral home and how a dead child should be prepared for the transfer to a funeral home. Thus, when I have a child dying, I check the protocol line-by-line. As a nurse, this helps me a lot. (Participant 8, Pediatric ICU)

3. Feeling Constrained by Systemic and Practical Challenges

Participants perceived systemic and practical challenges, such as insufficient end-of-life care competency, heavy workloads, and restrictive environments. These issues hindered their ability to provide focused and compassionate care in neonatal and pediatric ICUs. These challenges contributed to participants' moral distress and prevented them from practicing end-of-life care as they believed it should be delivered.

1) Feeling unprepared for end-of-life care

Most participants reported feeling unprepared to provide effective end-of-life care in neonatal and pediatric ICUs, citing insufficient knowledge, skills, and emotional preparedness. Challenges included limited training in symptom management, discomfort in communicating about death and dying, and uncertainty regarding appropriate end-of-life practices. Such gaps often resulted in hesitation in engaging closely with dying children and their families, which contributes to emotional strain and moral distress. To strengthen both competence and confidence in delivering end-of-life care, some participants emphasized the need for communication training to equip nurses with the skills needed to support families, engage in difficult conversations, and respond empathetically to grief.

> Who knows how parents feel when watching their child die and when the child's skin color changes? Sometimes, discharge can be delayed because of various situations, including late hearse. I think that such waiting time is the most painful thing for the parents. But I cannot say [to the parents], "It's hard, right?" or "The baby was so

pretty." I do not know if those words are the right things to say. So, I just do not say anything for emotional support and try to rule out my emotions as much as possible. I do not know whether I am doing the right thing. (Participant 6, Pediatric ICU)

2) Struggling to focus on end-of-life care amid heavy workloads

Most participants faced significant challenges in providing focused and compassionate end-of-life care because of administrative tasks after the child's death and competing responsibilities for other children. These time constraints hindered their ability to remain fully present with dying children and their families in neonatal and pediatric ICUs, leading to fragmented care and missed opportunities for emotional support. When care fell short of the standards of compassionate practice, some participants experienced frustration and a sense of professional inadequacy.

[After a child's death], I had to quickly return the opioids and other medications, figure out which funeral home the child was going to, clean the child and show them to the parents… and sometimes accept other children admitted to the ICU at the same time. Therefore, I barely had time or emotional space to comfort the parents or fully or empathize with them. (Participant 9, Pediatric ICU)

3) Confronting environmental barriers to compassionate care

In neonatal and pediatric ICUs, environmental barriers often hinder the provision of focused, compassionate end-of-life care. Participants identified constant medical equipment alarms, crying children, and strict precautionary procedures as environmental barriers. These barriers made it difficult for families to concentrate on the last moments with their children. Consequently, most participants emphasized the importance of private, protected spaces where families could spend uninterrupted time with their dying child in a calm and respectful environment. During the COVID-19 (coronavirus disease 2019) pandemic, visitation policies further limited family presence. This led to emotional distress among participants, who felt that the time allowed was insufficient. Some participants also noted the difficulty of enforcing restrictions, even for closely extended family members (e.g., aunts and uncles).

It is hard to control the noise in the neonatal ICU. Even though most of our babies are intubated or critically ill, there are still some babies who cry on their own. When I hear those cries, I feel strangely sorry toward the parents of the dying child. For them, there is no turning back, and hearing another baby crying, sounding relatively healthy, might be hurtful. Even if a screen is put up, they can still hear everything going on outside. (Participant 11, Neonatal ICU)

DISCUSSION

This study explored Korean neonatal and pediatric ICU nurses' perceptions of end-of-life care, focusing on its components, facilitators, and challenges in daily practice through semi-structured individual interviews and thematic analysis. Three themes emerged during analysis, namely "supporting families' emotional and relational closure," "perceiving relational and systemic supports as enabling end-of-life care," and "feeling constrained by systemic and practical challenges." The analysis showed little difference in nurses' perceptions of end-of-life care between neonatal and pediatric ICUs. These themes reflect the complex interplay of interpersonal and institutional factors shaping nurses' experiences of providing end-of-life care and highlight critical areas for enhancing such care in neonatal and pediatric ICUs.

In our study, nurses in neonatal and pediatric ICU actively supported families in achieving emotional and relational closure. They did this by fostering bonding, facilitating meaningful farewells, and guiding parents toward accepting their children's impending death. These efforts include promoting memory-making activities (e.g., a memory box in neonatal ICUs), encouraging physical closeness, providing private and respectful environments, and delivering clear, compassionate communication. Existing literature demonstrates that such practices help bereaved families maintain continuing bonds, alleviate regret and psychological distress, and promote emotional adjustment through anticipatory guidance and emotional preparation [9,22]. For instance, Clarke and Connolly [22] reported that mothers of deceased newborns and children expressed deep appreciation for being introduced to memory-making and highlighted the comfort and emotional support they found in tangible mementos. These findings underscore the importance of neonatal and pediatric ICU nurses in actively facilitating and sustaining family-centered end-of-life care.

Our participants also perceived the engagement of pediatric palliative care teams as essential for providing emotional and practical support to families before and after a child's death. Evidence shows that integrating these teams into ICU care enhances care quality and alleviates the emotional burden on ICU nurses [13,23]. However, access to these services in South Korea remains limited. In 2017, only 9 (14.8%) of the 61 healthcare institutions provided inpatient palliative care to pediatric patients with cancer, and only one institution served children with non-cancerous conditions [24]. Most institutions reported reluctance to provide pediatric palliative care primarily because of insufficient support from trained pediatric palliative care professionals [24]. Addressing this gap requires strengthening specialized education in pediatric palliative care, supporting labor costs for these professionals, and establishing a separate and sustainable pediatric palliative care infrastructure [24]. These findings underscore the urgent need for comprehensive educational, financial, and workforce investments to advance pediatric palliative care service delivery in Korea.

The theme, "perceiving relational and systemic supports as enabling end-of-life care" illustrates how a combination of relational and structural support enables nurses to provide compassionate and effective care during a child's final moments in neonatal and pediatric ICUs. Relational support, including emotional reassurance, collaborative teamwork, and role modeling, helps alleviate nurses' psychological distress during emotionally demanding end-of-life situations. Consistent with our findings, Stayer and Lockhart [7] reported that providing rest time for nurses responsible for dying patients and promoting emotional sharing among colleagues helped reduce the stress and burnout associated with end-of-life care. Implementing both formal and informal emotional support systems is essential to safeguarding nurses' well-being and preventing emotional burnout following the death of a child. Linebarger et al. [23] emphasized nurses' participation in timely debriefing sessions, mourning rituals, and institutions' provision of professional counseling services to staff. Enhancing the emotional resilience of neonatal and pediatric ICU nurses is essential to help them cope with the psychological toll of repeated exposure to end-of-life situations [7]. To this end, institutional leaders should develop and implement structured mental health programs that offer accessible and ongoing psychological support to nurses involved in end-of-life care.

Clear communication among healthcare providers and shared planning with families and children were also perceived as essential relational supports for providing coordinated and consistent end-of-life care that meets the needs of dying children and their families. This aligns with existing literature emphasizing the importance of clear, collaborative communication for improving care consistency among healthcare providers and shared decision-making between the child/family and healthcare providers in neonatal and pediatric end-of-life contexts [13]. Finally, structured protocols and checklists play a critical role in supporting nursing as they provide end-of-life care in ICU settings [25]. Although the tools mentioned in our study were primarily administrative, focusing on medication returns, documentation, and postmortem arrangements, they helped reduce ambiguity, standardize practices, and enhance care safety. Together, both interpersonal and procedural support within neonatal and pediatric ICUs may help nurses sustain compassionate and coordinated care at the end of a child's life.

The theme, "feeling constrained by systemic and practical challenges," highlights the multifaceted challenges that impede the delivery of compassionate end-of-life care in neonatal and pediatric ICUs. Participants reported feeling unprepared for end-of-life care, particularly regarding compassionate communication. They struggled to focus on dying children and families amid excessive workloads and confronting environmental barriers, such as pervasive noise and lack of privacy. These challenges contributed to moral distress and hindered nurses from providing care consistent with their professional and ethical values. Specifically, nurses' insufficient competency in compassionate communication during the child's final moments are common and impede the provision of appropriate support for bereaved families [7]. The absence of established guidelines for communicating end-of-life care with children further complicates this type of care [26].

To address these gaps, educational programs and standards regarding pediatric hospice and palliative care have been progressively developed worldwide. For example, the End-of-Life Nursing Education Consortium critical palliative care program in the United States provides ICU nurses with training in pain and symptom management, ethical and cultural considerations, communication, bereavement, and leadership [27]. Similarly, the European Foundation for the Care of Newborn Infants established standards to support neonatal care in Europe [28]. In Korea, although pediatric palliative care education was incorporated into the national hospice

care training curriculum in July 2022, it is currently offered only through designated central hospice centers [29]. This limited accessibility underscores the need to expand educational opportunities for ICU nurses (e.g., through online education) and to develop specialized curricula focused on compassionate communication in neonatal and pediatric end-of-life care. Strengthening educational content and integrating it into nursing programs are essential for building communication competencies in this area.

High administrative burdens also intensify emotional strain and compromise the quality of end-of-life care [9]. Additionally, continuous alarms, crying infants, and the lack of privacy in open spaces have been reported to disrupt families' end-of-life experiences and exacerbate distress for both nurses and families [14,30]. Although Korea's Medical Service Act mandates the installation of isolation rooms, including negative-pressure isolation rooms, in ICU settings [31], their availability for end-of-life care is often limited. This indicates the need for increased access to single or private rooms to better accommodate dying children and their families. To ensure holistic, family-centered end-of-life care and reduce the emotional burden on nurses, it is essential to streamline administrative tasks and foster a respectful and supportive ICU environment.

This study has some limitations. Since this study interviewed nurses working in neonatal and pediatric ICUs of advanced general hospitals in a metropolitan area of South Korea, the findings may not apply to the end-of-life care experiences of nurses in other settings. Furthermore, most participants were single women, which may have influenced the findings. Additionally, although data saturation was achieved for the pediatric ICU data, it was not fully reached for the neonatal ICU data owing to the small sample size. However, this study is one of the few on neonatal and pediatric end-of-life care in South Korea, and the findings may contribute to the development of practical strategies to improve the quality of end-of-life care for neonatal and pediatric populations in ICUs.

This study outlines the key components of end-of-life care delivered by nurses in Korean neonatal and pediatric ICUs, along with the facilitators and challenges. To enhance the quality of neonatal and pediatric end-of-life care, it is essential to develop and implement specialized nursing education programs that focus on compassionate communication and standardized care protocols. Creating supportive environments (e.g., quiet, private spaces) can further ensure dignity and comfort for dying children and their families. Additionally, policy initiatives should prioritize the integration of pediatric palliative care teams into ICU care and the establishment of formal and informal emotional support systems for nurses regularly exposed to end-of-life situations. These efforts are critical for fostering sustainable, family-centered end-of-life care in neonatal and pediatric ICUs.

CONCLUSION

This study indicates that neonatal and pediatric ICU nurses sought to support the family's emotional and relational closure with their child but faced systemic and practical challenges. To address these challenges and improve the quality of neonatal and pediatric end-of-life care, stakeholders should provide educational, administrative, and environmental support. Future research should investigate end-of-life care practices in neonatal and pediatric ICUs on a large scale, explore advance care planning and surrogate decision-making for children in ICUs and their families, develop testable interventions to improve nurses' communication competencies, and study the institutional systems surrounding this type of nursing care.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors. Formal analysis: all authors. Investigation: HJL. Methodology: all authors. Supervision: HK. Writing–original draft, review, and editing: all authors. Final approval of published version: all authors.

Conflict of interest

This article was adapted from a thesis by Hyo Jeong Lee in partial fulfillment of the requirements for the master's degree at Chung-Ang University. No existing or potential conflict of interest relevant to this article was reported.

Funding

None.

Data availability

The data cannot be publicly disclosed. For the research data, please contact the corresponding author.

Acknowledgements

We appreciate all nurses who participated in this study. Declaration of generative AI and CI-assisted technologies in the writing: We acknowledge the use of ChatGPT as a tool for editing and refining the language in this work.

ORCID and ResearcherID

Hyo Jeong Lee https://orcid.org/0009-0005-5312-5936
https://researcherid.com/rid/NKQ-5946-2025
Hyejin Kim https://orcid.org/0000-0003-3001-8095
https://researcherid.com/rid/DUZ-5655-2022

REFERENCES

1. Statistics Korea. Preliminary results of birth and death statistics in 2022 [Internet]. Statistics Korea; 2023 [cited 2005 Oct 10]. Available from: http://kostat.go.kr
2. Choi J, Park E, Choi AY, Son MH, Cho J. Incidence and mortality trends in critically ill children: a Korean population-based study. J Korean Med Sci. 2023;38(23):e178. https://doi.org/10.3346/jkms.2023.38.e178
3. Health Insurance Review and Assessment Service. Results of adequacy evaluation for neonatal intensive care unit in 2020 (2nd). Health Insurance Review and Assessment Service; 2022.
4. Terp K, Sjöström-Strand A. Parents' experiences and the effect on the family two years after their child was admitted to a PICU: an interview study. Intensive Crit Care Nurs. 2017;43:143-148. https://doi.org/10.1016/j.iccn.2017.06.003
5. Shin Y, Lim JH, Kim G. Effects of maternal empowerment program on stress, anxiety, depression and parenting confidence in mothers of preterm infants in the neonatal intensive care unit. Child Health Nurs Res. 2018;24(2):252-261. https://doi.org/10.4094/chnr.2018.24.2.252
6. Hill K, Coyne I. Palliative care nursing for children in the UK and Ireland. Br J Nurs. 2012;21(5):276-281. https://doi.org/10.12968/bjon.2012.21.5.276
7. Stayer D, Lockhart JS. Living with dying in the pediatric intensive care unit: a nursing perspective. Am J Crit Care. 2016;25(4):350-356. https://doi.org/10.4037/ajcc2016251
8. McConnell T, Porter S. The experience of providing end of life care at a children's hospice: a qualitative study. BMC Palliat Care. 2017;16(1):15. https://doi.org/10.1186/s12904-017-0189-9
9. Bloomer MJ, Brooks LA, Coventry A, Ranse K, Rowe J, Thomas S. "You need to be supported": an integrative review of nurses' experiences after death in neonatal and paediatric intensive care. Aust Crit Care. 2025;38(3):101149. https://doi.org/10.1016/j.aucc.2024.101149
10. Chatmon BN, Richoux D, Sweeney B. The impact of end-of-life care among nurses working in the pediatric intensive care unit. Crit Care Nurs Clin North Am. 2023;35(3):275-286. https://doi.org/10.1016/j.cnc.2023.04.002
11. Kim S, Savage TA, Song MK, Vincent C, Park CG, Ferrans CE, et al. Nurses' roles and challenges in providing end-of-life care in neonatal intensive care units in South Korea. Appl Nurs Res. 2019;50:151204. https://doi.org/10.1016/j.apnr.2019.151204
12. Mörelius E, Foster M, Gill FJ. A scoping review of nursing research priorities in pediatric care. J Pediatr Nurs. 2020;52:e57-e69. https://doi.org/10.1016/j.pedn.2020.01.006
13. Adistie F, Neilson S, Shaw KL, Bay B, Efstathiou N. The elements of end-of-life care provision in paediatric intensive care units: a systematic integrative review. BMC Palliat Care. 2024;23(1):184. https://doi.org/10.1186/s12904-024-01512-5
14. Kim S, Savage TA, Hershberger PE, Kavanaugh K. End-of-life care in neonatal intensive care units from an Asian perspective: an integrative review of the research literature. J Palliat Med. 2019;22(7):848-857. https://doi.org/10.1089/jpm.2018.0304
15. Kim ES, Kim S, Kim S, Kim S, Ahn SY, Lee H. Palliative care for infants in the neonatal intensive care unit: a scoping review. J Hosp Palliat Nurs. 2024;26(1):14-20. https://doi.org/10.1097/NJH.0000000000000985
16. Wi DH, Kang SJ. Relationship among nurses' knowledge, attitude towards palliative care and perception of death in neonatal intensive care units. Child Health Nurs Res. 2016;22(4):257-264. https://doi.org/10.4094/chnr.2016.22.4.257
17. Yi YH, Yang HM. Nurse's grief experience and attitudes toward bereavement/end-of-life care of families of dying infants in the neonatal intensive care units. J Korean Data Anal Soc [Internet]. 2015 [cited 2005 Oct 10];17(2):1045-1060. Available from: https://www.kci.go.kr/kciportal/ci/sereArticleSearch/ciSereArtiView.kci?sereArticleSearchBean.artiId=ART001985952
18. Kang HJ, Bang KS. Development and evaluation of a self-reflection program for intensive care unit nurses who have experienced the death of pediatric patients. J Korean Acad Nurs. 2017;47(3):392-405. https://doi.org/10.4040/jkan.2017.47.3.392
19. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-357. https://doi.org/10.1093/intqhc/mzm042
20. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101. https://doi.org/10.1191/1478088706qp063oa
21. Lincoln Y, Guba E. Naturalistic inquiry. Sage Publications; 1985.

22. Clarke T, Connolly M. Parent's lived experience of memory making with their child at or near end of life. Am J Hosp Palliat Care. 2022;39(7):798-805. https://doi.org/10.1177/10499091211047838
23. Linebarger JS, Johnson V, Boss RD, Linebarger JS, Collura CA, Humphrey LM, et al. Guidance for pediatric end-of-life care. Pediatrics. 2022;149(5):e2022057011. https://doi.org/10.1542/peds.2022-057011
24. Moon YJ, Shin HY, Kim MS, Song IG, Kim CH, Yu J, et al. Palliative care practitioners' perception toward pediatric palliative care in the Republic of Korea. Korean J Hosp Palliat Care. 2019;22(1):39-47. https://doi.org/10.0000/kjhpc.2019.22.1.39
25. Kim J, Yun HY, Kim EJ, Kim H, Kim GA, Kim SH, et al. Development of an end-of-life nursing care protocol for intensive care units: Delphi survey method. J Hosp Palliat Nurs. 2022;24(4):E159-E165. https://doi.org/10.1097/NJH.0000000000000872
26. Mesukko J, Turale S, Jintrawet U, Niyomkar S. Palliative care guidelines for physicians and nurses caring for children and their families in the pediatric intensive care units: a participatory action research study. Pac Rim Int J Nurs Res. 2020;24(2):202-218.
27. Ferrell BR, Dahlin C, Campbell ML, Paice JA, Malloy P, Virani R. End-of-life Nursing Education Consortium (ELNEC) Training Program: improving palliative care in critical care. Crit Care Nurs Q. 2007;30(3):206-212. https://doi.org/10.1097/01.CNQ.0000278920.37068.e9
28. Mancini A, Price J, Kerr-Elliott T. Neonatal palliative care for nurses. Springer; 2020.
29. National Hospice Center. Statutory compulsory education [Internet]. National Hospice Center; 2022 [cited 2005 Oct 10]. Available from: https://hospice.go.kr:8444/?menuno=70
30. Nourmusavi Nasab S, McLaughlan R, Smith CL. Exploring environmental considerations for terminally ill pediatric patients in palliative care inpatient units: a narrative review. HERD. 2024;17(4):268-293. https://doi.org/10.1177/19375867241271439
31. Medical Service Act, Act No. 19818 (Oct 31, 2023) [Internet]. Ministry of Government Legislation; 2023 [cited 2005 Oct 10]. Available from: https://elaw.klri.re.kr/eng_service/lawView.do?hseq=64153&lang=ENG

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):284-295
https://doi.org/10.4094/chnr.2025.026

pISSN 2287-9110
eISSN 2287-9129

CHNR

Comparative effectiveness of DistrACTION Cards and Buzzy for pain relief during intravenous infusion in preschool children in Korea: a quasi-randomized controlled trial

MinJi Lee[1], Euna Park[2]

[1]Master's Candidate, Department of Nursing, Pukyong National University, Busan, Korea
[2]Professor, Department of Nursing, Pukyong National University, Busan, Korea

Corresponding author
Euna Park
Department of Nursing, Pukyong National University, 45 Yongso-ro, Nam-gu, Busan 48513, Korea
Tel: +82-51-629-5785
Fax: +82-51-629-5789
E-mail: pea9451@naver.com

Received: July 29, 2025
Revised: September 18, 2025
Accepted: October 8, 2025

Purpose: In this study, we aimed to compare the effects of two distraction interventions—DistrACTION Cards and Buzzy—on pain relief in children undergoing intravenous infusions in the emergency department.
Methods: A quasi-randomized controlled trial was conducted in children aged 4–6 years receiving intravenous infusions in a single emergency department. Participants were assigned to the DistrACTION Cards group (n=31), Buzzy group (n=30), or control group (n=31). Pain was assessed using the pulse rate, Faces Pain Rating Scale, and Face, Legs, Activity, Cry, Consolability scale.
Results: Both distraction interventions significantly reduced observed pain (Face, Legs, Activity, Cry, Consolability scores) compared to that in the control group. The DistrACTION Cards group showed significantly lower pain scores than the control group during the procedure (p<.05) and demonstrated a consistent trend of pain reduction across all phases. Self-reported pain scores (Faces Pain Rating Scale) after the procedure were significantly lower in both intervention groups compared to those in the control group (p<.05); however, no significant differences were found in the extent of change between groups. No significant group differences were observed in pulse rate.
Conclusion: Both DistrACTION Cards and Buzzy effectively reduced intravenous infusion-related pain in preschool children. DistrACTION Cards showed greater consistency than Buzzy in pain reduction as measured by the Face, Legs, Activity, Cry, Consolability scale, suggesting they may be considered as a preferred option in clinical practice. Further research in diverse clinical settings is needed to confirm these findings.

Keywords: Attention; Hospital emergency services; Intravenous infusions; Pain; Preschool child

INTRODUCTION

Children visiting the emergency department frequently experience pain, distress, and anxiety owing to the various medical procedures administered [1]. Among these, intravenous procedures are common interventions performed for diagnostic and therapeutic purposes in pediatric patients and are considered a major cause of pain and distress in children [2]. In particular, the emergency department environment—where children experience heightened fear and anxiety—exacerbates their perception of pain [3].

Inadequately managed needle-related procedural pain can

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

cause needle phobia in children, which may trigger physiological responses such as vasovagal reactions, increased heart rate, and elevated blood pressure during subsequent procedures, as well as increased distress and fear. Needle phobia may also result in avoidant behaviors toward medical procedures and parental refusal to adhere to vaccination schedules, ultimately affecting the child physiologically, emotionally, and psychologically. Therefore, effective pain management is essential during intravenous procedures in children [4-6].

The International Association for the Study of Pain recommends an integrated approach to reduce needle-related procedural pain in children, which includes non-pharmacological interventions such as distraction and relaxation techniques, the use of topical anesthetics, active parental involvement, and the use of age-appropriate language [7]. Among these, non-pharmacological interventions are non-invasive, free of side effects, and can be independently applied by nurses, making them effective for acute procedural pain management in children. Such interventions include distraction, massage, heat or cold therapy, guided imagery, information sharing, and relaxation techniques [8,9]. According to Distraction Theory, distraction is a cognitive-behavioral strategy that reduces pain, stress, and anxiety by redirecting the child's attention away from painful stimuli toward more engaging and pleasurable ones [10].

Despite the proven effectiveness of distraction techniques, their application in clinical practice remains limited [11]. The emergency department presents significant challenges for effective pediatric pain management owing to high patient turnover, time constraints, staffing shortages, and a lack of structural and institutional support for pain management strategies. Therefore, the introduction of cost-effective, rapid, and easy-to-use interventions is necessary to effectively manage procedural pain in children in this setting [12].

DistrACTION Cards and Buzzy are frequently used distraction interventions for effective intravenous pain management. DistrACTION Cards use various visual stimuli to divert the child's attention, thereby reducing pain and anxiety during procedures. They are simple, cost-effective, and can be easily applied by nurses or caregivers without specialized training [13]. Buzzy is a bee-shaped vibrating device with a built-in ice pack, reported to effectively reduce intravenous-related pain in children through the combined effects of vibration and cold stimulation. According to the Gate Control Theory, non-noxious stimuli such as touch, vibration, and cold can activate sensory pathways that close the "gate" in the dorsal horn of the spinal cord, thereby inhibiting the transmission of pain signals to the central nervous system [14]. The vibration and cold stimulation provided by Buzzy may activate this mechanism, thereby effectively minimizing pain. Buzzy is particularly suitable for emergency settings owing to its ease of use, affordability, minimal preparation time, and rapid effect in reducing procedural pain [15]. Previous studies comparing the pain-relieving effects of DistrACTION Cards and Buzzy during intravenous cannulation in children have reported inconsistent results. Some studies reported that Buzzy significantly reduced pain scores compared to DistrACTION Cards [16], whereas others found Buzzy to be more effective in reducing both pain and anxiety [13]. In contrast, another study demonstrated that both interventions markedly reduced pain without significant differences between them [17]. There have been inconsistent findings regarding the effects of DistrACTION Cards and Buzzy on venipuncture pain in children, and no domestic research has directly compared the effects of these interventions. Furthermore, previous studies have mainly focused on hospitalized school-aged children (6–12 years), and, to our knowledge, no study has been conducted on preschool children in the emergency department setting. Preschool children differ developmentally from school-aged children in how they perceive and express pain, and they experience greater fear and anxiety owing to their limited understanding of illness and medical procedures. In addition, because of magical thinking, they may interpret pain as a form of punishment, further amplifying procedure-related anxiety [18], and the unfamiliar emergency department environment can exacerbate these responses [19]. Therefore, in this study, we aimed to compare the effects of DistrACTION Cards and Buzzy on venipuncture pain in preschool children visiting the emergency department, thereby addressing the inconsistent findings of previous research, filling the gap in domestic studies, and examining the effectiveness of distraction interventions in a developmentally vulnerable age group within a highly stressful clinical setting. We hypothesize that there will be differences in pain levels among the DistrACTION Cards, Buzzy, and control groups. The specific research hypotheses (H1–H3) are as follows:

H1: Physiological pain scores measured before, during, and after intravenous procedures are expected to differ among the DistrACTION Cards, Buzzy, and control groups.

H2: Self-reported pain scores measured before and after in-

travenous procedures are expected to differ among the DistrACTION Cards, Buzzy, and control groups.

H3: Nurse-observed pain scores measured before, during, and after intravenous procedures are expected to differ among the DistrACTION Cards, Buzzy, and control groups.

METHODS

Ethical statements: This study obtained approval from the Institutional Review Board (IRB) of Busan St. Mary's Hospital (IRB no., 24-14000-111). Informed consent was obtained from all participants.

1. Study Design

This study was a quasi-randomized controlled trial designed to assess the effects of distraction interventions (DistrACTION Cards and Buzzy) on pain during intravenous procedures in children visiting the emergency department. The study was conducted in accordance with the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) guidelines [20].

2. Study Setting and Sample

Children who visited the emergency department of a general hospital located in Busan, South Korea, were recruited through convenience sampling. The inclusion criteria were as follows: (1) preschool children aged 4–6 years receiving intravenous procedures, (2) children without cognitive issues who had not received sedatives, anticonvulsants, or antipyretic/analgesic medications within the previous 6 hours, (3) children experiencing fever with a body temperature of <39°C, dehydration, or mild gastroenteritis within the first 24 hours (excluding children with febrile seizures, bleeding, or trauma), and (4) children and their parents who understood the purpose of the study and consented to participate.

The exclusion criteria were as follows: (1) children undergoing both intravenous procedures and blood sampling simultaneously, (2) children whose intravenous procedure was unsuccessful on the first attempt, (3) children demonstrating poor cooperation or excessive resistance, (4) children with Raynaud's syndrome or sickle cell disease, and (5) children with skin damage, abrasions, nerve injury, or sensory impairments at the site where the intervention device would be applied.

The sample size was calculated using G*Power ver. 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf) for repeated-measures analysis of variance (ANOVA) with a within–between interaction. Based on a previous study [13], the effect size (f) was set at .40, significance level at .05 (two-tailed), and statistical power at 98%, which resulted in a required sample size of 28 participants per group (total participants, 84). A higher power level (98%) was chosen to minimize the risk of type II error in this study involving preschool children undergoing invasive procedures in the emergency department. Because pain responses in this population are highly variable owing to developmental differences, heightened fear and anxiety, and the uncontrollable nature of the emergency department environment, we anticipated wide score dispersion. This conservative approach was therefore used to ensure that true intervention effects would not be missed despite the expected variability. Considering a potential dropout rate of 20%, a total of 105 children were recruited, with 35 participants in each group. Among them, four participants in the DistrACTION Cards group, five in the Buzzy group, and four in the control group were excluded owing to unsuccessful intravenous insertion on the first attempt or excessive resistance. Ultimately, 92 participants were included in the final analysis (Figure 1).

3. Variables and Measurements

1) Pulse rate

Physiological pain was assessed using a pulse oximeter (Nellcor Bedside SpO_2 Patient Monitoring System; Covidien). An elevated pulse rate indicates a greater degree of pain.

2) Faces Pain Rating Scale

Self-reported pain was measured using the Faces Pain Rating Scale (FPRS) developed by Wong and Baker [21]. This tool consists of six facial expressions, and children were asked to select the face that best represented their level of pain. The scale is scored as 0, 2, 4, 6, 8, and 10, with higher scores indicating greater pain intensity.

3) FLACC scale

Nurse-observed pain was assessed using the five items of the Face, Legs, Activity, Cry, Consolability (FLACC) scale developed by Merkel et al. [22]. Each item is scored from 0 to 2, resulting in a total score ranging from 0 to 10. A score of 0

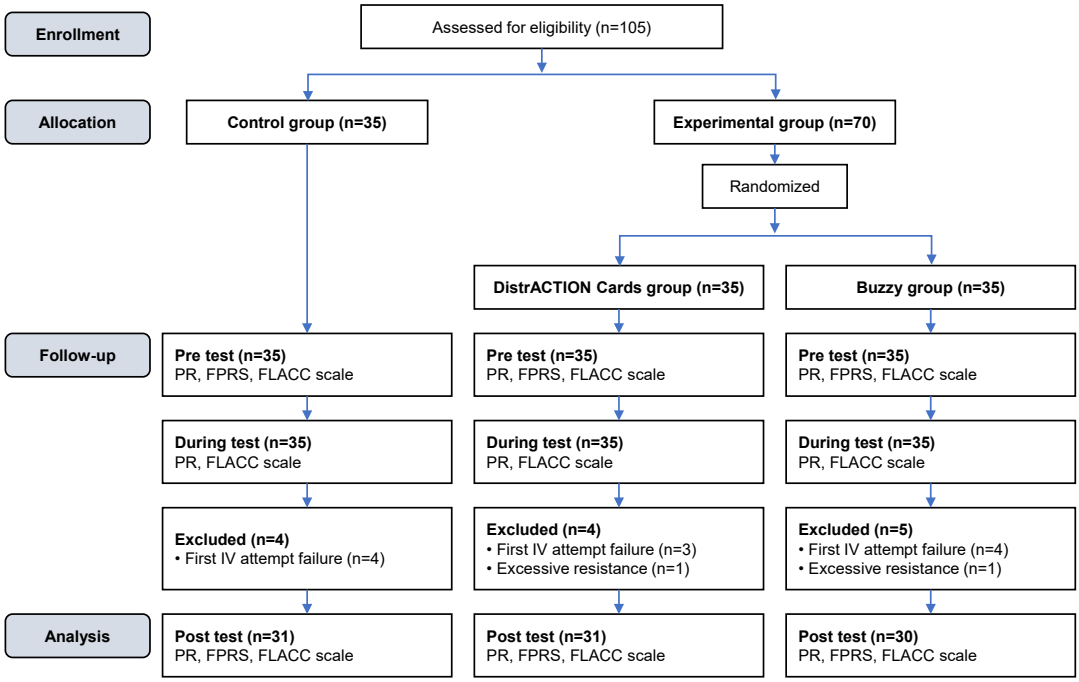


Figure 1. Study flowchart. FLACC, Face, Legs, Activity, Cry, Consolability; FPRS, Faces Pain Rating Scale; IV, intravenous; PR, pulse rate.

indicates relaxed and comfortable, 1–3 indicates mild discomfort, 4–6 indicates moderate pain, and 7–10 indicates severe discomfort or pain.

4) DistrACTION Cards

Each DistrACTION Card (Pain Care Labs) measures approximately 5×8 cm. A set consists of five cards with various illustrations. Four different sets were used in total, with each card featuring a unique picture on the front and questions on the back that require careful observation to answer. These cards are used to divert the child's attention during the procedure by questioning them about the illustrations.

5) Buzzy

The Buzzy device (Pain Care Labs) measures 8×5×2.5 cm and is a non-invasive, battery-operated, bee-shaped plastic device that produces vibration and includes detachable, wing-shaped ice packs. The ice pack is stored in the freezer and attached to the device before use. Buzzy is placed approximately 5 cm above the intravenous site. When activated, it delivers vibration and cold stimulation to the site for at least 30 seconds to relieve pain. The application time ranges from 30 to 120 seconds. After use, the ice pack is wiped with 83% alcohol and stored in the freezer for reuse.

4. Procedures

1) Data collection

Data collection was conducted first for the control group from July 15 to July 27, 2024, and then for the intervention group from July 28, 2024, to January 1, 2025. Children who visited the emergency department were enrolled sequentially after their caregivers were informed of the study's purpose and procedures and provided written consent. Participants in the intervention groups were randomly assigned to the DistrACTION Cards or Buzzy groups. Randomization was performed by having the caregivers draw a number card from an opaque box (20×20×20 cm); odd numbers assigned the child to the DistrACTION Cards group, and even numbers assigned the child to the Buzzy group. The control group did not receive any distraction intervention and underwent standard intravenous procedures performed in the emergency department.

The distraction interventions and assessments were performed by eight research assistants, all of whom were general nurses working in the emergency department with ≥1 year of clinical experience and excluded head nurses. This criterion was applied because we considered it essential for research assistants to have a minimum level of practical experience with the emergency department environment and

pediatric procedures to ensure reliable assessment. For each case, one research assistant was randomly assigned to measure the child's physiological pain (pulse rate), self-reported pain (FPRS), and nurse-observed pain (FLACC). In the DistrACTION Cards group, a different research assistant applied the intervention to clearly separate the roles of intervention and assessment.

Prior to data collection, the researcher provided standardized training to all research assistants. The training was directly conducted by the researcher, who utilized three video clips showing preschool children undergoing needle-related procedures. One video was used for instructional purposes to familiarize the research assistants with the evaluation procedures of the FLACC tool. The remaining two videos were used for practice. The research assistants viewed the two practice videos and independently rated the children's pain using the FLACC tool. Scores for each video were calculated, and the mean value was used to verify inter-rater agreement. Each training session lasted approximately 30 minutes and was repeated until a Fleiss's Kappa coefficient of ≥0.8 was achieved. Consequently, three training sessions were conducted. This process ensured consistency in the application of the FLACC tool across research assistants and enhanced the reliability of observational pain assessment during the study.

2) Intervention

This study was conducted in a private space with an area of 59.7 m^2. To reduce children's anxiety, the walls of the space were decorated in yellow and adorned with illustrations of cartoon characters to create a familiar and comforting atmosphere. The room temperature was maintained between 22°C and 24°C to provide a comfortable environment for the children. The study was conducted privately, with only one child and their caregiver present at a time, to ensure that participating children were not exposed to or influenced by the intravenous procedures performed on other children. To minimize confounding variables that could affect pain levels, all intravenous procedures were performed consistently by a researcher with >5 years of experience in the emergency department.

(1) General protocol

The child and their caregiver were guided to the laboratory, and the procedure was explained. A research assistant attached a patient monitor sensor connected to a pulse oximeter (Nellcor Bedside SpO_2 Patient Monitoring System; Covidien) to the hand on the side opposite to the injection site to measure physiological pain. Nurse-observed pain and self-reported pain were assessed using the FLACC scale and FPRS, respectively. A tourniquet was applied approximately 12–15 cm above a suitable vein to facilitate catheter insertion, and the optimal vein for intravenous insertion was selected. Hand hygiene was performed using 4% chlorhexidine gluconate or 70% alcohol. The injection site was disinfected using an 83% alcohol swab in a circular motion from the center outward over a 5–8 cm area. A 24G Jelco catheter was inserted into the vein. Once proper insertion was confirmed, the tourniquet was released and the needle stylet was removed. The research assistant measured pre-procedure physiological pain and nurse-observed pain using the pulse oximeter and FLACC scale. The intravenous line was connected to pre-prepared fluids and secured with Tegaderm. The child was allowed to rest for 5 minutes, and subsequently the physiological pain, nurse-observed pain, and self-reported pain were assessed again using the pulse oximeter, FLACC scale, and FPRS. The participant was informed that the experiment was completed and was given a coffee coupon as a compensation. Participants who were excluded from the study also received the same compensation.

(2) DistrACTION Cards group

In the DistrACTION Cards group, the research assistant continuously applied the intervention from the time the pre-procedure pain assessment was completed. The research assistant showed the cards to the child and repeatedly provided verbal prompts in the form of questions, such as, "How many ladybugs are in the picture?," "How many spots does the ladybug have?," and "Where are the elephant and monkey?." The intervention was maintained throughout the procedure and discontinued after intravenous fluid connection and securement were completed.

(3) Buzzy group

In the Buzzy group, immediately after the pre-procedure pain assessment, the researcher retrieved the ice pack from the freezer, attached it to the Buzzy device, and allowed the child to touch the device to stimulate initial interest. Once the intravenous site was determined, Buzzy was placed approximately 5 cm above the insertion site, and an additional tourniquet was used to secure the device to prevent movement. The vibration and cold stimulation were applied for at least

30 seconds and up to 120 seconds to ensure sufficient sensory stimulation. The intervention was maintained throughout the procedure and was discontinued after the intravenous fluid connection and securement were completed.

(4) Control group

In the control group, no distraction intervention was applied. From the completion of the pre-procedure pain assessment, the researcher provided general verbal support to the child using everyday expressions, such as, "It will be over soon, you are doing well," or "Mom is right here." These expressions were maintained at a level similar to that of typical clinical environments. The verbal support was maintained throughout the procedure till the intravenous fluid connection and securement were completed.

5. Data Analysis

The collected data were analyzed using the IBM SPSS/WIN ver. 29.0 program (IBM Corp.). The general characteristics of the participants were analyzed using frequencies and percentages. Homogeneity among the three groups was assessed using the chi-square test. To examine the homogeneity of dependent variables before the intervention, a one-way ANOVA or Kruskal-Wallis test was performed. The normality of pre-intervention dependent variables was assessed using the Shapiro-Wilk normality test. Repeated-measures ANOVA was used to analyze normally distributed variables. For the repeated-measures ANOVA, Mauchly's test of sphericity was conducted to verify the assumption of sphericity ($W = 5.951$, $p = .051$). As the assumption was not violated, the results based on the sphericity assumption were reported. For variables that did not meet the assumption of normality, the Wilcoxon test, Friedman test, and Kruskal-Wallis test were applied.

RESULTS

1. Homogeneity Test for General Characteristics

A total of 92 children participated in this study, with 31 assigned to the DistrACTION Cards group, 30 to the Buzzy group, and 31 to the control group. The results of the homogeneity test for general characteristics and dependent variables among the three groups are presented in Table 1.

The mean pre-intervention pulse rate was 124.58 beats per minute (bpm) in the DistrACTION Cards group, 127.10 bpm in the Buzzy group, and 132.00 bpm in the control group, with no statistically significant differences among the groups. The mean pre-intervention FPRS score was 7.10 in the DistrACTION Cards group, 7.13 in the Buzzy group, and 7.42 in the control group, with no significant differences among the groups. The mean pre-intervention FLACC score was 1.65 in the DistrACTION Cards group, 2.80 in the Buzzy group, and 2.52 in the control group, with no significant differences among the groups.

The results confirmed that there were no statistically significant differences in the general characteristics or dependent variables (pulse rate, FPRS, FLACC) among the three groups, indicating homogeneity.

2. Hypothesis Testing

1) Hypothesis 1

Physiological pain scores (pulse rate) measured before, during, and after intravenous procedures may differ among the DistrACTION Cards, Buzzy, and control groups.

There were significant differences in pulse rate over time within each group ($F = 78.815$, $p < .001$). In the DistrACTION Cards group, the pulse rate was highest during the procedure ($M = 132.81$) and lowest after the procedure ($M = 116.84$). In the Buzzy group, the pulse rate was highest during the procedure ($M = 133.27$) and lowest after the procedure ($M = 116.37$). In the control group, the pulse rate was highest during the procedure ($M = 142.94$) and lowest after the procedure ($M = 121.48$). Thus, in all groups, pulse rate increased during the procedure and decreased after the procedure.

However, no statistically significant differences were observed in pulse rate among the groups at each time point ($F = 1.464$, $p = .237$) and no significant interaction effect between time and group ($F = .916$, $p = .456$). Therefore, Hypothesis 1 was rejected (Table 2).

2) Hypothesis 2

Self-reported pain scores (FPRS) measured before and after intravenous procedures may differ among the DistrACTION Cards, Buzzy, and control groups.

Significant within-group differences were observed in FPRS scores before and after the procedure. In the DistrACTION Cards group, the FPRS score significantly decreased from 7.10 to 4.06 ($p < .001$). In the Buzzy group, the FPRS score significantly decreased from 7.13 to 4.47 ($p < .001$). In

Table 1. Homogeneity test of general characteristics and dependent variables of participants (N=92)

Characteristic	DC group	Buzzy group	Control group	χ^2, F, H	*p*
Gender				5.303	.077
Male	20 (64.5)	19 (63.3)	12 (38.7)		
Female	11 (35.5)	11 (36.7)	19 (61.3)		
Age (yr)				6.978	.140
4	5 (16.1)	11 (36.7)	9 (29.0)		
5	12 (38.7)	11 (36.7)	16 (51.6)		
6	14 (45.2)	8 (26.7)	6 (19.4)		
Parent				0.826	.971[a]
Mother	23 (74.2)	21 (70.0)	21 (67.7)		
Father	7 (22.6)	8 (26.7)	9 (29.0)		
Etc.	1 (3.2)	1 (3.3)	1 (3.2)		
Previous IV injection experience				2.190	.988
0	1 (3.2)	0 (0.0)	1 (3.2)		
1	2 (6.5)	1 (3.3)	2 (6.5)		
2	4 (12.9)	3 (10.0)	3 (9.7)		
≥3	24 (77.4)	26 (86.7)	25 (80.6)		
Chief complain				3.414	.489
Fever	17 (54.8)	13 (43.3)	20 (64.5)		
Acute gastroenteritis	11 (35.5)	15 (50.0)	9 (29.0)		
Etc.	3 (9.7)	2 (6.7)	2 (6.5)		
Position				7.780	.074[a]
Sitting	1 (3.2)	1 (3.3)	3 (9.7)		
Supine	28 (90.3)	22 (73.3)	19 (61.3)		
Parent's embrace	2 (6.5)	7 (23.3)	9 (29.0)		
Pre-procedural pulse rate	124.58±17.68	127.10±23.69	132.00±22.13	0.973	.382
Pre-procedural FPRS	7.10±3.34	7.13±3.22	7.42±3.06	0.100	.951[b]
Pre-procedural FLACC scale	1.65±2.69	2.80±2.73	2.52±2.28	4.965	.084[b]

Values are presented as number (%) or mean±standard deviation.
DC, DistrACTION Cards; FLACC, Face, Legs, Activity, Cry, Consolability; FPRS, Faces Pain Rating Scale; IV, intravenous.
[a]By Fisher's exact test: when expected frequency is less than 25%. [b]By Kruskal-Wallis test.

Table 2. Repeated measures ANOVA of pulse rate (N=92)

Group	Pre IV insertion1	During IV insertion2	Post IV insertion3	F (*p*)	Post-hoc	Sources	F (*p*)
DC group	124.58±17.68	132.81±16.15	116.84±15.73	23.805 (<.001)	2>1>3	Group	1.464 (.237)
Buzzy group	127.10±23.69	133.27±23.51	116.37±18.73	22.910 (<.001)	2>1>3	Time	78.815 (<.001)
Control group	132.00±22.13	142.94±23.00	121.48±19.87	32.851 (<.001)	2>1>3	G×T	0.916 (.456)
F (*p*)		2.262 (.110)	.744 (.478)				

Values are presented as mean±standard deviation unless otherwise stated.
ANOVA, analysis of variance; DC, DistrACTION Cards; IV, intravenous.

the control group, the FPRS score significantly decreased from 7.42 to 6.19 (p=.013).

Analysis of post-procedure FPRS scores among the groups revealed statistically significant differences (H=7.159, p=.028). The control group had the highest FPRS score (M=6.19) than the DistrACTION Cards (M=4.06) and Buzzy (M=4.47) groups. However, no significant differences were observed between the DistrACTION Cards and the Buzzy groups.

Furthermore, no statistically significant differences were found among the groups in the extent of change in FPRS scores Δ(pre-post), leading to the rejection of Hypothesis 2 (Table 3).

3) Hypothesis 3

Nurse-observed pain scores (FLACC) measured before, during, and after intravenous procedures will differ among the DistrACTION Cards, Buzzy, and control groups.

Significant within-group differences were observed in FLACC scores across time points. In the DistrACTION Cards group, no significant difference was observed between the pre-procedure (M=1.65) and during-procedure (M=2.61)

Table 3. Wilcoxon signed-rank and Kruskal-Wallis test results for self-reported pain (FPRS) analysis (N=92)

Group	Pre IV insertion	Post IV insertion	Z (p)	Δ(Pre–Post)	H (*p*)
DC group[1]	7.10±3.34	4.06±3.29	–4.061 (<.001)	3.03±3.18	4.159 (.125)
Buzzy group[2]	7.13±3.22	4.47±3.43	–3.875 (<.001)	2.67±2.99	
Control group[3]	7.42±3.06	6.19±3.07	–2.472 (.013)	1.23±2.86	
H (*p*)[a)]		7.159 (.028)			
Post-hoc		3>1,2			

Values are presented as mean±standard deviation unless otherwise stated.
DC, DistrACTION Cards; FPRS, Faces Pain Rating Scale; IV, intravenous.
[a)]By Kruskal-Wallis test.

FLACC scores; moreover, the lowest score was observed after the procedure (M=0.39). In the Buzzy group, no significant difference was observed between the pre-procedure (M=2.80) and during-procedure (M=3.30) FLACC scores; and the lowest score was observed after the procedure (M=0.13). In the control group, the FLACC score was highest during the procedure (M=4.84) and lowest after the procedure (M=0.94).

Analysis of FLACC scores during the procedure showed significant differences among the groups ($p=.022$). The control group had significantly higher FLACC scores (M=4.84) than the DistrACTION Cards group (M=2.61); however, no significant differences were noted between the Buzzy and control groups or between the DistrACTION Cards and Buzzy groups. Post-procedure FLACC scores also showed significant differences among the groups ($p=.034$). The control group had higher FLACC scores (M=0.94) than both the DistrACTION Cards (M=0.39) and Buzzy (M=0.13) groups.

Analysis of the change in FLACC scores Δ1 (from pre- to during-procedure) revealed statistically significant differences among the groups ($p=.003$). The control group showed an increase of 2.32 points, whereas the DistrACTION Cards and Buzzy groups showed smaller increases of 0.97 and 0.50 points, respectively. These results indicate that both intervention groups experienced a smaller increase in FLACC scores during the procedure compared to the control group. Therefore, Hypothesis 3 was supported (Table 4).

DISCUSSION

This study examined the effects of distraction interventions on pain during intravenous procedures in preschool children visiting the emergency department.

To test Hypothesis 1, changes in pulse rate were analyzed. After the intravenous procedure, the pulse rate decreased by 15.97 bpm in the DistrACTION Cards group, 16.9 bpm in the Buzzy group, and 21.46 bpm in the control group compared to the pulse rate during the procedure. However, no statistically significant differences were observed between the groups and no significant interaction effects were noted between time and group. All groups showed an increase in pulse rate during the intravenous procedure, followed by stabilization over time. These findings are consistent with those of Kim and Park [23], who examined pain changes after applying topical anesthetic cream (EMLA 5% cream) during intravenous procedures in hospitalized children aged 6–10 years. In their study, heart rate increased during venipuncture and decreased after the procedure; however, there were no statistically significant differences between the experimental and control groups. Similarly, the results support those of Yıldırım and Gerçeker [24], who investigated the application of virtual reality and Buzzy during intravenous procedures in children aged 4–10 years in a pediatric emergency department. Their study found no significant differences in pulse rate among the groups before, during, or after the procedure. Pulse rate changes can be influenced by various factors beyond pain, including anxiety, fever, and fatigue [25]. As this study was conducted in the unique setting of an emergency department, accurately assessing physiological responses to pain was challenging. Children received treatment without prior preparation in an unfamiliar environment; hence, environmental and psychological factors could increase fear and perceived pain, making pain management more challenging [19]. Although the study environment was designed to reduce children's anxiety, the inherent urgency and unpredictability of the emergency setting may have influenced physiological responses. Moreover, children's perception and expression of pain vary depending on their developmental stage, and the same stimulus can elicit different reactions at different times. Therefore, relying on a single indicator may be insufficient to objectively assess pediatric pain [26]. Future research should aim to control external fac-

Table 4. Friedman test results for observed pain (FLACC) across time points (N=92)

Group	Pre IV insertion[1]	During IV insertion[2]	Post IV insertion[3]	χ^2 (*p*)	Post-hoc	Δ1 (Pre–During)	Δ2 (Pre–Post)	Δ3 (During–Post)
DC group[4]	1.65±2.69	2.61±2.87	0.39±1.23	27.387 (<.001)	1,2>3	–0.97±1.76	1.26±2.07	2.23±2.40
Buzzy group[5]	2.80±2.73	3.30±2.65	0.13±0.57	34.523 (<.001)	1,2>3	–0.50±1.57	2.67±2.56	3.17±2.56
Control group[6]	2.52±2.28	4.84±3.48	0.94±1.97	41.040 (<.001)	2>1>3	–2.32±2.51	1.58±2.31	3.90±3.43
H (*p*)[a)]		7.659 (.022)	6.765 (.034)			11.360 (.003)	4.859 (.088)	4.448 (.108)
Post-hoc		6>4	6>4,5			6>4,5		

Values are presented as mean±standard deviation unless otherwise stated. Friedman test followed by the Wilcoxon signed-rank test with Bonferroni correction.
DC, DistrACTION Cards; FLACC, Face, Legs, Activity, Cry, Consolability; IV, intravenous.
[a)]By Kruskal-Wallis test.

tors such as children's psychological states more rigorously and adopt a multifaceted approach that considers various variables influencing pain responses.

To test Hypothesis 2, FPRS scores before and after the intravenous procedure were compared. The FPRS score decreased by 3.04 points in the DistrACTION Cards group, 2.67 points in the Buzzy group, and 1.23 points in the control group after the procedure compared to that before the procedure. Analysis of post-procedure FPRS scores showed that both the DistrACTION Cards group and the Buzzy group had significantly lower pain scores than the control group. However, when comparing the extent of change in FPRS scores before and after the procedure among the groups, no statistically significant differences were found. This result suggests that all three groups showed a similar pattern of change in self-reported pain scores, implying that the interventions may have been more effective in reducing the actual pain experienced immediately after the intravenous procedure rather than influencing the degree of change itself. These findings are consistent with those of Sivri et al. [17], who applied Buzzy, ShotBlocker, and DistrACTION Cards during venous blood sampling in hospitalized children aged 9–12 years. In their study, post-procedure FPRS scores were significantly lower in all intervention groups than in the control group, but no significant differences were observed among the intervention groups. In contrast, Cho et al. [27] reported contradictory results in a study applying Buzzy during intravenous procedures in hospitalized children aged 3–7 years in Taiwan. In their study, the FPRS scores of the control group increased after the intravenous procedure, differing from the results of the present study. Although both the study by Cho et al. [27] and the present study defined pre-procedure scores as anticipated pain and post-procedure scores as experienced pain, these discrepancies may be attributed to the environmental and cultural differences between Taiwanese and Korean children. Cheng et al. [28] investigated pain perception and beliefs among the Han, Amis, and Atayal ethnic groups in Taiwan and found distinct emotional and cognitive approaches to pain perception among different ethnic groups. The Han, who comprise approximately 90% of Taiwan's population, have a cultural background strongly influenced by Confucian values, which emphasize rational rather than emotional expression of pain and a typically negative attitude toward the use of analgesics. These cultural tendencies are likely reflected to a certain extent in children and may have influenced their pain expression and response to interventions. Although Korean children also belong to a Confucian cultural context, Korean parents place greater emphasis on emotional expression in their parenting beliefs, which is often reflected in supportive behaviors that encourage children's emotional expression [29]. These parenting styles may foster a tendency in children to express pain through self-reports, potentially affecting actual pain assessment scores. Therefore, future research should carefully consider cultural factors that may influence children's perception and expression of pain. Cross-cultural comparative studies involving children from diverse cultural backgrounds are required to examine the universality and validity of pain assessment tools.

To test Hypothesis 3, FLACC scores were analyzed. The change in FLACC scores Δ1 (from before to during the procedure) was significantly smaller in the DistrACTION Cards and Buzzy groups compared to that in the control group, suggesting that distraction interventions were effective in regulating children's pain responses. This finding is meaningful in that the interventions helped mitigate the sharp increase in pain scores typically observed at the time when actual pain occurs compared to observations in the pre-procedure phase. When comparing pain scores during the procedure, the DistrACTION Cards group showed significantly

lower FLACC scores than the control group, confirming that this intervention effectively reduced pain responses during the actual intravenous procedure. Although the Buzzy group did not show a statistically significant difference compared to the control group, the smaller increase in FLACC scores from pre- to during the procedure indicates that Buzzy provided a certain degree of pain relief. These findings are partially consistent with those of Cho et al. [27], who applied the Buzzy intervention to hospitalized children aged 3–7 years in Taiwan. Their study measured only FLACC scores during the intravenous procedure and reported significantly lower scores in the Buzzy group than the control group. In contrast, our study measured FLACC scores before, during, and after the procedure, and the most consistent pain control effect was observed for the DistrACTION Cards group. Although there was no significant difference between the Buzzy and control groups during the procedure, the Buzzy group exhibited the greatest reduction in pre- to post-procedure scores among the three groups. These findings suggest that DistrACTION Cards are most effective in modulating immediate pain responses, whereas Buzzy may have potential benefits in facilitating pain recovery after the procedure. These differences may be attributed to the distinct cognitive engagement mechanisms of the two interventions. In situations such as intravenous procedures, where pain occurs suddenly and unpredictably, a strategy that redirects attention to external tasks may be more effective in suppressing emotional pain responses than merely responding to sensory stimulation [30]. This observation is further supported by the finding that pain scores increased sharply during the procedure in the control group, whereas pain scores remained relatively stable in the DistrACTION Cards group. Additionally, post-procedure pain scores were lower in both the DistrACTION Cards and Buzzy groups than the control group, suggesting that distraction interventions may have a sustained effect on pain control even after the procedure. These results are consistent with those of Ballard et al. [31], who applied a distraction kit to children aged 3 months to 5 years visiting the emergency department and measured FLACC scores before, during, and after procedures. Their study similarly found the highest pain scores during the procedure and similar pain scores before and after the procedure across groups. The researchers interpreted these findings as evidence that distraction interventions promote faster pain recovery after the procedure. Therefore, this study showed that distraction interventions can contribute to pain control before, during, and after procedures in children, suggesting that strategies involving cognitive engagement may positively influence both immediate pain responses and post-procedural pain recovery.

This study had several limitations. First, the site of intravenous insertion was not considered as a variable, although pain intensity may vary depending on the insertion site, which could have influenced the results. Second, the study was conducted at a single institution with a relatively small sample, limiting the generalizability of the findings. Third, FLACC scores were evaluated by research assistants through observation, and thus some degree of subjectivity may have been involved. Nevertheless, this was the first study in Korea to comparatively evaluate the effectiveness of DistrACTION Cards and Buzzy in relieving intravenous injection pain in children, and the findings carry educational, clinical, and research significance. Educationally, they provide a case of a non-pharmacological intervention suitable for preschool children, contributing to nursing education. Clinically, they demonstrated the effectiveness of distraction interventions easily applicable in emergency settings, thereby helping reduce children's pain and improve satisfaction with nursing care. From a research perspective, this study enhances methodological validity by evaluating distraction interventions in the Korean clinical context and highlights the need for replication and multicenter studies to further expand the evidence base.

CONCLUSION

This study aimed to examine the effects of distraction interventions (DistrACTION Cards and Buzzy) on pain relief during intravenous procedures in preschool-aged children visiting the emergency department. The results showed that both interventions were effective in reducing nurse-observed pain (FLACC), with DistrACTION Cards demonstrating a more consistent trend of pain reduction, suggesting it may be prioritized in clinical settings. However, no significant differences were found in physiological indicators or self-reported pain scores, highlighting the need for a multidimensional approach to pain assessment. Future studies should incorporate designs that better control for external factors and include a broader population to enhance generalizability.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors. Data collection: ML. Formal analysis: ML. Writing–original draft: ML. Writing–review and editing: all authors. Final approval of the published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

The authors would like to thank the children and their families for their participation in this study, as well as the nurses who supported the research process.

ORCID and ResearcherID

MinJi Lee https://orcid.org/0009-0000-5540-6110
https://researcherid.com/rid/OMM-6718-2025
Euna Park https://orcid.org/0000-0003-0987-8349
https://researcherid.com/rid/OOL-8045-2025

REFERENCES

1. Pancekauskaitė G, Jankauskaitė L. Paediatric pain medicine: pain differences, recognition and coping acute procedural pain in paediatric emergency room. Medicina (Kaunas). 2018;54(6):94. https://doi.org/10.3390/medicina54060094
2. Wong CL, Choi KC. Effects of an immersive virtual reality intervention on pain and anxiety among pediatric patients undergoing venipuncture: a randomized clinical trial. JAMA Netw Open. 2023;6(2):e230001. https://doi.org/10.1001/jamanetworkopen.2023.0001
3. Ferraz-Torres M, Soto-Ruiz N, Escalada-Hernández P, García-Vivar C, San Martín-Rodríguez L. Can virtual reality reduce pain and anxiety in pediatric emergency care and promote positive response of parents of children?: a quasi-experimental study. Int Emerg Nurs. 2023;68:101268. https://doi.org/10.1016/j.ienj.2023.101268
4. Orenius T, Säilä H, Mikola K, Ristolainen L. Fear of injections and needle phobia among children and adolescents: an overview of psychological, behavioral, and contextual factors. SAGE Open Nurs. 2018;4:2377960818759442. https://doi.org/10.1177/2377960818759442
5. McMurtry CM, Pillai Riddell R, Taddio A, Racine N, Asmundson GJ, Noel M, et al. Far from "just a poke": common painful needle procedures and the development of needle fear. Clin J Pain. 2015;31(10 Suppl):S3-S11. https://doi.org/10.1097/AJP.0000000000000272
6. Taddio A, McMurtry CM, Logeman C, Gudzak V, de Boer A, Constantin K, et al. Prevalence of pain and fear as barriers to vaccination in children: systematic review and meta-analysis. Vaccine. 2022;40(52):7526-7537. https://doi.org/10.1016/j.vaccine.2022.10.026
7. International Association for the Study of Pain. Pain in children: management [Internet]. International Association for the Study of Pain; 2021 [cited 2025 Aug 20]. Available from: https://www.iasp-pain.org/resources/fact-sheets/pain-in-children-management/
8. Checa-Peñalver A, Lírio-Romero C, Luiz Ferreira EA, Hernandes-Iglesias S, García-Valdivieso I, Pérez-Pozuelo JM, et al. Effectiveness of non-pharmacological interventions in the management of pediatric chronic pain: a systematic review. Children (Basel). 2024;11(12):1420. https://doi.org/10.3390/children11121420
9. Sufyanti Y, Hidayah N, Utami R. Behavioral intervention on non-pharmacological pain management for child: a systematic review. Bali Med J. 2022;11(3):1141-1145. https://doi.org/10.15562/bmj.v11i3.3531
10. McCaul KD, Malott JM. Distraction and coping with pain. Psychol Bull. 1984;95(3):516-533.
11. Atefeh S. Barriers and facilitators of pain management in children: a scoping review. BMC Anesthesiol. 2025;25(1):148. https://doi.org/10.1186/s12871-025-02941-2
12. Bice AA. Inadequate pediatric procedural pain management in the emergency room: a policy analysis. Sch J Emerg Med Crit Care. 2017;1(1):25-30. https://doi.org/10.36959/592/374
13. Erdogan B, Aytekin Ozdemir A. The effect of three different methods on venipuncture pain and anxiety in children: Distraction Cards, virtual reality, and Buzzy(R) (randomized controlled trial). J Pediatr Nurs. 2021;58:e54-e62. https://doi.org/10.1016/j.pedn.2021.01.001
14. Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965;150(3699):971-979. https://doi.org/10.1126/science.150.3699.971
15. Jin F, Wang X, Qi M, Zhang W, Zhang Y. Effectiveness and safety of Buzzy device in needle-related procedures for children under twelve years of age: a systematic review and meta-analysis. Medicine (Baltimore). 2024;103(15):e37522. https://doi.org/10.1097/MD.0000000000037522

16. Inal S, Kelleci M. The effect of external thermomechanical stimulation and distraction on reducing pain experienced by children during blood drawing. Pediatr Emerg Care. 2020;36(2):66-69. https://doi.org/10.1097/PEC.0000000000001264
17. Sivri BB, Balci S, Dolgun G. The effect of 3 methods (Buzzy, ShotBlocker, and DistrACTION Cards) used while taking blood samples from children with pain and anxiety: a randomized controlled trial. Pediatr Emerg Care. 2023;39(8):600-607. https://doi.org/10.1097/PEC.0000000000002866
18. Kyle T, Carman S. Essentials of pediatric nursing. Yoon HY, Gu YJ, Kim GE, Kim EY, Park EA, Bae SH, et al., translators. Seoul: Hyunmoonsa; 2022.
19. Gripko M, Joseph A, MohammadiGorji S. Effects of the physical environment on children and families in hospital-based emergency departments: a systematic literature review. J Environ Psychol. 2023;86:101970. https://doi.org/10.1016/j.jenvp.2023.101970
20. Des Jarlais DC, Lyles C, Crepaz N. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: the TREND statement. Am J Public Health. 2004;94(3):361-366. https://doi.org/10.2105/ajph.94.3.361
21. Wong DL, Baker CM. Pain in children: comparison of assessment scales. Pediatr Nurs. 1988;14(1):9-17.
22. Merkel SI, Voepel-Lewis T, Shayevitz JR, Malviya S. The FLACC: a behavioral scale for scoring postoperative pain in young children. Pediatr Nurs. 1997;23(3):293-297.
23. Kim Y, Park HR. Effects of topical anesthetic cream on pain at venipuncture in children. Child Health Nurs Res. 2014;20(3):142-148. https://doi.org/10.4094/chnr.2014.20.3.142
24. Yıldırım BG, Gerçeker GÖ. The effect of virtual reality and Buzzy on First insertion success, procedure-related fear, anxiety, and pain in children during intravenous insertion in the pediatric emergency unit: a randomized controlled trial. J Emerg Nurs. 2023;49(1):62-74. https://doi.org/10.1016/j.jen.2022.09.018
25. Sammito S, Thielmann B, Böckelmann I. Update: factors influencing heart rate variability: a narrative review. Front Physiol. 2024;15:1430458. https://doi.org/10.3389/fphys.2024.1430458
26. Wong D. Pain assessment in children. Anaesth Intens Care Med. 2025;26(3):139-142. https://doi.org/10.1016/j.mpaic.2024.12.008
27. Cho YH, Chiang YC, Chu TL, Chang CW, Chang CC, Tsai HM. The effectiveness of the Buzzy device for pain relief in children during intravenous injection: quasirandomized study. JMIR Pediatr Parent. 2022;5(2):e15757. https://doi.org/10.2196/15757
28. Cheng Y, Lin M, Wang H. The cultural meanings of pain experiences among three ethnic groups in Eastern Taiwan. Formosa J Ment Health. 2009;22(2):181-202. https://doi.org/10.30074/FJMH.200906_22(2).0004
29. Jeong Y, Park H. Korean parent's belief about children's emotion and emotion related parenting. Korean J Dev Psychol. 2012;25(2):107-128.
30. Birnie KA, Noel M, Parker JA, Chambers CT, Uman LS, Kisely SR, et al. Systematic review and meta-analysis of distraction and hypnosis for needle-related pain and distress in children and adolescents. J Pediatr Psychol. 2014;39(8):783-808. https://doi.org/10.1093/jpepsy/jsu029
31. Ballard A, Le May S, Khadra C, Lachance Fiola J, Charette S, Charest MC, et al. Distraction kits for pain management of children undergoing painful procedures in the emergency department: a pilot study. Pain Manag Nurs. 2017;18(6):418-426. https://doi.org/10.1016/j.pmn.2017.08.001

ORIGINAL ARTICLE

Child Health Nurs Res Vol.31, No.4, October 2025;31(4):296-307
https://doi.org/10.4094/chnr.2025.030

pISSN 2287-9110
eISSN 2287-9129

CHNR

Effects of a virtual reality program and simulation training for nursing students on the measurement of vital signs in children: a mixed-methods study in South Korea

Sun Nam Park[1], Hyun Young Koo[2], Hye Young Hwang[3]

[1]Professor, Department of Nursing, Seoul Women's College of Nursing, Seoul, Korea
[2]Professor, College of Nursing·Research Institute of Nursing Science, Daegu Catholic University, Daegu, Korea
[3]Assistant Professor, Department of Nursing, Seoul Women's College of Nursing, Seoul, Korea

Corresponding author
Hye Young Hwang
Department of Nursing, Seoul Women's College of Nursing, 38 Ganhodae-Ro, Seodaemun-Gu, Seoul 03617, Korea
Tel: +82-2-2287-1739
Fax: +82-2-2287-1701
E-mail: hhy@snjc.ac.kr

Received: August 31, 2025
Revised: October 13, 2025
Accepted: October 28, 2025

Purpose: This study aimed to evaluate the effects of a virtual reality (VR) program and simulation training on nursing students' ability to measure vital signs in children.
Methods: This mixed-methods study, which included a randomized controlled trial and a qualitative study, was conducted from June 12 to November 15, 2023. Forty-four nursing students from a university in South Korea were randomly assigned to either the experimental or control group. The experimental group first participated in a VR program focused on measuring vital signs in children, followed by a high-fidelity simulation training. The control group received the training in the reverse order. The participants' knowledge, confidence in practice, and satisfaction with the practice were analyzed using the repeated-measures analysis of variance. VR learning experiences were analyzed through qualitative content analysis.
Results: Both the experimental and control groups showed significant increases in knowledge and confidence in practice after the interventions compared to baseline. However, there were no significant differences in changes in knowledge, confidence in practice, and satisfaction with practice between the two groups. Three themes were identified from the nursing students' experiences with VR learning: 'realistic learning training,' 'overcoming learning limitations,' and 'perceiving drawbacks.'
Conclusion: The VR program was as effective as high-fidelity simulation training in improving nursing students' ability to measure children's vital signs. Moreover, VR program offered additional benefits in addressing limitations of simulation-based learning. These findings suggest that VR program can serve as a valuable educational tool to enhance pediatric nursing skills.

Keywords: Nursing students; Pediatric nursing; Simulation training: Virtual reality; Vital signs

INTRODUCTION

Vital signs in children are crucial indicators of overall health, and changes reflect shifts in health status. Practicums focused on measuring children's vital signs are a vital component of the curriculum for nursing students, reflecting the high practical need in their training [1]. Due to an extremely low birth rate, few children are hospitalized at medical institutions, which complicates the process of securing pediatric nursing practicum centers. As a result, college nursing stu-

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (https://creativecommons.org/licenses/by-nc-nd/4.0/) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.
© 2025 Korean Academy of Child Health Nursing

dents have limited opportunities to engage in direct nursing tasks, such as taking vital signs, during their clinical practice to ensure patient safety. Consequently, these practicums are primarily observational [2]. There is a need to establish effective strategies to address the limitations of clinical practice in pediatric nursing.

As a result, simulation education is utilized as a method to supplement the limited clinical practice available for pediatric care in Korea. This educational approach involves designing scenarios that mimic real clinical situations, enabling students to develop their problem-solving skills through critical thinking in a risk-free setting. However, it has the drawback of only being able to accommodate a small number of students simultaneously. Furthermore, it is expensive, requiring costly simulation equipment, dedicated space for setup, and staff to manage and operate the equipment [3,4].

Children are more susceptible to infections than adults, necessitating high-quality, attentive nursing care. Following the coronavirus disease 2019 (COVID-19) pandemic, the use of virtual reality (VR) programs has been expanding as one of the non-face-to-face education that can minimize the spread of infection in pediatric nursing education [4]. VR employs computer-generated artificial environments that mimic real-life scenarios, enabling learners to make decisions and execute nursing tasks within these virtual settings [5]. Moreover, VR offers cost-saving benefits by eliminating the need for expensive simulation equipment and dedicated spaces through the development of VR programs. It also supports remote operation via networks, allowing learners to non-face-to-face practice without geographical or temporal limitations, while ensuring participant safety [6].

While improvements in knowledge, performance, satisfaction, confidence, and communication skills are commonly reported benefits of VR programs in nursing education, these effects were not observed in some studies [7-9]. Recent research on VR programs for pediatric care education involving nursing students has been limited. Current studies have focused solely on post-operative care for children following appendectomy [9], as well as the development and effectiveness of educational programs for managing infections in high-risk neonates [10,11] and in children with COVID-19 [12].

In pediatric nursing practice, measuring vital signs is one of the most fundamental and essential skills for assessing a child's condition and evaluating the effectiveness of nursing interventions [1]. It is a core competency that nursing students must acquire; however, opportunities for pediatric clinical practice are often limited due to safety and ethical concerns, making it difficult to provide sufficient hands-on experience [5,6]. To compensate for these limitations, high-fidelity simulation training has been widely used as an alternative teaching method, and more recently, VR programs have gained increasing attention as innovative educational tools.

Despite this growing interest, research comparing the effectiveness of VR programs and high-fidelity simulation training in teaching pediatric vital sign measurement remains limited. Therefore, this study aims to compare the effects of these two educational approaches on nursing students' learning outcomes.

Furthermore, recognizing that quantitative research alone may not fully capture learners' experiences and perceptions, this study adopts a mixed-methods approach by incorporating qualitative interviews exploring participants' learning experiences with the VR program [13]. Through this approach, the study seeks to provide comprehensive and practical insights into effective educational strategies for pediatric nursing practice.

Therefore, this study was designed to address the inherent limitations of clinical practice by applying both quantitative and qualitative research methods to examine the effectiveness of a VR program and high-fidelity simulation training as innovative educational strategies for enhancing the ability to measure pediatric vital signs, one of the most fundamental skills in assessing children's health status. The first objective was to compare the effectiveness of a VR program with that of high-fidelity simulation training in teaching nursing students how to measure children's vital signs. Additionally, the study compared the differences according to the order in which the VR program and high-fidelity simulation training are implemented. Furthermore, it explored the learning experiences of nursing students participating in the VR program.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Seoul Women's College of Nursing (IRB no., SWCN-202304-HR-002). Informed consent was obtained from all participants.

1. Study Design

This study employed a mixed-methods approach, comprising both a randomized controlled trial and a qualitative study. It aimed to evaluate the impact of a VR program and simulation training on nursing students' ability to measure vital signs in children, and was conducted at Seoul Women's College of Nursing in South Korea (Figure 1). The research adhered to the Consolidated Standards of Reporting Trials (CONSORT) statement [14] and the Consolidated Criteria for Reporting Qualitative Research (COREQ) reporting guidelines [15]. Additionally, the study was registered with the Clinical Research Information Service (CRIS) prior to the collection of baseline data (registration number: KCT0008536).

2. Study Setting and Participants

This study was conducted with students at a nursing college in Seoul, South Korea, from June 12 to November 15, 2023. The inclusion criterion was limited to third-year students who had no experience in pediatric nursing practicum. The study included only those participants who provided informed consent; students who declined to participate or who had completed a pediatric nursing practicum were excluded.

The required number of participants for each group was determined to be 22, as calculated using G*Power ver. 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf) [16]. We employed repeated-measures analysis of variance (ANOVA) along with a within-between interaction, setting the effect size at .25, the significance level at .05, the power at 95%, the number of measurements at 3, and the correlation coefficient at .50. This effect size was chosen based on findings from a previous study [17].

Given the potential for a 10% dropout rate, 50 nursing students (25 per group) were recruited by convenience sampling and then the 50 recruited students were randomly assigned to either the experimental group or the control group, with 25 students in each group, using a random number generator program based on their application numbers. During the study, a total of six participants dropped out due to health issues (such as COVID-19 infection) and private scheduling conflicts, resulting in a final sample size of 44 participants (22 participants in each of the experimental and control groups) in the quantitative data collection. Of the 44 participants, 10 participants (five per group) volunteered for the interview in the qualitative data collection (Figure 2).

3. Measurements

1) Knowledge about the measurement of vital signs in children

Knowledge about the measurement of vital signs in children was measured using a scale developed by researchers based on a VR program for the measurement of vital signs in children [1]. The scale consisted of seven items related to handwashing, checking body temperature, monitoring the apical pulse, and assessing the respiratory rate. Each item received a binary score, where 1 indicates a correct answer and 0 denotes an incorrect answer or a response of "I don't know." A higher score reflects a better understanding of how to measure vital signs in children. The content validity index (CVI) was measured at 0.90, as assessed by two pediatric nursing professors and three clinical nurses, each with over 5 years of experience in pediatric fields. Cronbach's alpha for this study was 0.63.

2) Confidence in practice

Confidence in practice for the measurement of vital signs in children was measured using a scale developed by researchers based on a VR program for the measurement of vital signs in children [1]. The scale was composed of eight items about preparing materials, explaining the purpose and

<table>
<tr><th>Group</th><th>Pre-test</th><th>1st intervention</th><th>Post-test 1</th><th>Interval</th><th>2nd intervention</th><th>Post-test 2</th></tr>
<tr><td>Exp.</td><td rowspan="2">• Knowledge
• Confidence in practice</td><td>VR program</td><td rowspan="2">• Knowledge
• Confidence in practice
• Satisfaction with practice</td><td rowspan="2">After 1 week</td><td>Simulation training</td><td rowspan="2">• Knowledge
• Confidence in practice
• Satisfaction with practice
• Interview about VR program experience</td></tr>
<tr><td>Con.</td><td>Simulation training</td><td>VR program</td></tr>
</table>

Figure 1. Research design. Con., control group; Exp., experimental group; VR program, virtual reality program on the measurement of vital sing in children; Simulation training, high-fidelity simulation of the measurement of vital sing in children.

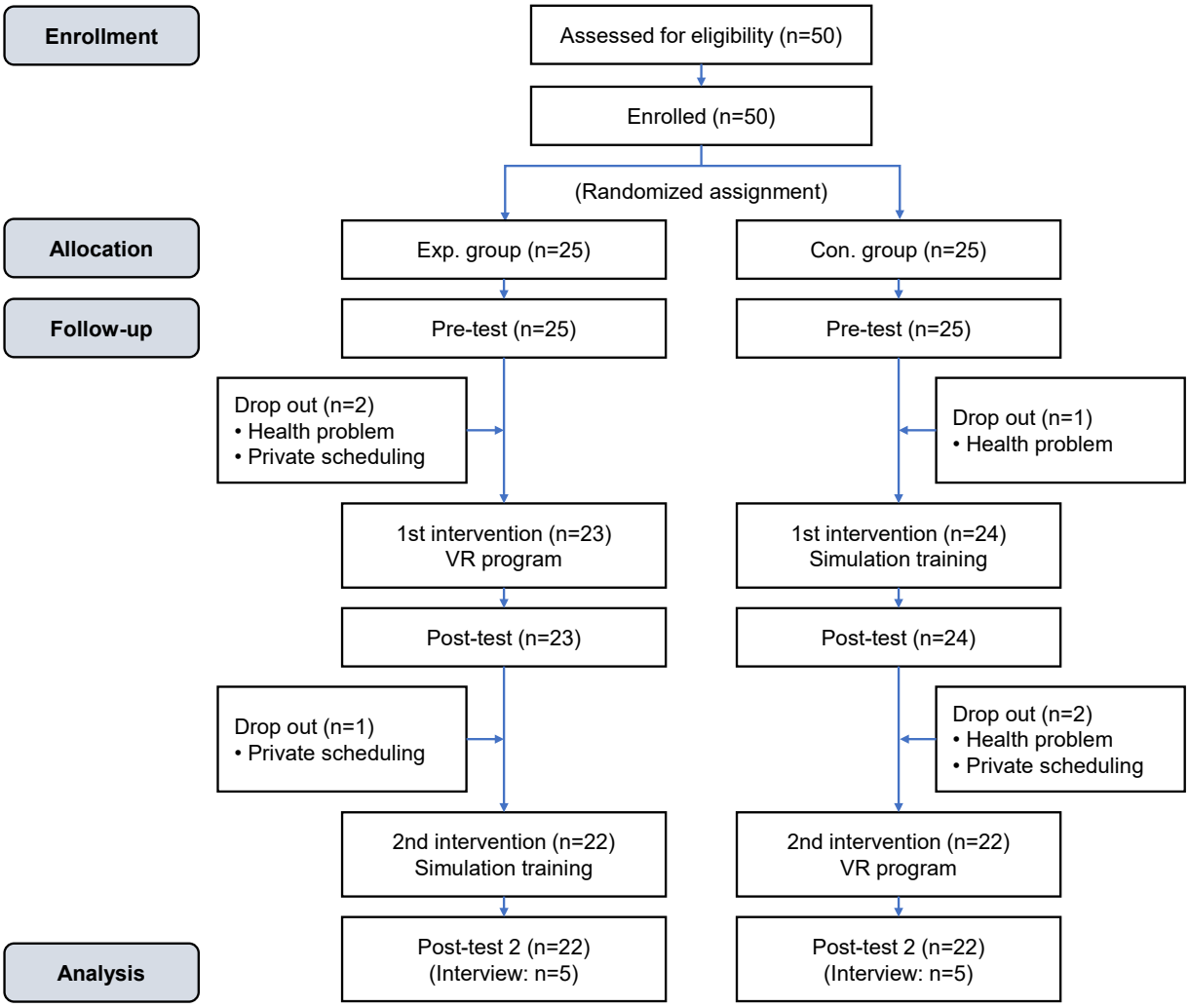


Figure 2. CONSORT (Consolidated Standards of Reporting Trials) flow diagram of participants' enrollment. Con., control group; Exp., experimental group; Simulation training, high-fidelity simulation of the measurement of vital sing in children; VR program, virtual reality program on the measurement of vital sing in children.

procedure, checking body temperature, monitoring the apical pulse, assessing the respiratory rate, and recording the findings. Each item was rated on a 10-point Likert scale, where 1 indicated "not at all" and 10 signified "strongly agree." A higher score reflected greater confidence in performing vital signs measurements in children. The CVI, assessed by two pediatric nursing professors and three clinical nurses with over 5 years of experience in pediatric fields, was 0.90. Cronbach's alpha for this study was 0.89.

3) Satisfaction with practice

Satisfaction with practice regarding the measurement of vital signs in children was measured using a scale developed by the researchers considering antecedent studies [10,18]. The scale consisted of eight items; each rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (strongly agree). A higher score reflects greater satisfaction with the practice of measuring vital signs in children. The CVI, assessed by two pediatric nursing professors and three clinical nurses with over 5 years of experience in pediatric fields, was 0.90. Cronbach's alpha for this study was 0.95.

4. Intervention

One day prior to the intervention, all participants who had completed the pre-test survey were provided with a handout detailing the vital sign measurement procedure. This was to allow them to voluntarily study the material both before and

during the practicum.

1) Virtual reality program on the measurement of vital signs in children

The VR program on the measurement of vital signs in children (henceforth, "VR program") was a self-practicum that utilized the contents developed by Park et al. [1]. Learners accessed the program individually through the university website or the designated domain (vr.xxjc.ac.kr) using web browsers such as Chrome and Edge on either a personal computer or a mobile phone. The program included content that enabled learners to review patient information and learning objectives, and to virtually practice the procedures for measuring body temperature, pulse rate, and respiration rate. During the session, learners could access reference data, tackle related questions (multiple choice, input type, and recording type), and view their performance levels and scores for these tasks. Each session lasted between 10 and 15 minutes. Learners were allotted approximately 50 minutes to engage freely with the VR-based practicum for measuring vital signs in children.

2) High-fidelity simulation on the measurement of vital signs in children

High-fidelity simulation for measuring vital signs in children was conducted using the Tetherless SimBaby simulator (SimBaby, Laerdal Medical, Norway, 2020) at the university's nursing simulation center. This simulation program replicated the same vital sign values (body temperature, pulse rate, and respiration rate) as those found in the VR-based child vital sign content. In a manner similar to the self-practicum at the university, participants were organized into three groups, with each group consisting of eight to nine members. Each group was allotted 50 minutes to complete the self-practicum.

5. Procedure and Data Collection

Research procedures and data collection were shown in Figure 1 and Figure 2.

1) Quantitative data collection

Quantitative data were collected through a series of online assessments and intervention sessions. All participants completed an online pre-test 1 day prior to the start of the intervention. After the pre-test, participants were provided with a handout on the procedure for measuring vital signs in children, which they were instructed to review independently. In the first intervention, the experimental group participated in the VR program, while the control group engaged in high-fidelity simulation training. Immediately after completing the first intervention, both groups took the first online post-test. The interval between the first and second interventions was set at 1 week, based on findings from previous studies that considered the spillover effect of the pre-test and potential diffusion effects between groups [19]. In the second intervention, the experimental group received the high-fidelity simulation training, whereas the control group participated in the VR program. Both groups completed the second online post-test immediately after finishing the second intervention. Because the self-administered online survey required participants to answer all questions before submission, there were no missing data in the final analysis.

2) Qualitative data collection

Qualitative data were collected from volunteers in each group until data saturation was reached, resulting in a total of 10 participants (five per group). In this study, the inclusion of 10 interview participants was deemed sufficient to achieve data saturation, based on previous research indicating that qualitative data saturation is typically reached with nine to 12 participants [20]. Participants were interviewed regarding their experience with the VR program following the second post-test. These interviews focused on their overall impressions of the VR program, including what they learned, what they enjoyed, what they felt was missing, and what could be improved.

To collect qualitative data, each participant was initially given an open-ended questionnaire to complete. Following this, they participated in an in-depth, face-to-face interview that lasted approximately 60 minutes. Interviews were conducted in a private, quiet setting. To ensure participant comfort, conversations began with general questions before moving to more in-depth topics. The interview questions were developed based on relevant literature, previous research findings, and the researcher's experience. To explore participants' VR program experiences in depth, a semi-structured interview guide was used. Researchers began with the main question, "Please tell us about your VR program experiences," and followed up with probing questions to encourage more detailed responses, such as "What was helpful for your learning?" and "Do you have any other comments about the

VR program?" The interview was voice-recorded, and pertinent details were noted in a notebook. When necessary, additional data were gathered through individual interviews, and the information compiled by researchers was subsequently re-verified.

6. Data Analysis

The quantitative data were analyzed using IBM SPSS ver. 25.0 (IBM Corp.). The chi-square test and independent t-test were conducted to evaluate the homogeneity of the experimental and control groups prior to the intervention. Repeated-measures ANOVA was used to examine differences in outcome variables based on the intervention.

The qualitative data were analyzed using the inductive content analysis approach across three stages: preparation, organizing, and reporting [21]. During the preparation stage, the interview data were transcribed and read multiple times to understand the overall content and select an analytical unit. In the organizing stage, meaningful statements were extracted and categorized according to the analytical units. Finally, during the reporting stage, the categories were presented.

7. Rigor

The researchers, drawing on their extensive experience providing simulation coursework, maintained methodological rigor. Throughout the study, they diligently reviewed qualitative research literature to ensure a comprehensive and in-depth exploration and description of participant experiences. The study employed established qualitative methods to ensure trustworthiness [22]. Credibility was achieved through open-ended questions and member checking (participant review of transcripts and findings). In addition, participants' statements were directly cited in the results. Transferability was maximized using purposeful sampling until data saturation. We maintained dependability by strictly following the content analysis approach [21] and conducting regular team discussions. The interview data were repeatedly reviewed to extract meaning units, which were subsequently categorized. To enhance the credibility and trustworthiness of the analysis, the research team discussed and reviewed the validity of both the data interpretation and the categorization process. Throughout the process, the researchers' objectivity ensured confirmability by preventing personal biases in data handling.

RESULTS

1. Homogeneity Testing of Participants' General Characteristics

The mean ages of the experimental group and control group were 23.45±2.89 years and 23.18±2.46 years, respectively. In terms of knowledge about measuring vital signs in children, the experimental group scored 4.04±1.39, while the control group scored 3.68±1.72. Regarding confidence in practicing the measurement of vital signs in children, the experimental group scored 3.31±0.47, and the control group scored 3.09±0.52 (Table 1).

Upon conducting homogeneity tests between the groups, we observed no significant differences in age, previous semester's school grade, satisfaction with the major, knowledge of vital signs in children, or confidence in practice (Table 1).

Table 1. Homogeneity testing of participants' general characteristics (N=44)

Variable	Exp. (n=22)	Con. (n=22)	t/χ^2	*p*
Age (yr)	23.45±2.89	23.18±2.46	0.34	.738
School grade			1.28	.733
≥A^0	6 (27.3)	5 (22.7)		
B^+	5 (22.7)	8 (36.4)		
B^0	6 (27.3)	6 (27.3)		
≤C^+	5 (22.7)	3 (13.6)		
Satisfaction with major	4.00±0.69	3.72±0.55	1.45	.155
Knowledge of vital signs (points)	4.04±1.39	3.68±1.72	0.77	.447
Confidence in practice (points)	3.31±0.47	3.09±0.52	1.50	.141

Values are presented as mean±standard deviation or number (%).
Con., control group; Exp., experimental group.

2. Effects of a VR Program for the Measurement of Vital Signs in Children

Table 2 summarizes the effects of the VR program on the measurement of vital signs in children. The analysis of knowledge regarding the measurement of vital signs in children revealed no significant differences between the groups (F=2.85, p=.099). However, there were significant differences over time (F=46.59, p<.001). The interaction effect between the groups and time was not significant (F=2.54, p=.099). The experimental group, which had an initial score of 4.04±1.39 on the pre-test, showed a significant increase to 5.72±0.76 on post-test 1 (t=6.14, p<.001). Similarly, the control group demonstrated an improvement, with scores rising from 3.68±1.72 on the pre-test to 4.77±1.06 on post-test 1 (t=2.94, p=.008), and further increasing to 5.59±1.00 on post-test 2 (t=3.25, p=.024).

In terms of confidence in measuring vital signs in children, significant differences were observed between the groups (F=13.95, p=.001), as well as based on time (F=106.49, p<.001). However, no significant interaction effect between the groups and time was noted (F=2.27, p=.112). The experimental group, which had an initial score of 3.31±0.47 on the pre-test, showed a significant increase to 4.59±0.50 on post-test 1 (t=10.84, p<.001), and further to 4.77±0.42 on post-test 2 (t=6.80, p<.001). Similarly, the control group demonstrated an improvement from 3.09±0.52 on the pre-test to 3.95±0.57 on post-test 1 (t=4.82, p<.001), and further to 4.45±0.59 on post-test 2 (t=3.92, p=.001).

In terms of satisfaction with the practice of measuring vital signs in children, there were no significant differences between the groups (F=0.02, p=.319) or based on time (F=1.59, p=.215). Additionally, no significant interaction effects between the groups and time were observed (F=0.00, p=1.000).

3. Learning Experiences with the VR Program for the Measurement of Vital Signs in Children

After analyzing significant statements from the data collected from participants, the experience of participating in VR programs for practicums on measuring children's vital signs was categorized into three main themes: "realistic learning training," "overcoming learning limitations," and "perceiving drawbacks." Additionally, eight subcategories were created (Table 3).

1) Category 1: realistic learning training

(1) Subcategory 1: similarity to the real clinical field

Participants experienced a sense of realism because the VR program closely mimicked an actual hospital setting, helping them become acquainted with the environment. Despite interacting through a computer or laptop screen, participants reported that activities such as preparing materials, checking on patients, and communicating with guardians closely resembled real clinical practice. Furthermore, they were able to perform tasks like measuring children's respiration rates by observing abdominal movements, identifying the sound of the apical pulse while listening to pulse sounds, and documenting their conversations with guardians. This process effectively taught them how to measure vital signs in children, mirroring a real-life setting.

> It felt so real because the VR looked exactly like a hospital setting. (Participant #7)

Table 2. Effects of a virtual reality program for the measurement of vital signs in children (N=44)

Variable	Pre-test	post-test1	post-test2	Difference[a]	Difference[b]	Group	Time	Group*Time
				t (p)	t (p)	F (p)	F (p)	F (p)
Knowledge						2.85 (.099)	46.59 (<.001)	2.54 (.099)
Exp. (n=22)	4.04±1.39	5.72±0.76	5.59±0.90	6.14 (<.001)	.83 (.418)			
Con. (n=22)	3.68±1.72	4.77±1.06	5.59±1.00	2.94 (.008)	3.25 (.024)			
Confidence in practice						13.95 (.001)	106.49 (<.001)	2.27 (.112)
Exp. (n=22)	3.31±0.47	4.59±0.50	4.77±0.42	10.84 (<.001)	6.80 (<.001)			
Con. (n=22)	3.09±0.52	3.95±.057	4.45±0.59	4.82 (<.001)	3.92 (.001)			
Satisfaction with practice						0.02 (.319)	1.59 (.215)	0.00 (>.999)
Exp. (n=22)	-	4.72±0.45	4.81±0.39					
Con. (n=22)	-	4.59±0.59	4.68±0.56					

Values are presented as mean±standard deviation unless otherwise stated.
Con., control group; Exp., experimental group.
[a]Difference between post-test1 and pre-test. [b]Difference between post-test2 and post-test1.

Table 3. Learning experiences with a virtual reality program for the measurement of vital signs in children

Category	Subcategory	Qualitative data
Realistic learning training	Similarity to the real clinical field	It felt so real because the VR looked exactly like a hospital setting. (Participant #7)
	Feeling novel	I was impressed by the VR program. It was very high-quality. (Participant #28)
	Feeling confident in future practice	I liked how the pulse and breathing sounds were very clear. I believe I can measure them accurately in clinical practice too. (Participant #17)
Overcoming learning limitations	Learning accurate methods	I could accurately know how to measure children's vital signs through a quiz. (Participant #34)
	Having no time or place limitations	VR is not constrained by time or place, and I could access it anytime I wanted without having to wait. (Participant #7)
	Ability to repeat practice	I learn more slowly than others and have to repeat a procedure many times to learn it. I liked VR because it allows me to repeat the practice. (Participant #7)
Perceiving drawbacks	An unfamiliar system	I did not know where the quiz was at first and clicked on the wrong answer many times. (Participant #25)
	Wanting to practice directly	It would have been better if I could practice directly on an object rather than just clicking everything. (Participant #7)

VR, virtual reality.

(2) Subcategory 2: feeling novel

Participants were impressed by VR and found participating in the VR program interesting. They expressed amazement at the lifelike details, such as the patient blinking and the movement of the patient's abdomen on the screen. Additionally, they were surprised to hear the patient's mother speak in a weary voice, reminiscent of an actual clinical guardian. Participants also found it interesting to practice measuring children's vital signs through VR.

> I was impressed by the VR program. It was very high-quality. (Participant #28)

(3) Subcategory 3: feeling confident in future practice

Participants reported that practicing vital sign measurements through the VR program felt akin to an actual practicum, and they believed it would improve their skills in clinical practice. They expressed confidence in their future clinical performance, attributing this to their ability to accurately measure children's pulse and respiration rates, provide clear explanations to guardians, and refine their communication skills by reviewing recorded explanations within the VR environment. Additionally, they noted that the VR program offered them preliminary exposure to hospital terminology, supplies, and atmosphere, which they felt would help them adapt more effectively to clinical settings.

> I liked how the pulse and breathing sounds were very clear. I believe I can measure them accurately in clinical practice too. (Participant #17)

2) Category 2: overcoming learning limitations

(1) Subcategory 1: learning accurate methods

Participants stated that the VR program enabled them to learn how to accurately measure vital signs. Specifically, they gained precise knowledge of children's characteristics and the necessary precautions for measuring vital signs. This was achieved by administering a quiz midway through the program, which helped identify and correct any inaccuracies in their understanding by reviewing the answers. Additionally, participants noted that, in contrast to simulation training, the VR program followed predetermined procedures. This structure allowed them to meticulously practice each stage according to standard procedures, which they found beneficial.

> I could accurately know how to measure children's vital signs through a quiz. (Participant #34)
> I found VR helpful because it allowed me to follow each stage and practice the correct procedures. (Participant #17)

(2) Subcategory 2: having no time or place limitations

Participants noted that the VR program was not constrained by time or place. In other words, the VR program could be accessed at any time and from any place, if portable electronic devices were available, such as tablet computers or mobile phones. Participants also mentioned that simulation training, which involves multiple people participating as a team, is time-consuming as they must wait for their turn. In contrast to the VR program, which can be conducted anytime and anywhere without spatial or temporal restrictions, simu-

lation training must be conducted in a designated practicum room, necessitating travel to a specific location.

> Simulation training was time-consuming because multiple people had to participate in it. Additionally, there was a constraint of place. However, VR is not constrained by time or place, and I could access it anytime I wanted without having to wait. (Participant #7)

(3) Subcategory 3: ability to repeat practice

Participants appreciated the VR program for its interactivity and the opportunity to engage in multiple practice sessions. They described it as customized learning, highlighting the ability to practice repeatedly at their own pace and according to their individual skill levels. The repeatability of the program was seen as a significant benefit, allowing them to continually practice and refine their understanding of the procedure to address their weaknesses.

> I learn more slowly than others and have to repeat a procedure many times to learn it. I liked VR because it allows me to repeat the practice. (Participant #7)

3) Category 3: perceiving drawbacks

(1) Subcategory 1: an unfamiliar system

Participants were sometimes confused due to their unfamiliarity with the VR system. Initially, they struggled to locate the quiz and occasionally clicked on the wrong answer. Additionally, they had difficulty hearing pulse sounds clearly because they had not prepared earphones. Furthermore, their lack of familiarity with the recording process prevented them from successfully recording their explanations for the guardian within the allotted time under the given circumstances.

> I did not know where the quiz was at first and clicked on the wrong answer many times. (Participant #25)

(2) Subcategory 2: wanting to practice directly

Participants expressed disappointment with the VR program because it did not enable them to perform nursing care directly. They acknowledged that while the VR program assisted in visualizing situations and learning procedures sequentially, it fell short by not allowing hands-on practice with actual objects, unlike simulation training. They emphasized the necessity of direct practice to effectively familiarize themselves with nursing skills.

> It would have been better if I could practice directly on an object rather than just clicking everything. (Participant #7)

DISCUSSION

The changes in knowledge, confidence in practice, and satisfaction with practice in experimental group, who first participated in the VR program and then in high-fidelity simulation training, were similar to those observed in the control group, who experienced the programs in the reverse order. Both the experimental group and the control group demonstrated improvements in knowledge and confidence in practice after both interventions compared to their baseline levels. However, satisfaction with practice did not differ between the two groups from the first to the second intervention. A meta-analysis on the effectiveness of VR in nursing education suggested that while VR education effectively enhances the knowledge of nursing students, it does not significantly differ from other educational methods, such as simulation training, in boosting confidence and satisfaction [8]. This finding is consistent with the results of this study.

To address the challenges in clinical practicum education, which often prevent nursing students from providing direct patient care, simulation training has been introduced and utilized. It has been reported that high-fidelity simulation effectively enhances nursing students' knowledge [23]. However, the educational effectiveness of simulation training can be influenced by the characteristics or competencies of the clinical practice faculty who conduct the training [24,25]. In contrast, VR programs offer consistent education, as all users are exposed to the same content, thereby avoiding the unintended effects of the personal characteristics of clinical practice faculty. Furthermore, a previous study that explored the demand for VR practicum education found that nursing students expected to receive standardized practicum education through VR [25]. Participants in this study noted that they were able to follow each stage and learn the accurate content because the VR program was conducted according to predetermined content and procedures. Therefore, VR can be utilized to implement standardized practical training in nursing education settings.

Furthermore, simulation training is constrained by time and place as it requires multiple participants to gather at a

specific place at a specific time. In contrast, the web-based VR program can be accessed from any location at any time using an electronic device, offering the flexibility to overcome these physical constraints. This allows learners to practice as often as they desire [1]. In this study, while participants had to wait their turn to engage in direct simulation training and travel to the practicum room, they could use the VR program whenever they chose, free from the restrictions of time and place. Participants identified the greatest benefit of the VR program as its repeatability. They viewed the VR program as a tailored learning tool that enabled them to practice repeatedly, depending on their level of skill. Previous research has also highlighted that a web-based VR program is a cost-effective approach that allows numerous learners to undertake individual training sessions [26]. Thus, the web-based VR program will allow nursing students to repeatedly practice essential nursing skills, proving to be both cost-effective and efficient.

In this study, participants experienced a heightened sense of realism as the VR program closely mimicked an actual hospital environment. They also honed their communication skills by interacting with a virtual patient and subsequently explaining their actions to a guardian. Given that nursing students often feel overwhelmed when communicating with patients or guardians in clinical settings [27], the VR program was specifically designed to facilitate the explanation of vital signs measurement procedures in children to their guardians. It allowed students to record their explanations, and then review these recordings, thus providing ample opportunity for communication practice. Participants were particularly impressed with the realistic depiction of a hospital ward, complete with sounds of pulses and breathing, as well as the inclusion of a recording device and a quiz. VR programs that incorporate interactive features have been shown to be more effective in knowledge retention [28]. Through repeated practice, participants gained confidence in handling clinical practicums. They expressed that engaging with the VR program prior to actual clinical practicums would be beneficial, as it provides a preliminary experience of a hospital setting. The VR program could be implemented before clinical practicum to assist nursing students in preparing for and adjusting to the clinical environment.

However, participants in this study often felt confused because they were not familiar with VR. Therefore, it is essential to provide thorough explanations and guidance before starting the program to help learners become accustomed to the VR system. Additionally, while participants acknowledged that VR aids in visual understanding and sequential learning of procedures, they were disappointed by its inability to allow hands-on practice with actual objects, unlike simulation training. They emphasized the necessity of practicing nursing skills directly to gain proficiency. In this study, participants accessed the VR program either through a web browser or by visiting the university's homepage on their mobile phone or tablet computer. However, it is challenging to improve motor skills with web-based VR programs, as they do not require physical movement to perform nursing skills. Furthermore, a meta-analysis on the effectiveness of VR in nursing education indicated that VR education did not enhance the skills of nursing students more effectively than simulation training [8]. This shortfall is attributed to the gap between virtual scenarios and actual practice. Learner satisfaction with VR education also inevitably varies based on the technical quality of the VR system. When developing a VR program, user proficiency must be considered. It should be designed to be user-friendly so that even individuals with low technical skill can easily use it and focus on the educational content.

To improve the nursing skills of nursing students, the development and integration of augmented reality technologies, such as holograms, motion sensors, and haptic devices, should be pursued [29]. However, augmented reality involves high costs, requires specialized equipment, and necessitates dedicated space for setup and operation. Unlike web-based VR programs, which are less restricted by time and location, augmented reality has physical constraints and does not easily support simultaneous multiple users. Consequently, web-based VR programs, which are more accessible and can be used repeatedly, are a preferable option for improving the performance of nursing students.

This study has some limitations. It utilized convenience sampling from nursing students at a single university, so caution should be exercised when interpreting and generalizing the findings. The study involved the application of a VR program for measuring children's vital signs to nursing students. Looking ahead, there is a need to develop and implement a variety of pediatric care topics to enhance the pediatric care competencies of nursing students. Given that nursing education can benefit from both web-based VR programs and augmented reality programs, future research should explore the use of both technologies to maximize their features and benefits.

Nevertheless, this study's unique significance lies in the following findings. This study revealed that when a web-based VR program and high-fidelity simulation training were implemented sequentially, there was a significant increase in practice confidence. This improvement was consistent even when the order of the training methods was reversed. Consequently, this study demonstrates the potential for web-based VR programs to be effectively integrated with high-fidelity simulation training or augmented reality.

Based on these findings, in clinical practice, efforts should be made to ensure practical clinical training is carried out in collaboration with nursing education institutions to foster competent pediatric nurses. From a research perspective, empirical evidence must be established by developing diverse pediatric nursing education methods and verifying their reliability and validity. For education, the effectiveness of training should be enhanced by utilizing various methods like VR, AR, and simulation, which allow students to safely and repeatedly practice core nursing skills. Furthermore, from a nursing education policy standpoint, it is necessary to standardize both nursing skills and educational methods.

CONCLUSION

This study was conducted to evaluate the impact of a VR program on nursing students' ability to measure vital signs in children, using a mixed-methods approach. It was found that the VR program was as effective as high-fidelity simulation training in enhancing students' knowledge and confidence in practice when measuring children's vital signs. By addressing learning limitations and offering realistic training, the VR program enhanced the clinical competence of nursing students. These findings suggest that the VR program may serve as a valuable tool for improving pediatric nursing education.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors. Data collection: SNP, HYH. Formal analysis: all authors. Writing–original draft: all authors. Writing–review and editing: all authors. Final approval of published version: all authors.

Conflict of interest

Hyun Young Koo has been editor of *Child Health Nursing Research* since 2016. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported.

Funding

This study was supported by innovation support project of the Seoul Women's College of Nursing in 2023.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgements

None.

ORCID and ResearcherID

Sun Nam Park https://orcid.org/0000-0003-4151-9442
https://researcherid.com/rid/KIC-8361-2024
Hyun Young Koo https://orcid.org/0000-0001-5848-2143
https://researcherid.com/rid/AHA-3307-2022
Hye Young Hwang https://orcid.org/0000-0002-7238-6729
https://researcherid.com/rid/OOM-4417-2025

REFERENCES

1. Park SN, Hwang HY, Koo HY. Development of a virtual reality program in South Korea for the measurement of vital signs in children: a methodological study. Child Health Nurs Res. 2023;29(2):137-148. https://doi.org/10.4094/chnr.2023.29.2.137
2. Koo HY, Lee BR. Development of a protocol for guidance in the pediatric nursing practicum in South Korea: a methodology study. Child Health Nurs Res. 2022;28(1):51-61. https://doi.org/10.4094/chnr.2022.28.1.51
3. Kim Y, Kim WJ, Min Hy. Nursing students' experiences in virtual simulation practice. J Korean Acad Soc Nurs Educ. 2020;26(2):198-207. https://doi.org/10.5977/jkasne.2020.26.2.198
4. Kim EJ, Lim JY, Kim GM. A systematic review and meta-analysis of studies on extended reality-based pediatric nursing simulation program development. Child Health Nurs Res. 2023;29(1):24-36. https://doi.org/10.4094/chnr.2023.29.1.24
5. Basdogan C, Ho CH, Srinivasan MA. Virtual environments for medical training: graphical and haptic simulation of laparoscopic common bile duct exploration. IEEE/ASME Trans Mechatron. 2001;6(3):269-285. https://doi.org/10.1109/3516.951365
6. Jeon H. Exploring study on virtual reality utilization strategies in scenario-based nursing simulation: an integrative review. J Korean

Soc Simul Nurs. 2019;7(1):45-56. https://doi.org/10.17333/JKSSN.2019.7.1.45
7. Kim SK, Eom MR, Park MH. Effects of nursing education using virtual reality: a systematic review. J Korea Contents Assoc. 2019;19(2):661-670. https://doi.org/10.5392/JKCA.2019.19.02.661
8. Chen FQ, Leng YF, Ge JF, Wang DW, Li C, Chen B, et al. Effectiveness of virtual reality in nursing education: meta-analysis. J Med Internet Res. 2020;22(9):e18290. https://doi.org/10.2196/18290
9. Tolarba JE. Virtual simulation in nursing education: a systematic review. Int J Nurs Educ. 2021;13(3):48-54. https://doi.org/10.37506/ijone.v13i3.16310
10. Yu M, Mann JS. Development of virtual reality simulation program for high-risk neonatal infection control education. Clin Simul Nurs. 2021;50:19-26. https://doi.org/10.1016/j.ecns.2020.10.006
11. Ryu J, Yu M. Virtual reality simulation for advanced infection control education in neonatal intensive care units: focusing on the prevention of central line-associated bloodstream infections and ventilator-associated infections. Healthcare (Basel). 2023;11(16):2296. https://doi.org/10.3390/healthcare11162296
12. Yu M, Yang MR. Effectiveness and utility of virtual reality infection control simulation for children with COVID-19: quasi-experimental study. JMIR Serious Games. 2022;10(2):e36707. https://doi.org/10.2196/36707
13. Mäkinen H, Haavisto E, Havola S, Koivisto JM. Graduating nursing students' user experiences of the immersive virtual reality simulation in learning: a qualitative descriptive study. Nurs Open. 2023;10(5):3210-3219. https://doi.org/10.1002/nop2.1571
14. Schulz KF, Altman DG, Moher D. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. BMC Med. 2010;8:18. https://doi.org/10.1186/1741-7015-8-18
15. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-357. https://doi.org/10.1093/intqhc/mzm042
16. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39(2):175-191. https://doi.org/10.3758/bf03193146
17. Ko EJ, Kim EJ. Effects of simulation-based education before clinical experience on knowledge, clinical practice anxiety, and clinical performance ability in nursing students. J Korean Acad Soc Nurs Educ. 2019;25(3):289-299. https://doi.org/10.5977/jkasne.2019.25.3.289
18. Lee SG. Effects of self-directed feedback practice using smartphone videos on basic nursing skills, confidence in performance and learning satisfaction [master's thesis]. Seoul: Yonsei University; 2015.
19. Thukral A, Joshi M, Joshi P, Prakash V, Adkoli BV, Deorari AK. Apps for management of sick newborn: evaluation of impact on health care professionals. J Trop Pediatr. 2014;60(5):370-376. https://doi.org/10.1093/tropej/fmu032
20. Wutich A, Beresford M, Bernard HR. Sample sizes for 10 types of qualitative data analysis: an integrative review, empirical guidance, and next steps. Int J Qual Methods. 2024;23:16094069241296206. https://doi.org/10.1177/16094069241296206
21. Elo S, Kyngäs H. The qualitative content analysis process. J Adv Nurs. 2008;62(1):107-115. https://doi.org/10.1111/j.1365-2648.2007.04569.x
22. Guba EG, Lincoln YS. Effective evaluation improving the usefulness of evaluation results through responsive and naturalistic approaches. 4th ed. Jossey-Bass; 1985.
23. Chu MS, Hwang YY. Effects of web-based simulation and high-fidelity simulation of acute heart disease patient care. J Korean Acad Soc Nurs Educ. 2017;23(1):95-107. https://doi.org/10.5977/jkasne.2017.23.1.95
24. Chang TP, Weiner D. Screen-based simulation and virtual reality for pediatric emergency medicine. Clin Pediatr Emerg Med. 2016;17(3):224-230. https://doi.org/10.1016/j.cpem.2016.05.002
25. Jeon J, Kim JH, Choi EH. Needs assessment for a VR-based adult nursing simulation training program for Korean nursing students: a qualitative study using focus group interviews. Int J Environ Res Public Health. 2020;17(23):8880. https://doi.org/10.3390/ijerph17238880
26. Padilha JM, Machado PP, Ribeiro A, Ramos J, Costa P. Clinical virtual simulation in nursing education: randomized controlled trial. J Med Internet Res. 2019;21(3):e11529. https://doi.org/10.2196/11529
27. Koo HY, Lee BR. Development and evaluation of a pediatric nursing competency-building program for nursing students in South Korea: a quasi-experimental study. Child Health Nurs Res. 2022;28(3):167-175. https://doi.org/10.4094/chnr.2022.28.3.167
28. Kyaw BM, Saxena N, Posadzki P, Vseteckova J, Nikolaou CK, George PP, et al. Virtual reality for health professions education: systematic review and meta-analysis by the digital health education collaboration. J Med Internet Res. 2019;21(1):e12959. https://doi.org/10.2196/12959
29. Shin H, Rim D, Kim H, Park S, Shon S. Educational characteristics of virtual simulation in nursing: an integrative review. Clin Simul Nurs. 2019;37:18-28. https://doi.org/10.1016/j.ecns.2019.08.002

Instructions to Authors

CHNR
Child Health Nursing Research

Child Health Nursing Research
Enacted in April 2006, and most recently revised in November 2024 and, applied from Vol. 31, No. 1 (2025 January)

I. Aim and Scope

Child Health Nursing Research (CHNR) aims to promote the health, development, and well-being of children and their families in Korea and all over the world by disseminating research on evidence-based practices.

Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal publishes articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues.

The primary readers of this journal include healthcare professionals, administrators, educators, caregivers, researchers, and various specialists dedicated to serving newborns, infants, children, adolescents, young adults, and their families. The ultimate goal of CHNR is to build a robust body of knowledge that will help improve clinical practice and community care to promote the health of children and families worldwide.

II. Research and Publication Ethics

CHNR is committed to ensuring ethics in scientific research and publishing. For the policies on research and publication ethics that are not stated in these instructions, the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals by International Committee of Medical Journal Editors (ICMJE) or the COPE Guidelines (https://publicationethics.org/guidance/Guidelines) can be applied. Furthermore, all processes of handling research and publication misconduct will follow the applicable COPE flowchart (https://publicationethics.org/resources/flowcharts).

1. Statements of Human and Animal Rights and Protection

CHNR endorses and follows international standards of ethical practice in human rights and protection and the principles described in the Declaration of Helsinki (Medical Research Involving Human Participants; https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/). According to the Bioethics and Biosafety Act of Korea and in order to meet international standards for ethical practice in human rights and protection, any research involving human subjects must be approved by an Institutional Review Board (IRB). When animals are used as research subjects, the study must be conducted in compliance with related regulations, such as those of the Institutional Animal Care and Use Committees (IACUCs, https://ori.hhs.gov/education/products/ncstate/iacuc.htm) or National Institutes of Health (NIH) Guide for the Care and Use of Laboratory Animals (https://grants.nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratory-animals.pdf). Any treatment methods in conflict with the regulations must be described and may be grounds for rejection.

2. Statements of Informed Consent

The researcher(s) must also obtain written voluntary informed consent from the participants or their parents or legal guardians. If the research involves a child or any vulnerable subject in any way, special and sensitive protection is needed to ensure the safety and protect the human rights of the subject. When necessary, the editor of CHNR may ask the author(s) to present the relevant document(s) on human rights and protection issues related to the manuscript, such as the informed consent form or documentation of the IRB approval of the study.

3. Originality and Duplicate Publications

Duplicate publication or duplicate submission is prohibited in accordance with the ICMJE recommendations (https://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/overlapping-publications.html). Manuscripts that have been published or are being submitted to other journal(s) should not be submitted to CHNR. Manu-

scripts that have been published or are currently under consideration for publication in CHNR must not be submitted to another journal. If a duplicate submission is detected, submission privileges to CHNR will be suspended for 2 years.

1) **Originality and plagiarism:** Authors must submit original manuscripts and confirm that they have cited or quoted others' ideas and texts appropriately and accurately. Plagiarism refers to the appropriation of another person's ideas, research processes, results, or texts as one's own. This includes using previously published material of oneself or any other author without citing the references. The editorial board of CHNR uses the Crossref Similarity Check tool to check for plagiarism. If plagiarism is discovered in a manuscript, it will not be published.

2) **Multiple, simultaneous, or duplicate submission:** The author(s) should not submit the same research to more than one journal and should not publish the manuscript in different languages. If authors wish to pursue a secondary publication of the manuscript in another language, they should obtain approval from the editor-in-chief of both related journals.

3) **Determination of duplicate publication:** The editorial board will review and assess the manuscript to determine any instances of duplicate submission or publication.

4. Authorship

Authorship is limited to those who have contributed substantially to the manuscript in terms of conception and design, as well as the collection, analysis, and interpretation of the data. All authors should be involved in drafting and reviewing the manuscript and must approve the final version of the manuscript. The corresponding author is required to confirm that all appropriate persons are listed as authors in the manuscript. All authors must agree to be accountable for all aspects of their work and to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Chatbots or other AI-assisted technologies cannot be listed as authors.

1) **Authorship taxonomy:** The corresponding author is responsible for ensuring that the descriptions are accurate and agreed upon by all authors. Each author's role(s) should be listed using the relevant categories mentioned above. It is possible for authors' contributions to span multiple roles. The CRediT taxonomy does not alter the journal's criteria for authorship qualification. Authors are requested to select the appropriate CRediT statements (https://credit.niso.org/) during the submission process. This information will appear above the references section of the published paper, as illustrated in the example below.

Table 1. Authorship Taxonomy (https://credit.niso.org/)

Term	Definition
Conceptualization	Ideas; formulation or development of overarching research goals and aims
Methodology	Development or design of methodology; creation of models
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components
Validation	Verification, whether as a part of the activity or separate, of the overall replication/ reproducibility of results/experiments and other research outputs
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection
Resources	Provision of study materials, reagents, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools
Data curation	Management activities to annotate (produce metadata), scrub data, and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse
Writing–original draft	Preparation, creation, and/or presentation of the published work, specifically writing the initial draft (including substantive translation)
Writing–review & editing	Preparation, creation, and/or presentation of the published work by those from the original research group, specifically critical review, commentary, or revision—including pre-or post-publication stages
Visualization	Preparation, creation, and/or presentation of the published work, specifically visualization/data presentation
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team
Project administration	Management and coordination responsibility for the research activity planning and execution
Funding acquisition	Acquisition of financial support for the project leading to the publication

2) **Changes to authorship:** CHNR does not correct authorship after publication unless the editorial staff has made a mistake. After submission and before publication, any changes in authorship—including adding or removing authors, or rearranging the order of authors—must be detailed in a letter to the editor from the involved authors. This letter must be signed by all authors of the paper. Additionally, every author must complete a copyright assignment.

3) **Corresponding author and first author:** CHNR does not allow multiple first authors or corresponding authors for a single article. Only one author for each article should correspond with the editorial office and reviewers.

4) **Contributors:** Any researcher who does not meet all four ICMJE criteria for authorship discussed above but contributes substantively to the study in terms of idea development, manuscript writing, conducting research, data analysis, and financial support should have their contributions listed in the Acknowledgments section of the article.

5. Conflict of Interest

Authors are required to disclose commercial or similar relationships to products or companies mentioned in the article being submitted or related to its subject matter. The corresponding author must notify the editor of any potential conflicts of interest that might have affected the study's findings or the way the data were interpreted. Even if the authors are certain that their respective judgments were unaffected when producing the article, any potential conflict of interest should be stated on the title page and at the ending section of the manuscript. Conflicts of interest can include ties to pharmaceutical corporations on a personal or financial level, political pressure from special interest organizations, or issues in the classroom.

Before evaluating a particular paper, CHNR requests that referees notify the editor if they have any conflicts of interest. All article submissions from editors, staff members, or editorial board members are handled in the same manner as unsolicited submissions. They will not participate in the decision-making or reviewer selection process. Even for commissioned manuscripts, editors will not handle their own work.

1) **Disclosure form:** The ICMJE Disclosure of Interest (https://www.icmje.org/disclosure-of-interest/) should be used as the model for the disclosure form.

2) **Role of the funding source:** The author is requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement, then this should be stated.

6. Reporting Standards

Authors should report their work accurately and objectively without inappropriate manipulation. Authors should describe their methods and procedures in enough detail and present sufficient references so that others can replicate the work. Authors should not produce, record, or report nonexistent data and results and should not change or omit data. Authors should also avoid producing multiple publications ("salami slicing") from content that should be only one substantial manuscript. Manuscripts that do not follow the international ethical standards of research and publication (i.e., those that involve fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate submission) will not be considered for publication in CHNR. The editorial board will adjudicate the specific reasons for rejection.

1) **Data access and retention:** Authors should retain research data and be prepared to allow access to the data in case the editorial board asks them to provide the raw data in connection with the editorial review.

7. Clinical Trials Registration

This journal follows the data sharing policy described in "Data Sharing Statements for Clinical Trials: A Requirement of the International Committee of Medical Journal Editors (ICMJE)" (https://doi.org/10.3346/jkms.2017.32.7.1051).

Registration with an accredited primary registry is essential for clinical research to ensure transparency and accountability. In Korea, the Korea Clinical Research Information Service (CriS, https://cris.nih.go.kr/) serves as an accredited primary registry recognized by the World Health Organization (https://www.who.int/clinical-trials-registry-platform).

ClinicalTrials.gov (https://clinicaltrials.gov), managed by the United States National Institutes of Health, is also a widely accepted registry.

However, registration may be waived if the study involves an educational intervention that poses no harm to participants. In such cases, authors are encouraged to discuss the need for registration with the editor, considering the specific nature of the educational intervention.

8. Fundamental Errors in a Manuscript

If authors find a fundamental error in a published manuscript, they should immediately inform the editor and cooperate with the editor to correct or withdraw the manuscript.

9. Process for Managing Publication Malpractice

If reviewers or readers suspect publication malpractice such as fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate publication; inappropriate changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the resolution process will be initiated following the flowchart provided by the COPE (https://publicationethics.org/guidance/Flowcharts). The ethics committee will discuss and adjudicate cases of suspected publication malpractice, as well as complaints and appeals against editors. CHNR will not hesitate to publish errata, corrigenda, clarifications, retractions, apologies, and expressions of concern when needed.

10. Disclosure of Artificial Intelligence (AI)–Assisted Technology

CHNR follows the Artificial Intelligence (AI)–Assisted Technology policy described in Recommendations of ICMJE (https://www.icmje.org/icmje-recommendations.pdf).

Authors must disclose if they used AI-assisted technologies (e.g., LLMs, chatbots, image generators) in their work. The use of AI should be described in the cover letter and relevant sections of the manuscript, acknowledging writing assistance in the acknowledgment section and data-related uses in the Methods section. For instance, writing assistance should be noted in the Acknowledgments section, while uses in data collection, analysis, or figure generation should be detailed in the Methods section. AI tools such as chatbots should not be listed as authors, as they cannot be held responsible for accuracy or integrity. Authors are responsible for ensuring the work's quality, reviewing AI-generated content for errors or bias, and avoiding plagiarism, including proper attribution for AI-generated text or images.

III. Guidelines for Manuscript Preparation

1. Types of Manuscripts

CHNR publishes original articles, review articles, and editorials on health care and nursing for birth to young people and their families.

1) **Original articles:** CHNR publishes original articles that fit the journal's aims and scope. These are comprehensive papers that present novel research findings. They include reports of empirical data from top-notch scientific and clinical research studies that are relevant to nursing and health care for people from the beginning of life to young adulthood and their families. Original articles cover children's health issues, with topics encompassing nursing theory, practice, and education, among others. The articles published in CHNR present significant research results obtained using a variety of methodologies, including mixed-method designs, observational, quasi-experimental, and experimental investigations, as well as qualitative methods and measurements, including the development and evaluation of instruments. The appropriate standards should be followed when writing research papers.

2) **Review articles:** Critical presentations on themes of interest and importance to child health nursing theory, practice, and education are included. A review article's body should consist of a thorough evaluation of the literature that is supported by academic research, critical analysis, and reasoned conclusions. CHNR publishes comprehensive literature reviews, as well as systematic reviews that target specific research problems, such as scoping reviews. It also issues discussion papers, which are academic works with a discursive or argumentative tone. All articles must contain a discussion and critical evaluation of a significant body of research or other scholarship.

3) **Editorials:** Editorials are by invitation only and feature re-

marks made by institutional representatives or individual authors on topics of current interest. Authors should contact the manager in the editorial office if they have any suggestions for editorials that deal with topics that are critically important to the discipline, especially those that are contentious or closely related to recent or upcoming journal articles.

2. Authors of Manuscripts

Anyone may submit a manuscript for publication in CHNR. If the manuscript is derived from a dissertation, the author must disclose that the manuscript is the product of a dissertation for an academic degree program. The first author must be the author of the dissertation.

3. General Information

1) Language and style: Every manuscript should be written in English. The author can submit the manuscript as a Microsoft Word file or HWP file with an A4 paper size layout. The margins of the paper should be set as follows: top 30 mm, bottom 25 mm, left 25 mm, and right 25 mm. A 10-point font size should be used, and the text should be double-spaced.

2) Manuscript length: Abstracts, texts, references, tables, and figures included in the manuscript have different limits depending on the type of manuscript submitted, but all submissions must comply with the contents of Table 3. The number of references is recommended to be 30 or fewer for an article. However, authors may include additional references depending on the type of article, such as meta-analyses, systematic reviews, or structural equation models.

Table 3. Recommended maximums for articles submitted to *Child Health Nursing Research*

Publication type	Word count of abstract	Word count of main text	Numbers of tables & figures
Original article	250	6,000	5
Review article	250	8,000	5
Editorial	N/A	2,500	5

3) Abbreviations used: If authors choose to use an English abbreviation, the complete spelling must be used upon first mention, and the abbreviation may be used after that. The title should not include any abbreviations.

4) Samples and participants: Authors should confirm the correct use of the words "sex" (when reporting biological factors) and "gender" (identity, psychosocial, or cultural factors), and report the sex or gender of study participants. Authors should define how they determined race or ethnicity and justify its relevance. If a study was done involving an entire population, the authors should explain the reason.

5) Prior approval for the use of psychosocial questionnaires (survey tools): Authors must obtain permission for the utilization of any psychosocial questionnaire from the tool's copyright holder.

6) Describing machinery or technical equipment: When identifying machinery and equipment, the following should be included in parentheses: the model and manufacturer. Brand names are identified by ™, ®, etc. Brand names should be used only when necessary.

7) Reference and citation style: References and citations follow National Library of Medicine [NLM] style. The submitting authors are responsible for ensuring adherence to NLM guidelines.

8) Inclusive language: Authors are encouraged to use inclusive language that acknowledges diversity, respects all individuals, and promotes equal opportunities. Assumptions about the reader's beliefs or identities should be avoided, and authors must refrain from language that implies superiority based on factors such as age, gender, race, ethnicity, culture, sexual orientation, disability, or health condition. Writing should be free of bias, stereotypes, and cultural assumptions. Gender neutrality is encouraged by using plural nouns (e.g., "patients") instead of gendered pronouns ("he/she"). Descriptors of personal attributes should only be used if relevant and valid.

4. Reporting Guidelines for Specific Study Designs

Research reports frequently omit important information. Therefore, reporting guidelines have been developed for a number of study designs. Authors are encouraged to adhere to relevant reporting guidelines when describing their study. A good source of reporting guidelines is the EQUATOR Network (https://www.equator-network.org/) and the United

States National Institutes of Health/ National Library of Medicine (https://www.nlm.nih.gov/services/research_report_guide.html)

1) Observational cohort, case-control, and cross-sectional studies: Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)

2) Qualitative studies: Consolidated Criteria for Reporting Qualitative Research (COREQ), Standards for Reporting Qualitative Research (SRQR)

3) Quasi-experimental/non-randomized trials: Transparent Reporting of Evaluations with Non-randomized Designs (TREND)

4) Randomized (and quasi-randomized) controlled trials: Consolidated Standards of Reporting Trials (CONSORT)

5) Study of diagnostic accuracy/assessment scale: Standards for the Reporting of Diagnostic Accuracy Studies (STARD)

6) Systematic review and meta-analysis: Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA), Meta-analysis of Observational Studies in Epidemiology (MOOSE)

7) Quality improvement studies: Standards for Quality Improvement Reporting Excellence (SQUIRE)

5. Sequence of Headings in an Original Article

The manuscript should be organized as follows. Each section should be clearly delineated. Instructions for each appear below the list.

Beginning section	- Cover letter - Title page - Abstract and keywords
Middle section (main text)	- Introduction - Methods - Results - Discussion - Conclusion
Ending section	- ORCID and ResearcherID - Authors' contributions - Conflict of interest - Funding resource - Data availability - Acknowledgements - Declaration of generative AI and AI-assisted technologies in the writing - Supplementary materials - References
Other elements	- Tables and Figures

1) Beginning section

(1) Cover letter

The authors should include a cover letter to the editor in which they summarize the main components of the manuscript and what makes its contribution original and relevant to the Aims and Scope of CHNR. The author(s) should also address any other matters associated with authorship and publication they wish the editors to consider.

(2) Title page

① The content of the title page should appear as follows in this order: Title, running title, type of manuscript, author(s), corresponding author, conflict of interest, IRB approval, Medical Subject Headings (MeSH, https://www.ncbi.nlm.nih.gov/mesh/) keywords, number of references, and number of words of the English abstract. More specific requirements for these components are detailed below.

② Type of manuscript: One of the following should be noted: original article, review article, editorial, or invited paper.

③ Author(s): This section should list the names of all authors, each with their position and affiliation including title, department, and location of institutions to which the work should be attributed. It should also present each author's ORCID number, ResearcherID and describe the author's role in this study.

④ Corresponding author: The corresponding author should be identified with their address (including zip code), email, telephone number, fax number, and ORCID number or ResearcherID.

⑤ Conflict of interest: Any matter pertaining to the research should be noted here, such as the source of research funds, conflicts of interest, or indication that the manuscript is derived from a dissertation or thesis for an academic degree program.

⑥ IRB approval: The author should provide information about the institution that provided IRB approval, in-

cluding the approval number, and informed consent. However, if the study did not involve humans or animals, a statement should be made about IRB exemption.

⑦ MeSH Keywords: The keywords are drawn from the MeSH list (not more than five).

⑧ Number of references: It is recommended that an article include no more than 30 references. However, for articles that have no reference restriction, such as meta-analyses, systematic reviews, or structural equation models, authors are free to provide more references.

⑨ Number of words in the abstract: The number of words in the abstract should be noted. The total should be no more than 250 words.

(3) Abstract and keywords

An abstract of up to 250 words for articles (including reviews) should be on a separate page. It should cover the main factual points, including statements of the purpose, methods, results, and conclusions. The abstract should be accompanied by a list of three to five keywords for indexing purposes. The keywords should be as specific as possible and drawn from the list of MeSH keywords.

2) Middle section

The text should be composed in the following order: Introduction, Methods, Results, Discussion, and Conclusion.

(1) Introduction: The introduction should clearly state the need for this study and the main question or hypothesis of the study. A literature review or summary of background information related to the study should be presented.

(2) Methods: This section should describe the study design, setting and samples, ethical considerations, measurements/instruments, data collection/procedure, and data analysis used. If the study is qualitative, the research instrument can be omitted. An "Ethics statement" should be provided after the "Methods" heading in a text-box format.

Example 1:
Ethics statement: This study was approved by the Human Ethics Committee of the University of XXX (IRB No. 202104-0002-03). Informed consent was obtained from all participants (or their parents/legal guardians).

Example 2:
Ethical statements: This study is a literature review of previously published studies and was therefore exempt from Institutional Review Board approval.

(3) Results: The main results should be summarized in concise paragraphs. Levels of statistical significance and confidence intervals should be noted where appropriate.

(4) Discussion: The discussion should be based only on the reported results. The discussion is recommended to reflect advances in nursing practice and nursing knowledge development.

(5) Conclusion: Conclusions and recommendations for further study should be presented here, but the study results should not be summarized again.

3) Final section

(1) ORCID and ResearcherID: The authors should provide the ORCID number and ResearcherID.

(2) Authors' contributions: Authors' contributions should be based on the authorship taxonomy.

(3) Conflict of interest: Authors are required to disclose commercial or similar relationships to products or companies mentioned in or related to the subject matter of the article being submitted. If there are no conflicts of interest, the following is an example of a sentence that can be used: "No existing or potential conflict of interest relevant to this article was reported."

(4) Funding resource: Funding institutions' policies should acknowledge sources of funding for the manuscript. If there is no funding resource, the following is an example of a sentence that can be used: "None".

(5) Data availability: Based on the plan for data sharing, authors should deposit their data after de-identification and report the DOI of the data and the registered site. The corresponding author should be contacted to confirm the availability of data.

Example 1:
The data cannot be publicly disclosed due to the Data Use Agreement with the Society for OOO (OOO). For the research data, contact the OOO (URL) / or the corresponding author's name (abcde@gmail.com).
Example 2:
Data files are available from Harvard Dataverse: https://doi. org/10.7910/OOO/3OOO9O Dataset 1. Raw data of responses from South Korean nursing students in 202X.

(6) Acknowledgments: Any persons who contributed to the study or the manuscript but did not meet the authorship requirements can be listed here. Written permission should be obtained from any person or organization mentioned in this section.

(7) Declaration of generative AI and AI-assisted technologies in the writing: Authors are required to disclose the utilization of generative AI and AI-assisted technologies in the writing process by including a statement after their work within the main text file, before the References list. The declaration must be positioned in a new section headed "Declaration of Generative AI and AI-assisted Technologies in the Writing Process."

Example:
During the preparation of this work the author(s) used [NAME TOOL/SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

This declaration excludes using basic tools to check grammar, spelling, references, etc. A statement is unnecessary if there is no information to provide.

(8) Supplementary materials: If there are supplementary materials to help the understanding of readers or too much data to be included in the main text, they may be presented as supplementary data.

(9) References: Manuscripts submitted must adhere to the NLM citation style, with authors responsible for ensuring compliance with NLM guidelines and the accuracy of all references. Authors are responsible for the accuracy of the references. The use of DOIs is highly encouraged.

(10) Tables and Figures: The total number of tables and figures in a manuscript is no more than 5. All tables and figures should be easy to understand, even when presented separately from the rest of the manuscript, and should present information relevant to the study.

6. References Format

A description of the References section is provided below. The references are formatted according to *Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers* (https://www.ncbi.nlm.nih.gov/books/NBK7256/) if not mentioned below. The references should be numbered serially in the order of appearance in the text, with numbers in brackets [ ]. The original reference number should be used if a reference is cited more than once. If there are 7 or more authors of a cited work, the first 6 should be listed, followed by "et al."

1) Journals

The name of the journal should be written in full. For 6 or fewer authors, all authors should be listed. For more than 6 authors, the first 6 should be listed, followed by et al.

- Lee SJ, Han YR. The influencing factors of pediatric nurses' perception of patient safety culture and partnership with patients' parents on patient safety nursing activities in South Korea: a descriptive study. Child Health Nurs Res. 2024;30(4):255-265. https://doi.org/10.4094/chnr.2024.008
- Kang HK, Kim TB, Kim KH, Kim MJ, Kim JH, Kim HY, et al. Development and effect of a metabolic syndrome prevention program for university students using mobile application. Child Health Nurs Res. 2014;20(3):205-214. https://doi.org/10.4094/chnr.2014.20.3.205
- Cesare M, Cocchieri A. Can an increase in nursing care complexity raise the risk of intra-hospital and intensive care unit transfers in children? A retrospective observational study. J of Pediatr Nurs. 2024 Nov 28 [Epub]. https://doi.org/10.1016/j.pedn.2024.11.015
- Cho CU. Stem cell windpipe gives Korean toddler new life. The Korea Herald. 2013 May 2;Sect. 01.

2) Books & Book chapters

- Brown B. Braving the wilderness: the quest for true belonging and the courage to stand alone. Random House: 2017.

- Peate I. The student's guide to becoming a nurse. 2nd ed. John Wiley & Sons; 2012.
- Min KA, Kim CG. Nursing management. Knowledge & Future; 2012.
- Bochner BH. Identification of nodal metastases: the role of iron oxide enhanced MRI. In: Lee CT, Wood DP, editors. Bladder cancer. Humana Press; 2010.
- Radley DC, How SK, Fryer AK, McCarthy D, Schoen C. Rising to the challenge: results from a scorecard on local health system performance, 2012 [Internet]. Commonwealth Fund; 2012 [cited 2017 Feb 8].

Available from: https://www.commonwealthfund.org/sites/default/files/documents/___media_files_publications_fund_report_2012_mar_local_scorecard_1578_commission_rising_to_challenge_local_scorecard_2012_finalv2.pdf

3) Scientific and technical reports

- Korean Women's Development Institute. 2015 National multicultural family survey report. Ministry of Gender Equality & Family; 2016. Report No.: MOGEF2016-3.
- Won YJ, Shin HR, Jeong GW, Shin AS, Gong HJ, Oh CM, et al. Cancer registration & statistics branch, division of cancer registration & surveillance. National Cancer Control Institute Annual Report. National Cancer Center; 2012. Report No.: 2012.11-13520000010145-10.

4) Unpublished theses or dissertations

- Lee YH. Development and effects of nocturnal emission and menstruation education program using CAI for Korean elementary school children [dissertation]. Ewha Womans University; 2010.
- Choi JW. Clinical characteristics and treatment outcomes of pediatric neurofibromatosis type 2: Neurosurgical series [master's thesis]. Seoul National University; 2013.

5) Conference proceedings

- Bell JM. Highlights from the 10th international family nursing conference. 10th International Family Nursing Conference; 2011 June 24-28; Kyoto. Sage Publications; 2012. p. 135-139.

6) Web

- Statistics Korea. Cause of death statistics in 2023 [Internet]. Statistics Korea; 2024 [cited 2024 Dec 10]. Available from: https://kostat.go.kr/board.es?mid=a20108100000&bid=11773&act=view&list_no=433679

7. Tables and Figures Format

1) Table formatting

① All lines should be single. Vertical lines should not be used.

② The title of a table should appear above the table. Only capitalize the first letter of table titles. Ex) Table 1. Responses to question types

③ Tables should be numbered consecutively, e.g., Table 1, Table 2, and so on.

④ Table data should be explained in the footnotes. All abbreviations used in the tables should be defined in the footnotes of every table in which they appear. Ex) HR, heart rate; T, temperature.

⑤ In a table, use a superscript lowercase letter to indicate each footnote. The tables should be placed beneath the footnotes. Ex) [a]Surviving case; [b]Deceased case.

⑥ If the value of a decimal can possibly exceed 1, a 0 should appear before the decimal point; otherwise, nothing should appear before the decimal point. Ex) $t = 0.26$, $F = 0.92$ Example: $p < .001$, $r = .01$, $R^2 = .61$

⑦ The statistical significance (p-value) should be written without a footnote and should be rounded to three decimal places. Ex) $p = .003$. If p is 0.000, then indicate that p is less than 0.001 ($p < .001$). If p is 1.000, then indicate that p is greater than 0.999 ($p > .999$).

2) Illustration and photograph format rules

① The title should appear below an image. Only the first letter of the first word should be capitalized (sentence case). Ex) Figure 1. Mean responses to questions by student grade categories.

② Acceptable figure file formats are BMP, JPG, PSD, TIF, AI, EMF, EPS, WMF, DOC, XLS, PPT, and PDF.

③ The size of the image should be 102×152 mm (4×6 inches). Larger images may be permitted; however, each image should not exceed 203×254 mm (8×10 inches).

④ If one figure contains 2 or more images, consecutive alphabetical letters should be used to distinguish among the images. Ex) Figure 1A, Figure 1B

⑤ The photomicrograph of a tissue sample, the region from which the tissue was extracted, and the staining

method should be noted. The magnification scale must be included.

3) Quotations from other sources

Citations may follow any style, such as NLM, APA, or others.

IV. Submission and Peer Review

1. Submission

Manuscripts must be submitted through the CHNR website (http://www.e-chnr.org/) or CHNR peer review system (http://www.chnr-submission.org/). Authors may review the submission instructions and access all submission forms, including the author checklist. During submission, information on the authors' ORCIDs and the ResearcherID will be requested. All required forms are available on the journal's website (https://www.e-chnr.org/) and the Korean Academy of Child Health Nursing's website (https://www.child-nursing.or.kr).

2. Peer Review

1) Policy: All papers, including those invited by the editor, are subject to peer review. Two or more reviewers and the editor will conduct a **double-blind** peer review of each manuscript. The Editorial Board selects reviewers based on expertise, publication history, and past reviews. During the peer review process, reviewers can interact directly or exchange information (e.g., via submission systems or email) with only an editor, which is known as "independent review." An initial decision will normally be made within two weeks after the reviewers agree to review a manuscript. No information about the review process or editorial decision process is published on the article page.

2) Preview: The editorial committee initially evaluates each submission. The main goal is to quickly determine which papers should not be sent for peer review and which ones should. To prevent delays for authors who may wish to submit their work elsewhere, papers that do not meet basic standards or are unlikely to be published, even with a favorable peer review—such as those with insufficient novel contributions or unclear relevance to the field—may be rejected at this stage.

3) Peer review process and the author's response to the reviewers' comments

There is a two-week peer review period, and the first decision is made after the evaluation is finished. Following the review, the Editorial Board will decide between the options: acceptable options include minor revision, major revision, or rejection. The Editorial Board may request authors to make changes to the manuscript in response to reviewers' comments. The author should reasonably indicate if the reviewer's opinion is unacceptable or if the reviewer is thought to have misinterpreted the data. The authors should try their best to comply with any requests made by the reviewers to modify the manuscript.

After making changes to the manuscript, the author should upload the updated files along with a response to each reviewer's comment. Revisions from the author must be finished within 15 days of the request. The Editorial Board will inform the author if it is not received by the deadline. The author should discuss an extension with the Editorial Board if they want to prolong the revision window past 15 days. Up to two rounds of the manuscript evaluation process may be offered. The Editorial Board may consider further review upon the author's request. The Editorial Board will ultimately decide whether to approve the submitted manuscript for publication and may, if necessary, ask for additional alterations, edits, and deletions to the article text. Statistical editing is also done if a statistician needs to review the data professionally.

The editor-in-chief of CHNR will make the final decision regarding the manuscript's publication based on the reviewers' comments and the scientific merits of the manuscript. Any potential or existing conflict and issues in the manuscript must be discussed in detail with the Editorial Board.

4) Submission by editors: All manuscripts from editors, employees, or editorial board members are processed the same way as other unsolicited manuscripts. Editors will not handle their own manuscripts even if they are commissioned. During the review process, they will not engage in the selection of reviewers and the decision process.

More details on other pertinent regulations are available on the journal's website. If there are any questions regarding the use of the online submission system, authors may contact the editorial office of CHNR.

5) **Appeals of decisions:** Any appeals against the editorial decision must be made within 2 weeks of the date of the decision letter. Authors who wish to appeal against a decision should contact the Editor-in-Chief, explaining in detail the reasons for the appeal. All appeals will be discussed with at least one other associate editor. If consensus cannot be reached thereby, an appeal will be discussed at a full editorial meeting. The process of handling complaints and appeals follows the guidelines of COPE available from (https://publicationethics.org/appeals). CHNR does not consider second appeals.

V. Final Preparation for Publication

1. Final Version

After the paper has been accepted for publication, the author(s) should submit the final version of the manuscript. The names and affiliations of the authors should be double-checked, and if the originally submitted image files were of poor resolution, higher-resolution image files should be submitted at this time. Symbols (e.g., circles, triangles, squares), letters (e.g., words, abbreviations), and numbers should be large enough to be legible on reduction to the journal's column widths. All symbols must be defined in the figure caption. If references, tables, or figures are moved, added, or deleted during the revision process, renumber them to reflect such changes so that all tables, references, and figures are cited in numeric order.

2. Manuscript Corrections

Before publication, the manuscript editor will correct the manuscript so that it meets the standard publication format. The author(s) must respond within 48 hours when the manuscript editor contacts the corresponding author for revisions. If the response is delayed, the manuscript's publication may be postponed to the next issue.

3. Proofs and Reprints

The author(s) will receive the final version of the manuscript as a PDF file. Upon receipt, the author(s) must notify the editorial office of any errors found in the file within 48 hours. Any errors found after this time are the responsibility of the author(s) and will have to be corrected as an erratum.

4. Correction

To correct errors in published articles, the corresponding author should contact the journal's editorial office with a detailed description of the proposed correction. Corrections that seriously affect the interpretation or conclusions of the article will be reviewed by the editors. Corrections will be published as an author correction or a publisher correction in a later issue of the journal.

Minor errors will be corrected directly in the online version of the article. An indication of the correction, along with the date it was made, will be added to the article information in both the HTML and PDF versions. A separate correction note will not be published.

VI. Article Processing Charge

After the acceptance of a manuscript, the author is responsible for the following fees: the publication fee, the special typesetting fee, and the printing fee for each volume of the paper. Upon acceptance, an article-processing charge (APC) of 600,000 Korean won per article is requested from the corresponding author.

Authors in developing countries (https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf) may be exempt from author fees after negotiation with the Editorial Board.

If at least one of the authors is a member of the Korean Academy of Child Health Nursing, the paper qualifies for a discounted submission.

VII. Copyright, Open Access Policy

1. Copyright

All manuscripts published in CHNR are protected by copyright. The copyright and the transfer right of the digital content of the published paper and journal are owned by the Korean Academy of Child Health Nursing. All authors should agree to the copyright transfer during the submission process.

After the acceptance of the manuscript, the author must submit the copyright transfer agreement to the Korean Academy of Child Health Nursing. All authors should print their names and sign the copyright transfer agreement.

2. Open Access Policy

CHNR is an open-access journal. Articles are distributed under the terms of the Creative Commons Attribution-Non-Commercial-NoDerivatives 4.0 (CC BY-NC-ND 4.0) license, which permits copying and distributing the material in any medium or format in unadapted form only, for noncommercial purposes only, and only if attribution is given to the CHNR. This is in accordance with the Budapest Open Access Initiative definition of open access. It also follows the open access policy of PubMed Central at United States National Library of Medicine (http://www.ncbi.nlm.nih.gov/pmc/).

All articles published in the journal are freely available through open access for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

VIII. Other Editorial Policy

1. Data Sharing Policy

To verify study accuracy and reproducibility, authors are encouraged to deposit raw or analyzed data in a public repository, such as Harvard Dataverse (https://dataverse.harvard.edu/dataverse/), Open Science Framework (https://osf.io/), etc. upon acceptance of the manuscript. Submission of raw or analyzed data is highly recommended. Authors should provide the relevant website URL or sources if data are already public. Authors may discuss options with the editor if data cannot be publicized. Based on the degree of the sharing plan, authors should deposit their data after de-identification and report the DOI of the data and the registered site. Authors with questions about data deposition are encouraged to contact the editorial office.

2. Archiving Policy

All manuscripts published in CHNR are freely available through open access to read and download from any electronic link, including those found on the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication. In the event CHNR is no longer published, previously published articles will continue to be available via the National Library of Korea (http://nl.go.kr), PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/journals/4129/), and Science-Central (https://www.e-sciencecentral.org/journals/169/).

3. Preprint Policy

A preprint can be defined as a version of a scholarly paper that precedes formal peer review and publication in a peer-reviewed scholarly journal. CHNR allows authors to submit preprints to the journal. Preprints are not treated as duplicate submissions or duplicate publications. CHNR recommends authors to disclose preprint status with a DOI in the letter to the editor during the submission process. Otherwise, the submission may be flagged by a plagiarism check program—Similarity Check (Crosscheck) or Ithentificate, etc.. Preprint submissions will be processed through the same peer-review process as usual submissions. If a preprint is accepted for publication, authors are recommended to update the information in the preprint with a link to the published article in CHNR, including the DOI in CHNR. It is strongly recommended that authors cite the article in CHNR instead of the preprint in their next submission to a journal.

Publisher

Korean Academy of Child Health Nursing

President

Hyun Young Koo, RN, PhD Professor

Daegu Catholic University College of Nursing 33, Duryugongwon-ro 17-gil, Nam-Gu, Daegu, Republic of Korea, 42472

Tel: +82-53-650-4829, Homepage: https://www.childnursing.or.kr/, E-mail: childnursing@childnursing.or.kr

Editorial Office

Child Health Nursing Research

Editor-in-Chief

Yunsoo Kim, RN, PhD Associate Professor

Department of Nursing, Catholic Kwandong University, Gangneung 25601, Republic of Korea

Tel: +82-33-649-7614, Fax: +82-33-649-7620, E-mail: agneskim@cku.ac.kr

Manuscript Editor

Hyun Joo Kim

Infolumi, Seoul, Korea

Jihye Jang, RN

Department of Nursing, Catholic Kwandong University, Gangneung 25601, Korea

Tel: +82-33-649-7614, Fax: +82-33-649-7620, E-mail: jjpluh@gmail.com

Layout Editor
In A Park
M2PI, Seoul, Korea

English Editor
Andrew Dombrowski
Compecs Inc., Seoul, Korea

Website and JATS XML File Producer
Min Young Choi
M2PI, Seoul, Korea

Author Checklist

CHNR
Child Health Nursing Research

Title of the Manuscript : _____

Please check the items below (if indicated) before submission of the manuscript:

1. GENERAL CONSIDERATION

□ This article has not been published elsewhere and will not be published elsewhere.
□ The manuscript is typewritten and double-spaced in a file formatted for A4-sized paper.
□ The number of pages including tables and figures is no more than 20.
□ The parts of the manuscript are presented in the following order: title page, English abstract, introduction, methods, results, discussion, conclusions, conflicts of interest, acknowledgments, references, tables, and figures.
□ Page numbers appear at the bottom of each page.

2. TITLE PAGE

□ The title, a separate running title (if the main title exceeds 40 characters in English), author names, their affiliations, research design type, number of words in the English abstract and number of references, keywords (English), and any relevant statements of related funding or conflicts of interest, or mention of an associated graduate thesis are all presented.
□ At the bottom of the title page, the email address, telephone, fax, and ORCID number, ResearcherID, plus the full postal address of the corresponding author, are provided.

3. ENGLISH ABSTRACT

□ The abstract contains no more than 250 words with 5 or fewer keywords at the bottom.
□ The abstract section contains the following in this order: title, author names with affiliations, body of abstract (Purpose, Methods, Results, and Conclusion), and keywords.
□ The keywords are drawn from the MeSH list.
□ The abstract does not include abbreviations, references, or diagrams.

4. MAIN TEXT

□ The main text consists of an introduction, methods, results, discussion, conclusions, conflicts of interest, and acknowledgments.
□ This article has not been published elsewhere and will not be published elsewhere.

5. REFERENCES

□ Every article in the reference list has been cited in the proper location(s) within the main text.
□ References and citations may follow any style, for example, NLM, APA, etc. However, after the manuscript is accepted, all references and citations must follow Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers, 2nd Edition (2007).
□ The number of references is recommended to be 30 or fewer for an article.

6. TABLES AND FIGURES

□ The titles should be placed above tables and below figures.
□ Non-standard abbreviations should be defined below tables and figures.
□ When using numbers, the units should be specified.

7. RESEARCH AND PUBLICATION ETHICS

□ Research involving humans that is submitted to CHNR should comply with the principles addressed in the Declaration of Helsinki (Ethical Principles for Medical Research Involving Human Subjects, https://www.wma.net/wp-content/uploads/2016/11/DoHOct2013-JAMA.pdf).
□ The publication and research ethics of CHNR strictly follow the ICMJE guidelines (http://www.icmje.org), which

state that authorship requires "substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND drafting the work or revising it critically for important intellectual content; AND final approval of the version to be published; AND agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All other contributors should be credited in the acknowledgments."

□ Duplicate publication or duplicate submission is prohibited. Manuscripts that have been published or are being submitted to other journal(s) must not be submitted to CHNR. Manuscripts that have been published or are currently under consideration for publication in CHNR must not be submitted to other journals.

□ Manuscripts that do not follow international ethical standards of research and publication (i.e., those involving fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate submission) will not be considered for publication in CHNR. The editorial board will adjudicate the specific reasons for rejection.

□ Institutional Review Board (IRB) approval
- Approved by an IRB ( )
- Non-human or animal research ( )

• The authors of this article understand and confirm the abovei nstructions.

• Name of corresponding author: _____ Date: _____/_____/_____ Signature: _____

Copyright Transfer Agreement and Disclosure of Conflict of Interest

CHNR
Child Health Nursing Research

• Manuscript Number: _____

• Title of the Manuscript: _____

COPYRIGHT TRANSFER AGREEMENT

We the undersigned authors have all made significant contributions to this manuscript and agree to its submission to *Child Health Nursing Research* and, if accepted, to its publication in this journal. We warrant that this article is original, does not infringe on any copyright or other proprietary right of any third party, is not under consideration by another journal, and has not been previously published.

DISCLOSURE OF CONFLICT OF INTEREST

Each author is responsible for disclosing to the publisher all potential conflicts of interest regarding this manuscript (any financial support or benefits that have been received by the author(s) that could affect the work reported in the article) and whether the author regards them to be actual conflicts of interest.

List any potential conflicts of interests of this manuscript or indicate "None"

_____

_____

Please sign below to indicate that the necessary copyright transfer and disclosure of conflicts of interest have been completed.

Date :

Name	Signature	Name	Signature