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Editorials in February Issue of Asian Nursing Research

Gearing toward transformativistic nursing science with rigorous and applicable research

Eunyoung E. Suh, Editor in Chief

Since Asian Nursing Research (ANR) was founded in 2007, notable achievements have been made through the efforts of many nursing scholars across Asia. ANR is listed in the Social Sciences Citation Index (SSCI) and Science Citation Index Expanded (SCIE), and has established itself as a significant journal with a 5-year Impact Factor of 3.1. Hundreds of nursing scholars not only in South Korea but also in many Asian countries are submitting papers to ANR, and the number of papers submitted to ANR last year was well over 700. Among published papers, the percentage of citations in other journals has reached 91%, and the Impact Factor ranking in nursing journals around the world has risen to 60% (Clarivate, 2024). This success is a testament to the contributions of thousands of domestic and foreign nursing scholars putting their vigorous efforts toward deep and rigorous nursing science. It can also the result of developments in all areas of nursing, including educational institutions as well as systems and operations in clinical fields.

The collective mission of ANR's readers is to elevate the journal's quality through enhanced paper submissions and the training of the next generation of nurses and nursing scholars. However, when we consider real-world applicability in nursing research and education apart from the remarkable progress mentioned above, we are faced with challenges that have not been solved for a long time in nursing discipline and community. As a nurse researcher who has taken on the important role of Editor in Chief starting in 2024, I would like to summarize three challenges in nursing and seek ways to solve those challenges.

First, the research results of nursing scholars should be applied to clinical practice and clinical challenges should be investigated through research, but the gap between academics and clinical practice is rarely narrowed. To celebrate the 50th anniversary of the founding of the Korean Society of Nursing Science in 2020, we analyzed the keywords of 2877 paper abstracts published in the Journal of Korean Academy of Nursing for 50 years (Kim, et al., 2020). From the keywords analysis, the transformation and development of nursing academia and practice fields were evident, for example, in one birth control and family planning in the 1970s and the other, nursing concepts and theories in the 1980s. With becoming one of the woman-dominant healthcare professionals in the 1990s, the application of global standards in the 2000s, and the quality improvement in the 2010s, the findings illustrated the footprints of our former nursing generation.

The final visualization of the whole 50 years of research accumulation beautifully depicted four clusters including keywords of experimental designs, equation modeling, and instrument development, and lastly not the least qualitative research. However, the thousands of studies mentioned above have rarely been applied to clinical nursing practice. In applied disciplines such as nursing, where theory and practice are closely connected, it is essential to establish a virtuous feedback system in which research results are applied to clinical practice and problems in clinical practice are explored through research. However, nursing discipline has very low autonomy in clinical settings to apply research results. Research that only uses various levels of difficulty and complexity in research methodology without the essence of nursing care is aimless. Those cannot be applied to patients in the field, and is difficult to consider as contributing to the body of nursing knowledge.

Second, the absence of caring data in medical institutions, where the majority of nurses work, poses a significant challenge. Although nurses form the largest group among healthcare professionals in hospitals, there is a lack of data demonstrating the impact of their care. The focus on treating diseases in hospital settings often overlooks the essential role of nursing care. There may be a lot of data about the patient's disease process and physical indicators, the data centered on care is not easily constructed and accumulated. Efforts are needed to collect and emphasize data on the quantity and quality of care provided by nurses in various levels of hospitals.

The configuration and process of nursing practice in tertiary hospitals where the largest number of nurses are concentrated shows the current attainment of nursing in South Korea, so it is meaningful to observe the quantity and quality of caring among nurses' work. According to the National Health Insurance Corporation report (Suh et al., 2021), which meticulously observed the actual practice of nurses, direct nursing such as medication, treatment, and physical indicator measurement face-to-face with patients was less than half of the indirect nursing time such as medication preparation, data input, and supplies preparation, and most direct nursing was also performed according to the medical orders rather than by the tailered care led by nurses.

In the work of nurses, they must design and provide care tailored to patients, measure its effectiveness, and then accumulate the positive results to create a virtuous feedback system that can provide better care to patients. To achieve this, it is essential to compose nurses' awareness, fact-showing research, and administrative support to clarify care within the entire hospital system

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and increase the visibility of nurses who provide care most professionally.

Lastly, for the continuous development of nursing research, creative nursing education and clinical transformational innovation must be accompanied. In the past, education, research, and clinical practice could function independently. In the digital era of the 4th Industrial Revolution, fostering collaboration between hospital nursing department leaders and university professors responsible for education and research is paramount. Such collaboration is indispensable for elevating human-centered nursing to a professional standard across academic, research, and practical domains. There has been collaboration in the past where professors advise on clinical nursing research conducted in hospitals and clinical experts participate as reviewers on theses produced by nursing universities, but that level of collaboration is insufficient to achieve the transformative innovation required in the present era.

According to a recent doctoral dissertation in nursing, the age, nursing dependency, the numbers of treatment, medication, examination, the risk of falls and pressure ulcers of patients in a tertiary hospital are increasing every year, but the nurse staffing ratios have been the same over 20 years (Hong, 2022). This is evidence that the position of nurses as a professional in designing and providing care as a professional in hospital has not been secured, and it is a basis for the urgent need for collaboration with nursing scholars outside the hospital. The nursing leaders of each medical institution and universities concentrate on their hospital or college duties, often resulting in a sluggish response to the evolving direction of nursing development shaped by the broader nursing community. This lack of immediate awareness and proactive planning for innovation hampers progress.

Many Asian countries, including South Korea, are facing an aging population, a decline in birth rates, and an increase in chronic diseases, which means a surge in the population in need of care in the future. Nursing must establish itself as a dignified profession that practices humanism and ethics at the forefront of medical care in the future. In order to solve the above-mentioned challenges that we are currently facing, we must begin steps toward transformative innovation in universities, research institutes, and clinical fields, and I am confident that ANR will be a platform to record such steps.

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Review Article

The Evolution of Phenomenology in Korean Nursing Research: A Scoping Review

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SUMMARY

Purpose: Phenomenological methods are used to capture human experience, and nursing research has long attempted phenomenological approaches in many studies. This study explored the 22-year trends (2001– 2022) in phenomenological research within Korean nursing science and identified the types of journals where research is published, common phenomenological data analysis methods, phenomena of interest, and standards of rigor applied to phenomenological studies.

Methods: This scoping review followed the six stages recommended by Arksey and O'Malley's (2005) and utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for scoping reviews (PRISMA-ScR) for reporting guidance. A total of 4,354 articles acquired through systematic searches across seven search engines PubMed, CINAHL, Embase, Research Information Sharing Service (RISS), Korea Citation Index (KCI), Korea Institute of Science and Technology Information (KISTI), and Korean studies Information Service System (KISS) were reviewed. Key search terms and inclusion and exclusion criteria were used as strategies to identify relevant articles.

Results: In the final review, 568 Korean phenomenological studies were included. Among the phenomenology research, 50.4% of the total work was performed between 2016 and 2020, and the Colaizzi method of study was the most common (62.9%). Most researchers were published in nursing journals (55.8%). Nurses constituted the majority of participants (24.5%), followed by people living with illnesses (23.1%) and people of all ages. The primary focus included participants' experiences: the disease experience of the sick, the job-related experience of the nurses, and the learning-related experience of the nursing students. The median sample size of reviewed papers (i.e., 9) is relevant to phenomenological research saturation. The most rigorous studies applied Lincoln and Guba's criteria (54.0%).

Conclusions: Advancing phenomenological research in nursing entails giving priority to diverse perspectives, rigor, and the foundational essence of phenomenology. Ensuring transparency and reliability requires reinforcing rigor through the integration of phenomenology, philosophy, and effective data analysis methods.

Introduction

Philosophical phenomenology constitutes an optimal foundation for qualitative research [1]. Phenomenology explores, interprets, or explains phenomena in real-world contexts and settings by focusing on specific meanings. Within background philosophies, phenomenology is categorized as descriptive, prioritizing the account of 'individual experiences themselves (Zu den Sachen selbst!)', and hermeneutic, which emphasizes the 'interpretation' of these experiences [2]. Descriptive phenomenology

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aims to describe the main aspects of experiences in consciousness [3], while hermeneutic phenomenology seeks to comprehend how humans make sense of their experiences and interpret their surroundings [2].

In nursing, descriptive approaches have proven useful in uncovering the nature of phenomena that have been incompletely conceptualized, and interpretive approaches are helpful in examining the contextual characteristics of experiences that may have direct relevance to nursing practice [4].

Phenomenology in nursing inquiry, a subfield of applied phenomenology, has grown over the last 20–25 years [5]. Phenomenological approaches are useful in nursing research for two reasons. First, it effectively determines the meaning of complex human experiences. Understanding how patients experience their illness and cope with it can help nurses provide better care tailored to each patient's needs [6]. Second, existing approaches to quantitative research are limited in that they are unable to explain the complex interactions between humans and the environment [7]. Phenomenological approaches allow nurses to comprehend the characteristics and distinctive ways of living of particular people using a phenomenological framework [8].

In Korea, qualitative research methodology in nursing took its initial steps with phenomenology and grounded theory approaches in the 1990s [9]. Since 2006, research methodologies, including diverse and specific approaches, have been developed [10]. Several qualitative studies, including phenomenology, often lack a clear description of the research methodology employed and the philosophical background that led to employing that methodology [11]. According to Lee [12], phenomenological methodologies used in qualitative research in Korea mainly encompass epochë, phenomenological reduction, methods of interpretation, and intentional analysis. Despite various methodologies, ensuring research rigor is difficult because research is either skewed towards select scholars or lacks an explanation of the process's phenomenological context [13]. To enhance the caliber of the phenomenological investigation focused on Korean contexts, a comprehensive review of past nursing-oriented phenomenological research is necessary.

Qualitative research rigor involves minimizing researcher bias and ensuring accurate research outcomes through a reflective and comprehensive review of the research process [14]. Lincoln and Guba [15], Sandelowski [16], and Morse [17] distinguished the dimension of rigor by presenting diverse approaches and definitions for ensuring rigor. Given that rigorous research necessitates dependability and validity, continuous consideration is essential for establishing adequate standards in qualitative research [18]. To properly integrate phenomenology in nursing, it is crucial to assess researchers' conscientious efforts toward thorough investigation.

The scoping review design is considered the most suitable approach to analyzing the trend of phenomenology in Korean nursing research since the design's objective is to comprehensively explore the existing literature on a specific topic or research area, facilitating the identification of key concepts [19]. Employing a scoping review methodology, this study meticulously scrutinized 22-year (2001–2022) annual trends in Korean nursing literature. The goal is to offer valuable insights for nursing researchers utilizing phenomenological approaches.

Aims

What is known from existing literature through phenomenology in Korean nursing inquiry?

This study sought to review the following:

1) To examine the kinds of journals that usually publish phenomenological research.
2) To explore the characteristics and methods of analysis used in each period of phenomenological research.
3) To investigate topics and phenomena that are interesting for phenomenological research.
4) To analyze various forms of rigor in research using phenomenological approaches.

Methods

Study design

The methodological approach of this review was based on Arksey and O'Malley's [20] six-step framework for scoping reviews: (1) identifying the research questions; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing, and reporting the results; and (6) consultation exercises. The review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) reporting guideline extension for scoping reviews [21]. The protocol was registered in the Open Science Framework (OSF) on July 20, 2023: https://archive.org/details/osf-registrations-y5qrs-v1. The current study did not critically appraise the studies as scoping reviews do not focus on quality assessment [20].

Search methods

Studies from 2001 to 2022 were searched based on the literature showing that phenomenological research has been growing in Korea since 2000 [9]. Peer-reviewed articles on phenomenological research in Korea were obtained from seven search engines: PubMed, CINAHL, and Embase for international engines, and the services of Research Information Sharing Service [RISS] (www.riss.kr), Korean Citation Index [KCI] (www.kci.go.kr), the Korea Institute of Science and Technology Information [KISTI] (www.ndsl.kr), and Korean studies Information Service System [KISS] (http://kiss.kstudy.com) for Korean domestic engines. Additionally, the following main search terms were used: *(phenomen*)*, *(qual*)*, and *('South Korea')* for English search engines, while *"hyeonsanghag"*, *"hyeonsang"*, and *"jiljeog"* for Korean search engines. The search was conducted up to January 31, 2023, according to the conditions of each search engine.

Study selection

For the scoping review literature search, the researchers searched the COre area of the COSI (COre, Standard, Ideal) model proposed by the US National Library of Medicine (NLM), which is the center of the literature search [22]. To identify the trends in phenomenology between January 1, 2001, and January 31, 2023, the following inclusion criteria were applied: (1) published in peer-reviewed scientific journals; (2) full-text articles; (3) published in either Korean or English; (4) focused on original nursing articles published using phenomenological methodology; and (5) articles in which nursing scholars participate as main authors (first or corresponding author) after verifying the researcher's affiliation and institution. The study also implemented the following exclusion criteria: (1) review journals and (2) cases that do not adhere to the phenomenological method (i.e., grounded theory, abstract, mixed research, quantitative research, case study, Q methodology, survey research, and focus group studies). Focus group phenomenological studies were excluded from this study owing to disagreement on whether a phenomenological technique analyzing an individual's subjective life experiences may be employed for focus group interviews [23].

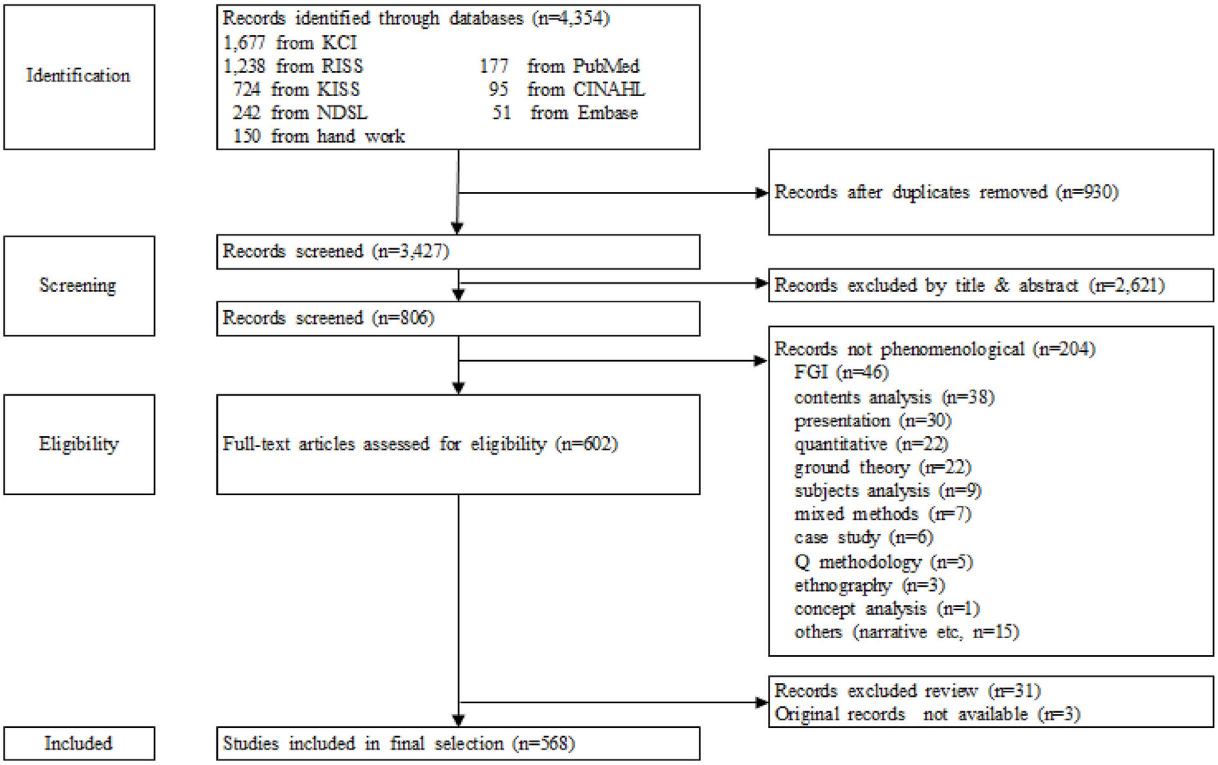


Figure 1. PRISMA Flow Diagram. Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

All duplicates were removed using EndNote X9 (Clarivate Analytics), a reference management software. Four reviewers screened all the titles and abstracts for inclusion and exclusion criteria. Subsequently, full texts were read independently by four reviewers to confirm if they fulfilled the inclusion and exclusion criteria. Any discrepancies were addressed through consensus with four investigators.

Charting the data

A tabular data extraction form was created using Microsoft Excel, with reference to a previous study [24]. The selected literature was examined for data elements, including research period, phenomenological data analysis method, journal type, number of samples, participant characteristics, and criteria for rigor. The process of data extraction was independently carried out by four researchers.

Collating, summarizing, and reporting the results

Based on the phenomenological data analysis methods, the articles were classified into three categories: descriptive phenomenology (Colaizzi, Giorgi, and Van Kaam), interpretive phenomenology (van Manen, Benner, and Smith), and others (Merleau-Ponty; Diekelmann, Allen, and Tanner; Krippendorff; Dilthey and Gadamer; Munhall and Boyd). Journals were classified as either Korean or English, as well as whether they were nursing journals. The classification of phenomena of interest was based on the keywords. For analysis of the sample sizes, the articles were classified into $n < 10$, $10 \leq n < 20$, and $n \geq 20$.

For the categories of rigor classification, the four aspects of rigor (i.e., truth value, applicability, consistency, and neutrality) and the four criteria proposed by Lincoln and Guba (i.e., credibility, transferability, dependability, and confirmability) were used [15,25]. Additionally, the four categories proposed by Sandelowski (i.e., credibility, fittingness, auditability, and confirmability) were also included [16]. For the subcategories, the studies were classified into those that included rigor and those that did not mention rigor.

Consultation exercise

To enhance the overall content, an expert phenomenologist was invited to conduct an advisory meeting. Following the consultation, the study's rigor criteria and keyword classifications were refined based on the obtained results.

Results

Out of the 4,354 articles assessed, 568 studies that focused on Korean phenomenological studies were selected (Figure 1).

Type of journals

The descriptive attributes of the journals focusing on phenomenological nursing studies are presented in Table 1.

In this type of journal, 506 (89.1%) articles were written in Korean, of which 280 (49.3%) were published in nursing journals and 226 (39.8%) were published in other journals. A total of 62 articles (10.9%) were written in English, of which 37 articles (6.5%) were published in nursing journals.

Approximately 44.2% of all studies (39.8% in Korean and 4.4% in English) were submitted to journals outside the purview of nursing but in alignment with the context of phenomenological research in this study. Apart from nursing journals, the present investigation also considered prominent qualitative research journals and interdisciplinary journals as significant sources, housing a substantial body of phenomenological papers with relevance to the field of nursing.

Table 1 *Type of Journal (N = 568).*

Study characteristics	n (%)
Journal type	
Written by Korean	506 (89.1)
Nursing Journal	280 (49.3)
Others	226 (39.8)
The Academy of Qualitative Research	31 (5.4)
The Korea Academia-Industrial cooperation Society	29 (5.1)
Korean Association for Learner-Centered Curriculum and Instruction	14 (2.5)
AsiKora-pacific Journal of Multimedia Services Convergent with Art, Humanities, and Sociology	14 (2.5)
Etc.	138 (24.3)
Written by English	62 (10.9)
Nursing Journal	37 (6.5)
Others	25 (4.4)
International Journal of Qualitative Studies on Health and Well-being	2 (0.3)
International Journal of Environmental Research and Public Health	2 (0.3)
Healthcare	2 (0.3)
Etc.	19 (3.4)

Phenomenological data analysis methods

The results for the phenomenological data analysis methods are in Table 2. The 568 articles were divided into five-year units based on the analysis of the trends in qualitative research presented by Kim et al [10]. Overall, 66 articles (11.6%) were published from 2001 to 2005, 70 from 2006 to 2010 (12.3%), 98 from 2011 to 2015 (17.2%), and 334 from 2016 to 2022 (58.9%), showing a rapid increase in number after 2016.

In terms of phenomenological data analysis methods, descriptive phenomenology, which encompasses Colaizzi, Giorgi, and Van Kaam, accounts for 84.0% (477 articles), while interpretive phenomenology, which involves van Manen, Benner, and Smith, comprises 14.1% (80 articles). Other approaches included Diekelmann, Allen and Tanner, Krippendorff, Dilthey and Gadamer, Munhall and Boyd, and Merleau-Ponty, which together accounted for 1.9% (11 articles), including those that did not mention methodology (4 articles). Colazzi had the highest frequency with 357 articles (62.9%), followed by Giorgi with 113 articles (19.9%), and van Manen with 73 articles (12.9%) (Table 2).

Classification of topics and phenomena of interest

The classification results of the types of topics and phenomena of interest are shown in Table 3. The participants in the phenomenological studies were classified into different groups, such as nurses, people living with illness and life cycle problems, nursing college students, caregivers, and others. In the life cycle classification, the stages of infants and toddlers were excluded due to the absence of studies on them facing challenges in expressing their opinions. Of the different classifications, the topic with the highest proportion of topics was the disease experience of persons with illness (18.3%), followed by the nurse's job-related experience (16.7%), and the nursing college student's learning experience (9.2%). Nurses were the most frequently studied participants in the research (24.5%). Approximately one-third of the content related to nurses focused on their experience when caring for patients with infectious diseases, such as COVID-19, and end-of-life patients. Nursing administration and work experience accounted for around two-thirds of nurse-related content. The second-largest number of studies were on people living with illness (23.1%), followed by life cycle studies (17.6%), which include research on older adults and maternity experiences such as pregnancy, childbirth and parenting experiences. Nursing college students constituted the fourth-largest group (16.0%), followed by caregivers (9.3%), and other contents (9.5%), which include experiences of North Korean defectors and migrants.

The most used sample size was "$n < 10$" (58.0%). The sample size had a median of 9 (interquartile range: 7–11), with a range from 3–53.

Classification of rigor assessment criteria

The results of classifying the rigor assessment criteria of the selected articles are shown in Figure 2. Of the 568 studies, those that presented Lincoln and Guba's rigor assessment criteria accounted for the highest proportion (54.0%), followed by studies with Sandelowski's rigor assessment criteria (7.6%). Additionally, 17.4% of the studies presented rigor without mentioning the name of the researchers or the assessment criteria; 4.4% were classified as "others," and 16.6% did not have rigorous assessment criteria. Among the studies that presented Lincoln and Guba's rigor assessment criteria, studies that did not describe the specific content of rigor assessment while presenting the four categories (i.e., credibility, transferability, dependability, and confirmability) only, and studies that mentioned the name of Lincoln and Guba but did not describe the categories, were included. Most studies that did not meet the rigor assessment criteria and studies that did not specifically discuss rigor performed rigor assessment only through the member checking process after the study. Member checking is one of the triangulation methods used to increase the credibility of qualitative research [15]. In this study, the analysis showed that the terms rigor and truth value were used interchangeably in qualitative research for the validity and reliability of quantitative research.

Discussion

This study examined the development trends of nursing research using phenomenological research methodology, focusing

Table 2 *Phenomenological Data Analysis Methods (N = 568).*

Categories	Descriptive phenomenology (n)			Interpretive phenomenology (n)		[a]Others (n)	Total n (%)
	Colazzi	Giorgi	Van Kaam	Van Manen	Benner, Smith		
2001~2005	35	13	2	14	1	1	66 (11.6)
2006~2010	35	22	2	10	0	1	70 (12.3)
2011~2015	64	14	2	15	1	2	98 (17.2)
2016~2020	189	60	1	27	4	5	286 (50.4)
2021~2022	34	4	0	7	1	2	48 (8.5)
		477		80		11	568

[a] Other: Diekelmann, Allen & Tanner (2), Krippendorff (2), Dilthey & Gadamer (1), Munhall & Boyd (1), Merleau-Ponty (1), inaccuracy (4).

Table 3 *Type of Topics and Phenomena of Interest (N = 568).*

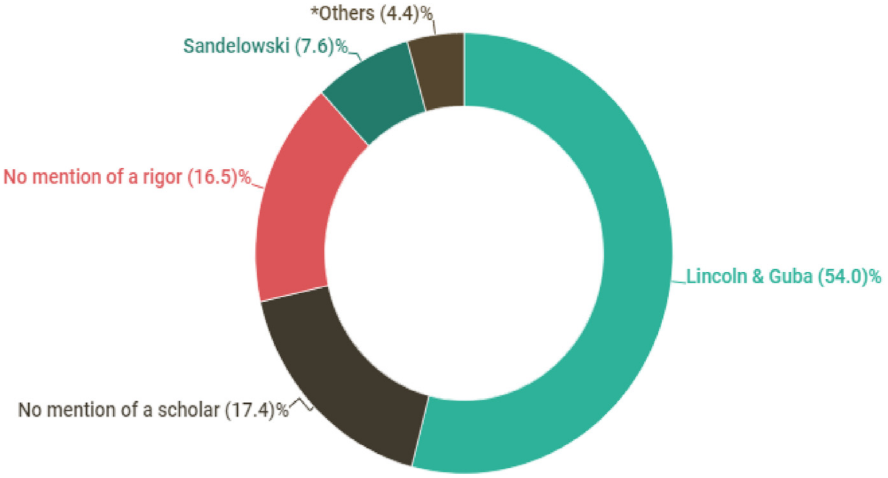
Participants	Experience	Categories (n)	Subtotal n (%)	Total n (%)
Nurses	Job	Job stress (33), Special department (12), New graduate nurse (8), Patient safety (7), Gender difference (6), Violence (6), Education (4), Professionalism (4), Overseas activity (4), Others (11)	95 (16.7)	139 (24.5)
	Care	Infectious disease care (13), End-of-life care (12), Nurse-patient relationship (6), Chronic disease (6), Vulnerable people (5), Others (2)	44 (7.8)	
People Living with Illness	Disease	Cancer diseases (28), Cerebral nervous system disease (17), Mental diseases (16), Infectious diseases (13), Chronic renal diseases (9), Cardiac diseases (5), Others (16)	104 (18.3)	131 (23.1)
	Facility Residence	Caring satisfaction (9), Hospitalization satisfaction (5)	14 (2.5)	
	Others	Good nursing experience (3), Spiritual experience (3), Organ transplant experience (3), Others (4)	13 (2.3)	
Life Cycle	Older adults	Psychological issues (11), Health promotion (4), Lifestyle (4), Meaning of life (3), Living alone (2), Employment (2), Others (4)	30 (5.3)	100 (17.6)
	Adult			
	Women	Pregnancy & Childbirth (13), Parenting (9), Others (3)	25 (4.4)	
	Middle	Aging (11), Psychological and mental health issues (6), Others (3)	20 (3.5)	
	Youth	Lifestyle (6), Perspective of marriage and childbirth (3), Dating violence (3), Others (3)	15 (2.6)	
	Adolescents	Home environment (3), Smoking (2), Violence (2), Others (2)	9 (1.6)	
	Child	Short stature disorder (1)	1 (0.2)	
Nursing College Students	Learning	Clinical practice (34), Teaching and learning methods (10), Laboratory practice (8)	52 (9.2)	91 (16.0)
	College Life	Volunteer work (6), Male student (4), Transfer student (4), North Korean defector (3), Extracurricular activities (3), Career (3), Mature-age student (2), Others (8)	33 (5.8)	
	Others	Communication (1), Socialization (1), Immobility (1), Violence (1), Disease (1), Weight control (1)	6 (1.0)	
Caregivers	Family Care	Care for sick child (7), Mental illness (7), Disabled people (7), Cerebral nervous system disease (6), Facility residence (4), Premature baby (4), End-of-life (3), Others (7)	45 (7.9)	53 (9.3)
	Social Care	Caregivers (4), Volunteers (2), Others (2)	8 (1.4)	
Others	Immigrant & Defector	Motherhood (13), Social adaptation (7), Health promotion (2)	22 (3.9)	54 (9.5)
	Lifestyle & Health Promotion	Smoking and smoking cessation (4), Complementary and alternative therapy (2), Oral contraceptive (1), Physical activity (1)	8 (1.4)	
	Others	Healthcare provider (4), Educator (4), Vulnerable people (3), Graduate student (2), Occupational health (2), Others (9)	24 (4.2)	
Sample size	<10			329 (58.0)
	10 ≤ n < 20			219 (38.5)
	≥20			20 (3.5)

on Korea's cultural environment over the past 22 years. The number of studies has increased significantly over the past seven years (2016–2022), with more than half of all papers published during this period. The increased interest in phenomenological research may have resulted from the recognition that quantitative research alone has limitations in providing a complete account of human existential crises [26].

In addition to journals focusing on nursing, articles were also actively submitted to interdisciplinary convergence journals. To garner recognition for phenomenology in nursing from other disciplines and foster seamless communication, it is imperative to contemplate the fundamental essence of phenomenology.

Colaizzi's method, the most widely used approach, emphasizes traits that research participants share, while the Giorgi method investigates individual uniqueness within the constraints of the structural context. Both approaches follow a step-by-step analysis method derived from Husserl's theory, providing accessibility, systematic process explanations, and detailed result descriptions [27,28]. This framework serves as a valuable guide for novice researchers by aligning participants' experiences [3]. Van Manen's interpretive phenomenology, constituting 12.7% of methodologies, employs Heideggerian hermeneutic phenomenology in nursing research [29]. Known for its intuitive approach, Van Manen's interpretive phenomenology guides researchers in defining problems, interpreting participants' experiences, and fostering reflection on the researcher's role, perspective, and embodiment, enhancing reflexivity and presence [30].

However, some scholars have expressed concerns about the application of phenomenological methods in nursing research, emphasizing the importance of a more thorough consideration of the study's philosophical and methodological foundations [31]. Paley [32] has criticized nurses for misinterpreting and



*Others : Giorgi; COREQ; Field & Morse; Meadow & Morse; Kitto; Colaizzi;Smith; Creswell & Miler; Yardley (IPA) et al.

Figure 2. Classification of Criteria for Evaluation of Rigor.

misappropriating Husserl's phenomenology and for relying on secondary sources rather than the core texts themselves. Hassan [33] recommends that nurse researchers who do not adequately prepare and understand phenomenology and Husserl's philosophy should consider using different qualitative approaches. When using phenomenological methodology in nursing, it is vital to constantly think about relevant philosophical concerns and approaches to communicate effectively with other disciplines. Various phenomenological perspectives must be tried to produce research methodologies appropriate for nursing.

Nurses' experiences in the nursing profession and job stress in medical facilities are a few of the topics of significant interest in research using the phenomenological approach. These findings reflect not just Korea's prevalent hospital-centered disease treatment system but also the problems of living as a nurse, such as nurses' workplace adaption, high-intensity labor, and ambiguous scope of work. Nurses' work goes beyond medical institutions and into society at large. It is vital to be more active in the phenomenological research of nurses, not only in medical institutions but also in the community, to reflect the diverse work experiences of nurses [34].

Studies on nurses' experiences of caring for patients with infectious diseases such as MERS, COVID-19, and HIV were conducted using a phenomenological approach because the approach provides a more complete description of diverse and unexpected clinical situations and allows researchers to understand the participants' perspectives more deeply. The approach can also be considered useful for investigating changes in the medical environment [35]. Among the experiences of people living with disease, research on cancer patients, which has the highest mortality rate in Korea as of 2022 [36], demonstrates medical personnel's determination to fully understand and directly support people living with cancer. The fact that studies related to older adults account for roughly 30.0% of life span categories can be regarded as reflecting the Korean societal phenomenon of entering a super-aged society. Various studies dealt with the participation experience using a phenomenological method to verify the effectiveness of health promotion programs among the aged studies. It is crucial to assess if research investigating programs employed the philosophical approach and methodology of phenomenology and whether this method was effectively utilized to unveil the study's true meaning. Additionally, concerns about older adults are linked to social and cultural welfare infrastructure. Further research is needed to reflect on and interpret the experiences of older adults in a social setting from the standpoint of health professionals.

Among the “other” classes were 22 articles focusing on North Korean defectors and immigrants, revealing that immigrants face challenges accessing health care in unfamiliar environments, leading to a health disparity compared to natives. Particularly, social barriers faced by immigrant mothers exacerbate their vulnerability as outsiders and women [37]. Listening to their perspectives and aiding their adjustment can foster a healthy community.

The median sample size in the phenomena of interest (i.e., 9) relates to the concept of saturation in qualitative research. Saturation occurs when collected data ceases to produce novel information or themes [38]. Scholars propose various participant ranges, such as Morse's six [39], Dukes [40] and Frechette's [29] three to ten, and Polkinghorne's five to 25. For a sample size that determines the adequate saturation of the data, the scope of the study, essence of the phenomenon, quality of the data, and study design are more important aspects for consideration than the precise number of participants [41]. As the subjective judgment of the researcher is important, the preparation and insight of the researcher are necessary for phenomenological research.

Lincoln and Guba's criteria were predominantly employed as benchmarks for ensuring rigor; however, vigilance is warranted in instances where explicit standards for rigor assessment are absent. Notably, in Korean nursing journals, 25.0% of cases exhibited a lack of rigor criteria, employing terminology distinct from that of the researchers. Due to the pivotal role of rigor in qualitative research, its absence may compromise the overall value of the study [42]. Lincoln and Guba offered a naturalistic approach that included credibility, transferability, dependability, and confirmability [25]. Sandelowski categorizes rigor into four dimensions [16], while Morse defines it as having three components [17]. Nursing researchers should use and communicate rigor criteria to enhance trustworthiness. Qualitative research rigor, especially in phenomenology, is debated due to word disagreements and varied criteria usage [43]. An analytical process consistent with social science notions is necessary [17].

To conduct phenomenological research in nursing, the current authors had the opportunity to learn and experience qualitative research methods by attending qualitative research classes held at the College of Nursing and other conferences. However, it was difficult to derive clear answers regarding the training a researcher needs for understanding epochë and the knowledge and skills required in phenomenological reduction and interpretation. It is critical to perform adequate phenomenological research and provide training (educational curriculum) to boost research rigor and help participants understand and appreciate the substance and characteristics of their experiences. To uncover the substance and characteristics of participants' experiences and improve study rigor, researchers should be trained as “instruments” that embody phenomenological insight. For example, to effectively grasp Heidegger's theory, a fundamental comprehension of existentialism is essential, along with comprehensive insights into the prevalent philosophical movements of the time.

Limitations

This retrospective analysis spanning 22 years of Korean nursing phenomenological research reveals trends, methodological preferences, and challenges, despite having inherent limitations. First, over the course of the previous 22 years, our inquiry was limited to phenomenological research papers where a nursing researcher was the main author (i.e., first or corresponding author). The study's limitations stem from its incapacity to incorporate a more comprehensive phenomenological approach, particularly when nursing scholars collaborate as co-authors. Second, there is a lack of in-depth analysis on participant-related aspects while investigating nursing phenomenological research concerning analytical methodologies, phenomena of interest, and rigor utilization. Third, a comprehensive scrutiny of rigor, crucial for evaluating phenomenological research, was not conducted. Future research should explore strategies that enhance rigor in phenomenology within the nursing context. Notably, the study did not assess the overall quality of the selected study. For subsequent studies, the recommendation is to employ assessment tools like the Critical Appraisal Skills Program (CASP) qualitative checklist [44], the standards for reporting qualitative research (SRQR; a synthesis of recommendations) [45], or consolidated criteria for reporting qualitative research (COREQ) checklist [46].

Conclusion

This 22-year retrospective analysis of Korean nursing phenomenological research elucidates trends, methodological preferences, and challenges. Prior literature highlights a notable surge in phenomenological research on human subjects in nursing, emphasizing the dominance of the descriptive phenomenological analysis method, particularly Colazzi's. It advocates for expanding the hermeneutic approach to fully comprehend nursing practice experiences. The findings of this study offer crucial insights, urging researchers to prioritize rigor, diverse perspectives, and the fundamental essence of phenomenology to elevate the field's credibility and relevance. Ensuring rigor in research necessitates the integration of phenomenology, philosophy, data analysis, and collection approaches to effectively capture diverse phenomena of interest. To enhance the depth and scope of phenomenological inquiry within the Korean nursing research environment, it is recommended to strengthen the educational program for cultivating researchers with inherent phenomenological insight. Additionally, promoting interdisciplinary research expansion is suggested through seamless communication and collaboration with diverse academic disciplines.

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Conflict of interest

The authors declare no conflicts of interest.

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Research Article

Tendency to Stigmatize Epidemic Diseases Scale: Scale Development and Validity Study

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SUMMARY

Purposes: The purpose of this study was to develop a scale to measure stigma during epidemics among adults in nursing care and validate its psychometric properties.
Methods: The preliminary items of the Tendency to Stigmatize Epidemic Diseases Scale scale were developed through a literature review, the Delphi technique, and content validity analysis. A total of 723 adults living in Turkey responded to the questionnaire from June to December 2021. The collected data were analyzed by exploratory factor analysis and confirmative factor analysis using SPSS and AMOS programs.
Results: The experts agreed on 51 scale items, and 24 items were removed following exploratory factor analysis. On the 27-item scale, a five-factor structure was found with an eigenvalue >1, explaining 59.2% of the total variance. The overall Cronbach's α value was 0.88.
Conclusions: This scale is a reliable and valid measurement tool for adults to determine their level of stigma during epidemics in nursing care. This scale helps develop interventions to improve the psychological health of adults in nursing care.

Introduction

Epidemics caused by infectious diseases (malaria, cholera, Spanish flu, COVID-19, *severe acute respiratory syndrome*, etc.) have been a problem for the humanity throughout the history because they affect not only infected individuals but societies as well [1,2]. Epidemics, from the 19th century's smallpox to the 21st century's COVID-19, have always been associated with stigma and serious social consequences [3]. It is also emphasized that in epidemics caused by respiratory viruses, different social reactions occur because there is less control over the contamination and spread, and when this situation is combined with the fear of global epidemic, economic collapse, and famine scenarios, stigma may be exacerbated [3,4]. In the literature, it has been seen that different characteristics of stigma emerge when epidemics related to infectious diseases such as plague, tuberculosis, syphilis, human immunodeficiency virus (HIV), hepatitis, Middle East respiratory syndrome, and COVID-19 occur [3]. It has been observed that stigmatization might occur in a certain group of people. For instance, homosexual men are stigmatized in having sexually transmitted diseases such as HIV, individuals with low socioeconomic status are stigmatized in having tuberculosis, and risk group of the elders or individuals with chronic health problems are stigmatized in having COVID-19 [3,5–7]. However, it appears that insufficient information about the prognosis and consequences of diseases, the uncertainty of the process of finding a treatment, and the fear caused by the lack of an effective preventive treatment option or vaccine are underlying causes of stigmatization in epidemics [3,5]. It is observable that fear and anxiety associated with epidemic diseases lead to stigmatization by creating negative attitudes and beliefs toward people, places, or society [5,6,8]. Related studies have reported that people are labeling patients with epidemic diseases as ignorant or negligent and that they are held responsible for transmitting diseases to society, resulting in social devaluation and discrediting as well as social stigma [3,6]. Consequently, negative attitudes and beliefs such as isolation, fear of death, discrimination, embarrassment, and exclusion also increased rapidly [7]. Social stigma can intensify structural and internalized stigma. Stigmatization may worsen physical and mental health such as depression, anxiety, emotional and mental distress, decreased quality of life, reduced compliance with

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treatment, and reduced access to medical facilities [3,7]. Therefore, improvements regarding this situation are needed. Improvements can be done by analyzing the tendency to stigmatize epidemic diseases.

Stigma refers to discrimination against an identifiable group of people, a place, or a nation [9,10] whereas stigma related to epidemic diseases are characterized by labeling, stereotyping, and discriminating against individuals with infectious disease symptoms. This can result in loss of status, and it consists social, interpersonal, and individual levels. [11,12]. According to Yuan et al. [13], the overall pooled prevalence of stigma is 34%, including a perceived stigma of 31.0% and an enacted stigma of 36.0%. When the causes of stigmatization are examined, it can be seen that social structures and policies create preparatory or facilitating factors, while insufficient information or contradictory messages constitute the triggering factors. Stigma toward epidemic diseases has already been discussed in many studies [4,8,14–17]. In these studies, it can be seen that the stigma scales related to diseases such as HIV, hepatitis C virus, Middle East respiratory syndrome, and tuberculosis focus on internalized and perceived stigma. However, the COVID-19 stigma scale is more relevant to structural and internalized basis, and the studies emphasize the disease specifics on individual levels. According to Goffman's social stigma theory, it is known that stigmatization occurs due to the socially discrediting quality or behavior and that it only occurs through social relationships. Social stigma is shaped by certain cultural configurations that emerge over time and place, and this also affects labeling, discrimination, and stigma on structural and individual levels [12,18]. For this reason, organizational, social, internalized, perceived, and structural stigmas are examined in the study we discussed. Those five aspects of stigmatization are constantly interacting with each other (Fig. 1).

Reliably and accurately measuring the tendency to stigmatize epidemic diseases in adults is of great importance in effective planning and implementation of nursing care. These measurements can increase individuals' treatment compliance, support psychosocial health, create an effective strategy in health communication, and increase cooperation with the society. It can also increase nurses' ability to provide individualized nursing care and help them deliver nursing services more effectively. Therefore, measuring stigmatization tendency accurately and reliably is of critical importance for controlling epidemics and protecting public health [19–21]. In this regard, the purpose of this study is contributing to the literature by providing a new measurement tool that is not disease-specific and that can be used in different epidemic diseases. It may also encourage research on stigma that analyzes the level of stigma specific to the epidemic disease.

Methods

Study design

The present study adopted an instrument development and validation design. This study was prepared in line with the scale development principles of DeVellis to determine individuals' epidemic disease stigmatization levels [22]. Scale development was conducted in three stages (Fig. 2).

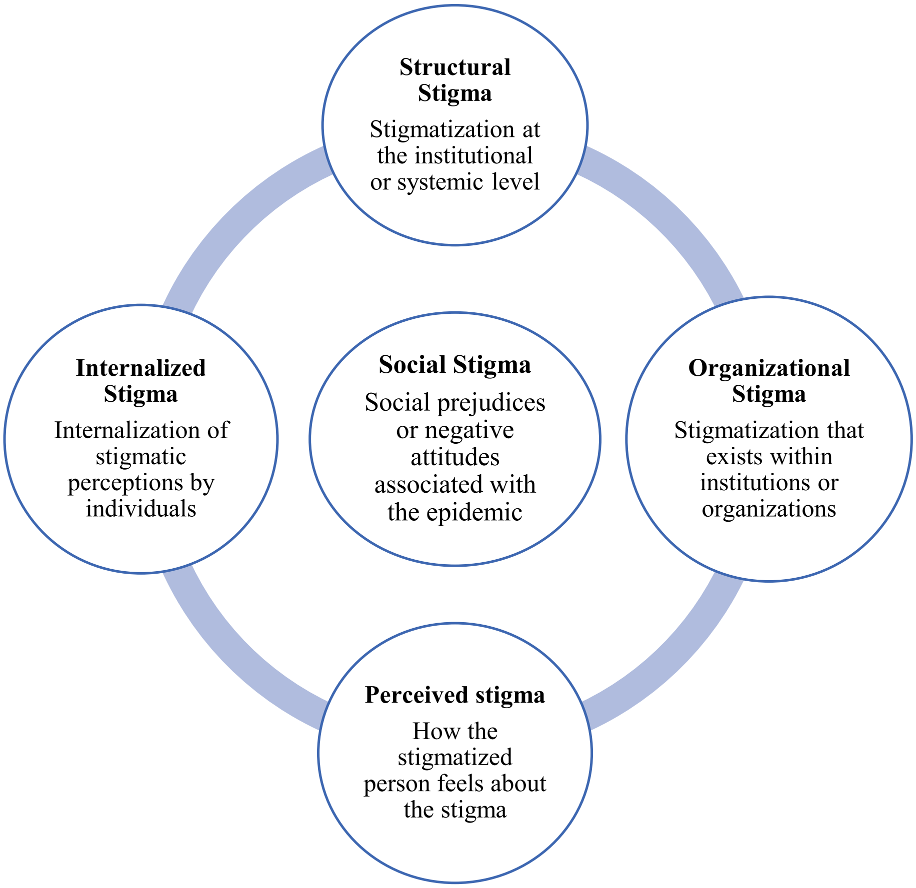

Figure 1. Conceptual Structure of the Scale Development Process.

Phase 1: scale development

Clarification of concept

To develop the Tendency to Stigmatize Epidemic Diseases Scale (TSEDS), a comprehensive literature review was conducted to examine stigma dimensions and stigma scales [9,14–17,23–26]. Previous studies have used these scales as self-report tools that specifically measure stigma related to chronic diseases. For this reason, scales for epidemic diseases and COVID-19 stigma scales provided important guidance in creating the structure [27,28]. The subdimensions were then defined, based on the structures associated with stigma [10,12,18]. While creating the conceptual framework of the scale structure, the following structures, which are in constant interaction with each other, were taken as basis: individual stigma, social stigma, and structural stigma [10,29,30]. In addition, the stages of stigmatization were taken into consideration in creating the scale items, such as labeling, stereotypes, prejudices, emotional reactions, loss of social reputation, and discrimination [30,31]. As a result, it is aimed to measure stigma during epidemic diseases by creating five subdimensions: internalized stigma, perceived stigma, social stigma, and organizational and structural stigma.

Establishing the item pool

The Delphi technique was used to develop a scale-item pool and evaluate its content validity [32]. In this process, the problem was first defined, and the panel members were selected in the second step. Twenty-five experts were selected and contacted, 20 of whom agreed to participate in the study. In this context, 14 experts in the fields of mental health, public health, infectious diseases, internal diseases, and scale development (three psychiatry nurse academicians, two public health nurse academicians, one infectious disease specialist, one internal disease specialist, two nurse academicians with scale development experience, three infection control nurses, and two specialist nurses), and six patients with the epidemic disease (six nurses diagnosed with COVID-19) were invited to participate. In the first round, they were asked to answer the following question: “Which emotions, attitudes, and behaviors define individual stigma, social stigma, and structural stigma in epidemics?” At the end of this round, their responses were analyzed by the research team, and the first draft was created by combining similar items. The experts reviewed the first draft of the scale in the second round and were asked to rate each item on a 4-point scale (1 = *not appropriate*, 2 = *seriously reviewed*, 3 = *slightly revised*, 4 = *appropriate*). All experts agreed on 51 scale items after the third round of Delphi. After obtaining the experts’ opinions, the researchers made necessary arrangements in terms of language and expression.

Phase 2: evaluation of the scale

Setting and samples

Participants constitute the internal and external stakeholders of a university located in Istanbul, Turkey. This university was chosen because it has approximately 21,000 students, over 50,000 graduates, and over 1,400 academics. In addition, this university has two full-fledged hospitals, with a bed capacity of approximately 200, a dental hospital, ambulatory care centers, an eye hospital, and nearly twenty primary, secondary, and high school schools. These institutions continued to provide services during the pandemic period. The majority of individuals receiving services from institutions are employees, graduates, and students. The study population included individuals aged above 18 years who could be reached online through the university, did not receive psychiatric treatment, and did not receive outpatient or inpatient treatment and care during the COVID-19 pandemic. Considering the number of items in the draft scale to calculate the required sample size in scale-development studies, it was necessary to work with a sample at least five times the number of items [33–35]. A total of 431 people who volunteered to participate in the study constituted the study sample. After this stage, a final TSEDS with 27 items was developed, including five dimensions (structural stigma, perceived stigma, organizational stigma, internalized stigma, and social stigma). Another cross-sectional online survey was conducted to evaluate the psychometric properties of the final scale. The sample size of this stage was calculated according to confirmatory factor analysis (CFA). The sample size for CFA is recommended to be at least 100–200 [36]. At this stage, a total of 300 people were invited to the study, and questionnaires that were not filled out appropriately were excluded from the study. Inclusion criteria were the same as those included in the first stage. At this stage, a total of 292 people filled out the 27-item TSEDS. All 292 people who participated in this survey completed the survey again four weeks later [16,24,35].

Ethical consideration

This study was approved by the Yeditepe University Non-Interventional Clinical Research Ethics Committee (Yeditepe University Approval no. 202109093). The participants were also informed that completing the questionnaire was voluntary. The data were kept anonymous and were used only for study purposes, and their permission was received with an “informed-consent form.”

Instruments

Data were collected online between June 1 and December 31, 2021, with a socio-demographic information form consisting 17 questions, a draft scale consisting 51 items, and an epidemic disease anxiety scale (EDAS) consisting 18 items and four subfactors (epidemic, economic, quarantine, and social life) developed by Sayar et al. [37]. Cronbach's α for the EDAS scale was 0.90. The scores ranged from 18 to 90, with a high score indicating an increase in epidemic disease anxiety [37]. The EDAS was used for parallel form reliability.

Data analysis

SPSS 25 and AMOS 21 packages were used to analyze the data. Descriptive statistical methods, including frequency, percentage, mean, and standard deviation, were used to summarize the data.

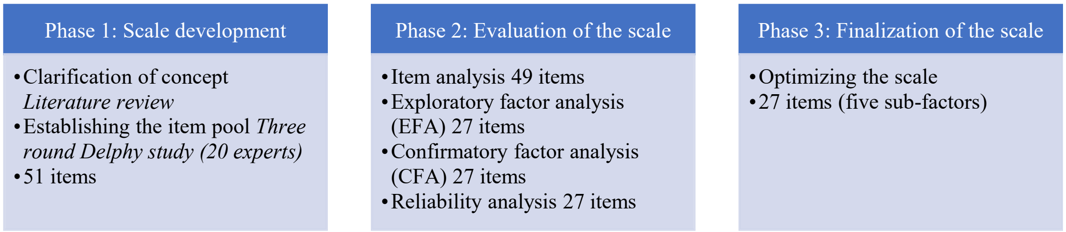

Figure 2. Scale Development Process.

Skewness and kurtosis values of ±1.5 were used as a condition of conformity to a normal distribution [38]. Construct validity was assessed by item analysis, exploratory factor analysis (EFA), and CFA. During item analysis, two items were deleted due to item total correlation values that are lower than 0.20 and also items that reduced Cronbach's α (35). In order to eliminate the common factors, EFA was done using principal component analysis and varimax rotation. For EFA, Kaiser–Meyer–Olkin (KMO) and Bartlett tests were conducted to evaluate sampling adequacy. The KMO value that has been used to assess whether factor analysis were suitable or not should be below 60 [39]. Moreover, Bartlett's Test of Sphericity's results should be statistically compatible [40]. It has been observed that the data were appropriate for factor analysis. According to the EFA results, five factors with eigenvalues greater than 1 were obtained. CFA was used to verify the factor structure that has been found from EFA. The ratio of chi-square to the degree of freedom, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), Tucker–Lewis index (TLI), incremental fit index (IFI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR) were evaluated. The ratio of chi-square to the degree of freedom value below 3, CFI, TLI ve IFI values above 0.90, and RMSEA and SRMR values below 0.08 indicate the goodness-of-fit [39–41]. After CFA, convergent validity was assessed based on mean variance extracted and composite reliability (CR). Cronbach's alpha was calculated for item analyses and scale and subdimensions to examine internal consistency reliability. The item-total correlation coefficient was calculated within the scope of item analysis. Pearson's correlation analysis and a paired samples t-test were used to analyze the test–retest results. For parallel form reliability, the correlation values between the EDAS and the scale used in the study were analyzed using Pearson's correlation analysis. The results were evaluated at 95.0% and 99.0% confidence intervals and significance levels of $p < .005$ and $p < .001$, respectively.

Results

Twenty experts participated in the first phase of this study. All experts had at least 10 years of work experience.

In total, 723 adults participated in the second phase of the study. The sociodemographic characteristics of the participants are presented in Table 1.

Phase I: scale development

The item pool was created using the Delphi technique, which was repeated three times. In the first round, the experts provided 107 answers to the questions sent via e-mail. Subsequently, a pool of 75 items was formed by bringing similar items together and transforming them into scale items. Twenty items were removed from the pool at the end of the second round. At the end of the third round, the experts reached a consensus on 51 items; consequently, a draft scale consisting of 51 items was developed. The results of the content validity using the Delphi technique are presented in Supplemental Table S1.

Phase 2: evaluation of the scale

Item analysis

Two items with an item-total correlation coefficient of less than .20 for the items of the scale were deleted [39–41]. The reliability of the remaining 49 questions increased to .90. These results show good homogeneity and discrimination among the 49 items; therefore, factor analysis was performed for all items.

Table 1 *Distribution of General- and Epidemic-Disease-Related Characteristics of the Participants (n = 723).*

Variable		Frequency (percentage, %)			
		First sample (n^{a} = 431)		Second sample (n^{a} = 292)	
Gender	Women	324	(75.2)	224	(76.7)
	Men	107	(24.8)	68	(23.3)
Age, years	20–29	120	(27.8)	77	(26.4)
	30–39	159	(36.9)	113	(38.7)
	40–49	32	(7.4)	24	(8.2)
	50–59	120	(27.8)	78	(26.7)
Marital status	Married	92	(21.3)	86	(29.5)
	Single	339	(78.7)	206	(70.5)
Status of having a child	Yes	85	(19.7)	71	(24.3)
	No	346	(80.3)	221	(75.7)
Educational background	Primary education	22	(5.1)	12	(4.1)
	Associate degree	15	(3.5)	10	(3.4)
	Undergraduate	328	(76.1)	214	(73.3)
	Graduate	66	(15.3)	56	(19.2)
Working status	Yes	111	(25.8)	98	(33.6)
	No	320	(74.2)	194	(66.4)
Income level	Low	46	(10.7)	31	(10.6)
	Middle	360	(83.5)	244	(83.6)
	High	25	(5.8)	17	(5.8)
Place of residence	Metropolis	346	(80.3)	231	(79.1)
	City center	28	(6.5)	21	(7.2)
	City	57	(13.2)	40	(13.7)
COVID-19 reatment status	Outpatient treatment	372	(86.3)	256	(87.7)
	Inpatient treatment	59	(13.7)	36	(12.3)

[a] Frequency.

Results of exploratory factor analysis

EFA was applied using the principal components method and the varimax axis rotation method to examine the scale's construct validity. The KMO value was .95, and Bartlett's test of sphericity was statistically significant (X^2 = 13381.534; $p < .001$).

As a result of the first-factor analysis, 11 factors with eigenvalues higher than one were obtained [39–41]. The following items were excluded from the scale: 4, 5, 12, 13, 19, 21, 33, 39, and 50 (boarding items); 35 (low factor load); 1, 17, 20, 23, 25, 26, 40, 41, 42, 43, 44, and 51 (not suitable for the theoretical structure). As a result, 22 items were removed, and the final scale comprised 27 items. Thus, five factors with eigenvalues greater than one were obtained. The total variance explained by the five factors in the scale was 59.2% (Table 2).

Confirmatory factor analysis

Table 3 shows the standardized factor loadings of the factors according to the primary-level CFA results applied to the scale. To test the convergent validity of the measurement model, mean explained variance (AVE) and CR values were calculated. The CR values, which are the combined reliability values calculated for the model, are between .74 and .92 and above .70, indicating that the combined reliability condition is fulfilled. The smallest AVE value is between .48 and .65 and is close to .50. It can also be seen that all CR values are greater than the AVE values (Tables 4 and 5, Fig. 3).

The scale met the primary CFA goodness-of-fit values (χ^2/SD = 1.96, GFI = .86, AGFI = .83, CFI = .93, IFI = .93, TLI = .93, RMSEA = .06, and SRMR = .06). Similarly, it met the goodness-of-fit values for the secondary-level CFA (χ^2/SD = 2.02, GFI = .85, AGFI = .82, CFI = .93, IFI = .93, TLI = .93, RMSEA = .06, and SRMR = .07) [39–41].

According to the secondary-level CFA results of the scale, factor loads on each subfactor are between .30 and .96. It can be seen that the calculated AVE value is .50, and the overall CR value is greater than the AVE value. Additionally, the R^2 values for all factors were .09, .50, .93, .49, and .70.

Reliability analysis

Cronbach's α values of the scale's subfactors are between .64 and .87, and the total Cronbach's α value of the scale is .88. To test the reliability of the parallel scale, a positive and moderately significant relationship was found between the scale and the EDAS applied simultaneously ($r = .51$, $p < .001$). A positive relationship exists between the scale and epidemic subdimensions ($r = .49$, $p < .001$), economic subdimension ($r = .38$, $p < .001$), quarantine subdimension ($r = .35$, $p < .001$), and social-life subdimension ($r = .38$, $p < .001$).

The scale was reapplied to the sample group 4 weeks after the first application. The correlation coefficient between the first and second application of the items should be at least .20 [42]. The correlation between .47 and .64 for the test–retest reliability of the scale was significant ($p < .001$), whereas repeated measurements did not show a statistically significant difference ($p > .999$). These results demonstrate that the scale is reliable and invariant over time.

Phase 3: finalization of the scale

The researchers finalized the scale, which comprised 27 items with scores between 27 and 135. Additionally, a structure with five subfactors was obtained in the scale. These factors include F1 (structural stigma) with 7 items (15, 16, 17, 18, 19, 20, 22), F2 (perceived stigma) with 6 items (1, 2, 3, 4, 5, 6), F3 (organizational stigma) with 5 items (23, 24, 25, 26, 27), F4 (internalized stigma) with 6 items (7, 8, 9, 10, 11, 12), and F5 (social stigma) with 3 items (13, 14, 21).

Table 2 *Results of Explanatory Factor Analysis and Descriptive Statistics (n = 431).*

Items	Mean ± SD[a]	F1	F2	F3	F4	F5
Item 31	3.75 ± 1.28	.831				
Item 32	3.51 ± 1.33	.800				
Item 29	3.57 ± 1.33	.764				
Item 34	3.87 ± 1.15	.742				
Item 36	3.44 ± 1.31	.687				
Item 30	3.3 ± 1.42	.679				
Item 38	3.93 ± 1.15	.653				
Item 8	2.16 ± 1.26		.841			
Item 7	2.35 ± 1.26		.779			
Item 9	2.21 ± 1.27		.749			
Item 3	2.24 ± 1.23		.696			
Item 6	2.35 ± 1.27		.674			
Item 2	1.7 ± 1.03		.673			
Item 47	0.13 ± .2			.781		
Item 46	1.76 ± 1.07			.779		
Item 49	2.01 ± 1.22			.773		
Item 48	2.08 ± 1.21			.743		
Item 45	2.26 ± 1.29			.691		
Item 15	2.2 ± 1.19				.747	
Item 16	2.0 ± 1.1				.629	
Item 24	2.75 ± 1.29				.618	
Item 18	2.48 ± 1.24				.614	
Item 22	2.12 ± 1.27				.607	
Item 11	1.92 ± 1.21				.606	
Item 27	3.37 ± 1.13					.749
Item 28	2.61 ± 1.18					.688
Item 37	2.65 ± 1.24					.607
Eigenvalues		4.07	3.74	3.25	3.12	1.82
Explained variance (%)		15.06	13.86	12.02	11.56	6.76
Cumulative variance (%)		15.06	28.92	40.94	52.51	59.26
Cronbach's α of each subscale		.87	.87	.84	.80	.64

Note. F1: structural Stigma, F2: perceived stigma, F3: organizational stigma, F4: internalized stigma, F5: social stigma.
Total Cronbach's α: 0.88.
[a] SD = standard deviation.

Table 3 *Validity and Reliability Analysis Factor Loads (n = 292).*

Factor name and items	Factor loads	*t*-value	AVE	CR
Factor 1: Structural stigma			.48	.86
29. People who catch epidemic diseases should have exclusive public transportation	.73			
30. People who catch epidemic diseases should not have treatments at hospital with other people	.59	9.56		
31. People who catches epidemic diseases should not be using the common areas with their neighbors	.78	12.64		
32. People should be distant from the people who catch epidemic diseases	.80	12.81		
34. People should be afraid of contacting with each other during pandemics	.62	9.94		
36. People who catch epidemic diseases are prevented to enter public building or social venues	.71	11.45		
38. People who catch epidemic diseases are taken an area away from other patients in the hospital	.59	9.49		
Factor 2: Perceived stigma			.65	.92
2. I would be embarrassed if I catch an epidemic disease	.80			
3. I would feel guilty if I catch an epidemic disease	.71	13.05		
6. I would feel alone if I catch an epidemic disease	.76	14.39		
7. I would feel resentful due to the reactions of the other people if I catch an epidemic disease	.79	15.04		
8. I would be afraid that people might judge me if I catch an epidemic disease	.90	18.13		
9. I would be afraid that people might not contact me if I catch an epidemic disease	.87	17.12		
Factor 3: Organizational stigma			.61	.88
45. People who catch epidemic diseases should be isolated from society	.63			
46. I would not want to take an elevator with healthcare workers	.89	11.96		
47. I would not want to live in the same apartment building with healthcare workers	.85	11.64		
48. Hospitals that allow patients with epidemic diseases should not be never visited	.76	10.69		
49. Healthcare workers who take care of people with epidemic diseases should not enter public areas	.75	10.62		
Factor 4: Internalized Stigma			.55	.88
11. If someone close to me (friends, family member etc.) catches an epidemic disease, I would be contacting them less	.67			
15. If I catch an epidemic disease, my friends would be more distant.	.84	12.50		
16. If I catch an epidemic disease, I would stop contacting with the people due to their reactions	.77	11.59		
18. If I catch an epidemic disease, I would not enjoy anything	.57	8.94		
22. If I catch an epidemic disease, relationships with my family would be affected	.79	11.91		
24. If I catch an epidemic disease, relationships with my social	.77	11.56		
Factor 5: Social stigma			.49	.74
27. People who catch epidemic diseases would be reluctant to tell to other people	.57			
28. People who catch epidemic diseases would be outcast from society	.79	8.72		
37. People who catch epidemic diseases would be discriminated from society	.73	8.48		

Note. AVE = average variance extracted; CR = composite reliability.
*$p < .001$.

Table 4 *Model Suitability (n = **292**).*

Model	CMIN/df	RMSEA	SRMR	GFI	AGFI	CFI	IFI	TLI
First	1.96	.06	.06	.86	0.83	.93	.93	.93
Second	2.02	.06	.07	.85	0.82	.93	.93	.92
Acceptable values	<3.0	<.08	<.08	>.90	>0.90	>.90	>.90	>.90

Note. AGFI = adjusted goodness-of-fit index; CFI = comparative fit index; CMIN/df = the ratio of chi-square to the degree of freedom; GFI = goodness-of-fit index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR, standardized root mean squared residual; TLI = Tucker–Lewis index.

Table 5 *Factor Loadings, Convergent Validity, and Composite Reliability for Second-Order Model of the TSEDS (n = 292).*

Main construct/subconstruct	Factor loads	*t*-value	R^2	AVE	CR
TSEDS				.50	.83
Structural stigma	.30		.09		
Perceived stigma	.71	4.15	.50		
Organizational stigma	.96	4.32	.93		
Internalized stigma	.70	3.99	.49		
Social stigma	.83	4.39	.70		

Note. AVE = average variance extracted; CR = composite reliability; TSEDS = Tendency to Stigmatize Epidemic Diseases Scale.
$^*p < 0.001$.

Discussion

This study aimed to test the scale's psychometric properties to determine the level of stigma associated with epidemics. To test its construct validity, a five-factor model was determined to obtain a simple optimal structure that is easy to interpret using the principal components method and varimax axis rotation method. The scale reflects conceptual theory within the framework of elements in the stigma structure [10]. The scale developed in this context includes concepts of individual, social, and structural stigma [10]. Overall, the CFA results show that stigma fits well with its theoretical structure. The scale was finalized with 27 items at the end of the analysis. Additionally, a correlation was observed between the internal consistency of the scale and the overall scale. The load score of the total and subdimensions was calculated on the scale, showing that the items had structural precision, and the scale's total score represented the entire structure of the feature to be measured.

The scale's factor structure was determined to have five components representing structural, perceived, organizational, internalized, and social stigma load. When compared with other scales related to stigma, differences and similarities were observed [9,43]. Internalized stigmatization concepts, which are perceived in field-based scales, are more common. However, the concepts of social, organizational, and structural stigmatization do not coexist. The level of internalized stigma draws attention to low self-esteem and self-evaluation, and individuals are exposed to social, organizational, and structural stigma. Thus, it is important to include questions that investigate stigmatization tendencies during epidemics more comprehensively. In this way, it is possible to help individuals in the early detection and intervention of psychological, emotional, and social problems. This scale is crucial because it allows individuals to measure the stigmatization tendency during epidemics with all dimensions. In this study, the conceptual structure and main framework of the stigma phenomenon during epidemics were developed using classical and current sources [9,43,44]. Additionally, the Delphi technique was used to create an item pool and evaluate content validity.

CFA was used to evaluate whether the items in a scale were adequately represented in the specified subscales and whether the subscales sufficiently explained the structure of the scale. The fit indices and factor loadings evaluated the model's fit. Structural stigma, the first of the defined factors, is the creation of injustice and inequality of opportunity in the system itself, such as restricting opportunities against groups in society by sociopolitical forces and not allocating sufficient shares from government budgets [10]. It seems that structural stigma is addressed more in cases such as mental diseases, sexual orientation, and HIV/AIDS [7,10,15]. However, with the experience of the COVID-19 pandemic, the importance of structural stigma has also been seen. That's why we worked extensively on these dimensions and items with our expert team. Individuals' structural stigmatization tendency can be evaluated with the TSEDS scale developed in this study. Additionally, it is seen that 15.1% of the total variance of the scale belongs to this dimension.

The second factor is perceived stigma, how the stigmatized individual feels about the stigma [10]. Guilt, discrimination, fear, etc. are included as negative emotions in many stigma scales [9,14,17,27]. Our second factor, which constitutes 13.9% of the total variance of the scale, can evaluate the perceived stigmatization tendency, including these emotions, with six items. We think that this dimension should especially be taken into consideration in individualized nursing care. An increase in this tendency in individuals receiving health services may cause treatment and care to be ineffective.

The third factor is organizational stigma, the stigma experienced during daily transactions in the public sphere [10]. This dimension refers to the problems that may be experienced in areas such as hospitals, workplaces, public institutions, etc. [10]. It is seen that Kuramochi's Epilepsy Self-Stigmatization Scale is addressed in two items as the dimension of social incomprehension [14]. However, it is insufficient in measuring this dimension. The organizational stigma dimension, which constitutes 12.0% of the total variance in the scale we developed, consists of a total of five items. Measuring this dimension can play a fundamental role in creating nurses' health communication strategies.

The fourth factor is internalized stigma, where the stigmatized individual accepts the attributions, internalizes them, assimilates the beliefs of the society and embraces the existence of this situation [10]. It is seen that this dimension is mostly addressed in studies on the stigma scale [9,14,17,27]. The internalized stigma dimension, which constitutes 11.6% of the total variance in the TSEDS, consists of a total of six items. In CFA, the correlation between the perceived stigma subfactor and the internalized stigma subfactor was found to be .81. Looking at the correlation coefficients between the factors, these values should not be .85 or above [36,40]. On the scale we developed, this value seems close to the upper limit. However, a strong theoretical relationship between subdimensions may cause the correlation to increase, but perceived stigma is a situation in which the individual or others feel at risk of experiencing negative stigma or discrimination. Internalized stigma, on the other hand, is the situation in which the individual develops beliefs against society's negative perceptions of stigma and discrimination and identifies these negative beliefs with the identity [10,12,17,18]. When examined within the scope of the conceptual framework of stigma, CFA results support the structure of the scale and show that it is a valuable tool that can be used.

The fifth factor, social stigma, is the social and psychological reactions, intolerant behaviors and attitudes that society shows toward a stigmatized person or group [10]. Social stigma is addressed with eight items in the social isolation dimension in the cancer stigma scale [9]. There are a total of three items in this dimension, which constitute 6.8% of the total variance in the TSEDS.

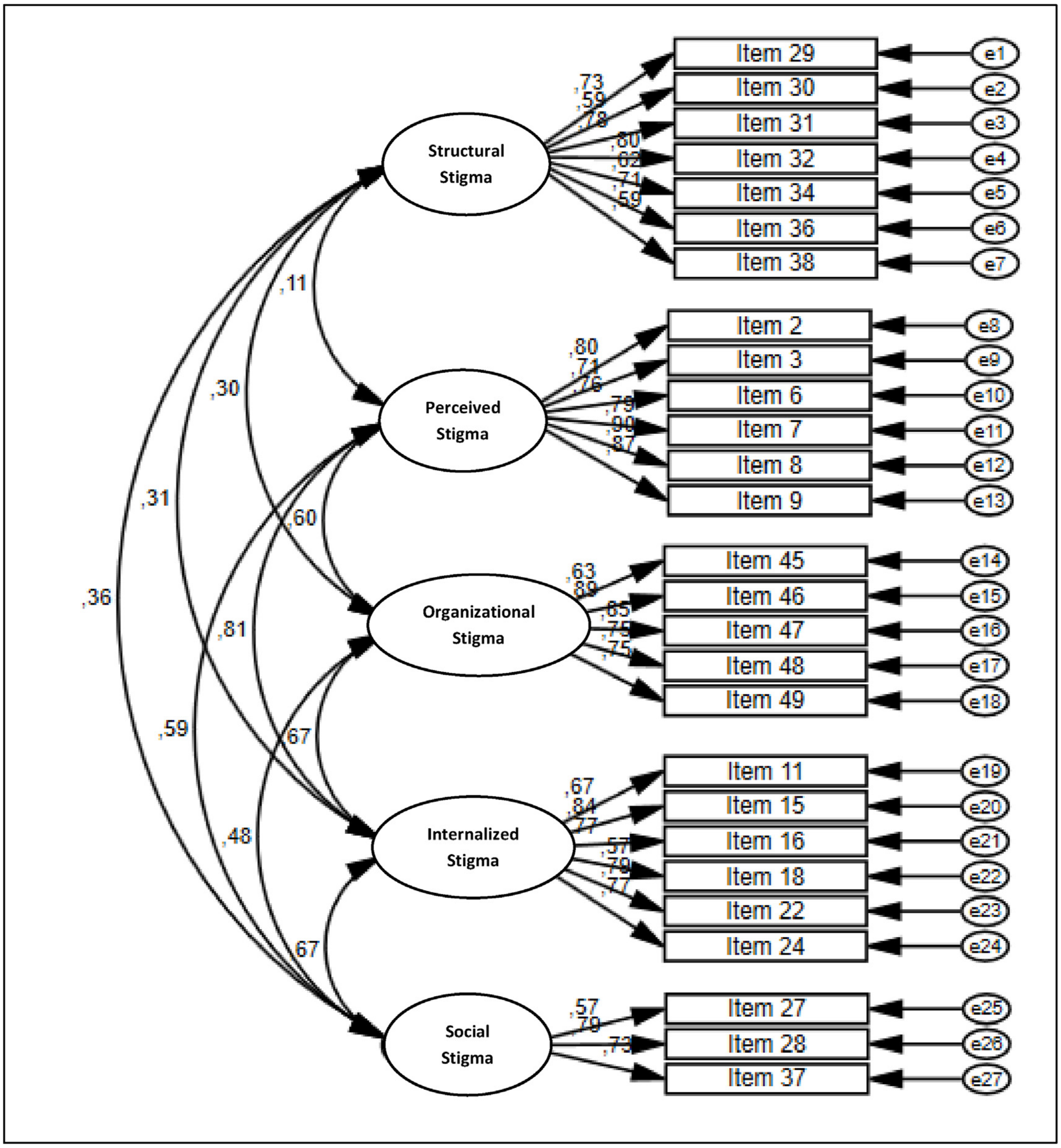

Figure 3. Confirmatory Factor Analysis of the Tendency to Stigmatize Epidemic Diseases Scale ($n = 292$).

This scale, we developed, can measure the tendency to be stigmatized in a broad perspective, in line with the conceptual framework of stigma. Reliable measurement of stigmatization tendency from a broad perspective can help understand how supportive the society is in the process of combating epidemics. Nurses should encourage the cooperation of the society with these measurements and serve as a bridge between the health authorities and the society.

As a result, the tendency to stigmatization may negatively affect individuals' compliance with treatment and protective measures, may cause individuals to remain silent about disease symptoms or contact or avoid sharing information. Additionally, stigma may cause psychosocial effects such as stress, anxiety, and depression in individuals. These situations can cause treatment ineffectiveness, make the epidemic difficult to control, and contribute to the spread of the disease. Therefore, it is important to determine the stigmatization tendency of individuals in epidemic diseases and to reduce this tendency because stigma can cause patients to avoid seeking their treatment or coming into contact with other people. Nurses play a key role in tackling stigma and helping educate society against such false beliefs and prejudices. Therefore, it is important for nurses to have measurement tools for epidemic diseases in order to provide rapid intervention.

Conclusion

This study showed that the scale developed to determine the tendency to stigmatize epidemic disease is valuable and reliable. It is the first scale developed on this subject, and it may encourage the development of strategies to reduce stigma during epidemics. This scale can ensure that nurses are aware of the society's emotions and behaviors related to epidemic diseases. In this way, positive patient outcomes can be achieved for the society, such as receiving quality nursing care, treatment compliance, and increased access. Additionally, the nurse–patient relationship process can be positively affected. It can also be used in different cultures after being translated into other languages. Further research is recommended to evaluate the risk factors for stigma in adults during epidemics. It is recommended that validity and reliability studies be conducted among individuals from different countries and cultural backgrounds to verify the applicability of the scale in future studies on TSEDS.

Conflict of interest

The authors have no relationships of financial support or other relationships that might pose a conflict of interest.

CRediT authorship contribution statement

Sevim Şen: Formal analysis, Investigation, Resources, Data curation, Writing—Original draft, Writing—Review & editing, Supervision. **Hediye Arslan Özkan**: Writing—Review and editing—Supervision. **Ceren Zeren**: Investigation, Data curation, Writing—Review and editing—Resources. **Begüm Kırık**: Investigation, Data curation, Writing—Review and editing—Resources.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2024.01.001.

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Research Article

Online Gambling Patterns and Predictors of Problem Gambling Among Korean Adolescents During the COVID-19 Pandemic: A Cross-sectional Study

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SUMMARY

Purpose: This study examined online gambling patterns among Korean adolescents during the COVID-19 pandemic and identified predictors of problem gambling based on a socio-ecological model.
Methods: It used nationally representative data from the 2020 National Survey on Youth Gambling Problems conducted by the Korea Center on Gambling Problems. This study selected a sample of 780 adolescents aged 13–18 years who reported having gambled online at least once in the last three months from the raw data of respondents. They were classified as the non-problem group and problem group according to the Gambling Problems Severity Scale (GPSS) of the Canadian Adolescent Gambling Inventory (CAGI). The predictive factors of problem gambling were analyzed by logistic regression analysis.
Results: The prevalence of problem gambling was 24.6 %. Its predictors included intrapersonal [male (odds ratios, OR = 1.67); gambling prior to COVID-19 (OR = 2.08)] and interpersonal factors [frequent gamblers in peers (OR = 4.34); peer pressure (OR = 2.34)]. Social factors, such as gambling in online community (OR = 5.60), sports betting (OR = 53.24), and lotteries (OR = 17.03) were associated with problem gambling.
Conclusions: The major predictors of problem gambling among adolescent online gamblers included peer gambling and specific types of gambling. To prevent problem gambling, strategies targeting peer groups are essential. In addition, nurses need to share with families, schools, communities, and policymakers that online gambling, such as lotteries and sports betting, are high-risk of adolescent problem gambling, and recommend them to collaborate for stricter regulatory measures.

Introduction

Since the outbreak of COVID-19, land-based gambling has decreased on account of the limited operation of facilities and the imposition of social distancing, while participation in online gambling increased [1]. Online gambling is becoming increasingly popular among young people due to its easy accessibility and the ability to enjoy it through digital devices, such as smartphones, and it is widely promoted through online gambling advertisements and the spread of related content [2,3]. Compared to other age groups, adolescents spend more time online, are frequently exposed to online gambling advertisements, and are more likely to be involved in online gambling, which shares similar styles and platforms with online games they are already familiar with [4–6]. Global participation rates in online gambling among adolescents ranged from 8.1 % [7] to as high as 32.8 % [8] prior to the COVID-19 pandemic, and it has been reported that the number of gamblers has increased by about 20.0 % in the post-COVID period [1]. This indicates that online gambling is no longer a problem behavior limited to specific groups, but has become a global mental health issue for adolescents worldwide.

During the pandemic-related lockdown, adolescents experienced increased levels of boredom, depression, and anxiety as they spent more time at home [9]. The increased time spent online to

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cope with emotional problems may have influenced their participation in online gambling [10,11]. Gambling companies are increasingly shifting their attention to online and are actively marketing their services on websites, social media platforms, and games that are popular among young people [4,6,12]. Marketing strategies that provide incentives for referring new acquaintances are accelerating the spread of online gambling among young people [13,14]. Furthermore, novice gamblers are frequently provided with complimentary chances to gamble, making it simple for financially inactive adolescents to begin gambling [15,16]. The direct marketing of online gambling sites and the sharp increase in online activities during the pandemic have not only led to the initiation of online gambling among young people but also to their continued involvement, leading to problem gambling [6,17].

Problem gambling has been defined as a gambling behavior that disrupts daily life and is difficult to quit despite negative financial, mental, and physical health consequences [18]. Problem gambling among adolescents has been associated with poor academic achievement, the breakdown of relationships, substance abuse, and depression, all of which can hinder their overall growth and development [7,19,20]. The prevalence of problematic online gambling in adolescents is reported to be 7.5–18.1 % [18], which is two to three times higher than the 0.12–5.8 % prevalence observed in all age groups [21]. Due to characteristics such as impulsiveness, high risk-taking, immaturity in self-regulation and coping, and vulnerability to addiction, adolescents are more likely than adults to become problem gamblers once they are involved in gambling [2,4]. Furthermore, problem gambling among adolescents is often concealed, making it challenging to detect before it becomes severe, and it may persist into adulthood [2]. Therefore, early detection and preventive measures are particularly crucial for adolescents.

To effectively prevent problem gambling among adolescents, it is necessary to verify predictors. The related factors of problem gambling identified in previous studies were intrapersonal, interpersonal, and social factors. There was gender, age, socioeconomic status [7,20,22,23], and gambling history such as gambling experience and age of first participation [7,22,24] as intrapersonal factors, and parental attachment, family and peer gambling [7,14,16,24,25] as interpersonal factors. And the exposure of gambling facilities and advertisements [6,16,17,25,26], the venue and specific type of gambling [15,22,24], and online gambling community participation [26,27] were social factors influencing problem gambling. This suggests that several factors at the multi-level of the ecological system impact on problem gambling.

The factors associated with problem gambling interact with one another at the multi-level, so a comprehensive understanding of problem gambling is difficult if these factors are considered independently [23,26]. Hence, it is necessary to investigate based on a socio-ecological model that can integratively consider the intrapersonal, interpersonal, and social factors affecting adolescents. This model should be employed to consider the social context, especially the critical social event, the COVID-19 pandemic has triggered changes in various ecological factors highly related to online gambling, potentially contributing to problem gambling [22,24]. During this period, adolescents spent more time engaging in online activities such as video games and social networking, which were already familiar to them due to social isolation [10,11]. Consequently, they were much more likely to be exposed to gambling advertisements and marketing campaigns on these online platforms compared to other age groups [2,6,28,29]. The pandemic-induced changes in environments have led to shifts in individuals and relationships, and have influenced the ecological systems related to online gambling among adolescents. This suggests that the factors associated with problem gambling have changed during the pandemic, indicating limitations in understanding problem gambling using current research and evidence. Therefore, it is appropriate to employ a socio-ecological model to gain a comprehensive understanding of adolescent problem gambling, taking into account the altered influencing factors during the COVID-19 pandemic.

The escalating mental health issues among adolescents in the post-COVID era have become a cause for concern, necessitating the efforts by nurses to address this situation. Particularly, identifying the predictive factors of the increasing online gambling problems post-COVID can be particularly beneficial for nurses in managing adolescent mental health issues. It can also provide a new perspective for improving practice in early detection and preventing problem gambling. Therefore, this study aims to investigate the online gambling behaviors of adolescents during the COVID-19 period and comprehensively examine the multi-level predictive factors of problem gambling based on a socio-ecological model.

Methods

Study design

This descriptive secondary data analysis study utilized nationally representative data from the 2020 National Survey on Youth Gambling Problems (2020 NSYGP) [19].

Study sample

The participants of this study are adolescents who have gambled online during the COVID-19 pandemic. The respondents who reported to have participated in online gambling in the past three months in the 2020 NSYGP [19] were selected as the study sample. A total of 780 participants who met the criteria were included in the analysis for this study.

Data collection

The raw data of this study was the 2020 NSYGP, which had been collected by the Korea Center on Gambling Problems [19]. This nationwide cross-sectional survey was conducted to assess the gambling problems of the 15,349 Korean adolescents attending middle and high schools from September 7 to October 23, 2020. A stratified cluster sampling method was used to obtain a nationally representative sample of Korean adolescents. The method employed stratified variables, including the region (17 metropolitan cities and provinces) and school level (middle school, general high school, and specialized high school). After the survey, post-stratification and weighting were applied to align the distribution of the sample with that of the population. The 2020 NSYGP allowed respondents to choose their preferred survey method (offline or online) due to the pandemic. It was confirmed that there was no significant effect of the selection in the 2020 NSYGP report.

Measures

The survey questionnaire used in the 2020 NSYGP was designed by experts from the National Youth Policy Institute and the Korea Center on Gambling Problems [19]. The survey items were finalized after undergoing validity reviews by experts in the youth, education, mental health fields, as well as middle and high school teachers. In this study, specific survey items were selected as research variables based on the socio-ecological model, considering factors at the intrapersonal, interpersonal, and community and social levels, as discussed by the research team.

Problem gambling severity

The survey used the 9-item Gambling Problems Severity Scale (GPSS) from the Canadian Adolescents Gambling Inventory (CAGI), a 24-item self-report measurement tool, to assess gambling problems in adolescents aged 13–17 years [30]. It used the Korean version of the GPSS, verified as reliable and valid by the Korea Center on Gambling Problems [31]. Each item was measured on a four-point Likert scale (0–3 points), with total scores ranging from 0–27 points. The severity scoring of the CAGI/GPSS is as follows: Level 1 (0–1) is "green," which indicates no problem gambling; Level 2 (2–5) is "yellow," which indicates low to moderate severity; and Level 3 (6 or more) is "red," which indicates high severity. For analysis, Level 1 was classified as the non-problem group (NPG), and Levels 2 and 3 as the problem group (PG). At the time of GPSS development, the Cronbach's α value was 0.83–0.90, and that of the Korean version was 0.85. The Cronbach's α value in the 2020 NSYGP was 0.818.

Intrapersonal factors

Intrapersonal factors include socio-demographic variables such as gender, age, school grade, area of residence, and monthly allowance. The variable "age of gambling onset" refers to the age at which gambling is first involved, and the question of whether they had ever participated in gambling prior to the COVID-19 pandemic was named "gambling before COVID-19" and coded as "yes" or "no".

Interpersonal factors

Variables related to family and friends were included at the interpersonal level in this study. The satisfaction levels of relationships with family and peers were assessed using a Likert scale, which ranged from 0 (not at all satisfied) to 10 (very satisfied). When asked about the presence of frequent gamblers surrounding, respondents were asked to answer "yes" or "no". Those who answered "yes" were categorized as family if the gambler was a parent, sibling, or relative and as peers if they were friends or juniors/seniors from school. This variable was named "frequent gamblers around" and coded as "no", "family", and "peers". The respondents coded "yes" or "no" depending on whether the gambling they had recently participated in was introduced by a friend, and the variable was named "peer pressure".

Community/social factors

Community and social factors included the presence of gambling facilities nearby, media exposure to gambling, gambling in online community, gambling prevention education, anti-gambling campaigns, and the specific types of online gambling involved. The variable "nearby gambling facilities" was coded as "yes" or "no" in response to the question of whether there are gambling facilities (such as race tracks, lottery venues, and adult arcades) in the proximity of the residential area. The "media exposure to gambling" refers to gambling exposure through mass and social media, such as TV, movies, online advertising, online communities, and video-sharing platforms. It was coded as "yes" or "no" based on the presence of exposure. Respondents who reported that they had participated in gambling with online community members within the last three months were coded as "yes" in the variable for "gambling in online community". Similarly, the participants were asked to answer whether they had participated in gambling prevention education and whether they had been exposed to a problem gambling awareness campaign or booklet. Their responses were then transformed into variables for "gambling prevention education" and "anti-gambling campaigns". The "types of online gambling" that are accessible to adolescents is classified into six categories: betting games (such as bingo or graph games), card games, casinos, sports betting, lotteries, and sports pools. It was investigated that for the presence of participation and frequency for each type, frequency was categorized as "less than once a month", "monthly", "weekly", and "daily". To examine regular participation by each type of online gambling, we categorized participants based on whether they engaged at least once a week. Respondents who reported weekly or daily participation were coded as "yes" for that type, while others were coded as "no".

Data analysis

All estimations were calculated based on the weights and were analyzed using IBM SPSS Statistics for Windows, version 25.0. The raw data underwent an editing process to identify and remove untrustworthy responses and data errors at the institution that conducted the 2020 NSYGP. Data cleaning was then completed to address any abnormalities in the edited data by analysis professionals and survey researchers [19]. This study sample was selected from the raw data, and there was no missing data. Descriptive statistics were used to examine the distribution of demographic and gambling-related characteristics. The difference between the NPG and the PG was analyzed using Chi-square tests, and the predictors of problem gambling, based on a socio-ecological model, using logistic regression analysis. The probability of problem gambling when exposed to gambling-related factors was calculated as odds ratios (OR), and statistical significance was analyzed by setting a two-tailed test at a significance level of 0.05.

Ethical considerations

We stated the purpose and execution plan of this study and submitted an application for the use of data along with a written oath to the Korea Center on Gambling Problems, and received the raw data via e-mail. The data provided by the institution did not contain personally identifiable information. This study was granted permission to be exempted from the institutional review board reviewed prior to the conduction of the research (Approval no. PNU IRB/2022_14_HR).

Results

In this study, 24.6 % of the samples were classified as the PG, while 75.4 % were categorized as the NPG. The mean age of the participants was 16.46 ± 1.74 years. The most popular types of online gambling participated in over the past three months included betting games and card games. Table 1 illustrates the demographic and gambling-related characteristics of the sample.

Figure 1 illustrates the frequency of online gambling by type to analyze patterns of gambling behavior. In card games, over half (56.6 %) of the participants gamble more than once a month, and the proportion of monthly gambling was the highest (35.9 %). Following this, the prevalence of monthly gambling was high in the order of betting games (29.9 %), casinos (25.2 %), and sports betting (24.0 %). The type of the highest percentage of regular participation, gambled more than once a week, was sports betting (23.7 %), followed by lotteries (21.6 %), and card games (20.7 %). The proportion of daily gambling was highest in card games (4.9 %) and sports betting (4.6 %).

There was a significant difference between the NPG and the PG in relation to regular gambling across all types of online gambling (Table 2). It was confirmed that a higher proportion of regular participants was found in the PG compared to the NPG in

Table 1 *Demographic and Gambling-related Characteristics of the Study Participants (N = 780).*

	Online gamblers	NPG (*n* = 580)	PG (*n* = 200)
	n (weighted %)/M ± SD		
Intrapersonal			
Gender			
Women	362 (42.5)	304 (48.2)	58 (25.0)
Men	418 (57.5)	276 (51.8)	142 (75.0)
Age (years)	16.64 ± 1.74	16.49 ± 1.73	17.09 ± 1.67
School grade			
Middle school	334 (42.7)	270 (46.1)	64 (32.3)
High school	446 (57.3)	310 (53.9)	136 (67.7)
Residence areas			
Capital	60 (19.1)	48 (20.4)	12 (14.9)
Metropolitan	272 (21.2)	196 (20.3)	76 (24.2)
Province	448 (59.7)	336 (59.3)	112 (60.8)
Monthly allowance (USD)			
Less than 80	544 (67.3)	424 (71.7)	120 (53.8)
More than 80	236 (32.7)	156 (28.3)	80 (46.2)
Age of gambling onset (years)	14.72 ± 2.88	14.87 ± 2.81	14.63 ± 3.09
Gambling prior to COVID-19			
No	380 (48.0)	322 (53.8)	58 (30.3)
Yes	400 (52.0)	258 (46.2)	142 (69.7)
Interpersonal			
Satisfaction with relationship with parents	7.56 ± 2.29	7.71 ± 2.16	7.11 ± 2.60
Satisfaction with relationship with peers	7.34 ± 2.15	7.43 ± 2.17	7.05 ± 2.07
Frequent gamblers around			
No	620 (80.8)	503 (88.4)	117 (57.4)
Family	28 (2.8)	22 (3.2)	6 (1.5)
Peers	132 (16.4)	55 (8.4)	77 (41.0)
Peer pressure			
No	580 (75.4)	479 (82.9)	101 (52.3)
Yes	200 (24.6)	101 (17.1)	99 (47.7)
Community/society			
Nearby gambling facilities			
No	652 (81.2)	496 (82.6)	156 (76.9)
Yes	128 (18.8)	84 (17.4)	44 (23.1)
Media exposure to gambling			
No	610 (76.3)	451 (76.2)	159 (76.4)
Yes	170 (23.7)	129 (23.8)	41 (23.6)
Gambling in online community			
No	722 (91.0)	554 (95.0)	168 (79.0)
Yes	58 (9.0)	26 (5.0)	32 (21.0)
Gambling prevention education			
No	336 (42.4)	251 (42.5)	85 (42.3)
Yes	444 (57.6)	329 (57.5)	115 (57.7)
Anti-gambling campaigns			
No	278 (36.6)	209 (37.9)	36 (32.7)
Yes	502 (63.4)	371 (62.1)	131 (67.3)
Types of online gambling[a]			
Betting games	460 (32.0)	340 (35.9)	120 (24.0)
Card games	352 (25.6)	253 (28.2)	99 (20.5)
Casinos	171 (11.8)	88 (10.6)	63 (14.2)
Sports betting	165 (11.4)	86 (8.4)	79 (17.4)
Lotteries	137 (9.9)	83 (8.3)	54 (13.2)
Sports pools	131 (9.2)	80 (8.5)	51 (10.7)

Note. M = mean, NPG = non-problem gamblers, PG = problem gamblers, SD = standard deviation, USD = united states dollar.

[a] Multiple response.

betting games ($X^2 = 45.612$, $p < .001$), card games ($X^2 = 5.780$, $p = .016$), casinos ($X^2 = 56.754$, $p < .001$), sports betting ($X^2 = 113.318$, $p < .001$), lotteries ($X^2 = 82.589$, $p < .001$), and sports pools ($X^2 = 42.745$, $p < .001$).

The analysis of multicollinearity in the related variables for problem gambling revealed that the tolerance limit ranged from 0.369 to 0.910, which was below 1.0, and the variance inflation factor ranged from 1.051 to 2.708, which was lower than 10, indicating that there was no problem of multicollinearity. We analyzed logistic regression analysis based on a socio-ecological model to identify the predictors for problem gambling among adolescent online gamblers (Table 3). Related variables were classified as intrapersonal, interpersonal, and community/society levels to be included in the model, and conducted a Hosmer–Lemeshow test to verify the fitness of the model, confirmed at 7.14 ($p = .521$). At the intrapersonal level, the probability of problem gambling is 1.67 times higher in male adolescents than in females, and 2.08 times higher in those who gambled prior to COVID-19 than those who did not. In terms of interpersonal level, participants who existed frequent gamblers in peers (OR = 4.34) or had peer pressure (OR = 2.34) were associated with a higher probability of being a problem gambler than participants who did not. At the community/society level, adolescents who gamble in online communities are 5.6 times more likely to experience problem gambling. Regular participants in sports betting (OR = 53.24) and lotteries (OR = 17.03) had a higher probability of being a problem gambler compared to those who did not.

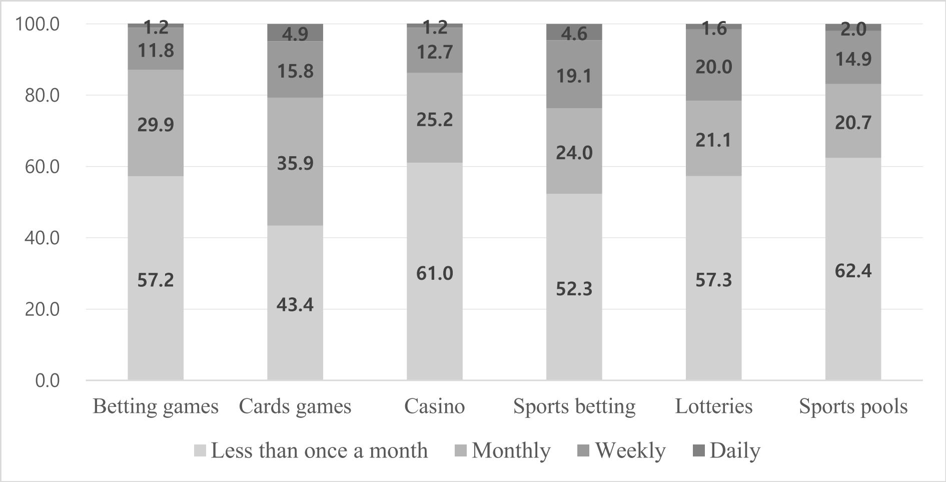

Figure 1. Frequency of Online Gambling by Type.

Discussion

We used a socio-ecological model to identify significant predictors of problem gambling among adolescent online gamblers. This was achieved by considering intrapersonal factors, such as gender and previous gambling experience prior to the COVID-19 pandemic, as well as interpersonal factors, such as peer pressure and frequent gambling within the peer group. At the social level, gambling in online communities, including specific types of gambling like online sports betting and lotteries, was found to be predictive of problem gambling.

The percentage of Korean adolescents participating in online gambling increased from 8.2 % in 2018 to 11.7 % in 2020 [19]. During the pandemic, reports indicated that 9.4 % of Spanish adolescents participated in online gambling [32], while the percentage was significantly higher at 22.5 % in Italy [33]. The prevalence of online gambling has risen by 11–20 % in numerous countries as a result of the effects of pandemic-related lockdowns, particularly among younger age groups [1,3]. Thus, the findings of this study demonstrate a growing trend of online gambling behaviors among adolescents worldwide. In addition, a considerable proportion of adolescents engaged in betting games, card games, and casinos during the COVID-19 pandemic that is a similar online gambling pattern of many adults who participated in horse betting, casinos, and poker [34]. The type of online gambling with a higher proportion of regular participation was sports betting, lotteries, and

Table 2 *Differences Between NPG and PG in Regular Gambling by the Types (N = 780).*

	NPG (n = 580)	PG (n = 200)	X^2	P
	n (weighted %)			
Betting games				
Yes	22 (3.8)	42 (18.5)	45.612	<.001
No	558 (96.2)	158 (81.5)		
Card games				
Yes	43 (8.0)	35 (13.8)	5.780	.016
No	537 (92.0)	165 (86.2)		
Casinos				
Yes	3 (0.3)	21 (10.8)	56.754	<.001
No	577 (99.7)	179 (89.2)		
Sports betting				
Yes	2 (0.2)	35 (19.0)	113.318	<.001
No	578 (99.8)	165 (81.0)		
Lotteries				
Yes	3 (0.3)	23 (14.9)	82.589	<.001
No	577 (99.7)	177 (85.1)		
Sports pools				
Yes	4 (0.7)	21 (9.7)	42.745	<.001
No	576 (99.3)	179 (90.3)		

Note. NPG = non-problem gamblers, PG = problem gamblers.

Table 3 *Logistic Regression Analysis of Problem Gambling Among Adolescent Online Gamblers (N = 780).*

Variables	Exp(B)	SE	OR	95 % CI	P
Intrapersonal					
Gender					
Women (ref)	—	—	—	—	—
Men	0.51	0.23	1.67	1.06–2.65	*.027*
Age	−0.07	0.08	0.93	0.79–1.09	.379
Residence areas					
Capital (ref)	—	—	—	—	—
Metropolitan	0.44	0.35	1.55	0.77–3.11	.214
Province	0.31	0.30	1.37	0.74–2.51	.306
Monthly allowance (USD)					
Less than 80 (ref)	—	—	—	—	—
More than 80	0.14	0.24	1.15	0.71–1.86	.568
Age of gambling onset	0.01	0.05	1.00	0.91–1.11	.914
Gambling prior to COVID-19[a]	0.73	0.30	2.08	1.15–3.77	*.015*
Interpersonal					
Satisfaction with relationship with parents	−0.05	0.04	0.94	0.85–1.03	.233
Satisfaction with relationship with peers	−0.09	0.05	0.90	0.82–1.00	.063
Frequent gamblers around					
Family	−0.55	0.71	0.57	0.14–2.30	.433
Peers	1.46	0.28	4.34	2.49–7.55	*<.001*
Peer pressure[a]	0.85	0.26	2.34	1.40–3.90	*.001*
Community/Society					
Nearby gambling facilities[a]	−0.29	0.28	0.74	0.42–1.30	.302
Media exposure to gambling[a]	0.14	0.28	1.15	0.66–2.00	.605
Gambling in online community[a]	1.72	0.31	5.60	3.00–10.46	*<.001*
Gambling prevention education[a]	−0.01	0.25	0.99	0.60–1.65	.993
Anti-gambling campaign[a]	0.04	0.27	1.04	0.61–1.78	.864
Types of online gambling					
Betting games	0.45	0.45	1.56	0.64–3.81	.320
Card games	−0.29	0.38	0.74	0.35–1.57	.438
Casinos	0.53	1.23	1.70	0.15–19.11	.667
Sports betting	3.97	1.08	53.24	6.40–442.88	*<.001*
Lotteries	2.83	1.01	17.03	2.32–124.77	*.005*
Sports pools	0.34	1.05	1.40	0.17–11.13	.746

Nagelkerke R^2, 0.45(-2 log likelihood, 597.81, $p < 0.001$).
Note. CI = confidence interval, OR = odds ratios, SE = standard error, USD = United States dollar.
[a] Reference category: no.

card games in this study. Adolescents with a limited comprehension of the potential risks associated with gambling may more frequently engage in these types of online gambling. Consequently, it is essential to implement educational interventions to assist adolescents in recognizing the problems and risks associated with online gambling.

The prevalence of problem gambling among adolescent online gamblers during the COVID-19 pandemic was 24.6 %. The prevalence of problem gambling was higher than the 21.9 % reported in a systematic literature review of studies using representative samples of adolescents prior to the pandemic [18], and also much higher than the 9 % prevalence in adults [35]. Several studies have assessed problem gambling, including land-based gambling, using different measurement tools, so attention should be needed in comparing the results of this study. While many studies have utilized tools to measure gambling behavior over the past year or lifetime, this study has investigated online gambling in the last three months, so it can be interpreted by focusing on behavior patterns among adolescents during the COVID-19 pandemic. The 24.6 % prevalence of problem gambling among adolescents in the early stages of the pandemic is expected to worsen in the future, due to the increase in online gambling content and direct marketing targeting young people [17,36]. The high prevalence of problem gambling among adolescents presented in this study suggests that clinical and community nurses should prioritize online gambling as a significant mental health concern for adolescents, especially in the post-COVID era. As a result, it is essential for nurses to have the ability to monitor and precisely detect the escalating issue of online gambling among adolescents, and practical interventions to effectively manage it.

At the intrapersonal level, adolescent online gamblers who were significantly more likely to have problem gambling were adolescents with gambling prior to COVID-19 and males. This finding is consistent with previous studies that have shown men to be more likely than women to be involved in online gambling and become problem gamblers [20,22–25,37]. The significant association between gambling prior to COVID-19 and problem gambling was similar with previous research suggesting that younger people are more likely to continue gambling once they have started [3,25,29,35]. Previous gambling experiences among adolescents may have been triggered by the unprecedented situation of the COVID-19 pandemic, resulting in heightened participation in online gambling and an exacerbated risk of problem gambling. Therefore, as adolescents who have ever gambled are at a high risk of problem gambling, community-based screening examinations by nurses could contribute to the early detection and prevention of problem gambling by identifying individual factors, such as gambling behavior.

At the interpersonal level, perceived peer gambling and peer pressure were identified as factors that influence problem gambling among adolescent online gamblers. Young people may gamble with friends to foster camaraderie or a sense of belonging to a peer group, and they are more likely to consider gambling as a means to socialize with friends, introduce it to other friends, and enjoy it together, similar to online games [13,38]. During the pandemic, adolescents have had increased chances to engage in online gaming or gambling with peers as a result of social distancing measures [39], similar to adult gamblers who participate in gambling as a social activity [40]. These factors may ultimately contribute to the development of problem gambling and have adverse effects on their relationships with peers. Meanwhile, a high-quality friendship, characterized by a strong sense of cohesion, can become an important source of support and a key factor in reducing problem behaviors [26]. However, this secondary data analysis study was unable to identify the factor of friendship quality. Follow-up studies should investigate the protective factors of peer influence among adolescents. From a nursing practice perspective, it is essential to provide peer groups with health education and counseling to prevent the normalization of online gambling. Additionally, nurses should share the concerns about online gambling to families and school teachers, encouraging them to pay attention and guide adolescents toward healthy activities with their peers.

Gambling in online communities was significantly associated with adolescent problem gambling. Only about 20 % of gambling-related online communities are dedicated to preventing or treating problem gambling, while the rest are operated for the purpose of sharing gambling tips or experiences with members and involve in gambling together [26]. Additionally, online gambling communities provide a tempting environment for adolescents through aggressive marketing as well as support from fellow members of these communities. Therefore, adolescents may be more likely to begin or lead more gambling due to the influence of perceptions or behaviors related to gambling, especially if participated in the community with a strong interest in gambling [6,26,27]. Therefore, they should be able to recognize harmful elements online, such as gambling communities and content like the numerous advertisements and marketing that encourage participation in online gambling. School nurses should improve media literacy among adolescents so that they can critically evaluate the risk factors encountered during internet activities.

In this study, sports betting and lotteries were the most significant predictors of problem gambling among adolescent online gamblers. As lockdowns related to the pandemic made it impossible to attend sports events in stadiums, online sports betting has emerged as an entertainment activity that appeals to young people with marketing strategies that promise vicarious gratification [36]. Consequently, online sports betting has become the most favored option among gamblers who have engaged in gambling more frequently than ever before during the pandemic [35]. Online lotteries can also be more appealing to adolescents because they can quickly check the results with a small bet, and the sound and visual effects are similar to those of other online games [41]. Considering these appealing aspects, sports betting, and lotteries may be even greater risk to adolescents. Furthermore, they may be perceived as less problematic, as watching and enjoying sports games are socially acceptable activities, and lotteries are operated as legal businesses [42–45]. Therefore, it is necessary to inform families, schools, and communities about these types of online gambling associated with high risk of problem gambling and cooperate to regulate strictly.

In contrast to previous findings, participation in gambling prevention education and exposure to anti-gambling campaigns as social efforts to prevent gambling problems were not identified as significant protective factors in this study [46]. The different results from previous studies indicate the need for more effective approaches to prevent and intervene in adolescent gambling. Therefore, based on the predictive factors identified in this study, there is a demand for prevention education, with more specific strategies applied. As demonstrated in this study, raising awareness and enforcing regulations about the harmful environment related to adolescent gambling is an effective preventive strategy. Additionally, implementing an intervention strategy considering different influencing factors across multilevel to modify adolescents' awareness and attitudes toward gambling can further enhance prevention effects. In addition, the findings of this study can be shared with mental health professionals and policymakers to establish better prevention strategies through collaboration.

Limitations and future directions

Given the cross-sectional design of our study, caution must be taken during the interpretation of our results, as direct effects of the changes to the pre–COVID-19 environment could have occurred. An examination of the factors of change that affected the process of transition from the onset of gambling to problem gambling can aid the derivation of important evidence for preventive intervention strategies. Future research would greatly benefit from a longitudinal study on adolescent online gambling and problem gambling.

Various factors related to family or the quality of interpersonal relationships affect problem gambling in adolescents [24,38], but the effects of these factors could not be confirmed in our study due to limitations in the data analysis. Future studies should investigate factors, such as the influence of family and quality of peer relationships on problem gambling among adolescent online gamblers.

Our study identified the influencing factors of problem gambling among adolescents focusing on risk factors, and was limited to identifying protective factors. A meta-analysis on the influencing factors of problem gambling [23] raised issues of the number of identified protective factors being very small compared with the risk factors, and effect size being insufficient. The harmful environment and risk factors of online gambling will increase further in the future, and necessitate the identification of protective factors and strategies to strengthen them. Thus, further efforts are required to explore the protective factors against problem behaviors among adolescents, especially problem gambling.

Conclusion

The prevalence of problem gambling among adolescent online gamblers was high during the COVID-19 pandemic, at 24.6 %. This indicates the seriousness of the problem and the urgency for early detection of problem gambling and its prevention measures. Nurses working in clinical or community settings who are responsible for managing and preventing mental health issues among adolescents should pay attention to the severity of online problem gambling in adolescents, especially in the post-COVID era. This study comprehensively identified multi-level factors that predict problem gambling among adolescent online gamblers, based on a socio-ecological model. Therefore, when developing nursing intervention strategies, it is important to implement a comprehensive approach that considers multi-level predictors of adolescent problem gambling. The main predictors of problem gambling were peer gambling at the interpersonal level, participation of gambling in online community and the specific type of online gambling at the social level. To prevent problem gambling among adolescents, it is essential to educate peer groups about the risks of gambling and to promote media literacy to help them make informed decisions about harmful elements in online communities. Stronger regulations are particularly needed for online sports betting or lotteries, which pose a high risk of problem gambling, through cooperation with families, schools, and communities.

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Conflict of interest

The authors declare that they have no conflict of interest.

Data statement

The data used in this study can be used by requesting data disclosure from the Korean Center on Gambling Problems in South Korea.

Ethical consideration

This study was approved by the institutional review board of the Pusan National University prior to the conduction of the research (PNU IRB/2022_14_HR).

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Research Article

Experience in Professional Resilience for Nurses Caring for Patients with COVID-19: A Qualitative Descriptive Study

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SUMMARY

Purpose: During the COVID-19 pandemic, nurses have faced many professional and ethical dilemmas and challenges along with bearing physical, mental, and emotional stress resulting from worrying about themselves or their family being infected and stigmatized. This stress can potentially lead to burnout and resignation. Professional resilience is crucial for nurses to cope with these adverse situations. This study aimed to investigate the process by which nurses adapt, change, and overcome challenges during the COVID-19 pandemic and ultimately demonstrate professional resilience.
Methods: Descriptive phenomenology was applied. Semi-structured interviews were conducted with 11 nurses working in COVID-19 wards and intensive care units to collect data. Giorgi's phenomenological analysis method was employed.
Results: Based on the interview responses, four major themes were identified: 1) balancing patient care, self-protection, and passing on experience; 2) providing timely pandemic team resources and social support; 3) nurses' perseverance amid social discourse and constrained lives; and 4) selfless dedication shaping nursing's pinnacle experiences.
Conclusions: In the face of a sudden pandemic, frontline nurses play a critical role in maintaining medical capacity. Consequently, they must balance their families, lives, and work while adapting to the impact of the pandemic and changing practices and procedures based on the development of the pandemic and policy demands. The study findings provide insights into the challenges and emotional experiences encountered by nurses during a sudden pandemic outbreak and can serve as a reference for developing strategies to help nurses overcome these challenges and enhance their professional resilience.

Introduction

The COVID-19 pandemic emerged in December 2019 in Wuhan, China, and rapidly spread worldwide, becoming a global public health crisis. The World Health Organization (WHO) officially declared COVID-19 as a global pandemic on March 11, 2020 [1]. According to WHO statistics, as of April 19, 2023, the cumulative number of confirmed COVID-19 cases worldwide was approximately 770 million, with nearly 6.9 million deaths, resulting in a mortality rate of 1.0% [2]. During the same period, the Taiwan Centers for Disease Control (2023) reported approximately 10.03 million local confirmed cases of COVID-19 and nearly 20,000 deaths in Taiwan, leading to a mortality rate of almost 0.2 % [3]. The COVID-19 outbreak in 2019 has posed unprecedented challenges to

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medical personnel, with multiple restrictions in their personal lives and significant changes in their work environments [4]. Similar situations were observed during the Severe Acute Respiratory Syndrome (SARS) outbreak in 2002 and Middle East Respiratory Syndrome (MERS) outbreak in 2012, which also placed severe burden on the medical industry.

Resilience is the personal characteristic of coping with adversity and undergoing a dynamic process of recovery from challenging situations [5]. Professional resilience, on the other hand, has found application in a range of human services professions, including counseling, social work, education, psychological therapy, and other healthcare-related fields. It is employed to characterize the process through which individuals providing services to vulnerable or at-risk populations not only survive but also flourish within inherently stressful work environments [6]. Due to the COVID-19 pandemic, the significance of professional resilience in nursing practice has been increasingly emphasized. It is within this context that nurses have demonstrated their ability to adapt, navigate change, overcome adversity, and ultimately manifest the process of professional resilience when facing the challenges posed by the pandemic [7].

Previous qualitative studies on nurses' resilience have primarily focused on examining how nurses adapt to the challenges of the pandemic, both in their professional roles and personal lives, and how this adaptation enhances their resilience [8,9]. Regarding quantitative studies on resilience in multiple Asian and American countries, the research, as conducted by Jo et al. [10], investigated the correlation between nurses' responses to the pandemic, their health, career planning, and resilience. These studies on resilience collectively portrayed the personal and emotional journey of nurses as they faced the multifaceted impact of COVID-19. However, professional resilience is the nourishment for the growth of nurses, contributing to the long-term development of their clinical practice careers [11]. Nurses, who have encountered substantial job-related stress due to the sudden impact of the pandemic, undergo processes of adaptation, change, and breakthrough, which are worth exploring in-depth to better understand their professional resilience in nursing practice.

Methods

Design

In this study, the descriptive phenomenology method was employed to investigate the experiences of nurses caring for patients with COVID-19, with a specific focus on their real-life experiences. The aims of this study were to investigate how nurses responded to the impact of the COVID-19 pandemic and how they adapted, changed, and overcame to enhance their professional resilience in nursing practice. Therefore, the study posed the following research questions:

1. How did nurses respond to the impact of the COVID-19 pandemic?
2. How did nurses adapt to enhance their professional resilience in nursing practice?
3. How did nurses change to enhance their professional resilience in nursing practice?
4. How did nurses overcome to enhance their professional resilience in nursing practice?

This method was developed by American psychologist Amedeo Giorgi, and many other psychologists have subsequently taken inspiration from Edmund Husserl and developed various rigorous descriptive phenomenology methods [12,13]. Descriptive phenomenology refers to the analysis of respondents' subjective experiences to gain insight into the underlying meaning of these experiences [14]. This study followed the research checklist of the COnsolidated criteria for REporting Qualitative (File S1).

Participants and settings

This study used purposive sampling to select nurses who worked in COVID-19 wards and intensive care units of a teaching hospital in Eastern Taiwan. Only nurses who had participated in the care of patients who were suspected or confirmed to have COVID-19 were included. Written study descriptions and registration forms for voluntary participation were provided to the eligible hospital units, which were collected every week. Interviews were scheduled according to the convenience of the volunteer participants. The interview questions were continually reviewed to ensure their universality throughout the study.

Data collection

Data were collected from July 21, 2021, to July 20, 2022, through face-to-face interviews conducted according to a semi-structured guide (Table 1). The interview guide was developed according to published literature on the pandemic and after discussions with two nursing professors specialized in qualitative research and the head nurse of the clinical COVID-19 care unit. The final interview guide was confirmed after discussions and review by the team members, and a pre-interview of a nurse who was willing to participate was scheduled. Two nursing professors (the fifth and sixth authors), who had no hospital positions but were proficient in qualitative research, were asked to conduct the interviews. Prior to the interviews, participants were informed about the study's purpose, procedure, and principles of confidentiality, and their informed consent was obtained. The interviews were conducted in familiar, quiet, comfortable, and private locations chosen by the participants. Each interview lasted 30–90 min and was audio recorded, with nonverbal behaviors such as body movements, facial expressions, and emotions also noted throughout the interview. The sample size was determined when the interview responses reached saturation; none of the participants refused to be interviewed or withdrew from the study. The interview responses were documented in an interview log for observation.

Data analysis

Data analysis was conducted by three researchers, including two experienced in teaching qualitative research and publishing

Table 1 *Semi-Structured Interview Guide.*

1. Please introduce yourself and talk about your work experience.
2. Please describe your experiences of caring for COVID-19 patients (the daily activities while providing care, how you felt, and any views you have)
3. How did the provision of care affect you? How did you cope?
4. During the COVID-19 pandemic, what did you think needed to be changed in the care process? What gave you the motivation and energy to change?
5. Regarding the care of COVID-19 patients, how did you get to where you are now?
6. Regarding the care of COVID-19 patients, what thoughts or suggestions about the care process would you share with other nurses?

research papers. Transcripts of the interviews were jointly reviewed by two researchers to ensure accuracy, and the data analysis was performed according to the descriptive phenomenology method developed by Giorgi et al. [15]. During the preliminary stage, consensus on the data analysis was reached after every interview, and every third interview was reviewed to verify data source and accuracy. Similar analysis foci and scopes were categorized as sub-themes through consensus among the three researchers, and major themes were then determined.

Ethical considerations

This study was approved by the hospital institutional review board (approval no. 2020A021). Prior to the interviews, the participants were informed about the study's purpose, significance, and procedure to ensure that the study complied with the principles of confidentiality and informed consent. After the participants' consent was obtained, their names were replaced with numbers in the study log to ensure their privacy, and the participants were informed that the information and notes collected in the process would be used solely for the study and that they had the right to withdraw from the study at any time.

Rigor

The standard of rigor in this study was based on Lincoln and Guba's [16] criteria for qualitative research. Interviews were conducted with an open attitude, and audio recordings and interview notes (including observations and reflections) were verified at least twice to ensure their credibility. The interview notes were reviewed jointly by at least two researchers to ensure the reliability of the data analysis. Regular team meetings were held throughout the research process to verify data and log any subjective views among the researchers. Lastly, data restoration was performed to analyze the data objectively and retain the raw data, ensuring data consistency.

Results

In this study, 11 female nurses were interviewed. Their demographic and professional information is presented in Table 2. The respondents worked in general and emergency COVID-19 wards as well as intensive COVID-19 wards. Most of the respondents (n = 9) lived with their families, and the duration of their care for patients with COVID-19 ranged from 1 day to 1 year. Most of the respondents cared for patients with mild COVID-19 symptoms, and none had cared for patients with severe symptoms. The researchers converted 230 units of meaning obtained from the interviews into psychological language and identified 33 psychological terms. The interview contents were further divided into 14 sub-themes and summarized into four core themes. Table 3 presents a summary of the interview themes, sub-themes, and relevant interview excerpts.

Table 2 *Demographic and Professional Information of the Study Participants (N = 11).*

Characteristics	Mean (SD, min-max)/*N*
Age (years)	31.35 (7.02, 23-42)
Nursing seniority	6.68 (9.10, 1.33-20)
Care of COVID-19 days	57.45 (109.45, 1-365)
Number of caring patients with suspected COVID-19	28.27 (43.89, 1-130)
Number of caring patients with mild to moderate COVID-19	5.91 (9.10, 0-23)
Responsible unit	
General acute dedicated ward with COVID-19	5
Dedicated intensive care unit with COVID-19	6
Education	
College	10
Junior college	1
Marital status	
Married	6
Unmarried	5
Co-resident	
Yes	9
No	2

Theme 1: Balancing patient care, self-protection, and passing on experience

Nurses faced unique challenges when dealing with unfamiliar and highly infectious diseases for the first time. They must grapple with their own anxieties about potential infection while simultaneously shouldering the responsibility of caring for patients. This necessitated adaptive and transformative behaviors during the pandemic crisis, including 1) caring for the anxiety of patients with suspected and confirmed cases; 2) practicing self-isolation and protection measures; and 3) facilitating experience sharing and guidance.

The care process involved challenges related to the rigorous checks of one's personal protective equipment (PPE) while providing treatment. Thus, nurses experienced high levels of anxiety and repeatedly checked the tightness of their protective gear from head to toe (D-2-26 and B-11-16, Table 3). The standards of care were high, and caring for confirmed cases had even stricter requirements including self-isolation to prevent transmission to their colleagues and family. Moreover, nurses were highly cautious to prevent accidental breaches of disease-prevention etiquettes.

They constantly worried about transmitting the virus to their families, and therefore, repeatedly washed their hands and showered before going home, then again at home. The nurses stated that they could not guarantee that they would not accidentally expose their family to the virus when caring for confirmed patients with COVID-19 (D-3-9, D-5-37, and G-2-11, Table 3).

The nurses displayed strong nursing ethics and strongly believed in the mission of nurses in the face of a pandemic. They also acknowledged that nurses cannot choose their patients. In particular, when the hospital is dedicated to treating patients with COVID-19, nurses cannot not shirk from their responsibility of fighting COVID-19 and providing care (C-5-3, I-7-11, J-7-32, and H-3-18, Table 3). Senior nurses felt proud to be selected as pioneers in the fight against COVID-19. Senior nurses considered it their responsibility to pass on their experience to their juniors, and scheduling senior and junior nurses to work in the same shift allowed senior nurses to mentor junior nurses in providing COVID-19 care and provide consultations and guidance (I-31-26, and H-22-39, Table 3).

Theme 2: Providing timely pandemic team resources and social support

Nurses exhibited transformative behaviors and breakthroughs in professional resilience when their pandemic response teams faced adversity. These actions included: 1) promptly adhering to national policies; 2) ensuring a safe working environment; 3) sharing responsibilities with peers, and collaborating as a team; and 4) garnering support from both families and society.

Nurses were required to actively comply with rolling policies issued by the Central Epidemic Command Center in response to the

Table 3 *Identified Themes, Sub-themes, and Quotes from the Interviews.*

Theme	Sub-theme	Quotes from the interviews
Balancing patient care, self-protection, and passing on experience	Caring the anxiety of patients with suspected and confirmed cases	“One particularly strong impression is the first time I had to take a blood sample from a patient with confirmed COVID-19; …, my hands were shaking badly … my hands could not stop shaking … my whole body was shaking, and I was sweating all over.” (D-2-26).
		“If a confirmed case was involved, the sentiment was to pay additional attention to whether the PPE was configured properly. … we would test the mask a few more times to check whether the goggles fog up.” (B-11-16)
	Practicing self-isolation and protection measures	“Fear of being infected and fear of negligence, fear of doing something wrong or the virus spreading because of my carelessness … My biggest fears are spreading the virus and catching it myself …. “(D-3-9)
		“I worried about bringing home the virus to my family …. I would shower after finishing my shift and before leaving the hospital and going home, then once again before going to bed …. I reinforced my cleanliness.” (D-5-37)
		“Some things are beyond one's imagination, such as if the patient is a confirmed case and has severe COVID-19,… you cannot guarantee that you won't be exposed to the virus … you tend to worry.” (G-2-11)
	Facilitating experience sharing and guidance	“I did not really hesitate, because … my job is to care for these types of patients (who are infected or caught up in an epidemic), so I was alright.” (C-5-3)
		“Nurses encounter all sorts of patients, and you cannot avoid them. … because we are a dedicated hospital, ….” (I-7-11)
		“In nursing, you have no choice to avoid being assigned certain patients, because this is my job.” (J-7-32)
		“Stress is inevitable, but this is our job, and we don't have a choice! And because you don't have a choice, you just have to be more attentive and meticulous!” (H-3-18)
		“I feel that we have a responsibility to look after our junior nurses and assist them with the clinical tasks and procedures related to caring for patients in the pandemic,… We have to pass the torch, and passing it to our junior nurses is very important.” (I-31-26)
		“… the senior nurses and meticulous nurses were scheduled first, … By the time the junior nurses are scheduled to care for patients with COVID-19, they have someone—a senior nurse—that they can look to for guidance.” (H-22-39)
Providing timely pandemic team resources and social support	Promptly adhering to national policies	“We would be confused, the situation was unclear, …, [the CDC] …. Sometimes we had trouble keeping up with the information, as changes would be made every three days or every week, and we would have to continually update our information.” (B-13-35)
		“… we were always on the go and always changing our processes. We would receive new information every day or every other day. Then you would have to remember the updates all the time.” (E-5-11)
		“Especially because COVID-19 is unprecedented, the rules and measures are constantly being updated, and we are constantly receiving new information.” (F-22-6)
		“Because COVID-19 cases were constantly incoming, almost every day, the infection control specialists constantly provided new updates, which our head nurse and infection control personnel would announce.” (I-11-36)
	Ensuring a safe working environment	“The hospital really backed us. The stance of the Ministry of Health and Welfare was that wearing PPE, one layer of protection was enough, but we would wear two layers of disposable coveralls and PPE …. The hospital also provided us with lodgings. The chief of the nursing department and head nurses also strived for the installation of monitors in all the wards of the hospital, …” (B-2-26)
		“In the beginning, the senior nurses—the leaders—were the ones on the front line. Some were not willing! … Later on, they were given bonuses, which made their initial sacrifice worthwhile. Yes, incentives were given.” (F-31-18)
		“Our lead nurses eased our burden by lowering the patient-to-nurse ratios … When we had to start placing patients with COVID-19 in general patient rooms, we were extremely nervous, … The lead nurses and someone from the engineering department conducted a smoke test to create a small area of negative pressure …, see how the smoke drifts, and that area will be the safest place.” (B-6-13)
	Sharing responsibilities with peers, and collaborating as a team	“That sort of team spirit …, everyone is ready to lend a hand … We always double-check for each other ….” (D-2-9)
		“Among colleagues … the perimeter (intensive care units for patients without COVID-19) was mostly handled by those colleagues … They helped us out a lot. For example, if I needed anything, I could ask them, and they would bring us the supplies and so on. They would provide whatever help they could.” (F-10-1)
		“I think that unit colleagues are important, everyone should have a supportive attitude. I think that fellow nurses in the unit are important, people on the line who support you, and you are not quietly taking on everything by yourself. You get the sense that you are fellow comrades.” (I-14-16)
	Garnering support from both families and society	“During that time, … The families of patients … would send meals … snacks … fruits … and hand cream …. It was heart-warming, knowing that some people saw our needs … and were cheering us on; it was honestly quite touching …” (F-27-2)
		“My husband would tell not to think too much about it … my family … They would try not to disturb my rest and let me sleep in, or they would take up the house chores …. Actually, I received a lot of support at home.” (E-15-8)
		“At one point, I told my father, I'll go and live in my grandmother's place, which was empty at the time. My father is more open-minded than I am … and he said there was no need …. I had the feeling of having my father's support.” (F-25-33)
Nurses' perseverance amid social discourse and constrained lives	Dealing with job-related stress on well-being	“… If I went a long time without caring for a COVID-19 patient or suddenly be assigned a new COVID-19 patient, even though emotionally I was not nervous, I would have nightmares and sleep poorly.” (D-3-22)

(*continued on next page*)

Table 3 (*continued*)

Theme	Sub-theme	Quotes from the interviews
		“Mentally, I may have felt fine, but it affected my sleep. My sleep would become interrupted, because I would either constantly wake up or dream about my job, and in my dream, I would not have worn my gear properly or committed some other mistake.” (D-3-27) “… It began to affect my sleep … I would constantly have nightmares! In the nightmares, I would feel quite nervous, and if I heard an ambulance go by, I would immediately wake up.” (E-16-27)
	Facing societal injustices and judgmental attitudes	“… I find whispering to be terrifying. I am scared that a neighbor or someone will know that I am caring for patients with COVID-19 …. That kind of public discourse I find quite terrifying ….” (B-7-43) “Opinions about the safety of nurses really touch a nerve … that is to say … the fact that others view us as a group of scary people, …because we take care of patients with COVID-19.” (B-5-27) “Your neighbors will fixate on you …., they know where you work. The nosier ones will ask if your hospital has admitted any patients with COVID-19 and if any of those patients are confirmed cases. say.” (F-24-43) “It feels lousy, or how previously, they said that nurses cannot travel abroad, but others can—a bunch of poorly thought-out commands or some accusations that did not sit well with me, and they made me feel like, it's not worth it!” (G-29-19) “It was frustrating, and not being to go anywhere (overseas) was also frustrating!….since they were saying that nurses should refrain from appearing in public places, ….” (F-24-24)
	Maintaining confidentiality at work	“The stress! The stress! Yes, when I first became aware, I decided against telling my parents … and when you start taking care of patients with COVID-19, I told them that I did not encounter patients with COVID-19 …. Otherwise, they would worry!” (H-2-4) “All you can do is say things like, we have isolation rooms, … I did not tell them in clear words that I was caring for patients who were suspected of having COVID-19 …” (I-10-13) “We do not discuss hospital matters with family, unless … yeah. The fact that we were caring for patients with COVID-19 … we also did not volunteer that information to friends!” (I-11-32) “I was worried my children would be discriminated against ….I did not tell my children which unit I worked in … I kept it vague.” (E-13-35)
	Self-isolating to protect their families	“… The fact that we were caring for patients with COVID-19 … we also did not volunteer that information to friends! … I should not run around, just stay either at home or at the hospital …. The stress was overwhelming …” (I-11-32) “I always wear a mask at home …. I did not eat with my family, I ate separately …. I wore a mask while sleeping.” (B-9-36) “While caring for patients with COVID-19, we were scared to eat with our families. Sometimes, our schedules would be delayed or when friends wanted to have dinner or wanted to go out, …, later during the lunch break, and avoid the lunch rush.” (E-2-14) “From the beginning, yes, you worry that you will infect your children … you become scared to come into contact with them. Before, we would kiss and hug our children, but then, we had to stop doing that ….” (E-13-35) “I would follow the rules and stay at home, and I ended up thinking, I will just stay in my room. Strictness is the best policy! Better to be strict with yourself than to go out without adequate preparation.” (A-19-42)
Selfless dedication shaping nursing's pinnacle experiences	Shouldering a sense of mission	“I was hesitant, but I did not say that I did not want to continue; I suppose I thought it was my mission! … I thought, if I do not step up, who else will step up … because in truth, everyone is also scared.” (B-2-11) “I've been a nurse for a long time, and early in my career, I knew that as a nurse, I would encounter such patients. …, I will not falter … However, an infectious outbreak like COVID-19 only needs to happen once in my lifetime …. Really, once was enough.” (I-27-7) “My role … well, I became a nurse because I enjoy being a nurse! … you know that eventually you will encounter a situation like this. Nursing brings new challenges every day, and you will always encounter some sort of emergency.” (E-17-43)
	Taking pride	“We would assign a senior nurse to each shift who would be able to oversee the situation, and that way, the staff would feel less nervous.” (E-20-4) “I take it for granted, which is to say, if the head nurse assigns a case to me, then it is mine! The role of a leader is to take on these burdens.” (I-27-37) “Our head nurse considers our seniority at the hospital as well as our personalities and work attitudes and so on …. Based on all these factors, our head nurse will make selections.” (H-4-5) “We are also leaders, and I understand that leaders and senior nurses would be assigned before junior nurses, especially when caring for severe COVID-19 cases. So you have to lead by example. We are the leaders, and of course the head nurse would assign us heavy work.” (I-7-26)
	Achieving peak experiences	“My inner thoughts were, why me? … But then I thought, if not me, someone else has to take care of these patients, so you may as well take the opportunity to learn how to do it. Basically, I tried to look at it from a more positive angle, otherwise you will end up in a negative place ….” (K-23-15) “In truth, you will think, I have done that! … on TV, you see reports about caring for patients with COVID-19, which you can relate to, and you think, I did that better than other people did …” (B-15-20) “When I was caring for patients with COVID-19, I was quite pleased with myself! … It was an extraordinary feeling … I felt as though I had gained that experience, because

Table 3 (*continued*)

Theme	Sub-theme	Quotes from the interviews
		sometimes you think, even if I wanted to experience something like this, I might not even have the opportunity." (G-27-19) "… I am actually encountering something that is not written in any of the books, … I guess it is a kind of joy …. I feel lucky.., and many situations that never happened to my predecessors happened to me (laughs) …. It all feels quite different … it's rather complicated …. It's a mixed bag … there's the challenge, but also the satisfaction." (B-20-38)

developments of the COVID-19 pandemic. With frequent revisions to disease-prevention policies of the government, nurses were required to stay updated and continually adjust their operational procedures and thinking and practices regarding infection control (B-13-35, E-5-11, F-22-6, and I-11-36, Table 3).

Frontline nurses combating COVID-19 were substantially encouraged by the government's rewards and recognition. The hospital was perceived to have adequate staffing, materials, and equipment to provide a safe work environment to the frontline nurses. To ensure the safety and peace of mind of frontline nurses, the hospital proactively provided sufficient and high-specification PPE and maintained lower nurse-to-patient ratios. The hospital also conducted regular safety checks, such as verifying safe lines of movement and performing smoke detection tests to further enhance the security and well-being of the nurses (B-2-26, F-31-18, and B-6-13, Table 3).

Colleagues in the healthcare team develop a strong sense of mutual respect and esteem as they unite in the battle against COVID-19. They support each other, irrespective of the assigned tasks, and check the adequacy of each other's PPE. They share the burden of caring for patients with COVID-19 together and motivate each other (D-2-9, F-10-1, and I-14-16, Table 3).

Support from the public in the form of food and essential resources and from family members are major driving forces in the fight against COVID-19. The voluntary provision of disease-prevention materials from the public and adequate opportunities to rest at home from family members demonstrate the universal acceptance of the work nurses do to combat COVID-19 (F-27-2, E-15-8, and F-25-33, Table 3).

Theme 3: Nurses' perseverance amid social discourse and constrained lives

Nurses simultaneously grappled with work-related and societal pressures, even as these constraints impacted their personal lives and social interactions. They continued to demonstrate adaptive and transformative behaviors within the process of professional resilience. These behaviors encompassed: 1) dealing with job-related stress on well-being; 2) facing societal injustices and judgmental attitudes; 3) maintaining confidentiality at work; and 4) self-isolating to protect their families.

The stress of providing care during the COVID-19 pandemic had an impact on the sleep quality of nurses, even resulting in them experiencing nightmares. Nurses were reported to have interrupted sleep, dreams about compromised protection at work, and nightmares. Moreover, they were often startled awake by the sound of ambulance sirens (D-3-22, D3-27, and E-16-27, Table 3).

Nurses encountered unfair treatment and various restrictions on their activities (such as early policies restricting overseas travel by medical personnel for nonacademic reasons as well as members of the public protesting against medical personnel appearing in public spaces) during the COVID-19 pandemic, which led to feelings of resentment. Moreover, nurses were sometimes treated as an outsider by their neighbors or perceived as terrorists spreading contagion (B-7-43, B-5-27, and F-24-43, Table 3). Furthermore, disease-prevention policies even prevented nurses from leaving the country and required them to avoid public spaces, which led to feelings of injustice and resentment among them (G-29-19 and F-24-24, Table 3).

To prevent family members from worrying and to avoid potential scapegoating by neighbors, nurses often refrained from discussing the specifics of their work. In the early stages of the COVID-19 pandemic, nurses hesitated to engage in detailed discussions about their work with the family, fearing that their family members would be stigmatized or scapegoated (H-2-4, I-10-13, I-11-32, and E-13-35, Table 3).

To minimize the risk of transmitting the virus to their household members, nurses adopted high self-isolation standards by secluding themselves and staying at home. They limited their travel to the commute between their home and the hospital. Moreover, they refrained from going out and avoided crowded places (I-11-32, Table 3). While at home, they isolated themselves in their rooms and minimized contact and interactions with family. They even ate separately. Furthermore, some nurses even wore masks while sleeping (B-9-36, E-2-14, E-13-35, and A-19-42, Table 3).

Theme 4: Selfless dedication shaping nursing's pinnacle experiences

Nurses shared that demonstrating professional resilience was a result of passionate learning throughout the pandemic journey, creating personal pinnacle experiences in their nursing careers. This included: 1) shouldering a sense of mission; 2) taking pride; and 3) achieving peak experiences.

Despite initial hesitations, nurses expressed feelings of pride and accomplishment as well as the willingness to learn, be challenged, and accept the mission of providing nursing care and the sacrifices involved in it. The participants indicated that the accompanying stress did not diminish their passion for nursing; some even thrived under pressure. The participants stated that they chose this profession because they enjoy nursing and were committed to not wavering or giving up in the face of the pandemic; however, they revealed that one such experience in a lifetime was sufficient for them (B-2-11, I-27-7, and E-17-43, Table 3).

Head nurses scheduled nurses' work shifts based on the nurses' personalities and job abilities. This approach may further enhance the feelings of purpose and pride among the nurses who were chosen (E-20-4, I-27-37, H-4-5, and I-7-26, Table 3).

Some participants stated they used to question why the pandemic was happening to them, but later changed their perspective and considered it as a rare learning opportunity. They were in the middle of a pandemic that was widely reported by the media, and they believed that not every nurse could have such a meaningful experience in their nursing career (K-23-15, B-15-20, G-27-19, and B-20-38, Table 3).

Discussion

This qualitative study explored the experiences of nurses as they adapted to the pandemic, exhibited behavior changes, overcame challenges, and ultimately demonstrated professional resilience in nursing practice. The results revealed four main themes: 1) balancing patient care, self-protection, and passing on experience; 2) providing timely pandemic team resources and social support; 3) nurses' perseverance amid social discourse and constrained lives; and 4) selfless dedication shaping nursing's pinnacle experiences.

In the present study, the mood of nurses when caring for confirmed or suspected patients was similar to other research findings. Nurses face considerable physical and emotional pressure, especially when caring for patients with severe COVID-19 [17]. Nurses demonstrated various behaviors such as compulsive handwashing, disinfecting, repeated washing of clothes, and immediate showering to minimize the risk of infecting their family members [18]. Studies have found that nurses experienced stress and fear about their family's health and minimized contact with family because of their worry about transmitting the virus [8,19]. Marey-Sarwan et al. [8] reported that in the initial stages of the pandemic, nurses' anxiety was primarily due to the shortage of adequate protective gear and masks, as well as a lack of disinfection equipment. In contrast, in Taiwan, where this study was conducted, the government supplied an abundant amount of equipment, enabling nurses to concentrate on their pandemic response work without worry. Whether caring for confirmed or suspected cases, nurses followed rigorous protective measures and practiced frequent handwashing to mitigate the risk of infection.

During a pandemic, more patients should be assigned to the care of experienced and skilled nurses than to nurses with insufficient clinical experience, and the experienced nurses can assist in monitoring and guiding the less experienced nurses in developing relevant skills [20]. In line with the philosophy of experiential knowledge transfer in this study, the scheduling approach involved a pairing of both seasoned and less experienced nurses. This arrangement resulted in a significant decrease in the nurse-patient ratio. Seasoned nurses provided consultations and guidance on pandemic care procedures, showcasing their responsibility in knowledge transfer, while less experienced nurses could confidently follow their lead.

Billings et al. [21] asserted that although family and friends are generally considered major sources of support, they can sometimes be sources of stress. In contrast to some cases where family members discouraged nurses from pandemic involvement due to isolation and limited interactions, this study found that nurses' families, including older members, spouses, and children, provided strong support, actively minimizing disruptions and taking on household responsibilities to ensure nurses' rest. Marey-Sarwan et al. [8] similarly emphasized the importance of family support in maintaining a positive human environment and managing stress during the pandemic, which enhanced professional resilience in nursing practice.

Despite the hesitation during the early days of the pandemic, nurses still believed that combating COVID-19 was their responsibility as nurses and take pride in doing so, despite facing discrimination [22]. Nurses took pride in acquiring new knowledge and skills through their involvement in pandemic challenges, which bolstered their professional confidence and capabilities [21]. Consistent with this study, nurses, despite initial hesitations in patient care, bravely embraced the mission of nursing. They felt proud to be chosen as frontliners in the pandemic, seeing it as a unique learning opportunity and taking pride in their involvement widely covered in the media. Most nurses enhanced their pandemic response abilities through personal experiences, creating a sense of heroism when the pandemic was under control or concluded [8]. In this study, nurses mentioned that active learning and surpassing themselves led to peak nursing experiences, aligning with Abraham Maslow's concept of “peak experience.” By satisfying basic needs and achieving self-realization, professional resilience in nursing practice was greatly elevated [23].

Limitations

The study had several limitations. First, it focused on the experiences of frontline nurses providing regular care to patients with COVID-19 in dedicated wards and intensive care units. Therefore, the results may not be generalizable to nurses working in emergency or quarantine settings. Second, this study was conducted during the COVID-19 surge in Taiwan, when disease-prevention policies were heavily focused on preventing large-scale outbreaks. Consequently, many suspected cases and confirmed cases with mild symptoms were admitted for isolation, and the proportion of patients with severe symptoms was relatively low. Finally, units in charge of patients with severe symptoms often adopted rotating shifts to distribute the workload efficiently, thereby alleviating the stress on nurses, and to incentivize the allocation of resources. Consequently, nurses in Taiwan may have less extended contact with severe COVID-19 cases, and the results of this study cannot fully represent the experiences of nurses who care for patients with severe COVID-19.

Conclusions

The findings of this study illustrate that nurses, when confronted with sudden pandemics, undergo a process of adaptation, change, and transformation to balance their family, personal life, and work. Ultimately, they not only overcome the pandemic's impact but also enhance their professional resilience in nursing practice, leading to increased self-confidence and pride among nurses. This study reveals the full extent of professional resilience in nursing practice.

Author contributions

Study conception and design: PEC, YMS and CWC; conduction of the majority of the interviews: YMS and CWC; data analysis: PEC, YMS and CWC; manuscript drafting: PEC, YMS and CWC. Supervision: SCL, YPL, CHH and CWC. All authors approved the final version for submission.

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Conflict of interest

The authors declare no potential conflicts of interest, real or perceived.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Research Article

Trajectories of Wok Adjustment and Influencing Factors Among Newly Registered Nurses

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SUMMARY

Purpose: This study explored the work adjustment trajectory and its predictors and characteristics among newly registered nurses.
Methods: A total of 245 newly registered nurses working in a university hospital provided general baseline characteristics and completed a work adjustment questionnaire along with self-report measures of clinical competency, psychological capital, preceptor exchange, social support, and role conflict when they started working independently (baseline) and at 7 and 12 months after employment. Data were collected from July 2020 to August 2022. The collected data were subjected to a group-based trajectory model, χ2 test, F test, one-way ANOVA, and multiple logistic regression using SAS 9.4, and SPSS 25.0.
Results: Group-based trajectory modeling classified three newly registered nurse groups: nurses with a high work adjustment level in all subscales from the beginning of employment (early adjustment group, 16.1%), nurses with a moderate level of adjustment from beginning to end (standard adjustment group, 60.6%), and nurses with a low level of work adjustment from early to mid-term, rising later (delayed adjustment group, 23.3%). Higher hope, optimism, and emotional support predicted early and standard adjustments.
Conclusions: Based on the trajectory characteristics, newly registered nurses need to improve their work adjustment. The early and standard adjustment groups should continuously monitor their levels of work adjustment while monitoring their hopes, optimism, and emotional support. In particular, the delayed adjustment group required customized educational programs and strengthened peer support.

Introduction

Work adjustment is a continuous and dynamic process through which individuals achieve and maintain harmony with their work environment [1]. It can be challenging for newly registered nurses to transition from students to practicing nurses [2]. Nevertheless, the achievements and experiences accumulated during this period are crucial for establishing oneself as a competent nurse [2]. Previous studies on newly registered nurses have identified factors that influence work adjustment. Positive psychological capital (PsyCap) [3], nursing knowledge [4], clinical competency [5], self-efficacy [6], and resilience primarily [6] affected workplace adjustment. Simultaneously, leadership [7], organizational culture [7], social support [8,9], preceptor [8], job stress [10], and role conflict [10] were significant predictors of organizational adaptation.

However, most studies on new registered nurses' work adjustment assume that they are a single homogeneous population [3–10]. They focused on the characteristics of the newly registered nurse period, based on cross-sectional data. Few studies have

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viewed work adjustment as an ongoing process or investigated the changes and differences between individuals or groups over time. Consequently, extant studies may have overlooked the changes in and characteristics of work adjustment within the new nursing population. As a result, training programs for new nurses in most medical institutions based on existing studies tend to be unilaterally designed, assuming a homogeneous population, and do not effectively promote the work adjustment of new nurses [11].

Due to these previous studies' limitations, several longitudinal studies have been conducted in Korea to track the trajectories of changes in newly registered nurses [12–14]. However, most longitudinal studies on newly registered nurses have primarily focused on identifying the factors associated with turnover intention. Kim and Yon [12] found that changes in job stress, job satisfaction, and work competence among new nurses differed according to personality type. Ki [13] and Yoo [14] divided groups according to turnover intention and investigated related factors. Because these studies focused on new nurses' turnover within a few months, it was difficult to identify changes in work adjustment. Therefore, studies have explored the changes in work adjustment during the new nurse period, categorizing the patterns of changes, and identifying the required associated factors. Observing and clustering the trajectories of work adjustment during the first year as a new nurse and recognizing the traits and predictors of trajectories would be conducive to developing effective training programs that promote new nurses' work adjustment and growth.

Based on this context, this study attempted to identify the characteristics of work-adjustment trajectories using the main variables reported in previous studies. Previous studies have reported that clinical competency is a significant work competence required for adjustment [8]. Positive PsyCap is a personality trait related to organizational commitment and job satisfaction [3]. Furthermore, social support [9], and role conflict [10], preceptor [15] have been reported as job satisfaction and organizational socialization predictors. Based on these findings, these variables were selected as related factors and the trajectories of work adjustment and their characteristics were investigated among new registered nurses.

This study was conducted to better understand work adjustment patterns and their related factors. This study aimed to (1) identify distinct patterns of work adjustment changes among newly registered nurses over 12 months and (2) describe the characteristics associated with distinct work adjustment trajectories over time.

Methods

Study design

This prospective cohort study aimed to examine the different trajectories of work adjustment among newly registered nurses and identify their differences and predictors using data collected at three time points at five-month intervals from two months after employment.

Study population

The participants were newly registered nurses hired at a university hospital in South Korea between 2020 and 2021. Newly registered nurses were eligible to participate if they (a) provided direct care to patients, (b) worked rotating shifts, or (c) had been working for 2–12 months since employment. The exclusion criteria were (a) nurses who primarily performed educational and administrative work and (2) were hired in fixed-term or temporary positions. Additionally, nurses who resigned during the data collection period, those who did not provide contact information for cohort follow-up, and those who did not respond to the follow-up questionnaire survey were excluded from the study. This study was designed by referring to the prospective longitudinal study by Part et al. [16] that conducted group-based trajectory modeling and a study by Fan [17] that suggested that the moderate sample size of the growth trajectory was ($N = 100–200$). Additionally, we considered the potential withdrawal rate was set at 33% in the 17.0%–19.5% turnover rate on newly registered nurses in tertiary hospitals in 2019–2020 [18] and 30.6% in another longitudinal study on newly registered nurses [19]. Consequently, 373 newly registered nurses were recruited, of which 128 were excluded due to resignation before the follow-up, insufficient response, or being in the same department as the researcher; thus, the final analysis included 245 participants.

Data collection and procedure

This study was approved by the Institutional Review Board (No: AJIRB-MED-SUR-19-541) of the authors' hospital. All participants were informed about the study's purpose and procedures and asked to complete a questionnaire. The participants provided signed informed consent forms and all participants remained anonymous. Data were collected from newly registered nurses who signed an informed consent form through three survey rounds from July 1, 2020, to August 31, 2022. Informed consent was obtained from all 373 participants before the start of work. The baseline survey (T1) was performed two months after employment, which was the point at which official training of newly registered nurses was completed at the study hospital, and newly registered nurses began to work independently. Of the 373 nurses, 302 completed the questionnaire (81.0%). The second survey (T2) was conducted seven months after employment, and 255 questionnaires were retrieved (68.4%). The third survey (T3) was conducted 12 months after employment, when the newly registered year ended, and 245 questionnaires were retrieved (65.6%) and included in the final analysis.

Instruments

Work adjustment

Work adjustment was assessed using an instrument developed to measure work adjustment among new employees based on the work adjustment theory in the social sciences [20,21]. This instrument comprises 18 items in four domains: job satisfaction (five items), work performance (five items), interpersonal relationships (five items), and organizational adjustment (three items). This study revised the term “company” to “hospital” for use by nurses. Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with a higher score indicating a higher level of the corresponding factor. The reliability (Cronbach's α) of the tool was .76–.89 in the developmental study [20] and .92 in this study.

Clinical competency

Clinical competency was assessed using the modified Korean version of the instrument developed by Blanzola, Lindeman, and King [22] to measure nurses' knowledge and skills. The 26-item tool comprises seven domains: nursing diagnosis (two items), routine care (ten items), core skills (five items), fairness (two items), teamwork (two items), initiative (one item), and communication (four items). Each item was rated on a five-point scale ranging from 1 (more effort needed) to 5 (very good), with a higher score indicating better clinical performance and competency. The reliability

(Cronbach's α) of the tool was .84 at the time of development, .96 in the study by Lee [23], and .94 in this study.

Psychological capital

PsyCap was assessed using the Korean version of the Psychological Capital Questionnaire developed by Luthans et al. [24]. This 24-item tool comprises four domains: self-efficacy (six items), hope (six items), optimism (six items), and resilience (six items). Each item was rated on a five-point Likert scale consisting of 1 (not at all true), 2 (not true), 3 (neutral), 4 (generally true), and 5 (very true), with a higher score indicating a higher PysCap. Items 3, 8, and 19 were negatively worded and were reverse-scored. The reliability (Cronbach's α) of the tool was .89 at the time of development, .93 in the study by Choi [25], and .93 in this study.

Preceptor exchange

Preceptor exchange was assessed using the Korean version of the Leader-Member Exchange Multi-Dimensional Measure (LMX-MDM) developed by Liden and Maslyn [26] by setting leader to preceptors and member to new registered nurses. This 11-item tool comprises four factors: affect (three items), loyalty (three items), contribution (two items), and professional respect (three items). Following Kim [24], this study used a four-point Likert scale to reduce middle response bias. Each item was rated on a five-point Likert scale consisting of 1 (not at all true), 2 (not true), 3 (neutral), 4 (generally true), and 5 (very true), with a higher score indicating better preceptor exchange. The Cronbach's α was .91 in a study by Kim [27] and .90 in this study.

Social support

Social support was assessed using the Social Support Scale developed by Park [28] and modified by Jo et al. [29]. This 23-item tool comprises five domains: emotional support (nine items), informational support (seven items), material support (two items), and evaluative support (five items). Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with a higher score indicating greater social support. The Cronbach's α was .98 in the study by Jo et al. [29] and .96 in this study.

Role conflict

Role conflict was assessed using a tool developed by Rizzo et al. [30] and adapted and modified by Lee [31] for use by nurses in Korea. Each of the 16 items was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with a higher score indicating higher role conflict. The Cronbach's α was .89 at the time of development and 0.91 in this study.

Data analysis

Group-based trajectory modeling, using PROC TRAJ in SAS 9.4, identified distinct patterns of work adjustment in newly registered nurses from two months to 12 months after employment. The PROC TRAJ was developed to classify cases with similar change patterns over time [32]. In this study, a censored-normal distribution method was applied after a normality test of the work-adjustment score. Following this, the group-based trajectory models with two to five trajectory groups were tested by applying linear, cubic, and quadratic forms. The final number of trajectories was selected based on the Bayesian information criterion (BIC) value. Since higher BIC values indicate a better model fit, the value closest to 0 is the most appropriate [32]. According to Micheline et al. [33] who reported that several model fit criteria were needed to be presented, we considered the importance of the estimated model parameters and BIC values. Additional model selection criteria included the sample proportion, which should be at least 10%, and the posterior probability of a participant belonging to a particular trajectory group, which should average at least 0.70 for each trajectory group [34].

χ2 test and F test were used to explore the differences in general characteristics between the trajectory groups. Multinomial logistic regression analysis was used to determine the odds ratios (ORs) and 95.0% confidence intervals (CIs) for the associations between trajectory groups, general characteristics, and study variables. SAS 9.4 and IBM SPSS Statistics 25.0 were used for all statistical analyses and the internal consistency reliability of the instruments used in the study was analyzed using Cronbach's α.

Results

Model selection for work adjustment trajectories

The trajectories of work adjustment were analyzed using group-based trajectory modeling (GBTM), and the model was selected based on the absolute value of BIC and ≥10.0% of participants in each trajectory group with reference to Nagin and Odgers [32]. Three groups that satisfied the two conditions were selected as the best-fit model for the work-adjustment trajectories (Table 1). The trajectory functions of the three groups were optimized and the significance of the trajectory graphs were examined. The intercept-function model exhibited a significant trajectory function (Table 2).

Types of work adjustment change

Figure 1 illustrates the work adjustment trajectories identified by the GBTM. The vertical axis represents the work adjustment score, and the horizontal axis represents the time since employment. Table 2 presents the total work adjustment score and the scores for each work adjustment domain in the three groups at two months (T1), seven months (T2), and 12 months (T3) after employment.

Group 1 consisted of nurses showing a consistently high level of work adjustment concerning the total work adjustment score and each domain score since employment; 16.1% of the participants were in this group. Therefore, Group 1 showed a higher level of work adjustment at T1, T2, and T3 than the other groups. The average total score decreased slightly from T1 to T2 and was maintained at T3. Additionally, Group 1 showed higher scores in all domains of work adjustment than the other groups. Thus, group 1 was named the “Early adjustment group with high scores in all domains” (early adjustment group). These nurses scored the highest on work adjustment from an early stage and consistently showed high work adjustment until 12 months after employment.

Table 1 *Model Selection Results for Growth of 245 Newly Graduated Nurses.*

Model (no. of groups)	BIC	Estimated probability (% in each group)				
		1	2	3	4	5
2	−464.45	40.5	59.5			
3	−447.73	23.3	60.6	16.1		
4	−446.25	7.3	34.8	49.4	8.5	
5	−447.85	6.6	30.7	13.9	47.6	1.2

Note. BIC = Bayesian Information Criterion.

Table 2 *Descriptive Statistics of Work Adjustment on Trajectories by Times.*

Work adjustment	Group	M ± SD		
		T1	T2	T3
Total	Early adjustment	3.92 ± 0.42	3.87 ± 0.29	3.86 ± 0.35
	Standard adjustment	3.35 ± 0.34	3.28 ± 0.31	3.29 ± 0.33
	Delayed adjustment	2.70 ± 0.34	2.68 ± 0.35	2.74 ± 0.37
Jab satisfaction	Early adjustment	4.05 ± 0.50	3.88 ± 0.38	3.83 ± 0.40
	Standard adjustment	3.44 ± 0.45	3.28 ± 0.43	3.30 ± 0.43
	Delayed adjustment	2.69 ± 0.45	2.56 ± 0.47	2.61 ± 0.53
Job performance	Early adjustment	3.59 ± 0.51	3.74 ± 0.32	3.82 ± 0.37
	Standard adjustment	2.99 ± 0.44	3.17 ± 0.38	3.24 ± 0.42
	Delayed adjustment	2.39 ± 0.41	2.70 ± 0.45	2.87 ± 0.45
Interpersonal relationship	Early adjustment	4.03 ± 0.45	4.11 ± 0.32	4.12 ± 0.42
	Standard adjustment	3.62 ± 0.40	3.61 ± 0.39	3.63 ± 0.44
	Delayed adjustment	3.10 ± 0.50	3.02 ± 0.51	3.15 ± 0.50
Organizational adaptability	Early adjustment	4.07 ± 0.68	3.67 ± 0.67	3.55 ± 0.64
	Standard adjustment	3.35 ± 0.66	2.92 ± 0.61	2.80 ± 0.65
	Delayed adjustment	2.59 ± 0.74	2.27 ± 0.63	2.07 ± 0.63

Note. M = Mean; SD = Standard deviation; T1 = 2 month; T2 = 7 month; T3 = 12 month.

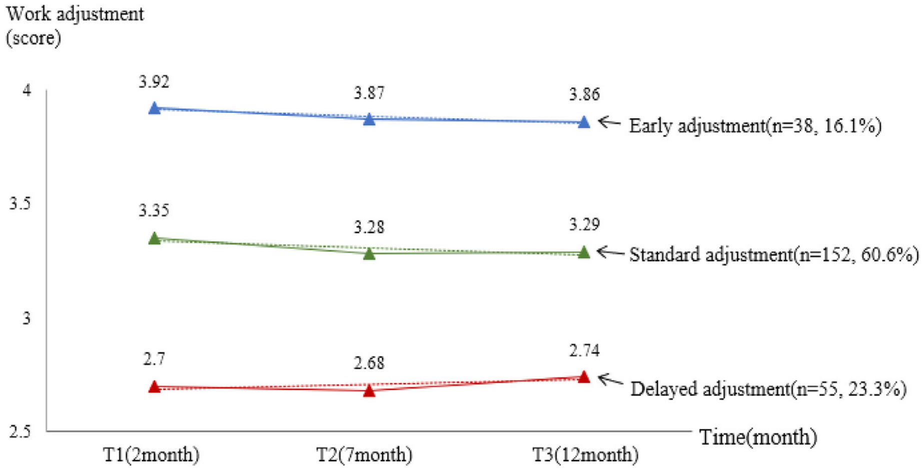

Figure 1. Predicted and Observed overall Work Adjustment for each Trajectory Group. Solid lines present the mean percentage overall work adjustment based on raw data, and dashed lines present the predicted mean percentage overall work adjustment based on trajectory modeling.

Group 2 consisted of nurses with an approximately medium total score, with the highest score in the interpersonal domain; 60.6% of the participants were in this group. Therefore, Group 2 showed a lower total work adjustment score than Group 1 but a higher total work adjustment score than Group 3, and the interpersonal score was higher than all other domains. Thus, this group was named the "interpersonally driven standard adjustment group" (standard adjustment group). These nurses adjusted to work while maintaining a relatively high interpersonal adjustment score compared to other domains. The highest percentage of nurses belonged to this group; therefore, this group can be considered the standard type of work adjustment.

Group 3 consisted of nurses with a low total score at all time points with a high degree of improvement in the job performance domain across the time points; 23.3% of the participants were in this group. In other words, Group 3 had a lower total work adjustment score than the other groups at T1, T2, and T3. Their scores slightly decreased from T1 to T2 but improved at T3. Regarding domain, their job performance scores increased continuously from T1 to T3, with the most significant improvement at T3. Thus, Group 3 was named the "Delayed adjustment group with delayed growth of practical competencies" (delayed adjustment group). These nurses demonstrated considerable growth in the job performance domain later in the year, a consistently low level of work adjustment throughout most of the year, and higher work adjustment at the 12-month mark, thereby demonstrating delayed work adjustment compared to other groups.

The posterior probability was computed to examine whether participants were assigned to the group that most accurately resembled their longitudinal work adjustment trajectory. The posterior probability was calculated for each participant in the trajectory groups and the participants were assigned to the group with the highest posterior probability. A value closer to one signified a better participant fit in the group set and indicated that the participant was assigned to the most appropriate group [31,34]. According to the analysis results, there was an 82.0% probability that participants in the early adjustment group would be appropriately assigned, an 88.0% probability that participants in the standard adjustment group would be appropriately assigned, and an 86.0% probability that participants in the delayed adjustment group would be appropriately assigned. Therefore, the participants were appropriately assigned to each trajectory group, and each

Table 3 *Differences in Work Adjustment Trajectories According to the General Characteristics.*

Characteristics	Total (*N* = 245)	Early adjustment (*n* = 38)	Standard adjustment (*n* = 152)	Delayed adjustment (*n* = 55)	χ^2	*p*
	n (%)					
Gender						
Men	19 (7.8)	6 (15.8)	12 (7.9)	1 (1.8)		.014[a], *
Women	226 (92.2)	32 (84.2)	140 (92.1)	54 (98.2)		
Religion						
Yes	76 (31.0)	15 (39.5)	41 (27.0)	20 (36.4)	3.17	.205
No	169 (69.0)	23 (60.5)	111 (73.0)	35 (63.6)		
Living with family						
Yes	63 (25.8)	12 (32.4)	36 (23.7)	15 (27.3)	1.27	.531
No	181 (74.2)	25 (67.6)	116 (76.3)	40 (72.7)		
Perceived Health						
Yes	173 (70.9)	38 (100.0)	111 (73.0)	24 (44.4)		<.001[a],*
No	71 (29.1)	0 (0.0)	41 (27.0)	30 (55.6)		
Desired department						
Yes	176 (71.8)	30 (78.9)	115 (75.7)	31 (56.4)	8.56	.014*
No	69 (28.2)	8 (21.1)	37 (24.3)	24 (43.6)		
Department						
General ward	97 (39.6)	16 (42.1)	52 (34.2)	29 (52.7)	5.91	.052
Others (ICU, OR, ER, etc.)	148 (60.4)	22 (57.9)	100 (65.8)	26 (47.3)		
Department satisfaction						
Yes	217 (89.3)	38 (100.0)	142 (93.4)	37 (69.8)		<.001[a],*
No	26 (10.7)	0 (0.0)	10 (6.6)	16 (30.2)		
Salary satisfaction						
Yes	203 (82.9)	36 (94.7)	132 (86.8)	35 (63.6)		<.001[a], *
No	42 (17.1)	2 (5.3)	20 (13.2)	20 (36.4)		
Perceived workload						
Overload	162 (66.4)	19 (50.0)	103 (67.8)	14 (25.9)	6.13	.047*
Manageable	82 (33.6)	19 (50.0)	49 (32.2)	40 (74.1)		

Note. ER = emergency room, ICU = intensive care unit, OR = operation room.
*$p < .05$.
[a] Fisher's exact test.

participant showed a similar work adjustment pattern to their group trajectory.

Differences in work adjustment trajectory according to participants' general characteristics

Table 3 presents the differences in work adjustment trajectories according to the participants' general characteristics. There were significant differences in the work adjustment trajectory according to sex ($p = 014$), perceived health ($p < .001$), assignment to the desired unit ($\chi2 = 8.56$, $p = .014$), satisfaction with the assigned unit ($p < .001$), satisfaction with wages ($p < .001$), and perceived workload ($\chi2 = 6.13$, $p = .047$). Regarding perceived health, 38 (100%) in the early adjustment group, and 111 (73.0%) in the standard adjustment group perceived themselves as healthy, and 30 (55.6%) in the delayed adjustment group perceived themselves as unhealthy. Regarding assignment to the desired unit, 30 participants in the early adjustment group (71.8%), 113 (78.9%) in the standard adjustment group, and 31 (56.4%) in the delayed adjustment group stated that they had been assigned to their desired units. Regarding satisfaction with the assigned unit, 38 (100.0%) participants in the early adjustment group, 142 (93.4%) in the standard adjustment group, and 37 (69.8%) in the delayed adjustment group were satisfied with their assigned units. Regarding wages, 36 (94.7%) in the early adjustment group, 132 (86.6%) in the standard adjustment group, and 35 (36.4%) in the delayed adjustment group were satisfied with their wages. The perceived workload was overloaded by 19 (50.0%) participants in the early adjustment group and 103 (67.8%) in the standard adjustment group, while the workload was perceived as manageable by 40 (74.1%) participants in the delayed adjustment group.

Predictors of work adjustment trajectory

Table 4 presents the results of the multinomial logistic regression analysis used to identify predictors of work adjustment trajectory. Multinomial logistic regression was performed using the general characteristics that differed significantly across the three groups, namely sex, assignment to the desired unit, satisfaction with wages, and perceived workload, as control parameters, and the major study variables, namely clinical competency, PysCap, role conflict, preceptor exchange, and social support, as covariates. Perceived health and department satisfaction were excluded from the analysis because none of the participants answered no in the early adjustment group.

Logistic regression analysis identified the hope and optimism domains of PsyCap, social support, and salary satisfaction as significant predictors. The Cox and Snell R2 was 0.55 and the Nagelkerke R2 was 0.65. The regression model showed a good fit ($\chi^2 = 192.12$, $p < .001$).

Compared to the delayed adjustment group, newly registered nurses in the early adjustment group had a higher hope domain for PsyCap and a higher emotional support domain for social support. Participants who expressed higher hope OR = 106.13, 95% CI = 4.95–2275.76] were more likely to have an early adjustment, similar to participants who experienced higher emotional support (OR = 78.04, 95% CIs = 2.48–2452.70). Compared to the delayed adjustment group, newly registered nurses in the standard

Table 4 *Influencing Factors on Work Adjustment Trajectories: Multinomial Logistic Regression Analysis.*

Factors	Early adjustment (ref. delayed)				Standard adjustment (ref. delayed)				Early adjustment (ref. standard)			
	β	*p*	OR	95% CI	β	*p*	OR	95% CI	β	*p*	OR	95% CI
Gender (ref. women)	−1.36	.452	0.26	0.01–8.88	−1.72	.249	0.18	0.01–3.34	0.36	.727	1.43	0.19–10.80
Desired dept. (ref. no)	−0.91	.270	0.40	0.08–2.03	−0.44	.352	0.65	0.26–1.62	−0.48	.493	0.62	0.16–2.42
Salary satisfaction (ref. no)	0.67	.182	5.31	0.46–61.51	0.90	.073	2.46	0.92–6.58	0.77	.510	2.16	0.22–21.25
Perceived workload (ref. overload)	−0.33	.68	0.72	0.15–3.42	−0.29	.747	0.75	0.26–2.11	−0.04	.946	0.96	0.29–3.15
Clinical competency	0.65	.475	1.91	0.33–11.22	0.67	.311	1.96	0.53–7.19	−0.03	.967	0.97	0.28–3.42
Psychological capital												
Self-efficacy	048	.675	1.62	0.17–15.43	1.01	.181	2.74	0.63–11.99	−0.53	.564	0.59	0.10–3.52
Hope	4.67	.003*	106.13	4.95–2275.76	0.50	.540	1.65	0.34–8.10	4.17	.002*	64.48	4.47–930.11
Optimism	1.85	.058	6.37	0.94–43.28	1.18	.040*	3.25	1.06–9.98	0.67	.416	1.96	0.39–9.95
Resiliency	1.51	.215	4.50	0.42–48.59	0.05	.945	1.05	0.25–4.55	1.45	.138	4.28	0.63–29.13
Preceptor exchange												
Affect	1.12	.297	3.06	0.37–25.15	0.54	.271	1.71	0.66–4.45	0.58	.549	1.79	0.27–12.00
Royalty	−0.14	.872	0.87	0.15–4.94	−0.35	.458	0.71	0.28–1.77	0.21	.789	1.23	0.28–5.49
Contribution	−0.24	.770	0.78	0.15–4.01	−0.47	.363	0.63	0.23–1.77	0.23	.736	1.25	0.34–4.63
Professional respect	−0.70	.643	0.50	0.03–9.45	0.02	.973	1.02	0.32–3.28	−0.72	.607	0.49	0.03–7.47
Social support												
Emotional support	4.36	.013*	78.04	2.48–2452.70	1.41	.127	4.08	0.67–24.94	2.95	.053	19.11	0.96–380.52
Informational support	−0.51	.683	0.60	0.05–6.95	0.54	.418	1.71	0.47–6.30	−1.05	.328	0.35	0.04–2.86
Tangible support	−0.82	.346	0.44	0.08–2.42	0.04	.932	1.04	0.39–2.83	−0.86	.236	0.42	0.10–1.76
Appraisal support	−0.76	.611	0.47	0.03–8.71	−0.85	.326	0.43	0.08–2.37	0.09	.945	1.09	0.09–12.73
Role conflict	−0.84	.296	0.43	0.09–2.08	−0.44	.343	0.64	0.26–1.61	−0.39	.554	0.68	0.18–2.48
Likelihood ratio test $\chi^2 = 192.12$, $p < .001$, Cox & Snell R2 = 0.55, Nagelkerke R2 = 0.65												

Note. CI = confidence interval; OR = odds ratio; ref. = reference.
*$p < .05$.

adjustment group had a higher PsyCap optimism domain. Participants who expressed higher optimism were more likely to have a standard adjustment than a delayed adjustment (OR = 3.25, 95% CIs = 1.06–9.98). Compared to the standard adjustment group, newly registered nurses in the early adjustment group had a higher hope domain for PsyCap. Participants who expressed higher hope were more likely to have an early adjustment (OR = 64.48, CIs = 4.47–930.11).

Discussion

This study used trajectory analysis to identify groups of newly registered nurses with work adjustment patterns. The results indicated that changes in overall work adjustment after employment could be classified into three groups: early adjustment, standard adjustment, and delayed adjustment. All groups maintained a similar level of adjustment at all time points. These results were consistent with the findings of Park and Lee [35], in which the degree of reality shock experienced by newly registered nurses remained unchanged throughout the registration period. Based on their results, the authors suggested that reducing reality shock in the early days of employment can effectively prevent the turnover of newly registered nurses. Since the early work adjustment level was maintained for 12 months, effective strategies must be implemented in the early stages to facilitate work adjustment.

The early-stage group had the lowest number of participants (16.1%). All the nurses in this group had good perceived health, were satisfied with their unit, and most were satisfied with their salaries. The predictors of the early adjustment trajectory were hope and emotional support compared to the delayed group, and hope compared to the standard group. Previous studies [36–38] found that higher hope levels of new nurses increased organizational commitment and socialization while reducing job stress, suggesting that hope is an essential predictor for this group. However, this group's work adjustment level declined over time. Ju et al. [39] reported that newly registered nurses were strongly motivated to work in the early months after employment; however, various factors that caused disappointment throughout their careers diminished their organizational commitment. Thus, it was necessary to identify the disappointment factors and prevent their adjustment from being reduced.

The largest group was the standard group (60.6%), which scored the highest in the interpersonal domain of work adjustment. In other words, these nurses adjust to the workplace through interpersonal relationships, consistent with previous findings suggesting that the interpersonal competencies of newly registered nurses are significantly correlated with organizational socialization [31,40]. Therefore, to help them maintain a high level of adjustment, organizations need to recognize interpersonal relationships' vital role in their adjustment and implement measures to help newly registered nurses build relationships. Additionally, the predictor of this group was optimism compared to the delayed adjustment trajectory. This study's results were similar to previous findings suggesting that optimism significantly predicts field adjustment [41]. As the largest population, they were potential candidates for early and delayed adjustments, making it essential to foster an environment that assists newly registered nurses in maintaining their optimism and good relationships.

Additionally, the delayed group (23.3%) had the lowest level of work adjustment, and their improvement was significantly delayed, requiring more attention than the other groups. Notably, the 12-month job performance of this group showed remarkable growth, indicating that work adjustment improved with job performance. Regarding general characteristics, a substantial percentage of the nurses in this group perceived themselves as having poor health, were not assigned to their desired unit, and wished to transfer to a different department or leave their jobs. In addition, several nurses in this group were unsatisfied with their salary compared to other groups and stated that their workload was manageable. However, in the other groups, a significant number considered their workload to be excessive. These results indicated that nurses in this group tended to evaluate their work environments and themselves negatively. The predictors for this group were low levels of hope, optimism, and emotional support compared to the other groups. The negative disposition in delayed adjustment can be understood based on previous studies, which suggested that work engagement significantly predicted organizational commitment [42–46]. In other words, expecting new registered nurses with negative and unenthusiastic attitudes toward their work from the beginning of their careers to adapt seamlessly to the organization and its environment may be unrealistic. Thus, means to enhance positivity and tailoring education must be employed to facilitate work adjustment in this group. For example, identifying the areas of practice in which these newly registered nurses show weaknesses before the end of their preceptorship or before their employment and providing education tailored to promptly improve such areas would assist in boosting their work adjustment. Evelyn et al. [47] suggested mastery learning and self-regulation as individualized strategies for enhancing clinical competence. Mastery learning is an individual educational method in which learners learn at their own pace and develop learning skills. Self-regulation is an educational strategy in which learners promote behaviors that include organizing information, receiving help from others, and practicing skills. An application of mastery learning and self-regulation for delayed groups and future studies on implementation and effectiveness are needed. Predictors of delayed adjustment include low levels of hope, optimism, and emotional support; this group is more likely to have poor job performance and negative attitudes. Consequently, interventions that foster hope and optimism within a supportive environment and focus on clinical competence are imperative for improving the work adjustment of individuals in this group. Yoo et al. [43] suggested that solely targeting newly registered nurses may be ineffective, as individual dispositions can easily permeate organizational culture [42]. Therefore, interventions involving a broad range of individuals such as preceptors, senior nurses, and managers may promote positivity among newly registered nurses. Simultaneously, departmental and organizational efforts emphasizing empathy, positive encouragement, and psychological support are crucial for creating a supportive work culture.

This study has some limitations. First, data collection was only conducted at one hospital. Second, clinical competency, preceptor exchange, and role conflict, which have been reported as influencing factors in previous studies, were not significant predictors in this study. This might be because the target hospital provides similar levels of training and preceptorship to all new nurses until two months of employment. In other words, the clinical competency and preceptor exchange of participants who received a similar quantity and quality of training and preceptorship at two months might not have had a significant effect on work adjustment changes in the following 12 months. Role conflicts among nurses are caused by the limitations of their roles and the complexity of clinical practice when performing tasks in hospitals [48]. Therefore, role conflict among new nurses with little work experience may not be significant. Based on these limitations, further studies in various medical institutions with large sample sizes and long-term follow-ups are required to generalize this study's results and derive additional trajectories for new nurses.

In summary, it is necessary to develop timely, effective, and intensive education programs and strategies that address the unique characteristics of each type of work adjustment trajectory to prevent delayed and ineffective adjustment in newly registered nurses. Customized education and training programs should be designed to screen for and address delayed adjustment, focusing on nurturing positive interpersonal relationships and considering individual capabilities. In addition, understanding the distinctive features of each work adjustment trajectory and implementing tailored interventions are important. Continued monitoring of levels of hope, optimism, and emotional support among nurses who exhibit early and standard adjustment is vital for preventing a decline in their adjustment levels. In contrast, nurses exhibiting delayed adjustment, who often display negative attitudes toward their work and environment, require interventions that foster empathy, positive encouragement, and psychological support, such as peer support programs, at the departmental and organizational levels.

Conclusions

This study aimed to identify work adjustment trajectories among newly registered nurses, categorize them, and examine the predictors and characteristics of each trajectory. This study identified three work adjustment trajectory groups for newly registered nurses: early, standard, and delayed. Based on the analyses, the predictors of early adjustment compared to delayed adjustment were identified as hope and emotional support, whereas the standard adjustment predictor was identified as optimism. This study's results highlight the need to implement effective and intensive educational interventions to promote early work adjustment among newly registered nurses. Moreover, continuous monitoring of hope, optimism, and emotional support in nurses who make early and standard adjustments is essential. Nurses who display delayed adjustment and require the most attention should be supported by organizational measures that provide effective and substantial training, empathy, positive encouragement, and psychological support, such as tailored education and peer-support programs, to accelerate the improvement of nursing competencies.

Source

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Conflict of interest

None declared.

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Research Article

Association Between Dyadic Coping and Quality of Life in Breast Cancer Patients and Their Spouses: An Actor-partner Interdependence Mediation Model

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SUMMARY

Purpose: This study aims to examine the relationship between dyadic coping (DC), intimate relationship, and quality of life (QOL), and to explore the mediating role of intimate relationship in patients with breast cancer (BC) and their spouses from a dyadic perspective.
Methods: A cross-sectional design was used in this present study, and 205 dyads of BC patients and their spouses who completed a sociodemographic and clinical questionnaire and self-reported measures assessing their DC, intimate relationship, and QOL were recruited. The actor-partner interdependence mediation model (APIMeM) was adopted for dyadic distinguished data analysis. The paired *t*-test, Pearson's correlation coefficients, and the structural equation model were employed for data analysis by using SPSS 22.0 and Amos 24.0.
Results: The current study revealed that, for BC patients and their spouses, intimate relationship mediates completely the actor effect of DC on QOL. That is to say, DC was positively related to intimate relationship and then improved QOL. It was interesting to find that, for both patients and their spouses, the intimate relationship could exert a partner-actor complete mediation effect between DC and QOL.
Conclusions: The DC perceived by both BC patients and their spouses has significant actor effects on QOL by improving the level of an intimate relationship. Furthermore, intimate relationship has significant actor-actor and partner-actor complete mediation effects for both patients and their spouses. Given the vital role of patient-spouse dyads, nursing staff should take patients' spouses into account when conducting related psychosocial interventions aiming to improve the QOL of BC patients and their spouses.

Introduction

Global Cancer Statistics 2020 shows breast cancer (BC) has become the most prevalent cancer for females worldwide, and the incidence of BC in China was the highest [1]. With the advancement of medical technology over the last few decades, the 5-year survival rate of BC in China is 82.0% [2]. The diagnosis of BC and subsequent therapies have been viewed as stressful experiences that negatively impacted both BC couples' quality of life (QOL) and had negative side effects on both patients and their intimate partners [3,4].

Physical, psychological, and social well-being are all considered several dimensions of QOL at the individual level [5]. It was reported that QOL has been regarded as an important index, assessing the influence of diagnosis and the following treatments [5]. Ahn et al. [6] found that BC patients' QOL was lower than that of the general population. Furthermore, as the main caregivers of patients, spouses needed to take the responsibility of caring for patients, reporting a poor level of QOL.

For a long time, the related research of BC was focused on an individual level [7]. However, in recent years, cancer patients and their spouses have seen cancer as a "we-disease", which needs them to cope together to improve their psychosocial adaptation,

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thus having a better QOL [8]. Dyadic coping (DC), which is a shared process between couples, is the process of one partner's personal stress moving to the other [9], and if one partner feels stressed, they will express it to his/her partner, then the other may response and coping the stress as a unit [10]. According to the Systemic Transactional Model (STM), DC was divided into two parts: positive DC and negative DC [9]. Stress communication, delegated DC, supportive DC, and common DC are all examples of positive DC. Additionally, previous literature demonstrated that positive DC can help couples improve their physical and psychological well-being by restoring the homeostasis of their intimate relationship [11,12].

Intimate relationship refers to the psychological and physical closeness generated from the process of dyadic interaction through verbal or non-verbal ways between couples [13]. When experiencing psychological distress, cancer patients and their spouses regard the intimate relationship as a resource and strategy, which has a positive effect on the quality of marital relationships and psychosocial adaptation and can improve the QOL of patients and their spouses [14–16]. Kayser and Acquati [3], investigating 86 BC patients and their spouses, found that one partner's intimate relationship was not only affected by the level of their own DC but also by their spouses.

Several studies have studied the relationship between DC, intimate relationship, and QOL among BC patients. Previous studies dezzmonstrated that positive coping behaviors of both BC patients and their family members could not only positively predict their own QOL, but also their family members' [17,18]. Shi et al. [19] also found that intimate relationship mediated significantly between DC and psychological well-being among BC patients. While, the mechanisms of the relationship between DC, intimate relationship, and QOL among BC patients and their spouses remain incompletely understood. According to the relationship intimacy model of couple adaptation to cancer, the couples' relationship intimacy played the mediation role between the relationship-enhancing behaviors and psychological adaptation. In this study, DC was seen as the relationship-enhancing behaviors, and intimate relationship and QOL were seen as the mediation role and outcome, respectively, thus to examine the mediation role from dyadic perspective.

The moderator and mediator effects of dyads may be examined using the Actor-Partner Interdependence Mediation Model (APIMeM), which extends the Actor-Partner Interdependence Model (APIM) by including a mediator variable [20]. The three pairs of variables that make up the APIMeM are X (initial variables), Y (outcome variables), and M (mediator variables) for the dyadic members. Additionally, it has six actor effects and six partner effects, each of which has been named A and P, respectively [21]. The actor effect refers to the impact of a partner's initial variable, specifically the patients' DC, on their own outcome variable, which is the patient's QOL. On the other hand, the partner effect pertains to the influence of a partner's initial variable, on their spouse's outcome variable. To the best of our knowledge, this study was the first to assess the connection between DC, close relationships, and QOL in China using the Actor-Partner Interdependence Mediation Model (APIMeM).

In order to determine whether intimate relationship mediated the effects of DC on QOL, the current study looked into the relationships between DC, intimate relationships, and the QOL of BC patients and their spouses. Based on the aforementioned literature review, we hypothesize that the DC of BC patients and their spouses would be directly and positively related to their own and spouses' QOL. Additionally, DC would improve the patients' QOL and their spouses' QOL in an indirect way, and these indirect effects were mediated by close relationships.

Methods

Study design and participants

This study used a cross-sectional design and adhered to the STROBE guideline for reporting observational studies [22]. Between December 2021 and June 2022, patients with BC and their spouses were recruited from the Department of Breast Surgery at three tertiary hospitals in Shenyang, Liaoning Province, China.

The eligibility criteria for patients included in this study were as follows: (1) females who were 20 years of age or older; (2) lived with a heterosexual partner for more than 1 year; (3) had a diagnosis of BC; (4) were fluent in Mandarin, and (5) able to understand and answer questions independently. The following inclusion criteria were for the spouses: (1) 22 years of age or older; (2) willing to participate in this study; and (3) could communicate in Mandarin. Psychiatric conditions and cognitive dysfunction were the exclusion criteria for patients and partners, which were judged according to the past history records in electronic medical records provided by doctors.

The sample size for the current study was generated using a rough estimation method by multiplying the number of study variables by 5–10 times [23]. Due to the 19 variables that needed to be taken into account, the sample size for this study ranged from 95 to 190 dyads. The required minimum sample size, with a loss rate of 20.0%, was 114 dyads. Twenty of the 225 dyads of BC patients and their spouses who were invited to participate in the study did not complete the questionnaires. The survey had a response rate of 91.1%; out of the 225 dyads, 15 patients had to stop responding due to serious health problems, and 5 patients were disqualified because their husbands were uninterested in the study. Finally, 205 BC patients and their partners finished this study.

Procedures

The Liaoning Cancer Hospital's Ethics Committee in China gave its approval to this study (No. 202112109). Before surveying, the researchers (Wei Chen and Hui Li) were trained in order to use the same standardized words to explain the aims and procedures. After reviewing the medical records, the researchers selected the participants strictly according to the selection criteria. All participants were made aware of the study's objectives, and after signing informed permission forms, patients and their spouses were required to respond independently to questionnaires within 25–30 minutes. Also, participants were informed that it was an anonymous survey, and the data was confidential. All participants had the right to refuse to withdraw from this research at any time. When participants encountered confused items, the researcher would give detailed explanation. Once participants finished the questionnaire, the researcher would check whether the items were answered entirely.

Measurements

Sociodemographic and clinical characteristics

The sociodemographic and clinical questionnaire was designed by the researchers, including age, length of the marriage, number of children, educational background, monthly household income, experience of caring for patients, employment status, treatment method, the time since diagnosis, and cancer stage.

Dyadic Coping Inventory (DCI)

The Chinese version of the Dyadic Coping Inventory (C-DCI), created by Xu et al., was used to measure the DC of patients and their spouses [24]. C-DCI consists of 37 items that evaluate how well couples handle stress and coping mechanisms, which can be divided into six dimensions including stress communication, supportive DC, delegated DC, common DC, negative DC, and coping evaluation. A 5-point Likert scale was used to rate the score of each item ranging from 1 (very rarely) to 5 (very often), and total scores were calculated by summing items 1 to 35 ranging from 35 to 175(the items 7,10,11,15,25,26, and 27 are negative items) [25]. The evaluation items 36 and 37 are not included in the total scores. Higher scores indicated the DC levels were better. The C-DCI has robust reliability and validity, and it has been widely utilized in couples with BC [19,26]. In this study, Cronbach's α of C-DCI was .95 in patients and .92 in spouses, and the range of Cronbach's α of the subscales was .68—.91 in patients and .61—.89 in spouses.

Locke-Wallace Marital Adjustment Test (MAT)

Intimate relationships between patients and their spouses were evaluated using the MAT, Chinese version, which was translated from Locke and Wallace [27] by Chinese scholar Wang Xiang-dong et al [28]. The MAT consists of 15 items, and the total score was determined by adding together each item's value, which ranges from 2 to 158. A higher score denotes a higher level of intimacy in the intimate connection. In this study, patients' and spouses' Cronbach's α for MAT were both .83.

Medical outcomes study 36-item short-form health survey (SF-36)

The Chinese version of the SF-36 consists of 36 items and is divided into the following 8 domains: physical functioning (PF), role-physical (RP), body pain (BP), general health (GH), vitality (VT), social function (SF), role-emotional (RE) and mental health (MH) was used to measure the QOL of patients and their spouses [29]. Additionally, two composite subscales of the SF-36 are the Physical Component Scale (PCS) and the Mental Component Scale (MCS). The following domains are part of the PCS: PF, RP, BP, and GH; while the remaining four domains belong to the MCS. Higher scores indicated greater functioning. Each dimension's ratings ranged from 0 to 100. The score of the PCS and the MCS was the average score of the four dimensions. Additionally, the SF-36's overall score is the sum of the scores for 36 items, ranging from 36 to 145 [30]. In this study, the Cronbach's α of SF-36 was .92 in patients and .91 in spouses, and its range of subscales' Cronbach's α was .76— .84 in patients and .72— .81 in spouses.

Data analysis

The data was analyzed using the software SPSS 22.0 and Amos 24.0. First, frequency and percentage were used to describe the countable data. The mean and standard deviation were used to express the data from a normal distribution. Then, the average differences in DC, intimate relationship, and QOL between patients and their spouses were examined using paired *t*-tests. Additionally, the Pearson correlation coefficient was utilized to evaluate the connections between patients' and spouses' QOL, intimate relationship, and DC.

To determine whether the patients' and their spouses' DC affected their own and their spouses' QOL directly and indirectly through the mediation of their own and their spouses' intimate connection, the Actor-Partner Interdependence Mediation Model (APIMeM) was utilized [21]. During the preliminary analysis, we found that patients' educational level and the time since diagnosis affected patients' QOL. Thus, educational level and the time since diagnosis were included as covariates in the final APIMeM. Two independent variables (patients' and spouses' DC and QOL) and two possible mediator variables (patients' and spouses' intimate relationship) compensate for the APIMeM's two parts and its six variables. The structural equation modeling (SEM) was utilized to evaluate the direct and indirect links between DC, intimate relationship, and QOL. Additionally, a 5000-sample, bias-corrected bootstrapping approach with a 95.0% confidence interval was used to calculate the mediation effects [31]. A two-tailed, $p \leq .05$ was considered to indicate a statistically significant difference.

Results

Sample characteristics

The mean ages of the 205 dyads of BC patients and their spouses were 47.21 (SD = 8.47) and 48.11 (SD = 8.99), respectively, and the majority of the couples were 36.00 to 59.00 years old. The mean years of length of marriage were 23.00 (SD = 10.23). Most patients were treated with surgery (105, 50.2%), and most patients were in stage (145, 70.7%). The details of sociodemographic and clinical information of patients and their spouses are shown in Table 1.

Breas cancer patients' and their spouses' mean scores of DC, intimate relationship, and QOL

Paired-samples *t*-tests showed that the scores of QOL between patients and their spouses were significantly different, and there was no significance between patients and their spouses' DC and intimate relationship. Table 2 displays the details of the mean scores for the other subscales.

Correlation analysis of the DC, intimate relationship, and QOL of patients and their spouses

The Pearson coefficient correlation analysis found that there were positive correlations between patients' and their spouses' DC ($r = .57$, $p < .010$), intimate relationship ($r = .60$, $p < .010$), and QOL ($r = .36$, $p < .010$). Patients' QOL was significantly associated with their own DC and intimate relationship and their spouses' intimate relationship, and spouses' QOL was significantly associated with both patients' and spouses' DC and intimate relationship. The details of the intercorrelations between the variables are displayed in Table 3.

Dyadic impact of DC on QOL via mediator role of intimate relationship

Figure 1 shows standardized estimates for the APIMeM. The initial APIMeM was a saturated model, and then the six actor effects and partner effects were constrained to be equal. The goodness of fit for APIMeM was satisfactory: $x^2/df = 2.09$, $RMSEA = 0.07$, $CFI = 0.98$, $IFI = 0.98$, $TLI = 0.95$. Table 4 presents the results of the direct and indirect impacts of DC on QOL.

Direct actor and partner effects

According to the actor effects of DC on intimate relationship, patients' and their spouses' DC were positively correlated with their intimate relationship ($\beta = .44$, $p < .001$ and $\beta = .39$, $p < .001$, respectively). Meanwhile, significant partner effects of patients' DC on their intimate relationship with their spouses and spouses' DC on patients' intimate relationship were found ($\beta = .15$, $p < .050$ and $\beta = .12$, $p < .050$, respectively).

Table 1 *Sample Characteristics of Patients and Their Spouses and the Univariate Associations With QOL.*

Variable	BC patients ($n = 205$)	BC patients' QOL			Spouses ($n = 205$)	Spouses' QOL		
	M ± SD or n (%)	M ± SD	t/F	p	M ± SD or n (%)	M ± SD	t/F	P
Age (years)	47.21 ± 8.47		0.19	.832	48.11 ± 8.99		0.53	.591
20~35	13 (6.3)	104.38 ± 14.69			19 (9.3)	122.34 ± 11.01		
36~50	177 (86.3)	104.91 ± 15.68			167 (81.5)	119.00 ± 14.34		
≥60	15 (7.3)	107.36 ± 14.75			19 (9.3)	119.93 ± 8.20		
Nationality			1.08	.284			0.68	.498
Ethnic Han	170 (82.9)	105.58 ± 15.36			177 (86.3)	119.65 ± 13.28		
Ethnic minorities	35 (17.1)	102.49 ± 16.14			28 (13.7)	117.77 ± 15.63		
Religious faith			1.23	.220			1.48	.141
Yes	19 (9.3)	109.22 ± 14.35			17 (8.3)	114.74 ± 14.52		
No	186 (90.7)	104.63 ± 15.58			188 (91.7)	119.82 ± 13.48		
Employment status			0.62	.541			0.67	.514
Employed	151 (73.7)	104.34 ± 16.39			179 (87.3)	119.42 ± 13.71		
Unemployed	24 (11.7)	107.42 ± 9.93			9 (4.4)	114.98 ± 17.42		
Retired	30 (14.6)	106.75 ± 14.56			17 (8.3)	121.46 ± 9.97		
Educational level			3.47	.017*			1.99	.117
Primary school	8 (3.9)	113.05 ± 11.60			9 (4.4)	118.81 ± 11.16		
Junior high school	68 (33.2)	101.71 ± 14.77			62 (30.2)	116.00 ± 13.91		
High school/vocational high school	35 (17.1)	101.91 ± 14.40			41 (20.0)	120.37 ± 13.37		
College and university	94 (47.8)	107.96 ± 16.05			93 (45.4)	121.28 ± 13.47		
Marriage length (years)	23.00 ± 10.23		0.33	.806				
0~10	27 (13.2)	103.64 ± 14.03						
11~20	56 (27.3)	106.56 ± 16.67						
21~30	76 (37.1)	105.11 ± 15.60						
≥31	46 (22.4)	103.95 ± 14.98						
Number of children			0.71	.494				
0	13 (6.3)	108.88 ± 16.31						
1	148 (72.2)	105.26 ± 15.80						
2	44 (21.5)	103.24 ± 14.26						
Residence			1.45	.237				
City	139 (67.8)	106.32 ± 15.81						
Suburban	26 (12.7)	102.16 ± 18.43						
Countryside	40 (19.5)	102.54 ± 11.68						
Medical insurance			1.907	.151				
Rural cooperative medical services	61 (29.8)	101.87 ± 12.48						
Medical insurance	136 (66.3)	106.30 ± 16.57						
Self-funded	8 (3.9)	108.18 ± 15.51						
Monthly family income (¥)			0.33	.860				
< 3000	45 (22.0)	104.37 ± 13.44						
3001~5000	64 (31.2)	105.44 ± 15.27						
5001~7000	31 (15.1)	105.21 ± 14.49						
7001~9000	27 (13.2)	107.57 ± 15.74						
≥9000	38 (18.5)	103.31 ± 18.95						
Time since diagnosis (months)			2.605	.037*				
< 1	70 (34.1)	109.45 ± 15.07						
1~2	58 (28.3)	102.33 ± 15.53						
3~5	47 (22.9)	101.69 ± 14.59						
6~8	23 (11.2)	104.26 ± 16.38						
≥9	7 (3.4)	108.83 ± 15.53						
Treatment type			2.39	.094				
Surgery	103 (50.2)	106.91 ± 14.43						
Neoadjuvant chemotherapy	33 (16.1)	106.12 ± 17.54						
Chemotherapy	69 (33.7)	101.78 ± 15.70						
Cancer stage			0.52	.593				
I	21 (10.2)	102.71 ± 14.33						
II	145 (70.7)	105.75 ± 15.50						
III	39 (19.0)	103.73 ± 16.26						

Note. M = Mean; SD = Standard deviation.
*$p < .05$.

At the same time, the actor effects of intimate relationship on QOL for both patients and their spouses were found to be significant ($\beta = .26$, $p < .001$ and $\beta = .30$, $p < .001$, respectively), but the partner effects were not significant. Additionally, the actor effects of DC on QOL were not significant for both patients and their spouses ($p > .050$). Finally, there were no significant partner effects of patients' DC on their spouses' QOL or spouses' DC on patients' QOL.

Indirect effects of dyadic coping on QOL

Table 4 presents the results of the mediation analysis. Both patients and their spouses had significant actor-actor complete mediation effects (both $\beta = .10$, CI = .05–.15), which indicated that both patients and their spouses' DC were associated with their own QOL through the complete mediating effect of their own intimate

Table 2 *Mean Scores of Variables and Dimensions (n = 205).*

Variable	Patient (M ± SD)	Spouse (M ± SD)	t^a	*p*
Dyadic coping	129.00 ± 18.87	127.40 ± 15.88	1.39	.166
stress communication	26.75 ± 5.14	25.97 ± 5.00	1.98	.049
supportive dyadic coping	36.01 ± 6.89	36.24 ± 5.46	−.53	.598
delegated dyadic coping	14.50 ± 2.52	14.33 ± 2.39	.88	.380
common dyadic coping	18.05 ± 3.33	17.86 ± 3.43	.79	.431
negative dyadic coping	33.69 ± 5.91	33.01 ± 6.43	1.53	.127
Intimate relationship	110.31 ± 20.81	112.75 ± 19.91	−1.92	.057
QOL	104.77 ± 15.50	119.19 ± 13.66	−12.42	< .001
PCS	50.00 ± 8.15	55.83 ± 8.14	−7.86	< .001
MCS	50.00 ± 9.31	55.58 ± 9.11	−7.60	< .001

Note. M = Mean; SD = Standard deviation.

[a] value of paired-sample *t*-test.

relationship. It's interesting to note that there were significant partner-actor mediation effects for both patients and their spouses, indicating that patients' DC had a positive effect on their spouses' QOL through their spouses' intimate relationship ($\beta = .03$, CI = .01 ~ .06), and spouses' DC had a positive effect on patients' QOL through patients' intimate relationship ($\beta = .03$, CI = .01 ~ .06)

Discussion

To the best of our knowledge, this study was the first to investigate the association between the DC, intimate relationship, and QOL of BC patients and their spouses from a dyadic perspective. More addition, the mediation effects of intimate relationship was explored by adopting APIMeM.

This study demonstrated that DC and the intimate relationship had a positive and directive relationship in both BC patients and their spouses. The results of this study were consistent with the previous research on cancer couples and revealed that common DC and the quality of the relationship had a positive relationship for both patients and their spouses [18]. A most likely explanation is that spouses, as the main supportive resource of BC patients, communicate with patients about the disease and the following process of rehabilitation frequently, which contributes to the enhancement of their internal cohesion and the improvement of the quality of their intimate relationship [32]. Moreover, when individuals felt that their spouse reported more disclosure to them, they would take on more responsibilities and provide more strategies about positive DC for their partners, thus the relationship of their intimate relationships could be enhanced [33].

Also, this study found that the intimate relationship had a positive and significant actor effect on QOL in both BC patients and their spouses. The results of this study were contrary to the previous study, which examined the relationship between intimate relationship and QOL for 183 prostate cancer patients and their spouses, and demonstrated that the intimate relationship of patients and their spouses was not statistically significantly associated with both QOL [34]. A possible explanation for this difference may be that compared with males, female cancer patients tend to communicate with their spouses about their disease and negative symptoms. This process is a positive factor contributing to the intimate relationship and further improves the QOL for both BC patients and their spouses.

In the current study, both patients and their spouses' DC had no actor and partner effects on their QOL, respectively, which was contrary to the results of a previous literature review revealing that positive DC had a directive association with couples' mental health, while the negative DC was linked with worse QOL [35]. DC coping consists of two parts: positive DC and negative DC, and the aim of a positive DC is to maintain or restore the level of personal well-being, while a negative DC in the context of Chinese culture may represent a protective behavior for their partners. This may be the reason why DC has no direct link to QOL for both patients and their spouses in the current study.

Furthermore, for both patients and their spouses, DC has a significant actor-actor complete mediation effect on QOL through their own intimate relationship. This finding was similar to a study examining the mediation effect of the intimate relationship between DC and QOL in gynecological cancer patients, which found that an intimate relationship exerted a complete mediation effect on the relationship between DC and QOL [36]. A possible explanation is that DC can be seen as a part of improving the quality of intimate relationship, which is conducive to the improvement of QoL. Positive DC can help both patients and their spouses establish a robust quality of marital satisfaction. Whereas, negative DC has adverse effects. So, it is crucial to help the dyads to take positive DC behaviors when encountering the illness and treatment of adverse effects, thus improving their QOL.

It was interesting to find that for both patients and their spouses, the DC had a significant partner mediation effect on QOL through the intimate relationship. While, to the best of our knowledge, there was no study examining the mediation effects of the intimate relationship between DC and QOL from a dyadic perspective for patients and their spouses at the same time. A possible explanation is that spouses provide more advanced care to BC patients. On the one hand, patients receive more supportive care and common communication which is conducive to improving their quality of the intimate relationship, thus making patients have a better QOL. On the other hand, influenced by Confucian culture, patients are not willing to let their husband bear too much pressure and caring burden for them, so they may choose to cope with the disease together to improve the QOL of their spouses. This finding emphasizes the importance of the interaction effect in BC patients and their spouses, suggesting that couple-based intervention in BC patients and their spouses is essential to improve their QOL in the future. Thus, clinical staff should encourage partners to express more about their feelings, communicate frequently with their

Table 3 *Pearson Correlations Between Dyadic Coping, Intimate Relationship, and QOL (n = 205).*

Variable	Dyadic coping (*r*(*p*))		Intimate relationship(*r*(*p*))		QOL(*r*(*p*))	
	P	S	P	S	P	S
P dyadic coping	1					
S dyadic coping	.57(*p* < .001)	1				
P intimate relationship	.51(*p* < .001)	.37(*p* < .001)	1			
S intimate relationship	.36(*p* < .001)	.47(*p* < .001)	.60(*p* < .001)	1		
P QOL	.19(*p* = .001)	.03(*p* = .657)	.25(*p* < .001)	.19(*p* = .007)	1	
S QOL	.30(*p* < .001)	.30(*p* < .001)	.24(*p* < .001)	.42(*p* < .001)	.36(*p* < .001)	1

Note. P = patient; QOL = Quality of life; S = spouse.

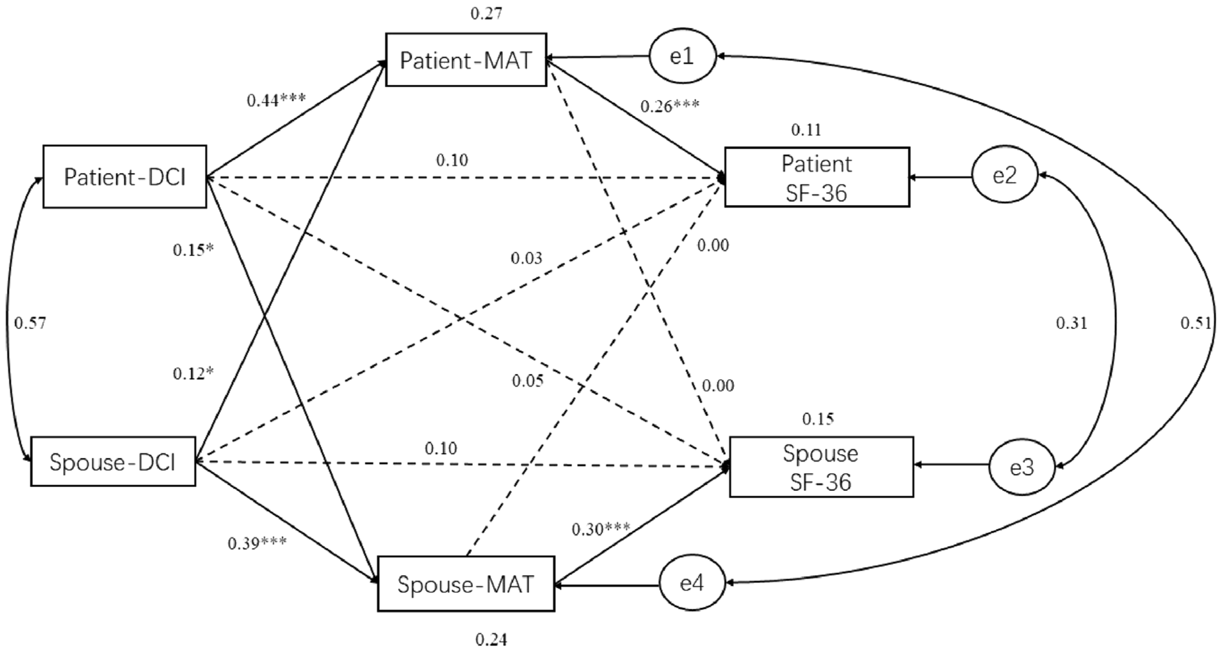

Figure 1. The Actor-Partner Interdependence Mediation Model in Patients with Breast Cancer and Their Spouses. *Note.* DCI = Dyadic Coping Inventory; MAT = Marital Adjustment Test; SF-36 = Quality of Life; Estimates are unstandardized regression coefficients; Significance path coefficients are in solid lines; *p < .05, ***p < .001.

Table 4 *The Total Effects, Total Indirect Effects, and Direct Effects of the APIMeM in Patients With BC and Their Spouses (n = 205).*

Effect			B	SE	95% CI	*p*
Actor effect	Patient	Total effect	.21	.06	.10~.31	.001
		Total IE	.12	.03	.06~.18	<.001
		Actor-actor Simple IE	.12	.03	.06~.18	.001
		Partner-partner Simple IE	.00	.01	−.02~.02	.985
		Direct effect	.10	.06	−.03~.21	.143
	Spouse	Total effect	.14	.09	−.05~.31	.140
		Total IE	.04	.03	−.02~.10	.147
		Actor-actor Simple IE	.04	.03	−.01~.09	.132
		Partner-partner Simple IE	.00	.10	−.02~.02	.986
		Direct effect	.10	.07	−.03~.22	.141
Partner effect	Patient	Total effect	.08	.07	−.06~.22	.261
		Total IE	.03	.02	−.02~.08	.195
		Actor-partner Simple IE	.00	.02	−.05~.05	.986
		Partner-actor Simple IE	.03	.01	.01~.07	.003
		Direct effect	.05	.08	−.10~.20	.566
	Spouse	Total effect	.05	.05	−.05~.14	.319
		Total IE	.01	.04	−.06~.08	.657
		Actor-partner Simple IE	.00	.03	−.07~.06	.986
		Partner-actor Simple IE	.01	.01	−.00~.04	.093
		Direct effect	.03	.05	−.07~.14	.572

Note. APIMeM = Actor-Partner Interdependence Mediation Model; B = Unstandardized regression coefficients; CI = Confidence interval; IE = Indirect effect; SE = Standard error.

spouses, so as to improve their intimate relationship, then enhancing both their QOL.

Also, this study does have several limitations that should be noticed. First of all, this study was a cross-sectional study, which could not reflect the dynamic characteristics and the relationships among both patients and their spouses' DC, intimate relationship, and QOL. Thus, longitudinal studies are recommended for future studies. Second, the time of cancer diagnosis and the type of treatment were not limited in this study, which may have a confounding effect on the interpretation of the results. Third, all the variables in this study were measured by self-reported, so, there may be reporting biases existing in this survey. Finally, this study was conducted in China, where people are in the context of Confucian culture. Future research should be conducted in diverse cultures.

Conclusions

In summary, this study showed that in both BC patients and their spouses, significant actor effects of DC on intimate relationship, and the intimate relationship to QOL were confirmed. Furthermore, intimate relationship has significant actor-actor and partner-actor complete mediation effects for both patients and their spouses. Given the vital role of patients-dyads, nursing staff should take patients' spouses into account when conducting related psychosocial interventions aiming to improve the QOL of BC patients and their spouses. The couple-based interventions conducted in the suitable context of a specific culture and region may be possible and effective in improving the BC patients' and their spouses' QOL.

Conflict of interest

All authors declare that they have no conflict of interests related to submitted manuscript.

Ethical approval

This study was approved by the Ethics Committee of the hospital of Liaoning cancer hospital, China (No. 202112109).

Consent to participate

Written consent was obtained from all participants.

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Research Article

Effectiveness of Non-pharmacological Interventions for Adolescents With Type 1 Diabetes in the Last Five Years: A Systematic Review and Meta-analysis

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SUMMARY

Purpose: Evidence on non-pharmacological interventions for adolescents with type 1 diabetes is unclear. This review aimed to evaluate the effectiveness of non-pharmacological intervention in adolescents with type 1 diabetes.
Methods: We conducted a search on databases from November 11 to 19, 2022, for randomized controlled trials for the effects of non-pharmacological intervention in adolescents with type 1 diabetes. To identify recent research trends, we included studies published from 2017 to November 2022. The risk of bias was assessed using the Cochrane risk-of-bias tool 2.0. To estimate the effect size, a meta-analysis was performed using RevMan 5.4 program and R Studio.
Results: A total of 45 studies were included in the systematic review. Among those, 30 studies were included in the meta-analysis. Non-pharmacological interventions were significantly effective in improving Glycated hemoglobin (HbA1c) (standardized mean difference [SMD] = −0.26, 95% confidence interval [CI]: −0.42, −0.09), quality of life (SMD = 0.44, 95% CI: 0.13 to 0.76), and anxiety (SMD = −0.91, 95% CI: −1.26, −0.56). Subgroup analysis showed that duration of intervention was not a covariate related to HbA1c levels.
Conclusions: Non-pharmacological interventions have shown effectiveness in improving the HbA1c, quality of life, and anxiety in adolescents with type 1 diabetes. Future studies with more rigorous methodology are needed to confirm and strengthen the validity of these findings. Additionally, attention to changes in the lipid profile and self-care motivation among adolescents with type 1 diabetes is warranted.
Trial registration number: Prospective Register of Systematic Reviews (CRD42022382190).

Introduction

Type 1 diabetes (T1D) is characterized by a complete lack of insulin due to the autoimmune destruction of pancreatic islet cells, resulting in lifelong absolute insulin deficiency [1]. With ongoing advancements in medical care and technology, millions of adults live with T1D, having been diagnosed during childhood [2]. In 2022, there were 8.75 million individuals worldwide with T1D; among them, 1.52 million (17.0%) were younger than 20 years [2]. It is predicted that the number of people living with T1D will increase by 66.0%–116.0% globally between 2020 and 2040 [3]. T1D is often associated with a diminished quality of life (QOL), serious long-term complications, reduced life expectancy, and substantial costs for individuals and healthcare systems, even in high-income countries [3].

Especially, hypoglycemia and hyperglycemia during adolescence can have long-term effects on mood, cognitive function, growth, development, and brain health, persisting into adulthood

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[4]. Boys who presented with diabetes ketoacidosis at the onset of T1D had a 4-cm-shorter final puberty height than those who did not present with diabetes ketoacidosis [5]. Adults with childhood-onset T1D had a 1.36- and 1.53-times-higher risk of depression and anxiety, respectively, than controls [6]. Therefore, it is essential for adolescents with T1D to prioritize glycemic control, reducing the risk of long-term complications and ensuring overall well-being throughout their lives.

Diabetes self-care behaviors, which include a balanced diet, regular physical activity (PA), blood glucose (BG) monitoring, and consistent insulin injection routine is strongly recommended for effective glycemic control in adolescents with T1D [7]. However, the prevalence of adolescents with T1D consuming fruits or vegetables at least once daily ranged from 35.7% to 51.7%, and the prevalence of those not engaging in PA for 60 minutes daily was 16.0% [8]. Additionally, a significant proportion (10.0%–55.0%) of adolescents with T1D reported alcohol and cigarette use [9,10], and 73.0% of them had an Glycated hemoglobin (HbA1c) level of 8.0% or higher, indicating suboptimal glycemic control [8]. Factors contributing to these low rates of adopting diabetes self-care behaviors included social stigma and discrimination, difficulties managing hypoglycemia in school, and a lack of privacy for insulin injections [11–13]. In a previous study, 33.3% of children with T1D administered insulin in the restroom, which was associated with the experience of depressive feelings [12].

Non-pharmacological interventions for glycemic control in adolescents with T1D include PA, a healthy diet, diabetes education, and psychological and social support [7]. Previous studies have shown that various interventions, such as recreational football with caloric control, motivational interviewing (MI), digital story-telling intervention focused on self-care enhancement, virtual group appointments, and psychological education were effective in enhancing diabetes self-care and self-efficacy [14] and improving diabetes self-care behaviors [15–17]. These interventions also proved successful in reducing diabetes distress [18] and HbA1c levels [15,19]. Therefore, as adolescents with T1D require not only improvement in self-care behaviors but also continuous motivation and psychological support, it is essential to incorporate non-pharmacological interventions into comprehensive diabetes care for this population [20].

However, previous meta-analyses have revealed inconsistent effects of non-pharmacological interventions on improving HbA1c levels and psychological outcomes in patients with T1D. Interventions such as self-management education using the internet or digital devices and psychological interventions showed no or inconsistent effects on HbA1c [14,21–25]. Similarly, structured education, skill-based psychosocial/cognitive support, and self-care behavior management interventions showed no effect on psychological outcomes including self-efficacy, depression, anxiety, stress, and QOL [22,23,26]. These studies primarily included literature published up to 2016–2017 [14,22,24,26]. Even with the inclusion of literature published up to 2018–2021, determining the comprehensive effectiveness of non-pharmacological interventions on adolescents with T1D remained challenging. Studies often focused on specific interventions, such as PA [27,28], nutrition therapy [29,30], or digital interventions [23]. Additionally, some studies included patients with type 2 diabetes in the analysis [23], or there was a limited number of studies involving adolescents with T1D, ranging from 2 to 18 studies.

Therefore, this study aimed to comprehensively explore various types of non-pharmacological interventions for improving health outcomes in adolescents with T1D conducted in the past five years, starting from 2017. Adolescence is marked by noticeable physical growth, emotional and mental turbulence, social stress, and academic pressure [31,32]. Due to these changes, the effects of non-pharmacological interventions may manifest differently in adolescents compared to adults [22]. Focusing on adolescents with T1D in this study is an important step in developing more targeted and effective preventive intervention strategies. Additionally, this study will be beneficial in identifying key outcome variables that emerge in response to the rapidly evolving diabetes management and healthcare environment, as well as the changing lifestyles of adolescents with T1D in the recent years.

Methods

Research design

This systematic review and meta-analysis examined the impact of non-pharmacological interventions on adolescents with T1D over the last five years. This review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement [33]. Ethics approval was obtained from the institutional review board (IRB) at Pusan National University (IRB No. PUN IRB/2023_05_HR).

Eligibility criteria

The eligibility criteria for this study were specified based on the population, intervention, comparator intervention, outcomes, and study design as follows: (1) population: adolescents with T1D, with a mean age of 10–19 in accordance with the definition in World Health Organization and Medical Subject Headings, (2) intervention: non-pharmacological interventions for diabetes management, (3) comparator intervention: no intervention, standard/routine care, usual care or alternative group, (4) outcomes: included all values of quantitatively measured outcome variables after the intervention, and (5) study design: randomized controlled trials (RCTs) and post-hoc analysis of RCTs.

The exclusion criteria were as follows: studies that (1) did not specify the mean age of the included participants, (2) involved interventions with medications or supplements for glycemic control, (3) were written in a language other than English, (4) were published only as abstracts or unpublished dissertations, and (5) were published before 2017.

Search strategy and study selection

Data search was conducted from November 11 to 19, 2022, covering literature from 2017 to November 2022. This timeframe was chosen because previous meta-analyses mostly included literature published up to 2016–2017 [14,22,24,26]. Additionally, our study aimed to identify emerging key outcome variables, considering the changing lifestyles of adolescents with T1D and the evolving diabetes management and healthcare environment in recent years. PubMed, Embase, CINAHL, and Cochrane were searched between November 11 to 19, 2022. The search strategy was constructed based on a combination of population, intervention, and study design derived from the population, intervention, comparator intervention, outcomes, and study design question. The main search terms and search strategy used were (adolescent* OR teen*) AND (insulin-dependent diabetes mellitus OR type 1 diabetes) AND (education OR exercise OR diet OR psychotherapy OR counseling) AND RCT. Subject headings, such as Medical Subject Headings terms, CINAHL headings, and Emtree, were also used accordingly. The specific search strategy was presented in the Supplementary Material A.

Selection and data collection process

The retrieved studies were merged into Endnote 20, and duplicate records were removed. One researcher (DL) reviewed the title and abstract for inclusion assessment. After completing the abstract review, two researchers (DL and YS) independently assessed full-text studies. In case where multiple reports from the same study were found, we considered them as one study [34]. Any disagreements between the two researchers were resolved through discussion or by involving a third researcher (GP).

Data extraction and risk-of-bias assessment

Two independent researchers (DL and YS) extracted the data using a standardized Excel table. The data included study author, year and country of publication, sample size, mean age and range, diabetes duration, intervention type, duration and frequency, outcome variables, and the outcome values at the post-test. Attempts were made to obtain data required for the meta-analysis by contacting the corresponding authors of 18 studies where statistical values were either missing or were presented graphically. However, no responses were received. If the articles reported median and interquartile range instead of mean and standard deviation, we converted the data according to the Cochrane Handbook for Systematic Reviews of Interventions [35]. We extracted data from graphs using Adobe Acrobat Reader (Adobe, CA, USA) software, which showed high intra-rater and inter-rater reliability, with no significant difference from the original data in calculating pooled effect sizes [36]. The two researchers discussed all disagreements, and a third researcher (GP) reviewed all the extracted data.

We assessed the risk of bias (RoB) using the revised Cochrane risk-of-bias tool for randomized trials (RoB 2.0) [37]. The RoB 2.0 tool assesses the RoB in five domains of RCTs: (1) randomization process, (2) deviations from intended interventions, (3) missing outcome data, (4) outcome measurement, and (5) selection of reported result. Each domain's RoB was determined using an algorithm based on signaling questions, resulting in judgments of ‘Low’ or ‘High’, or ‘Some concerns’. Two researchers (DL and YS) independently assessed the RoB in each study [37]. In cases of discrepancies between the two independent researchers, a third researcher (GP) was consulted to reach a consensus. The findings of the quality assessment are presented using a visualization tool in Supplementary Material B.

Data analysis

An analysis of variance was performed for the meta-analysis using the Cochrane's Review Manager software, and the publication bias and sensitivity analysis were assessed using R Studio 2022.12.0. A random-effects model was adopted in the meta-analysis, considering the variations among the included studies. The effect size was calculated using the means and standard deviations before and after the intervention. Standardized mean difference (SMD) was calculated for outcomes measured by different instruments or was reported in different units. When studies involved multiple groups, we selected one intervention group that best aligned with the study purpose and excluded the others [38]. For each effect size, a 95% confidence interval (CI) and statistical significance were calculated.

The forest plot was used to visually assess the heterogeneity of the studies, based on the direction of the effect size and its corresponding 95% CI. The Higgin's I^2 statistics was conducted to quantify the heterogeneity. Heterogeneity levels of 25.0%, 50.0%, and 75.0% represented low, medium, and high heterogeneity, respectively [39]. Subgroup analyses were conducted to evaluate the resources of heterogeneity and compare the effects between different subgroups. Publication bias was assessed using funnel plots and Egger tests [40]. Since the power of tests for funnel plot asymmetry is low with fewer studies, publication bias was assessed only when there were at least 10 studies included in the meta-analysis [41]. Sensitivity analyses were performed to evaluate the stability of the results using forest plots, estimating standardized mean differences after omitting each study, and the Baujat plot to detect sources of heterogeneity [42].

Results

Study selection

A total of 2,412 studies were identified from four databases (Figure 1). After removing 628 duplicates and excluding 1,697 studies that did not meet the eligibility criteria through title assessment, 87 studies remained. Through abstract and full-text reviews, studies that did not include adolescents with a mean age of 10–19 or not present the specific mean age of participants ($n = 4$), were not non-pharmacological interventions ($n = 5$), were not RCTs ($n = 13$), were presented only as abstracts ($n = 22$), were published before 2017 ($n = 1$), or were written in a language other than English ($n = 1$) were excluded. After these exclusions, 41 studies remained, and an additional 10 studies were identified through manual reference search, resulting in 51 studies. Among these, nine studies (two, two, and five studies) were identified as multiple reports, and we considered them as one study, including all outcome variables in the meta-analyses. As a result, 45 studies were included in qualitative synthesis (Supplementary Material C). Among these, 18 studies lacking necessary statistical values for meta-analysis and three studies with an overall high RoB were excluded, leaving 30 studies for inclusion in the quantitative synthesis. Requests for data were sent to the corresponding authors of the 18 studies; however, no responses were received.

Study characteristics

The details of the key characteristics of each included study are presented in the Table 1 and Supplementary Material D. Among the 45 studies included in the qualitative synthesis, 15 (33.3%) were published between 2017 and 2018, whereas 18 (40.0%) were published from 2019 to 2020. The majority of studies were published after 2019. The studies were conducted in the United States (17 studies, 37.8%) and Iran (6 studies, 13.4%). The mean age of participants in the 29 studies ranged from 10 to 14 years, and the mean duration of diabetes diagnosis varied from four to six years (22 studies, 48.9%). The most common intervention settings were hospitals/outpatient clinics (19 studies, 42.2%). The types of interventions encompassed cognitive/psychological intervention (2 studies, 4.4%), self-care behavior management (7 studies, 15.6%), education (2 studies, 4.4%), and combined intervention (34 studies, 75.6%). Thirteen studies (28.9%) reported intervention durations of six to 11 months, whereas 22 studies (48.9%) reported intervention durations of less than six months. Ten studies (22.2%) indicated a frequency of intervention of one to six times per week.

Among the 30 studies included in the meta-analysis, eight studies (26.7%) were published between 2021 and 2022, 12 studies (40.0%) between 2019 and 2020, and 10 studies (33.3%) between

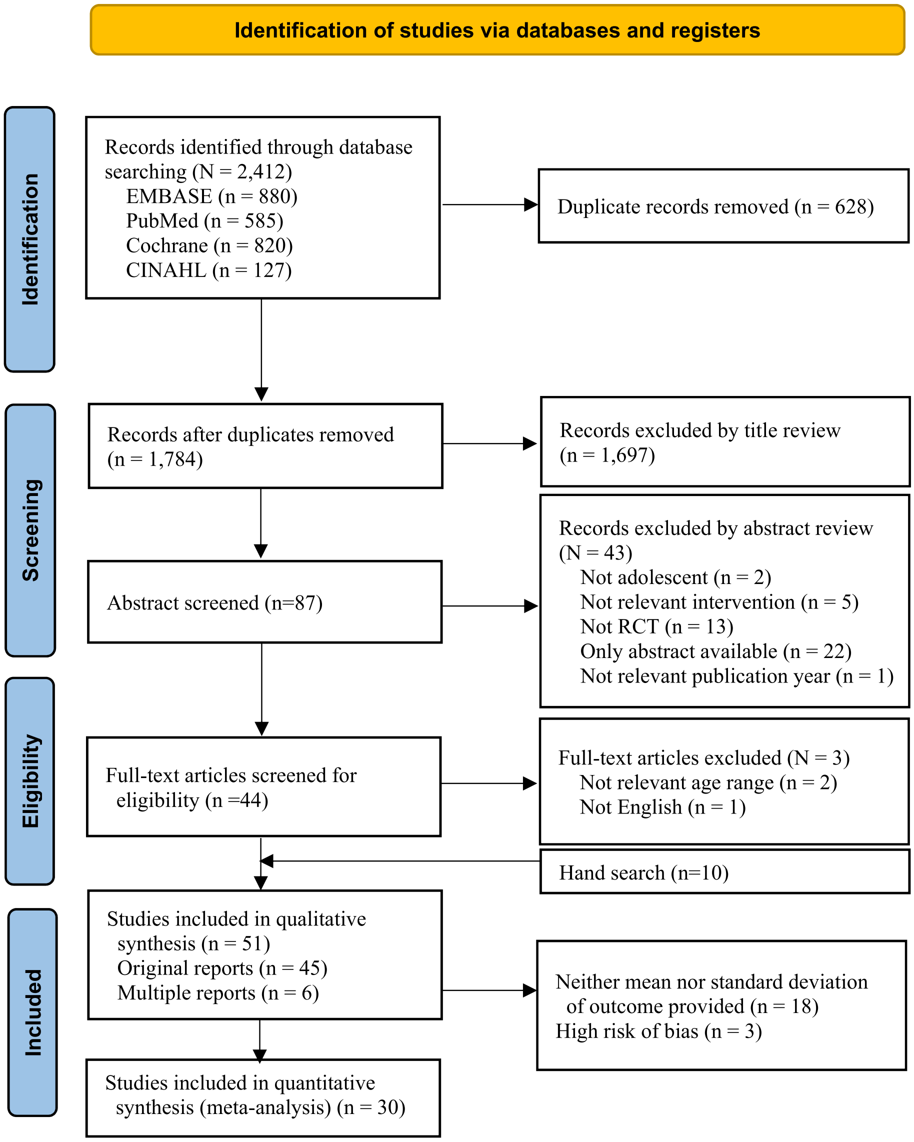

Figure 1. Flow Diagram of Study Selection Process.

2017 and 2018. In terms of country where the studies conducted, the United States and Iran were the most common, with seven (23.4%) and five (16.7%) studies, respectively. Additionally, 20 (66.7%) reported a mean age of 10 to 14 years. The majority of the interventions were conducted in hospital/outpatient clinic settings (11 studies, 36.7%). Seventeen studies (56.7%) had an intervention duration of less than six months. Six studies (20.0%) had an intervention frequency of one to six times per week, whereas another six studies (20.0%) had a frequency of more than once per day.

Risk of bias

The RoB judgment for each study was presented in Supplementary Material B.

It was difficult to determine concealment because the included studies did not specifically describe the random assignment method and allocation sequence. Consequently, the RoB in this domain was rated as some concerns in 20 of the 45 studies. In most of the included studies, there was no evidence that the experimental context led to deviations from the intended interventions. Accordingly, the RoB in this domain was low in 44 of the 45 studies. The majority of the studies presented intervention results, and we judged 35 studies to have a low RoB in the missing outcome data domain. We rated the RoB in the outcome domain as some concerns in 31 studies. However, the RoB due to the selection of reported results was considered low in all studies included. The overall RoB was high in three studies, some concerns in 33 studies, and low in 9 studies. Among the five domains, the outcome measurement (31 studies) and randomization process (20 studies) and had the highest proportion of studies with some concerns. We excluded three studies with a high RoB from the quantitative synthesis to ensure a higher certainty of the body of evidence [43].

Publication bias

Publication bias was assessed for HbA1c, with 27 studies included in the meta-analysis (Supplementary Material E). The funnel plots and Egger's linear regression test ($p = .229$) indicated no evidence of publication bias regarding HbA1c. Assessment of publication bias regarding other outcome variables was not performed due to the small number of studies included in the meta-analysis.

Table 1 *Characteristics of the Included Studies.*

Characteristics	Categories	$N = 45^a$ *n* (%)	$N = 30^b$ *n* (%)
Publication year	2017–2018	15 (33.3)	10 (33.3)
	2019–2020	18 (40.0)	12 (40.0)
	2021–2022	12 (26.7)	8 (26.7)
Country	The Unites States	17 (37.8)	7 (23.4)
	Iran	6 (13.4)	5 (16.7)
	Canada	3 (6.7)	1 (3.3)
	China	2 (4.4)	1 (3.3)
	New Zealand	2 (4.4)	2 (6.7)
	United Kingdom	4 (8.9)	3 (10.0)
	Poland	1 (2.2)	1 (3.3)
	Others[c]	10 (22.2)	10 (33.3)
Participants characteristics			
Mean age	10–14	29 (64.5)	20 (66.7)
	15–19	14 (31.1)	9 (30.3)
	Not Provided	2 (4.4)	1 (3.3)
Duration of diagnosis (year)	<4	4 (8.9)	3 (10.0)
	4–6	22 (48.9)	14 (46.6)
	≥7	8 (17.8)	5 (16.7)
	Not Provided	11 (24.4)	8 (26.7)
Setting	Conference hall/ center	6 (13.3)	4 (13.3)
	Hospital/outpatient clinic	19 (42.2)	11 (36.7)
	Hospital/outpatient clinic and hHome	3 (6.7)	2 (6.7)
	Play field	3 (6.7)	3 (10.0)
	Unclear	14 (31.1)	10 (33.3)
Sample size	<100	30 (66.7)	24 (80.0)
	100–199	10 (22.2)	5 (16.7)
	≥200	5 (11.1)	1 (3.3)
Intervention characteristics			
Type[a]	(A)	2 (4.4)	1 (3.3)
	(B)	7 (15.6)	5 (16.7)
	(C)	2 (4.4)	1 (3.3)
	(A) + (B)	3 (6.7)	3 (10.0)
	(A) + (C)	2 (4.4)	2 (6.7)
	(B) + (C)	21 (46.7)	13 (43.3)
	(A) + (B) + (C)	8 (17.8)	5 (16.7)
Duration of intervention (month)	<6	22 (48.9)	17 (56.7)
	6–11	13 (28.9)	8 (26.7)
	≥12	10 (22.2)	5 (16.6)
Frequency	<1 time/month	4 (8.9)	2 (6.7)
	1–5 time/month	2 (4.4)	2 (6.7)
	1–6 time/week	10 (22.2)	6 (20.0)
	≥1 time/day	7 (15.6)	6 (20.0)
	Not reported	16 (35.6)	10 (33.3)
	Others[d]	6 (13.3)	4 (13.3)
Outcome variables[e]			
	HbA1c	39 (86.7)	27 (90.0)
	Quality of life	17 (37.8)	9 (30.0)
	Self-care	11 (24.4)	4 (13.3)
	Body mass index	3 (6.7)	3 (10.0)
	Blood pressure	3 (6.7)	3 (10.0)
	Depression	5 (11.1)	3 (10.0)
	Family conflict	4 (8.9)	3 (10.0)
	Insulin amount	3 (6.7)	3 (10.0)
	Self-efficacy	7 (15.6)	3 (10.0)
	Anxiety	2 (4.4)	2 (6.7)
	Blood glucose	5 (11.1)	2 (6.7)
	Lipid profile	3 (6.7)	2 (6.7)
	Fear of hypoglycaemia	3 (6.7)	2 (6.7)
	Frequency of blood glucose monitoring	5 (11.1)	2 (6.7)
	Physical activity	2 (4.4)	2 (6.7)
	Stress	4 (8.9)	2 (6.7)
	Others[f]	28 (62.2)	10 (33.3)

Note. [a]Studies met inclusion criteria; [b]studies included in meta-analysis; [c]Australia, Austria, Brazil, Denmark, Finland, France, India, Saudi Arabia, Sweden, Tunisia; [d]once, twice; [e]multiple response; [f]adiponectin, adherence to daily glucose monitoring goal, bone mineral density, burden of diabetes, carbohydrate counting, children's hope, competence at self-care, coping, cortisol, daytime functioning, diabetes eating problem, diabetes family responsibility, dietary, distress, echocardiogram, emotion, endurance, fat-free mass, frequency of clinic attendance, frequency of family meal, frequency of hypoglycaemia, functional erobic capacity, gratitude, health, health care climate, hypertension, intention, knowledge, left ventricular function, lipoprotein profile, motivation, overweight/obesity, parent knowledge, parent motivation, parent self-efficacy, parental monitoring, parents' perception of their child's health, physical development, predilection for physical activity, problem-solving, satisfaction for intervention, self-regulation, sleep quality, strength (seated bench press, seated bench pull, seated leg press, and 6-min run test), total body fat, transition readiness, visual spatial working memory, well-being. 1.5-Anhydroglucitol.

(A) = cognitive/psychological intervention; (B) = self-care behavior management; (C) = education.

Effects of non-pharmacological interventions on outcome variables

Among the 45 studies, a meta-analysis was conducted on 30 studies. The interventions were classified into three types: cognitive/psychological interventions, self-care behavior management, and education. The cognitive/psychological interventions focused on cognitive changes or the provision of psychological support. These interventions encompass counseling, psychotherapy, cognitive behavioral therapy, and MI [24]. Self-care behavior management interventions aimed at behavior changes, including eating habits, PA, BG monitoring, medication, diabetes-coping skills, and problem-solving skills [44]. Education interventions were designed to provide information, including learning and quiz activity [21]. The effects of non-pharmacological interventions on outcome variables were examined based on the types of interventions (Table 2).

HbA1c

A total of 27 studies, involving 2,021 adolescents with T1D, were included in the meta-analysis of HbA1c levels. The results showed that non-pharmacological interventions had a significant effect on improving HbA1c levels, with a pooled SMD of −0.26 (95% CI: −0.42, −0.09, $p = .003$). However, there was high heterogeneity among the studies regarding non-pharmacological interventions ($I^2 = 69.0\%$, $p < .001$). The subgroup analysis based on the type of intervention revealed that combined intervention of cognitive/psychological intervention and self-care behavior management, involving two studies with 104 participants, effectively reduced HbA1c levels (SMD = −0.60, 95% CI = −1.01, −0.19, $p = .004$). These studies exhibited no heterogeneity ($I^2 = 0.0\%$, $p = .470$). Other types of interventions had no significant improvement in HbA1c levels. The differences between the subgroups were insignificant ($p = .360$).

Quality of life

Nine studies, involving 793 adolescents with T1D, were included in the meta-analysis of QOL. The results showed that non-pharmacological interventions had a significant effect on improving QOL, with a pooled SMD of 0.44 (95% CI: 0.13 to 0.76, $p = .006$). However, there was high heterogeneity among the studies regarding non-pharmacological interventions ($I^2 = 75.0\%$, $p < .001$). The subgroup analysis based on the type of intervention revealed that combined intervention of cognitive/psychological intervention and education (one study, 63 participants) (SMD = 1.15, 95% CI = 0.61, 1.69, $p < .001$) and cognitive/psychological intervention, self-care behavior management, and education (two studies, 378 participants) (SMD = 0.27, 95% CI = 0.07, 0.47, $p = .009$) effectively improved QOL. These studies exhibited no heterogeneity ($I^2 = 0.0\%$, $p = .900$). Other types of interventions had no significant improvement in QOL. The differences between the subgroups were significant ($p = .010$).

Table 2 *Subgroup Analysis for the Effects of Type of Non-pharmacological Intervention on Outcomes.*

Outcomes	Interventions[a]	k	No. of Participants (I/C)	Pooled Meta-analysis		Heterogeneity I^2 (p)
				SMD (95% CI, p)	Subgroup diff. (p)	
HbA1c	**Total**	**27**	**1031/990**	**−0.26 (−0.42 to −0.09, .003)**	**.360**	**69.0%, (<.001)**
	(A)	1	31/29	−0.43 (−0.94 to −0.08, .100)		NA
	(B)	5	183/184	−0.27 (−0.55–0.01, .060)		39.0%, (.160)
	(C)	1	70/81	−0.28 (−0.60–0.05, .090)		NA
	(A) + (B)	2	61/43	−0.60 (−1.01 to −0.19, .004)		0.0%, (.470)
	(A) + (C)	2	57/51	−0.03 (−0.41–0.34, .860)		0.0%, (.820)
	(B) + (C)	12	382/358	−0.22 (−0.60–0.16, .260)		84.0, (<.001)
	(A) + (B) + (C)	4	247/244	−0.11 (−0.29–0.07, .220)		0.0%, (.580)
Quality of life	**Total**	**9**	**411/382**	**0.44 (0.13–0.76, .006)**	**.010**	**75.0%, (<.001)**
	(A)	1	31/29	−0.12 (−0.62–0.39, .650)		NA
	(A) + (B)	2	40/21	0.26 (−0.29–0.80, .350)		0.0%, (.570)
	(A) + (C)	1	35/28	1.15 (0.61–1.69, <.001)		NA
	(B) + (C)	2	45/50	1.15 (−0.49–2.80, .170)		92.0%, (<.001)
	(A) + (B) + (C)	2	190/188	0.27 (0.07–0.47, .009)		0.0%, (.900)
Self-care	(A), (A) + (C), (B) + (C), (A) + (B) + (C)	4	214/209	0.18 (−0.03–0.39, .100)		11.0%, (.340)
Body mass index	(C), (B) + (C), (A) + (B) + (C)	3	238/224	0.02 (−0.16–0.21, .800)		93.0%, (<.001)
Blood pressure						
SBP	(C), (B) + (C), (A) + (B) + (C)	3	210/219	−0.05 (−0.24–0.14, .600)		0.0%, (.470)
DBP	(C), (B) + (C), (A) + (B) + (C)	3	210/219	−0.72 (−1.80–0.36, .190)		94.0%, (<.001)
Depression	(A), (B) + (C), (A) + (B) + (C)	3	211/207	−0.36 (−0.85–0.13, .150)		80.0%, (.007)
Family conflict	(A) + (B), (A) + (C), (A) + (B) + (C)	3	195/187	−0.78 (−1.57–0.02, .060)		90.0%, (<.001)
Insulin amount	(C), (B) + (C)	3	147/123	−0.13 (−0.57–0.31, .550)		49.0%, (.140)
Self-efficacy	(A) + (C), (B) + (C), (A) + (B) + (C)	3	92/82	0.53 (−0.59–1.65, .360)		90.0%, (<.001)
Anxiety	(B) + (C)	2	70/70	−0.91 (−1.26 to −0.56, <.001)		0.0%, (.930)
Blood glucose	(B) + (C)	2	31/34	−1.55 (−3.87–0.77, .190)		93.0%, (<.001)
Lipid profile						
Cholesterol	(B) + (C), (A) + (B) + (C)	2	140/138	−0.14 (−0.34–0.07, .190)		0.0%, (.850)
HDL	(B) + (C), (A) + (B) + (C)	2	140/138	−0.19 (−0.73–0.35, .490)		43.0%, (.190)
LDL	(B) + (C), (A) + (B) + (C)	2	140/138	−0.01 (−0.25–0.22, .930)		0.0%, (.370)
Triglyceride	(B) + (C), (A) + (B) + (C)	2	140/138	−0.16 (−0.40–0.07, .170)		0.0%, (.480)
Fear of hypoglycemia	(B) + (C)	2	49/55	−0.33 (−0.72–0.06, .101)		0.0%, (.980)
Frequency of BG monitoring	(A) + (B), (A) + (B) + (C)	2	90/91	0.21 (−0.36–0.77, .470)		70.0%, (.070)
Physical activity	(B) + (C)	2	32/30	0.02 (−0.48–0.52, .930)		0.0%, (.660)
Stress	(A), (B) + (C)	2	81/79	−0.48 (−1.43–0.48, .330)		88.0%, (.003)

Note. BG = blood glucose; BMD = bone mineral density; BP = bench press; C = control group; CI = confidence interval; DBP = diastolic blood pressure; HDL = high-density lipoprotein; I = intervention group; LDL = light-density lipoprotein; NA = not applicable; No. = number; SBP = systolic blood pressure; SMD = standardized mean difference.

[a] (A) cognitive/psychological intervention, (B) self-care behavior management, (C) education.

Anxiety

Two studies of combined intervention of self-care behavior management and education, involving 140 participants, were conducted to investigate the effects on anxiety. The pooled analysis revealed a significant improvement in anxiety, with a SMD of −0.91 (95% CI: −1.26, −0.56, $p < .001$) and no heterogeneity (Higgins $I^2 = 0.0\%$, $p = .930$).

Others

Other studies investigated blood glucose, self-care, body mass index, blood pressure, depression, family conflict, insulin amount, self-efficacy, lipid profile, fear of hypoglycemia, frequency of BG monitoring, PA, and stress. The results showed that non-pharmacological interventions had no effect on them.

Subgroup analyses of the intervention period

Subgroup analyses were performed to explore the potential influence of intervention duration, categorizing it into '<6-month' and '≥6-month' durations (Table 3). Among the five studies of self-care behavior management, the subgroup analysis of HbA1c by intervention duration revealed that the SMD was −0.23 (95% CI: −0.62, 0.16, $p = .250$) and −0.34 (95% CI: −0.81, 0.13, $p = .160$) in <6-month and ≥6-month durations, respectively. The heterogeneity was 19.0% ($p = .270$) and 62.0% ($p = .070$) in <6-month and ≥6-month durations, respectively. The differences between the subgroups were insignificant ($p = .730$) (Supplementary Material F).

Among the 12 studies of combined intervention of self-care behavior management and education, the subgroup analysis of HbA1c by intervention duration revealed that the SMD was −0.39 (95% CI: −1.05, 0.27, $p = .240$) and 0.01 (95% CI: −0.26, 0.29, $p = .920$) in <6-month and ≥6-month durations, respectively. The heterogeneity was 87.0% ($p < .001$) and 43.0% ($p = .140$) in <6-month and ≥6-month durations, respectively. The differences between the subgroups were insignificant ($p = .260$) (Supplementary Material G).

Sensitivity analysis

We conducted a sensitivity analysis in HbA1c (Supplementary Material H) and QOL (Supplementary Material I) using the leave-one-out approach. Using a random effects model, the overall pooled SMD of HbA1c was found to be −0.26 and the heterogeneity was $I^2 = 68.5\%$. When each study was excluded, the overall SMD and heterogeneity varied from −0.20 to −0.29 and 55.3% to 69.7%, respectively. The study conducted by Edraki et al. [45] was the most influential on the pooled SMDs and heterogeneity levels, according to a Baujat plot. When the study was excluded, the pooled SMD decreased to −0.20 (95% CI: −0.34 to −0.06), and the heterogeneity levels decreased to 55.3%.

The overall pooled SMD of QOL was 0.44, and the heterogeneity was $I^2 = 75.3\%$. When each study was excluded, the overall SMD and heterogeneity varied from 0.30 to 0.52 and 48.8% to 78.4%, respectively. The study conducted by Nazari et al. [46] was the most influential on the pooled SMDs and heterogeneity levels, according

Table 3 *Subgroup Analysis for the Effects of Intervention Duration on HbA1c Levels (N = 17).*

	K	SMD	95% CI	No. of participants		Z	p
				Int.	Cont.		
Intervention: Self-care behavior management (*n* = 5)							
<6 months	2	−0.23	−0.62, 0.16	67	67	1.16	.250
≥6 months	3	−0.34	−0.81, 0.13	116	117	1.40	.160
Intervention: Self-care behavior management & education (*n* = 12)							
<6 months	7	−0.39	−1.05, 0.27	184	162	1.16	.240
≥6 months	5	0.01	−0.26, 0.29	198	196	0.11	.920

Note. CI = confidence interval; k = number of studies; SMD = standardized mean difference.

to a Baujat plot. When the study was excluded, the pooled SMD increased to −0.30 (95% CI: −0.07 to −0.52), and the heterogeneity levels decreased to 48.8%. We did not conduct sensitivity analyses due to the limited number of studies involving interventions with other outcome variables.

Discussion

We conducted a systematic review and meta-analysis of non-pharmacological interventions for adolescents with T1D. The review included 45 RCTs published between 2017 and November 2022. Among these studies, 17 (37.8%) were conducted in the United States, six (13.4%) in Iran, and no studies were found from Korea. It is noteworthy that despite the increasing number of adolescents with T1D in Korea [47], there is a lack of RCTs focusing on non-pharmacological interventions. Managing HbA1c levels and addressing psychological outcomes, such as depression and anxiety, are crucial for improving the QOL and reducing diabetes-related complications in this population [7,48]. The identification of effective strategies using non-pharmacological interventions is essential for further research in Korea.

The most common intervention types identified in the included studies were combined intervention of self-care behavior management and education (21 studies, 46.7%), and combined intervention of cognitive/psychological interventions, self-care behavior management, and education (eight studies, 17.8%). In this study, we comprehensively investigated all outcome variables measured after the intervention, and significant effect sizes were observed for anxiety, HbA1c levels, and QOL (−0.91, −0.26, and 0.44, respectively). The combined intervention of cognitive/psychological intervention and self-care behavior management were effective in improving HbA1c levels. Additionally, the combined intervention of cognitive/psychological intervention and education, and combined intervention of cognitive/psychological intervention, self-care behavior management, and education were effective in improving QOL. The intervention incorporating cognitive/psychological elements is considered crucial for improving HbA1c and QOL in adolescents with T1D.

Among the studies included in the analysis of HbA1c, five studies utilized MI as a cognitive/psychological intervention. The intervention based on the Information-Motivation-Behavioral Skills model, which incorporated motivational enhancement interviews to develop self-management behavior plans, showed the most significant reduction in HbA1c [49]. Adolescents with T1D face challenges in diabetes management due to hormonal changes, psychological difficulties, and reduced treatment adherence [7]. MI, a patient-centered approach, has been effective in promoting positive health behaviors and addressing negative health-related behaviors [49]. Also, improving motivation for self-care is crucial. However, emotional issues common in diabetes, such as depression, anxiety, and burn out can impact motivation [24]. Nevertheless, due to the limited number of studies included in this meta-analysis, comparing the effcts of non-pharmacological interventions with other studies was challenging. Therefore, incorporating cognitive/psychological interventions, such as MI, along with education and self-care interventions, is essential in intervention programs for adolescents with T1D. Also, we suggest conducting RCTs and meta-analysis to examine the non-pharmacological intervention effect on self-care motivation of adolescents with T1D.

Non-pharmacological interventions had a significant effect on improving the QOL of adolescents with T1D. The intervention solely targeting education did not yield a significant improvement in QOL. However, the intervention demonstrated effectiveness when combined with other components, such as cognitive/psychological intervention or both cognitive/psychological intervention and self-care behavior management. Previous meta-analyses [14,21–25] have shown that structured education in patients with T1D has a positive impact on improving QOL. Structured education was considered a high-quality education program for patients with T1D [50]. Despite a wealth of data showing the beneficial outcomes of diabetes self-management education, there was considerable heterogeneity. A detailed qualitative analysis can offer valuable insights into the heterogeneity of interventions and help identify effective components among their characteristics. Further investigation is needed to determine the crucial components or combinations that contribute to improved QOL outcomes.

Combined interventions of self-care behavior management and education were implemented for various durations ranging from four weeks to 18 months. Subgroup analyses revealed that the duration of intervention was not a covariate related to HbA1c levels. Among the self-care behavior management, the SMD was larger with a duration of ≥6 months, which was not significant. Among the combined interventions of self-care behavior management and education, the SMD was larger with a duration of <6 months, which was also not significant. As HbA1c reflects glycemic control over the recent three months [2], we assumed that the effect would be significantly greater in interventions with a duration of ≥6 months. However, due to the variability among the studies included in our meta-analysis, these results are considered to be influenced by such heterogeneity. Particularly, in sensitivity analysis, the study by Edraki et al. [45] appeared to be highly influential on SMD and heterogeneity of HbA1c levels, requiring caution in interpretation. Further analysis is needed to explore the effects of intervention duration and specific characteristics to establish more conclusive evidence on the impact of reducing HbA1c.

The effects of non-pharmacological interventions on lipid profiles were investigated in only two studies in our meta-analysis, and no significant effects were observed. However, in a previous meta-analysis targeting patients with T1D, exercise training showed a significant effect on improving total cholesterol, LDL, and HDL [51,52]. Patients with T1D had a 4.08–9.38 times higher risk of coronary artery disease, heart failure, myocardial infarction, and stroke compared to the general population [53]. Also, risk of cardiovascular disease increases as the age of onset of T1D decreases [54]. The lipid profiles in T1D is unequivocally associated with cardiovascular abnormalities, which means that lipid profiles have a direct impact on cardiovascular function [55]. Therefore, consideration should be given to the lowering lipid profile of adolescents with T1D. However, the limited number of studies included in our meta-analysis makes it difficult to draw consistent conclusions regarding the effectiveness of non-pharmacologic interventions. Given the limitations of our study and previous reviews due to the small number of studies, we suggest conducting RCTs and meta-analyses to examine the non-pharmacological intervention effect on lipid profiles of adolescents with T1D.

This study had several limitations that could pose threats to the validity of the findings. Firstly, including only English-language RCTs may limit generalizability to non-English-speaking populations, potentially introducing selection bias and limiting diversity. Secondly, the significant heterogeneity among included studies can introduce variability and uncertainty in pooled results due to varying designs, participant characteristics, and measurements. Thirdly, the limited number of non-pharmacological interventions included in the subgroup analysis can restrict the ability to assess the effects of these interventions in a comprehensive manner. With a small sample size, the statistical power to detect significant effects or conduct meaningful subgroup analyses was compromised, reducing the robustness of the conclusions drawn from the study.

Despite these limitations, this study holds significant value as it conducted a systematic review and meta-analysis of a substantial number of RCTs. By including 45 RCTs in the systematic review and 30 RCTs in the meta-analysis, it provides a comprehensive evaluation of the effects of non-pharmacological interventions among adolescents with T1D. This study aimed to identifying key outcome variables for non-pharmacological intervention among adolescents with T1D in the recent years. Attention to the changes in the lipid profile of adolescents with T1D who have received non-pharmacological interventions is crucial. Furthermore, in the context of the dynamically changing landscape of diabetes management and healthcare, coupled with the evolving lifestyles of adolescents, there is a need to focus on enhancing self-care motivation in those with T1D. Based on the results of this study, healthcare providers should consider a comprehensive approach that combines cognitive/psychological, self-care behavior management, and education interventions to address the challenges faced by adolescents with T1D. Policies should be established to promote non-pharmacological interventions across home, hospital, and school settings, ensuring seamless and privacy-preserving support for adolescents with T1D.

Conclusion

We conducted a systematic review and meta-analysis to evaluate the effectiveness of non-pharmacological interventions in adolescents with T1D. Our review included 45 RCTs published within the last five years, and 30 of them were included in the meta-analysis. The findings of our review provide evidence supporting the effectiveness of non-pharmacological interventions in improving HbA1c levels and QOL among adolescents with T1D. We also observed that interventions combining cognitive/psychological intervention, self-care behavior management, and education were more effective than single interventions. However, it is important to acknowledge the limited evidence available to demonstrate the efficacy of different types and durations of non-pharmacological interventions. Furthermore, future research should explore outcome variables, such as lipid profile and self-care motivation, to further enhance the understanding and significance of non-pharmacological effects in adolescents with T1D.

Registration and protocol

This systematic review and meta-analysis has been registered with the International Prospective Register of Systematic Reviews under the registration number CRD42022382190. The protocol for the systematic review and meta-analysis is available at https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=382190.

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Availability of data, code, and other materials

The data supporting the review findings are available upon submitting a reasonable request to the corresponding author.

Conflict of interest

The authors declared no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2024.01.008.

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Research Article

Association Between Nurse-Led Multidisciplinary Education and Cardiac Events in Patients With Heart Failure: A Retrospective Chart Review

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SUMMARY

Purpose: This study examined the modifiable factors, including nurse-led multidisciplinary education and in/out-of-hospital rehabilitation, to predict cardiac events in patients with heart failure (HF) in South Korea.
Methods: A retrospective review of the medical records was conducted using data of patients admitted for HF between June 2021 and April 2022. A total of 342 patients were included in this study. Information related to HF education, cardiac rehabilitation, and demographic and clinical characteristics were collected. Cardiac events, including emergency department visits, readmissions, and deaths, were defined as a composite of events. After adjusting for covariates, a multivariate Cox proportional hazard regression model was used to explore the association between modifiable factors and cardiac events in patients with HF.
Results: During the follow-up period (median, 823 days), 123 patients (36.0%) experienced at least one cardiac event. In the Cox regression model, patients who received nurse-led multidisciplinary HF education during hospitalization were less likely to experience cardiac events (hazard ratio: 0.487; 95% confidence interval [CI]:0.239–0.993). Additionally, high NT-pro BNP levels were associated with an increased risk of cardiac events.
Conclusions: The education led by nurses on HF was a factor that reduced adverse prognoses in patients with HF. Our results highlight the importance of a nurse-led multidisciplinary approach during hospitalization.

Introduction

Heart failure (HF) incurs high medical costs and has high morbidity and mortality rates [1,2]. In particular, as age increases, the morbidity rate increases rapidly and is a major factor in the hospitalization of older adults [3–6], highlighting the importance of managing HF in aging populations. In Korea, HF has the highest mortality rate among patients with heart diseases. In 2021, the crude death rate by age group was 22.6 for those aged 60–69 years, 88.5 for those aged 70–79 years, and 555.1 for those aged over 80 years, indicating a higher mortality rate with increasing age [7]. The clinical course of HF is often characterized by high rates of physical frailty, delayed recovery, frequent rehospitalization, and poor quality of life [8]. Patient outcomes are often measured in terms of readmissions and mortality rates [2,3].

Poor functional status is associated with poor HF outcomes [9]. The frequency and severity of cardiac events, such as rehospitalization and emergency department (ED) visits, negatively impact disease prognosis [10]. Delayed treatment, which involves visiting a medical institution after the symptoms worsen, also increases readmission and mortality rates in patients with HF after discharge [11].

Previous studies investigating the occurrence and predictors of cardiac events after HF treatment used a multiparametric approach

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that included sociodemographic, biochemical (clinical), comorbidity, psychosocial, cognitive, and behavioral variables, with differences in the identified predictors [6,11–13]. Previous studies have confirmed the relationship between cardiac events and HF rehabilitation or education and demonstrated their effectiveness [1,8,10,14,15]. According to a previous study [13], the predictive factors for readmission within 30 days in Korean patients with HF were age, initial body weight, body weight change, pulse rate, hospitalization for six months prior to ED visit, number of medications, laboratory test results, main diagnosis of ED, and angiotensin-converting-enzyme inhibitor (ACEi)/angiotensin receptor blocker (ARB) medication use.

Despite much research, factors related to the occurrence of cardiac events after HF treatment and intervention effects vary across countries owing to differences in race, culture, and medical environments, and consistent results have not been reported. Therefore, it is necessary to identify the explanatory factors for cardiac events after HF treatment through repeated studies conducted within one country, toward consistency in results. In Korea, studies on cardiac events after HF treatment are relatively insufficient compared to those in other countries, and there are differences in the size and expertise of targeted medical institutions.

Previous studies have mostly included non-modifiable factors, implying that potentially modifiable factors, such as multidisciplinary education and in/out-of-hospital rehabilitation, need to be examined, which could contribute to the prevention of cardiac events in patients with HF. In a previous study conducted in Korea, nursing education for patients with HF was addressed. However, it was encompassed within the discharge education provided to all patients, making it challenging to assess its specific impact [16]. Treatment and management through nurse-led HF services support effective and safe practice [15]. A multidisciplinary team generally refers to specialists from two or more related departments or disciplines working together to discuss patient conditions and form a treatment plan dedicated to optimizing clinical decisions to enhance clinical outcomes [17]. In this approach, nurses play a leading role in patient education, which can be referred to as nurse-led multidisciplinary education [15]. Beyond identifying and responding to patient changes, a nurse-led multidisciplinary and integrated approach enhances health outcomes by implementing the recommended pharmacotherapy, increasing adherence to self-management strategies, promoting patient education, and coordinating treatment [18]. However, research on whether the nurse-led multidisciplinary approach has an impact on the prognosis of HF or prevention of cardiac events in Korea is limited.

In this study, we aimed to investigate whether systematic, nurse-led, multidisciplinary HF education and cardiac rehabilitation, conducted when patients are in a stable condition during hospitalization rather than during discharge education, have an impact on preventing cardiac events in patients. Based on factors verified in previous studies, this study retrospectively examined the predictive factors of cardiac events in patients with HF admitted to a specialized cardiac hospital in Korea, including demographic variables, disease-related variables, rehabilitation, and nurse-led multidisciplinary education. This study intends to provide directions for the future care of patients with HF.

Methods

This was a retrospective descriptive study that used medical record reviews, and was conducted using data of admitted patients with HF (International Classification of Diseases 10th edition-150.1–150.4, 150.9) [19], at a general hospital (with approximately 300 beds) designated and operated as a specialized cardiac hospital by the Ministry of Health and Welfare of South Korea. The chart review period for data collection spanned from June 2021 to April 2022, targeting adults aged >18 years with HF who were admitted from January to May 2019 to investigate cardiac events occurring at least 2 years after discharge from the index hospitalization. Since the data collection began in June 2021, requiring data for two years post-discharge, patients admitted before June 2019 were included in the study, starting from those admitted in May 2019. An events-per-variable ratio of 10 is recommended for the Cox regression-based prediction models [20]. To incorporate 7–9 independent variables into the final model, more than 90 patients with cardiac events were required. Considering an exclusion rate of approximately 30% due to the exclusion criteria and missing key variables, as well as an estimated cardiac event occurrence rate of approximately 30–40% based on a preliminary investigation (50 cases), we aimed for a sample size of approximately 500 cases. Because the average monthly admissions for patients with HF at the research hospital were approximately 100, we decided to collect data from January to May 2019 to achieve the target of 500 cases.

The exclusion criteria were as follows: (1) the primary diagnosis for index hospitalization was not related to HF or death during the index hospitalization ($n = 60$) (2) patients residing in long-term care facilities (e.g., nursing homes); ($n = 31$) or transferred to another healthcare institution after discharge ($n = 18$); and (3) patients who did not make a scheduled outpatient visit which led to the inability to determine the outcome after discharge ($n = 63$). Initially, 514 records were screened and 172 patients were excluded. Finally, 342 records were included in this study (Figure 1).

Data collection

Electronic medical records (EMRs) were reviewed to extract the following information from the index hospitalization: demographic and clinical characteristics, information related to HF education, and information related to cardiac rehabilitation. To identify patient prognosis, EMRs were reviewed for a median of 823 days (interquartile range: 728–1013 days) after the index hospitalization. Researchers developed a data collection protocol to ensure consistent data extraction. Initially, data for the first 50 cases were independently collected by a nursing professor (Investigator 1) and an experienced nurse with 8 years of expertise in understanding the EMRs of the hospital (Investigator 2). The agreement rate was greater than 90%. In case of discrepancies, the two investigators engaged in discussions to refine the data collection protocol. Subsequently, Investigator 2 proceeded independently with the data collection. Any ambiguities in the research were discussed by the principal investigators.

1) Demographic and clinical characteristics

Demographic information including age, gender, education level, marital status, and smoking status was collected. For clinical characteristics, data on left ventricular ejection fraction, symptoms during the index hospitalization (shortness of breath), laboratory test results, changes in weight between admission and discharge, respiratory rate at discharge, discharge medications, and length of hospital stay were collected. Additionally, based on previous studies indicating that chronic obstructive pulmonary disease (COPD) and atrial fibrillation adversely affect the prognosis of HF, the presence or absence of COPD and atrial fibrillation at discharge were also recorded [21,22].

2) Nurse-led multidisciplinary HF education and Cardiac rehabilitation

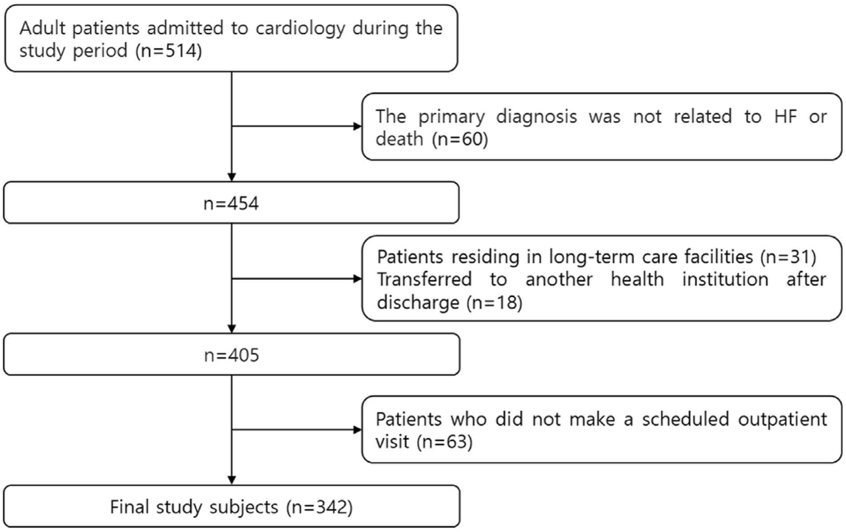

Figure 1. Flowchart of Study Subject Selection.

Nurse-led multidisciplinary HF education programs and cardiac rehabilitation were provided in the study hospital in accordance with the physicians' prescriptions. Indications for the prescription of HF education were individuals diagnosed with HF who had not previously received cardiac education programs at the study hospital. However, in some instances, reeducation was provided to patients who had previously received cardiac education programs. This additional intervention was implemented when the healthcare team determined that these patients exhibited insufficient self-care knowledge or demonstrated inadequate compliance with the prescribed treatment, resulting in recurrent hospitalization. At the institution where this study was conducted, a nurse-led multidisciplinary education protocol was developed and implemented specifically for patients with HF. To optimize the efficacy of educational interventions, sessions were conducted within the hospitalization period, excluding the day of admission characterized by numerous tests and the discharge day marked by preparations, and may have included video training, if required. In this study, the treatment team of the specialized cardiac hospital comprised nurses, physicians, dietitians, and physical therapists. Adopting a nurse-led multidisciplinary team approach, with exceptions for unavoidable circumstances, nurses were mandated to provide education, while the involvement of other team members was adjusted based on patient conditions or needs. The presence or absence of education and whether education was administered by multidisciplinary team members (nurse, physician, dietitian, physical therapist), were analyzed as dichotomous variables (Yes or No). Field-specific nurses conducted sessions for 15–20 min per patient. These nurses, with a background of working in the cardiology unit for a specified period, assumed the role of educators. Importantly, field-specific educators were not tasked with direct patient care within the unit. Instead, their responsibilities focused on coordinating patient care activities and providing targeted education related to cardiac care. These specialized educators provided information on HF and its symptoms, self-management techniques (including exercise, diet, medications, and how to respond to symptom flare-ups), the importance of daily symptom monitoring, and answers to patient questions. Primary care physicians provided education on the patient's overall condition and pathophysiology of HF. Dietitians provided information on the importance of a low-sodium diet, while physical therapists delivered information aimed at enhancing the physical well-being of patients with cardiovascular disease. Upon discharge, the hospital provided an animated video detailing the overall management of the HF. This video was accessible through the patient and caregiver applications.

If the primary physician deemed cardiac rehabilitation necessary, it was performed under the physician's prescription. Under Korean medical regulations on cardiac rehabilitation, a minimum of three experts are required to provide at least one hour of treatment, and comprises patient education, exercise, and cardiac evaluation. During the rehabilitation program, patients underwent a 20-min exercise session led by a physical therapist, followed by a 20-min cardiac assessment administered by a nurse, and then received a diagnosis from a physician to fulfill the one-hour treatment requirement. As per the requirements for cardiac rehabilitation, every initial session of cardiac rehabilitation involved the participation of three experts. Therefore, cardiac rehabilitation was analyzed based on its presence or absence.

3) Cardiac events

During the 2-year follow-up period after discharge and after index hospitalization, the occurrence of one or more cardiac events was defined as the presence of a cardiac event. Previous research in the field commonly employed a 2-year duration to assess the frequency and severity of cardiac events post-discharge [23]. The presence or absence of cardiac events was analyzed as a dichotomous variable. Time-to-event was defined as the time to the first cardiac event after hospital discharge. The outcome of this study was defined as the composite endpoint of the time to the first cardiac event, which included death, rehospitalization, or ED visit due to a cardiac cause after the index hospitalization. This information was extracted from patients' EMRs after the index hospitalization was reviewed.

Data analysis

To compare the patients' demographic and clinical characteristics and information related to HF education between patients with and without cardiac events, an independent *t*-test or chi-square test was conducted as appropriate. After controlling for significant variables in the univariate analysis, multivariate Cox proportional hazards regression was used to examine factors predicting cardiac event-free survival. Among the factors related to HF education, education provided by nurses, physicians, and dietitians were significant variables in the univariate analysis; however, they were deemed redundant in the final model because of overlapping meaning with HF education during hospitalization. Therefore, only "Education provided by Nurse," which exhibited the highest significance, was added as an independent variable in the final model. All statistical analyses were performed using SPSS software (version 24.0; IBM, Armonk, NY, USA).

Ethical considerations

This study was approved by the Institutional Review Board of the Sejong General Hospital (approval no. 2021-0356). During the extraction of data from the EMRs, personal information such as names, registration numbers, and birthdates was excluded. Each record was assigned a separate identification to manage the data securely. The collected data were stored in an encrypted format to ensure confidentiality and privacy.

Results

Sample characteristics

A total of 342 patients were included in the study. During the follow-up period (median, 823 days), 15 patients (4.4%) died of cardiac-related reasons. The total number of patients who experienced at least one cardiac event, including cardiac-related ED visits (n = 58, 17.0%) or readmissions (n = 70, 20.5%), were 123 (36.0%). There were more women (56.1%) than men among the patients. The mean age was 75.94 ± 12.54 years; the majority of patients had below middle school level education (65.8%) and were married (79.2%). Patients stayed for an average of 9.12 ± 9.01 days, and patients with a cardiac event were more likely to have longer stay ($p = .001$) (Table 1). On average, post-discharge clinic appointments were scheduled for approximately 14.17 ± 11.36 days after discharge. Comparing the characteristics of patients with and without cardiac events, patients with cardiac events were more likely to be older ($p = .013$), and have higher N-terminal pro-brain natriuretic peptide (NT-pro BNP) ($p = .001$), blood urea nitrogen (BUN) ($p = .007$), and uric acid scores ($p = .021$), and lower platelet ($p = .014$), cholesterol (($p < .001$), and low-density lipoprotein (LDL) levels ($p = .001$), than those without cardiac events. Patients with cardiac events were more likely to have atrial fibrillation ($p = .004$), or COPD ($p = .044$), and a higher respiratory rate at discharge ($p = .012$), than those without cardiac events.

Factors regarding HF education and cardiac rehabilitation

Among the 57 patients who received HF education, 51 received initial HF education, while 6 underwent re-education. HF education during hospitalization showed a statistically significant difference between patients with and without cardiac events ($p = .049$). HF education was provided by nurses, physicians, dietitians, and physical therapists. Among healthcare providers, when nurses ($p = .028$), physicians ($p = .045$), and dietitians ($p = .042$) provided education, there were significant differences in cardiac events (Table 2). Cardiac rehabilitation was performed in 19.9% of the patients, and there was no difference between patients with and without cardiac events.

Cardiac event-free survival

Among the 271 patients included in the Cox regression model, excluding those with missing data for the variables entered into the model, 94 patients (34.7%) experienced cardiac events. In the Cox regression model, after adjusting for age, patients who received nurse-led multidisciplinary education during hospitalization were less likely to experience cardiac events during the course of their disease (hazard ratio [HR]:0.49; 95% confidence interval [CI]:0.24–0.99). Higher NT-pro BNP was associated with an increased risk of cardiac events (HR: 1.23; 95%; CI: 1.03–1.46) (Table 3). However, platelets, uric acid, COPD, aspirin, and length of stay during the index hospitalization, which showed significant differences in the univariate analysis for cardiac events, were not significant in the Cox regression analysis.

Discussion

This study aimed to identify the predictors and occurrence of cardiac events by including not only demographic and disease-related variables but also modifiable factors, including those related to rehabilitation and education, in patients with HF who were discharged from a specialized cardiac hospital.

In this study, age, and NT-pro BNP and BUN levels were found to be related to cardiac events. Demographic and clinical variables are predictors of cardiac events [24], and clinical factors are the predominant predictors [25]. Age and frailty are major predictors of mortality and rehospitalization [26], and an increase in BNP levels after discharge is useful in predicting readmission within one month [27]. BNP is known to respond to hemodynamic changes within the ventricles, with its primary production and secretion occurring in the cardiac chambers. This unique characteristic enables the BNP levels to serve as reliable indicators of ventricular dysfunction. Additionally, literature supports the notion that BNP exhibits potent vasodilatory and natriuretic effects [28]. In the present study, gender was not a predictor of cardiac events in the patients with HF. This result differs from the findings of previous research, suggesting that HF symptoms of HF may vary according to gender [29,30]. In a study of older women with HF, body mass index and the use of lipid-lowering agents were significant predictors of readmission [16]. Compared to other countries, research on the occurrence and predictive factors of cardiac events in older women with HF in Korea is insufficient, and further research is needed. In addition, variables that showed differences between patients who experienced cardiac events and those who did not in the univariate analysis of this study included platelet count and uric acid, cholesterol, and LDL levels. These findings are consistent with those of previous studies. A low platelet count is independently associated with left ventricular ejection fraction, regardless of age and gender [31]. Elevated levels of uric acid correlate with impaired hemodynamics and independently predict adverse prognosis in patients with HF [32]. Hypercholesterolemia is a major risk factor for coronary artery disease; however, paradoxically, patients with advanced HF often have low cholesterol levels, which is associated with poor prognosis [33]. Additionally, long-term follow-up findings have shown that low LDL levels may predict a less favorable outcome in advanced HF, particularly in patients aged <70 years and those taking statins [34]. These findings suggest that laboratory test results in conjunction with the NT-pro BNP biomarker can serve as a reference for formulating appropriate treatment and monitoring plans for patients with HF.

This study found no significant difference in the incidence of cardiac events between the patients who underwent cardiac rehabilitation and those who did not. This finding contrasts with previous research suggesting that adequate rehabilitation and education can reduce or prevent cardiac events [8]. Individualized rehabilitation provided gradually from the beginning of hospitalization to after discharge has been found to be effective in improving the physical functions of patients [8]. Therefore, the timing and duration

Table 1 *Demographic and Clinical Characteristics of Study Participants ($n = 342$).*

Characteristics	Categories	Total ($n = 342$)	Cardiac event		*t or χ^2 (p)*
			Yes ($n = 123$)	No ($n = 219$)	
		n (%) or Mean ± SD			
Age (years)		75.94 ± 12.54	78.07 ± 10.92	74.75 ± 13.24	2.49 (.013)
Gender	Men	150 (43.9)	54 (43.9)	96 (43.8)	0.00 (.990)
	Women	192 (56.1)	69 (56.1)	123 (56.2)	
Education level	< Elementary school	163 (47.7)	63 (51.2)	100 (45.7)	3.31 (.347)
	Elementary school	62 (18.1)	18 (14.6)	44 (20.1)	
	Middle school	39 (11.4)	11 (8.9)	28 (12.8)	
	≥ High school	78 (22.8)	31 (25.2)	47 (21.5)	
Marital status	Married	271 (79.2)	96 (78.0)	175 (79.9)	0.17 (.684)
	Single/widowed/divorced	71 (20.8)	27 (22.0)	44 (20.1)	
Employment	Yes	68 (19.9)	16 (13.0)	52 (23.7)	5.94 (.051)
	No	240 (70.2)	95 (77.2)	145 (66.2)	
	Unknown	34 (9.9)	12 (9.8)	22 (10.0)	
Smoking ($n = 341$)	Never	275 (80.6)	103 (83.7)	172 (78.9)	3.93 (.140)
	Former	39 (11.4)	15 (12.2)	24 (11.0)	
	Current	27 (7.9)	5 (4.1)	22 (10.1)	
Left ventricular ejection fraction ($n = 302$)	< 40%	99 (32.8)	38 (35.2)	61 (31.4)	0.44 (.507)
	≥ 40%	203 (67.2)	70(64.8)	133 (68.6)	
Shortness of Breath at admission	Yes	296 (86.5)	109 (88.6)	187 (85.4)	0.71 (.401)
	No	46 (13.5)	14 (11.4)	32 (14.6)	
NT-pro BNP (pg/mL)[a] ($n = 275$)		5,243.21 ±10,857.26	854,8.63 ±9,292.31	6,565.26 ±11,553.13	3.48 (.001)
BUN (mg/dL) ($n = 335$)[a]		26.44 ± 15.20	28.51 ± 13.40	25.28 ± 16.03	2.74 (.007)
Cr (mg/dL) ($n = 335$)[a]		1.87 ± 7.58	1.54 ± 1.57	2.05 ± 9.39	1.14 (.254)
Hemoglobin (g/L) ($n = 329$)		12.09 ± 2.21	11.93 ± 2.06	12.18 ± 2.30	1.00 (.317)
Hematocrit (%) ($n = 329$)		38.20 ± 34.14	41.00 ± 55.80	36.59 ± 6.98	1.13 (.260)
Platelet (10^3/μL) ($n = 328$)[a]		209.94 ± 95.83	196.07 ± 85.39	217.84 ± 100.63	2.47 (.014)
Uric acid (mg/dL) ($n = 324$)		6.66 ± 2.37	7.06 ± 2.43	6.43 ± 2.31	2.33 (.021)
Total protein (g/dL) ($n = 322$)		7.03 ± 0.62	7.01 ± 0.65	7.04 ± 0.61	0.40 (.689)
Albumin (g/dL) ($n = 322$)		4.00 ± 0.51	3.98 ± 0.65	4.02 ± 0.41	0.63 (.526)
Cholesterol (mg/dL) ($n = 323$)		137.82 ± 38.90	126.91 ± 36.34	144.02 ± 39.03	3.88 (<.001)
HDL (mg/dL) ($n = 249$)		49.49 ± 13.34	51.40 ± 17.08	48.59 ± 16.03	0.77 (.441)
LDL (mg/dL) ($n = 248$)		77.14 ± 36.16	60.39 ± 26.98	85.38 ± 37.41	3.32 (.001)
Na (mEq/L) ($n = 333$)[a]		138.42 ± 4.36	137.83 ± 5.03	138.75 ± 3.90	1.91 (.058)
K (mEq/L) ($n = 334$)		4.31 ± 0.60	4.31 ± 0.57	4.30 ± 0.62	0.15 (.885)
Ca (mg/dL) ($n = 322$)		9.06 ± 0.47	9.06 ± 0.44	9.05 ± 0.48	0.17 (.886)
CRP (mg/dL) ($n = 250$)[a]		12.13 ± 24.91	12.91 ± 20.95	11.69 ± 22.49	0.43 (.671)
Changes in weight (kg) between admission and discharge[b] ($n = 301$)		−1.87 ± 3.31	−1.61 ± 3.09	−2.02 ± 3.42	1.02 (.311)
Atrial fibrillation at discharge	Yes	143 (41.8)	64 (52.0)	79 (36.1)	8.25 (.004)
	No	199 (58.2)	59 (48.0)	140 (63.9)	
COPD	Yes	35 (10.2)	18 (14.6)	17 (7.8)	4.05 (.044)
	No	307 (89.8)	105 (85.4)	202 (92.2)	
SBP (mmHg)		115.02 ± 16.52	114.50 ± 17.42	115.31 ± 16.03	0.43 (.667)
DBP (mmHg)		67.64 ± 12.04	66.46 ± 12.30	68.30 ± 11.87	1.35 (.177)
Respiratory rate at discharge (rate/min)		17.92 ± 1.02	18.11 ± 0.97	17.82 ± 1.04	2.52 (.012)
Heart rate (beat/min)		70.40 ± 12.40	70.78 ± 13.76	70.19 ± 11.59	0.42 (.674)
Aspirin	Yes	211 (61.7)	85 (69.1)	126 (57.5)	4.46 (.035)
	No	131 (38.3)	38 (30.9)	93 (42.5)	
Diuretics	Yes		109 (88.6)	182 (83.1)	1.89 (.170)
	No		14 (11.4)	37 (16.9)	
Digoxin	Yes		16 (13.0)	16 (7.3)	3.020 (.082)
	No		107 (87.0)	203 (92.7)	
Length of stay during the index hospitalization (days)[a]		9.12 ± 9.01	11.23 ± 10.66	7.94 ± 7.71	3.29 (.001)
Post-discharge clinic appointment (days)		14.17 ± 11.36	14.89 ± 12.94	13.76 ± 10.38	0.89 (.376)

Note. BUN = blood urea nitrogen; COPD = chronic obstructive pulmonary disease; Cr = creatinine; CRP = C-Reactive Protein; DBP = diastolic blood pressure; HDL = high-density lipoprotein; LDL = low-density lipoprotein; NT-pro BNP = N-terminal pro-brain natriuretic peptide; SBP = systolic blood pressure; SD = standard deviation.

[a] The distribution was skewed, and *P*-values were obtained based on log-transformed values.

[b] The changes in weight between admission and discharge were computed by subtracting admission weights from discharge weights.

of rehabilitation must be considered to maximize its effectiveness. Exercises for patients with HF should be prescribed individually based on the patient's condition. The New York Heart Association (NYHA) recommends early mobilization of patients after an episode of acute HF for NYHA class I–III HF, and gradual mobilization, respiratory exercises, and small muscle group exercises to establish clinical stability and help patients achieve a sufficient level of functional capacity. When the exercise intensity and duration are performed correctly, they are considered safe for the patient. The principles of exercise should be gradual and individualized, and it is important to assess contraindications to exercise [35]. Generally, it should begin with low-intensity aerobic exercise, gradually increasing the intensity that increases the heart rate to 60–70% of the predicted maximum heart rate. Moderate-intensity exercise is recommended for more than five days per week [36].

The number of rehabilitation sessions provided to patients with HF ranged from one to three in this study; the total amount of rehabilitation provided may not have been sufficient to significantly decrease the incidence of cardiac events through exercise training and lifestyle modification. Cardiac rehabilitation class 1a

Table 2 *Factors Related to Cardiac Rehabilitation and Heart Failure Education.*

Characteristics	Categories	Total (n = 342)	Cardiac event: Yes (n = 123)	Cardiac event: No (n = 219)	χ^2 (p)
		n (%) or Mean ± SD			
Rehabilitation					
Cardiac rehabilitation	Yes	68 (19.9)	20 (16.3)	48 (21.9)	1.58 (.208)
	No	274 (80.1)	103 (83.7)	171 (78.1)	
HF education during hospitalization					
Received the education	Yes	57 (16.7)	14 (11.4)	43 (19.6)	3.86 (.049)
	No	285 (83.3)	109 (88.6)	176 (80.4)	
The presence or absence of healthcare professionals for educational purposes					
Nurse	Yes	53 (15.5)	12 (9.8)	41 (18.7)	4.83 (.028)
	No	289 (84.5)	111 (90.2)	178 (81.3)	
Physician	Yes	51 (14.9)	12 (9.8)	39 (17.8)	4.03 (.045)
	No	291 (85.1)	111 (90.2)	180 (82.2)	
Dietitian	Yes	38 (11.1)	8 (6.5)	30 (13.7)	4.13 (.042)
	No	304 (88.9)	115 (93.5)	189 (86.3)	
Physical therapist	Yes	32 (9.4)	7 (5.7)	25 (11.4)	3.04 (.081)
	No	310 (90.6)	116 (94.3)	194 (88.6)	

Note. HF = heart failure; SD = standard deviation.

Table 3 *Cox Regression Analysis*[a] *for Cardiac Events*[b] *(n = 271, the number of patients with cardiac events = 94).*

Variables	Hazard ratio	95% confidence interval
Age (years)	1.01	0.99–1.03
NT-pro BNP (pg/mL)	1.23	1.03–1.46
Platelet (10^3/μL)	0.64	0.40–1.05
Uric acid (mg/dL)	1.04	0.95–1.14
COPD (ref: No)	1.46	0.78–2.73
Aspirin (ref: No)	1.05	0.67–1.64
Length of stay during the index hospitalization (days)	1.14	0.94–1.54
Nurse-led multidisciplinary education (ref: No)	0.49	0.24–0.99

Note. COPD = chronic obstructive pulmonary disease; NT-pro BNP = N-terminal pro-brain natriuretic peptide.

[a] Model p-value = .003.

[b] Cardiac events: death, readmission, and emergency department visits due to cardiac causes.

recommends cardiac care for patients with cardiovascular disease, which generally requires 24 training sessions, although high international and national variability has been reported [37]. The minimum amount required for physical activity must be set to maintain the effectiveness of cardiac rehabilitation [38]. Based on the recommendations for exercise, the purpose of the exercise provided in this study was to encourage early ambulation in the participants and to induce regular and continuous exercise after discharge. Therefore, it is necessary to evaluate the effectiveness of home-based exercises in home-based patients [10] because continued exercise in patients with HF after discharge affects their cardiac events and quality of life. However, fear of physical activity can be an obstacle to exercise-based rehabilitation [39]; therefore cognitive-behavioral interventions should be provided along with exercise rehabilitation in patients with HF.

In the hospital where this study was conducted, a multidisciplinary approach involving nurses, physicians, dietitians, and physical therapists was implemented. Nurse-led multidisciplinary education was found to be a significant factor in the prevention of cardiac events in patients with HF. An integrated multidisciplinary approach to chronic HF nursing care led by nurses has been shown to improve patient outcomes [14,15,40]. Among healthcare providers, nurses possess the best understanding of a patient's symptoms, educational requirements, and individual strengths and limitations that are critical for providing appropriate care [41]. Therefore, to reduce readmission in patients with HF, a multidisciplinary approach centered on field-specific nurses is important for patient education regarding disease understanding and management.

Finally, patient education plays a crucial role in enhancing self-care in individuals with HF. While healthcare professionals have identified medication adherence and prior hospitalization as predictors of readmission [20], insights gained from patient experiences affirm that effective communication between patients and healthcare providers, coupled with social and caregiver support, are pivotal elements in fostering self-care for those with HF [42]. Consequently, educational content should be tailored to address the needs of both healthcare professionals and patients by incorporating strategies to enhance communication and leverage resources from families and the community.

Therefore, it is imperative to understand the impact of treatment delay on HF outcomes. The NYHA functional class, along with factors such as depressive symptoms, HF knowledge, and HF awareness, contributes to treatment delays. Interventions encompassing improvements in functional status and psychological and cognitive-behavioral changes in patients play a significant role in mitigating cardiac events [11]. Subsequently, education and rehabilitation tailored to reflect these patient characteristics should adopt a multidisciplinary approach. Nurses, being among the healthcare professionals who best understand a patient's condition, play a crucial role in a multidisciplinary approach and serve as effective moderators. Recognizing the importance of nurses in this multidisciplinary context is essential for the overall success of patient education and rehabilitation.

This study has limitations in that it did not examine socioeconomic, cognitive and behavioral, or caregiver factors, and did not confirm the causal relationship between cardiac events and predictive factors. Additionally, chronic illnesses such as diabetes mellitus and hypertension were not included, apart from COPD and atrial fibrillation, as comorbidities that could potentially influence HF exacerbation.

Not receiving education during the index hospitalization implies that the patient might have received education before that. We did not consider the details of HF education received during previous hospitalizations in this study. Despite this limitation, nurse-led multidisciplinary education emerged as a factor influencing cardiac events in our study. This suggests that even if individuals had received education in the past, not receiving education during the current hospitalization was associated with a higher likelihood of cardiac events within 2 years. Future studies should carefully analyze these factors.

Furthermore, it is important to note that this study, being a chart review within a single medical institution, may not have captured cases in which patients sought care for cardiac events at other hospitals. The scope of our analysis was limited to the data available within our medical institution, and the findings may not fully represent the broader population experiencing cardiac events. In this study, the relationship between cardiac rehabilitation and cardiac events could not be identified because of the short duration of the cardiac rehabilitation. We suggest that a longer follow-up study be conducted to determine whether sufficient rehabilitation training is effective in preventing cardiac events.

Conclusions

In this study, nurse-led multidisciplinary education was identified as a factor that could reduce and prevent post-discharge cardiac events in patients with HF. However, further research is required to confirm the causal relationship between cardiac events and the predictive factors after HF treatment. Planning an adequate frequency of cardiac rehabilitation is necessary to prevent cardiac events in patients with HF. Utilizing indicators such as NT-pro BNP enables the identification of high-risk patients with an elevated likelihood of cardiac events and establishes plans for appropriate treatment and monitoring. Furthermore, there is a need for educational programs for older patients living alone or older family caregivers in Korea's aging society.

Credits

None.

Disclaimers

None.

Conflict of interest

The authors have no conflicts of interest to disclose.

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None.

Ethics

This study was approved by the Institutional Review Board of Sejong General Hospital on July 07, 2021 (2021-0356).

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Research Article

Resilience and Overcoming Experiences of Coronavirus Disease 2019 Patients Hospitalized in a Single-Room Isolation Ward: A Mixed-Methods Study☆

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SUMMARY

Purpose: The coronavirus disease 2019 (COVID-19) pandemic has caused patients to suffer from various physical and psychological symptoms and social challenges, but the impact was harder for those COVID-19 patients receiving treatment in single-room isolation wards in South Korea. This study aimed to investigate resilience, anxiety, depression, and sleep quality of those patients and the relationships between those variables, and explore the patients' experience of resilience during the COVID-19 treatment in single-room isolation wards.
Methods: This study employed a mixed-methods approach, collecting quantitative data through surveys and qualitative data through semistructured interviews conducted between May and October 2022. Quantitative surveys encompassing disease-specific and demographic information, visual analog scales to assess anxiety, depression, and sleep quality, and the Connor–Davidson resilience scale were administered to patients ($N = 153$). Qualitative thematic analyses were conducted following interviews with a subset of patients ($N = 13$) belonging to the high-resilience group.
Results: Resilience exhibited a negative correlation with anxiety and depression, while showing a positive correlation with sleep quality. Factors affecting resilience include having a spouse, educational attainment, and depression. The qualitative thematic analysis results were categorized into: (1) facing the reality of being isolated in a room; (2) struggling to accept and adapt to isolation; and (3) seeking connections in isolation.
Conclusions: This research sheds light on the challenges faced by individuals in isolation and underscores the crucial role of resilience in overcoming such challenges. The resilience observed in these patients is grounded in both interpersonal and profound spiritual connections. These findings underscore the necessity for nurses to develop customized strategies to alleviate the impacts of social isolation.

Introduction

The unprecedented coronavirus disease 2019 (COVID-19) pandemic has claimed the lives of millions of people worldwide [1], and South Korea has not been exempt from its impact. As of June 19, 2023, South Korea has reported approximately 32 million infections, accounting for 60.0% of the total population, and 34,960 deaths [2].

The COVID-19 pandemic has had adverse effects on both the physical and mental health of individuals [3]. Compared to the general population, COVID-19 patients show a higher prevalence of anxiety, depression, and sleep disorders [4–6]. Particularly, the greater disease severity observed in COVID-19 patients, often manifested by symptoms such as fever and hypoxia, has been found to be significantly linked to depression [7,8]. Furthermore, these psychological symptoms can be exacerbated by the side effects of treatment, such as those associated with corticosteroids, which are known to cause sleep disturbances [9]. Additionally,

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☆ **Instrument Permission:** Authorization to use the CD-RISC25 questionnaire was obtained from its developer, Jonathan Davidson, via electronic correspondence.

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when patients are isolated in a single room to prevent the spread of infectious diseases, they often experience negative emotions [10]. Confinement leads to limitations in daily activities, reducing social and physical contact, and resulting in feelings of loneliness, alienation, and social isolation [11]. Confinement, especially in single rooms, can heighten psychological distress in already vulnerable patients, potentially compromising therapeutic compliance and recovery [12]. Given the pivotal role of mental well-being in patient recovery [13], these psychological concerns must be proactively addressed.

Resilience is among the main factors enabling COVID-19 patients to adapt to and overcome extensive psychological, social, and emotional stress stemming from isolation and potential health risks [14,15]. Resilience is defined as an individual's psychological and social capacity to adapt and grow in the face of stress, trauma, and adversity [16], and constitutes an active ability to strengthen and mobilize resources during crises, emphasizing self-regulation and growth [17]. Resilience is not only influenced by intrinsic qualities but also by external factors such as socio-demographic characteristics. For example, spiritual or religious beliefs are linked to enhanced resilience, offering personal meaning and value in life during challenging situations [18]. Moreover, the presence of supportive individuals, such as family members, offers crucial social support and assistance, enhancing patient resilience, particularly when confronted with the isolation of a single-room ward [19,20]. Therefore, recognizing resilience as a multifaceted construct, influenced by various factors, is crucial in addressing the psychological impacts of COVID-19, especially for patients in single-room isolation.

Resilience has proven to play a positive role in the mental health of diverse populations during the COVID-19 pandemic. Notably, a negative correlation was observed between resilience and symptoms such as anxiety, depression, and psychological distress in COVID-19 patients [21–23]. Additionally, previous studies have shown that while anxiety and depression negatively affect resilience [24,25], sleep quality has a positive correlation with it during the pandemic [26,27]. These findings suggest that resilience can assist COVID-19 patients in coping more effectively during treatment, potentially leading to quicker recovery.

However, research on the resilience of COVID-19 patients isolated in single rooms remains limited. Most existing studies [21–23] heavily rely on quantitative methods, which provide only a partial understanding of the relations between resilience and other symptoms, but do not capture the full range of factors affecting patient resilience in isolated conditions. Therefore, a deeper exploration of the overcoming experiences of patients isolated in single rooms during pandemics such as the recent COVID-19 emergency is essential.

To bridge the gaps in the current literature, this study employs a mixed-methods approach. Quantitative analyses were conducted to investigate the connections between anxiety, depression, sleep quality, and resilience among COVID-19 patients in single-room isolation wards. Additionally, this study sought to explore the particular factors that influence resilience. Moreover, the experiences of patients who maintained high resilience even under the challenging conditions of COVID-19 isolation in a single room were explored and described.

Methods

Study design

This study employed a descriptive design with a mixed-methods approach, thereby expanding the depth and scope of research methodologies. By integrating both quantitative and qualitative studies, this approach enables a more comprehensive understanding of the research problem [28,29]. This approach enhances the overall reliability of the findings by uncovering phenomena that standard quantitative research might overlook and providing additional insights through the validation of results from qualitative studies [28]. This study initially conducted a quantitative investigation to determine the degree of resilience and its influencing factors among COVID-19 patients in single-room isolation wards. Afterward, a qualitative study targeting patients with high-resilience was conducted to gain further insights into their experiences while overcoming the disease, with the aim of thoroughly investigating specific factors contributing to resilience.

Setting and samples

Quantitative survey

Convenience sampling was employed to select participants from among patients admitted to single isolation rooms in a dedicated COVID-19 treatment ward at a tertiary hospital in Seoul, South Korea. These rooms, which were small and mostly windowless, limited views and movement but were designed for safety and infection control, equipped with closed circuit television (CCTV) and glass doors with adjustable transparency. Visits were prohibited to reduce infection risks. Typical treatment included antiviral medications such as remdesivir and steroids, alongside supportive care. Hospitalization usually lasted 7 days but could be extended for immunocompromised patients. The inclusion criteria included the following: individuals aged 18 and above, admitted to the isolation ward due to COVID-19 for at least 24 hours, with no prior hospitalization in the unit, and capable of communicating and answering the questionnaire. The 24-hour threshold was set to ensure a stable assessment period for the study and to exclude patients either nearing discharge or likely to be transferred to the intensive care unit (ICU) or general ward. This approach aimed to create a more uniform sample by including only those experiencing typical conditions of isolation. The exclusion criteria included those with a psychiatric history or cognitive impairment, visual or hearing disabilities, as well as those experiencing severe disease-related symptoms that could impede study participation (e.g., undergoing invasive oxygen treatment, general weakness, high fever, or significant pain). To confirm these criteria, consultation with the assigned nurse or checking medical records for relevant disease codes related to psychiatric history or cognitive impairment was undertaken.

G-power 3.1.9.2 was utilized to determine the specific number of participants required for the quantitative research [30]. The required sample size for regression analysis was calculated as 139 participants based on the following criteria: two-sided tail analysis, a medium effect size of 0.15, significance level of 0.05, power of 0.80, and incorporating 15 predictor variables (age, gender, religion, spouse, education level, occupation, average monthly income, cohabiting family, COVID-19 confirmed family, underlying disease, oxygen application, vaccination history, anxiety, depression, sleep quality). Considering a 10% dropout rate, 153 participants were selected for the quantitative research survey. After excluding two respondents with incomplete answers, data from a total of 151 participants were used for the final analysis.

Qualitative interviews

The purposive sampling method was employed to select participants from those who took part in the quantitative research survey, specifically targeting individuals with high levels of resilience who agreed to participate in in-depth interviews. The decision to focus on high-resilience individuals was intentional, with the aim of extracting insights into effective coping strategies in isolation. Understanding these strategies is crucial for developing interventions to enhance resilience among all patients facing similar situations. In-depth interviews were conducted with a total of 13 participants. To verify and clarify any ambiguous or insufficient content from the interviews, a follow-up interview was conducted with one of the participants, resulting in a total of 14 individual interviews.

Measurements

Resilience

A Korean adaptation of the Connor–Davidson Resilience Scale (CD-RISC), originally developed by Connor and Davidson [16], was developed and validated by Baek et al [31]. Permission was obtained from the developers to incorporate this procedure into our study. The CD-RISC questionnaire requires participants to rate their agreement with each statement based on their experiences over the past month or how they would have felt in similar circumstances if they had no experience. It consists of 25 items, each rated on a 5-point Likert scale, with scores ranging from 0 (“Strongly Disagree”) to 4 (“Strongly Agree”) points. The total score ranges from 0 to 100, with higher scores indicating greater resilience. The reliability of the instrument at the time of its development by Connor and Davidson [16] was Cronbach's $\alpha = 0.89$. In this study, Cronbach's $\alpha = 0.96$.

Anxiety, depression, sleep quality

To prioritize a simple and convenient instrument for patients, we used the visual analog scale (VAS) to assess anxiety, depression, and sleep quality. The VAS is commonly used to measure various subjective variables, such as pain, anxiety, and depression by offering a continuous range of values [32–34].

For anxiety, the far right indicates “very anxious,” and the far left indicates “not at all anxious.” In this study, the 100 mm was divided into ten 10 mm intervals, and scores were converted into a 0 to 10 scale, where higher scores indicate greater anxiety.

Similarly, for depression, the far right indicates “very depressed,” and the far left indicates “not at all depressed.” Scores were also converted into a 0 to 10 scale, with higher scores indicating more severe depression.

For sleep quality, the far right indicates “very poor,” and the far left indicates “very good.” The 100 mm line was divided similarly, but scores were inversely converted into a 0 to 10 scale, where higher scores indicate better sleep quality.

Data collection

Quantitative data collection

Data were collected from May to October 2022. Upon securing survey approval from nursing managers, collaboration with nurses in the single-room isolation wards was initiated to identify patients eligible to respond to the questionnaire. Once eligibility was confirmed, the study's purpose and methodology were explained to COVID-19 patients. Upon voluntary agreement to participate, written consent was obtained, and patients were requested to complete a self-report questionnaire. Surveys were administered directly in the patients' rooms, typically within 1–3 days following admission. To minimize disruption and maximize convenience, survey administration was carefully scheduled during the day or in the afternoon, avoiding times when professor rounds typically occurred. The process took approximately 10–15 minutes. Additional patient-related information, such as accurate diagnosis, oxygen therapy experience during admission, and oxygen capacity, was obtained through a review of medical records.

Qualitative data collection

Interviewees were selected from among the participants in the quantitative study who scored high in resilience on the survey, expressed a willingness to be interviewed, and agreed to be recorded. These one-on-one individual interviews were conducted by the lead researcher of this study. Additional patient information related to the study, such as diagnosis and duration of hospital stay, was collected during the interview. The interviews were semistructured, involving open-ended questions, and each session lasted approximately 40 minutes to an hour. To capture the participants’ most genuine and immediate emotions and memories of their hospital experience, interviews were conducted as close to the time of discharge as possible. The research questions prompted participants to recall and discuss events from the first day of their hospital admission. Specific questions included, “What were your initial thoughts on the first day after being diagnosed with COVID-19 and admitted to the isolation ward?”, “What negative thoughts or emotions did you experience?”, and “What were the challenges you faced upon being admitted to the isolation ward because of a COVID-19 infection, and which one was the most significant?”. Subsequent key questions included “How did you attempt to overcome the aforementioned challenges during your hospitalization?”

The interview content was directly recorded and then transcribed by the lead researcher at the conclusion of each interview. The transcribed material was cross-referenced with the recorded content, finalized, and organized in collaboration with another researcher in a manner beneficial for subsequent analysis. During transcription, nonverbal expressions reflecting the interviewee's emotions, as noted in the field notes, were also documented. If parts of the transcription were unclear or questionable, additional interviews were requested for clarification. This process continued until no new categories emerged, and the interviews concluded when both researchers agreed that theoretical saturation had been achieved.

Data analysis

Quantitative data analysis

The data collected through the survey were analyzed using SPSS/WIN 25.0. The participants' general characteristics (demographic and disease-related characteristics), depression, anxiety, sleep quality, and resilience levels were examined in terms of frequency, percentage, mean, and standard deviation. Differences in resilience levels based on the participants' general characteristics were assessed using the independent t-test and one-way analysis of variance (ANOVA); post-hoc testing was conducted using the Scheffé test. The correlation between depression, anxiety, sleep quality, and resilience was explored using the Pearson correlation coefficient. To determine the cut-off point for resilience, a stem-and-leaf plot was initially employed to understand the distribution of the resilience sum [35]. The data distribution revealed a bimodal distribution and a cut point was considered where the two peaks intersected. Clustering with $K = 2$ via K-means cluster analysis revealed that the cut point for the resilience sum could be set between 58 and 59 (cut-off point = 58.5). Accordingly, participants were categorized into two groups based on their resilience scores, and differences in depression, anxiety, and sleep quality between the groups were analyzed using the independent t-test. The factors affecting the participants’ resilience were analyzed using multiple regression analysis (enter method).

Qualitative data analysis

The qualitative data were analyzed through thematic analysis as proposed by Braun and Clarke [36], starting with a thorough reading of the transcribed files to capture participants' experiences, including raw content, meanings, tones, and nuances. Using MAXQDA software for initial coding, meaningful content within the transcripts was coded, and similar codes were merged into categories that grouped related data. These categories were then organized into themes, with all relevant data grouped accordingly. The relationship between themes and coded data was collaboratively reviewed and refined, merging sub-themes into overarching themes. Each theme was clearly named and defined, with representative examples selected to support the findings. The content was refined through three rounds of research meetings, culminating in a consensus on the final analysis by both researchers.

Ensuring rigor in qualitative research

In this study, the criteria proposed by Lincoln and Guba [37] were followed to ensure the rigor of the qualitative research:

(1) Credibility: The researcher, being a nurse in the same ward, had an insider's perspective and understanding of participants' experiences during hospitalization. The findings were verified with two participants to ensure accuracy;
(2) Transferability: The researcher provided detailed demographic and disease-related information to enhance the transferability of the findings. The research questions were meticulously crafted to accurately capture the participants' initial reactions, emotions, and coping strategies in the isolation ward. Direct citations from interview content were used in the research findings to vividly convey the participants' experiences, making the study more applicable to similar contexts;
(3) Dependability: Consistency in data analysis was ensured through the rigorous application of research procedures and collaborative discussions among researchers. Multiple rounds of review were conducted to guarantee the dependability of the results;
(4) Confirmability: To ensure research neutrality, the study adhered to the above-mentioned criteria. The entire research process and analysis were independently reviewed by two professors with significant expertise in qualitative research. This review included a thorough examination of interview data and continuous comparison with the literature to prevent researchers' assumptions or biases from influencing the study.

Ethical considerations

This study was conducted after obtaining ethical approval from the Clinical Research Ethics Committee of the certified tertiary hospital where the researcher is affiliated [IRB No. 2022-0583]. The study participants were provided with an explanatory statement and a consent form. They were informed about confidentiality, anonymity, the option to withdraw from the study at any point, and that the collected data would strictly be used for the purposes of the study. Interview participants were briefed on the purpose and intent of the study, procedure, research questions, and expected duration. Interviews were coordinated after discussing the schedule and location with participants willing to participate. All identifying information of the participants was replaced with assigned arbitrary numbers. All research materials, including case records, were encrypted and securely stored in the researcher's personal office, ensuring that only the researchers could access them.

Results

Quantitative results

Demographic and disease-related characteristics of participants

A total of 151 participants were included in the study, with an average age of 53.68 ± 12.79 years. Among them, 92 (60.9%) were male participants, 82 (54.3%) identified as religious, and 125 (82.8%) were currently living with a spouse. Regarding educational level, 75 participants (49.7%) had a high school diploma or lower, 77 (51.0%) were without an occupation, and 68 (45.0%) had an average monthly income of less than 2 million won. Additionally, 126 participants (83.4%) had family members living with them, and 85 (56.3%) had family members who had been infected with COVID-19. Regarding underlying diseases, 119 patients (78.8%) had pre-existing conditions, and 106 (70.2%) have experience with oxygen treatment during hospitalization. In terms of COVID-19 vaccination history, 69 (45.7%) participants had received third doses, representing the highest proportion (Table 1).

Differences in resilience based on participant characteristics

The degree of resilience exhibited statistically significant differences based on sex ($t = 2.16$, $p = .032$), religious status ($t = 3.68$, $p = .001$), presence of a spouse ($t = -5.29$, $p < .001$), education level ($F = 7.57$, $p = .001$), occupational status ($t = 3.59$, $p < .001$), average monthly income ($F = 7.95$, $p < .001$), and the presence of cohabiting family members ($t = 5.00$, $p < .001$). Post-hoc analysis indicated that participants with university degrees (65.07 ± 19.05) or graduate school degrees (74.66 ± 10.55) demonstrated significantly higher resilience compared to those with high school diplomas or lower (56.25 ± 20.08). Participants with an average monthly income of 6 million won or more (76.16 ± 15.55) exhibited significantly greater resilience than those with an income of less than 2 million won (54.48 ± 18.72) (Table 1.)

Descriptive statistics and correlations among research variables

The degree of resilience scored 61.64 ± 19.76 points (ranging from 0 to 100), whereas anxiety scored 4.46 ± 2.87 points (ranging from 0 to 10), depression scored 4.10 ± 2.74 points (ranging from 0 to 10), and sleep quality scored 5.86 ± 2.76 points (ranging from 0 to 10). The results indicated that the degree of resilience had a significant negative correlation with anxiety ($r = -0.54$, $p < .001$) and depression ($r = -0.60$, $p < .001$), whereas it had a positive correlation with sleep quality ($r = 0.47$, $p < .001$) (Table 2).

Comparing variables between high and low resilience groups

Based on K-means cluster analysis (cut-off point = 58.5), the degree of resilience was categorized into two groups. Substantial differences were noted in anxiety ($t = 5.70$, $p < .001$), depression ($t = 7.25$, $p < .001$), and sleep quality ($t = -4.74$, $p < .001$) between these two groups. Anxiety and depression were lower in the high resilience group, and sleep quality was better in the high resilience group (Table 3).

Factors influencing resilience

To identify the factors influencing resilience, a multiple regression analysis was conducted, incorporating independent variables such as sex, religious status, presence of a spouse, educational level, occupational status, cohabitation with family members, average monthly income, anxiety, depression, and sleep quality, all of which were significant in the univariate analysis. According to the multiple regression analysis, having a spouse ($\beta = .16$, $p = .026$),

Table 1 *Resilience Differences based on Demographic and Disease-related Characteristics.*

($N = 151$)

Variables	Categories	n (%)	Mean ± SD	t or F(p)
Age (years)	≦39	24 (15.9)	61.20 ± 18.58	0.95 (.421)
	40-49	33 (21.9)	66.33 ± 20.31	
	50-59	27 (17.9)	58.07 ± 21.29	
	≧60	67 (44.4)	60.93 ± 19.30	
	Mean ± SD	53.68 ± 12.79		
Gender	Men	92 (60.9)	64.39 ± 19.63	2.16 (.032)
	Women	59 (39.1)	57.35 ± 19.37	
Religion	Yes	82 (54.3)	66.85 ± 16.45	3.68 (.001)
	No	69 (45.7)	55.45 ± 21.63	
Spouse[a]	Yes	125 (82.8)	65.21 ± 16.01	−5.29 (<.001)
	No	26 (17.2)	44.46 ± 16.01	
Education level	High school or lower	75 (49.7)	56.25 ± 20.08	7.57 (.001)
	University	61 (40.4)	65.07 ± 19.05	(a<b, c)*
	Graduate school	15 (9.9)	74.66 ± 10.55	
Occupation	Yes	74 (49.0)	67.31 ± 19.27	3.59 (<.001)
	No	77 (51.0)	56.19 ± 18.78	
Average monthly income (10,000 won)	<200	68 (45.0)	54.48 ± 18.72	7.95 (<.001)
	200 ~ < 400	37 (24.5)	65.10 ± 17.99	(a< d)*
	400 ~ < 600	27 (17.9)	64.70 ± 20.52	
	≧600	19 (12.6)	76.16 ± 15.55	
Cohabiting family	Yes	126 (83.4)	64.96 ± 18.32	5.00 (<.001)
	No	25 (16.9)	44.88 ± 18.53	
COVID-19 confirmed family	Yes	85 (56.3)	62.32 ± 18.98	0.58 (.560)
	No	66 (43.7)	60.40 ± 21.08	
Underlying disease	Yes	119 (78.8)	61.95 ± 19.07	0.37 (.714)
	No	32 (21.2)	60.50 ± 22.46	
Oxygen application	Yes	106 (70.2)	59.09 ± 18.42	−1.03 (.303)
	No	45 (29.8)	62.73 ± 20.30	
Vaccination history (no. of doses)	No	17 (11.3)	65.25 ± 17.43	0.90 (.441)
	One	3 (2.0)	48.67 ± 4.04	
	Two	62 (41.1)	59.79 ± 21.57	
	Three	69 (45.7)	62.99 ± 18.90	

Note. SD = standard deviation; * Scheffé test.

[a] "Yes" indicates the presence of a current spouse, regardless of previous marital statuses such as divorce or widowhood.

Table 2 *Description and Correlations among Research Variables.*

($N = 151$)

Variables	Mean ± SD	Min-Max (Range)	Anxiety	Depression	Sleep quality
				r (p)	
Resilience	61.64 ± 19.76	24-91 (0–100)	–.54 (<.001)	–.60 (<.001)	.47 (<.001)
Anxiety	4.46 ± 2.87	1–10 (0–10)	1	.76 (<.001)	–.64 (<.001)
Depression	4.10 ± 2.74	1–10 (0–10)		1	–.67 (<.001)
Sleep quality	5.86 ± 2.76	1–10 (0–10)			1

Note. SD = standard deviation.

Table 3 *Differences in Variables between High and Low Resilience Groups.*

($N = 151$)

Variables	Cluster 1 (Low group) ($n = 63$)	Cluster 2 (High group) ($n = 88$)	t (p)
	Mean ± SD	Mean ± SD	
Anxiety	5.89 ± 2.67	3.43 ± 2.56	5.70 (<.001)
Depression	5.75 ± 2.48	2.92 ± 2.27	7.25 (<.001)
Sleep quality	4.68 ± 2.48	6.70 ± 2.65	–4.74 (<.001)

Note. SD = standard deviation.

graduating from a university ($\beta = .17$, $p = .023$), and depression ($\beta = -.37$, $p < .001$) were the main factors impacting resilience. The explanatory power of the model was 49.9% (Adj. $R^2 = .50$), which was statistically significant (F = 12.51, $p < .001$) (Table 4).

Qualitative results

Interviews were conducted with 13 participants, and an additional interview was carried out to ensure a clear understanding of insufficient data, resulting in a total of 14 interviews. In the qualitative study, the participants' average age was 52.85 ± 12.03 years, and their average hospitalization period in the isolation ward was 18.92 ± 21.03 days. The resilience score averaged 69.33 ± 13.05, with anxiety at 2.67 ± 1.88, depression at 2.66 ± 2.10, and sleep quality at 7.42 ± 1.88 points. All participants had a distinct diagnosis other than COVID-19, with five having lymphoma, two undergoing liver transplantation, two experiencing kidney transplantation, and one having a heart transplantation. Others were diagnosed with

Table 4 *Factors Influencing Resilience.*

($N = 151$)

Variables	B	SE	β	t	p	R^2	Adj R^2	F	p
Content	49.29	7.07		6.98	<.001	.54	.50	12.51	<.001
Gender_ men	3.97	2.46	.01	1.61	.109				
Religion_ yes	4.01	2.50	.10	1.60	.112				
Spouse_yes	8.39	3.72	.16	2.26	.026				
Education level									
University	6.63	2.89	.17	2.30	.023				
Graduate school	8.68	4.75	.13	1.83	.070				
Occupation_ yes	2.87	3.13	.07	0.92	.361				
Cohabiting family_ yes	4.76	3.73	.09	1.28	.203				
Average monthly income (10,000 won)									
200~ <400	2.69	3.39	.06	0.79	.428				
400~ <600	−2.97	4.35	−.06	−0.68	.496				
≧601	6.33	4.94	.11	1.28	.202				
Anxiety	−0.36	0.68	−.05	−0.54	.594				
Depression	−2.70	0.72	−.37	−3.77	<.001				
Sleep quality	0.63	0.61	.09	1.03	.304				

Durbin−Watson = 2.05; VIF = 1.12 ~ 2.96; Tolerance = .34 ~ .90.
Dummy variable = gender (reference: women); religion (reference: no); spouse (reference: no); education level (reference: ≦ high school); occupation (reference: no); cohabiting family (reference: no); average monthly income (reference: <200).

Crohn's disease, leukemia, and constrictive pericarditis. The majority, 11 (84.6%), had reduced immunity due to the use of immunosuppressive drugs or undergoing chemotherapy.

The education levels and marital statuses of the study participants varied widely: 5 (38.5%) had a high school education or lower, 4 (30.8%) had a university degree, and 4 (30.8%) had graduate qualifications. Moreover, 11 (84.6%) had a spouse and 7 (53.8%) practiced a religion. Through thematic analysis of the qualitative data, three themes and 11 sub-themes were derived (Table 5).

Theme 1: Facing the reality of being isolated in a room

Theme 1 vividly portrays the participants' intense physical and mental distress within the confines of the single-room isolation ward. Upon entering the COVID-19 isolation room, the participants confronted the stark reality of their situation. Characterizing it as an uncomfortable jail, they had to contend with their symptoms in solitude within the isolation room. The fear of uncertainty and the absence of attention from healthcare workers intensified the participants' need for communication.

Feeling like being in jail. For the participants, the isolation room resembled a solitary prison cell that entirely severed them from the outside world. Deprived of the ability to observe the weather outside, the continuous surveillance and supervision contributed to a feeling of lost freedom and agency. The lack of family visits fostered an atmosphere of darkness and coldness within the ward, leaving patients longing for support.

Table 5 *Themes and Sub-themes Related to Experiences Overcoming COVID-19.*

Themes	Sub-themes
Facing the reality of being isolated in a room	Feeling like being in jail
	Experiencing symptoms while surrounded by silence
	Fearing an uncertain future
	Too busy to care for me
Struggling to accept and adapt to isolation	Embracing the situation positively
	Enduring day by day with divine guidance
	Fostering autonomy through productive routines
	Viewing isolation as a valuable time for self-reflection
Seeking connections in isolation	Maintaining a sense of belonging through persistent communication
	Staying engaged with the outside world online
	Finding strength and solace in spiritual connection

> *"It would be great if there was even a small window here, but my room has no windows, so it feels the same 24 hours a day. I used to check the weather by asking my wife. Being alone, without family, is the hardest." (Participant 10)*

> *"Since there was a CCTV in the room, I felt constantly monitored, restricted, and controlled. It was very difficult at first, feeling like someone was watching my every move through the camera. I couldn't do anything freely." (Participant 1)*

Experiencing symptoms while surrounded by silence. The participants found themselves in an unforeseen situation, where they were infected with COVID-19 amid their ongoing fight against underlying diseases. The most challenging moments they recalled during hospitalization involved enduring severe physical distress alone, grappling with symptoms in the silent hospital room while yearning for their family's presence.

> *"When I had a fever, it rose to 38.9 degrees, and I experienced chills. It was so difficult when I had a fever. Being alone here, I didn't know if anyone could help... It was the hardest part because I had to endure the symptoms alone." (Participant 9)*

> *"Because of COVID-19, I felt shortness of breath and my oxygen saturation dropped significantly, so I couldn't go to the bathroom. I had to use diapers. I felt continuously emotionally devastated here. When my body was in pain, I missed my family the most." (Participant 10)*

Fearing an uncertain future. The participants experienced repeated cycles of recovery and exacerbation of COVID-19-related illnesses in the isolation ward. Throughout this process, they grappled with the fear of an uncertain future, uncertain about when they would fully recover, leave the isolation ward, and whether they would achieve complete healing. The anxiety and stress stemming from the unpredictability of their condition often hindered their ability to find restful sleep, further compounding their challenges.

> *"I am a transplant patient, and on top of that, I am taking antifungal drugs. So, when I got infected with COVID-19, fear naturally*

> *took precedence. I worried whether the disease would worsen. Can I recover completely? I felt a lot of uncertainty." (Participant 11)*
>
> *"After hearing that the CT scan showed pneumonia in a part where it was not previously detected, my hope that the treatment had been going well was shattered. I wondered if I could ever leave this place …" (Participant 6)*

Too busy to care for me. Participants could only interact with healthcare professionals in the isolation ward. They attempted to cope with the challenging situation through communication with these workers. However, healthcare professionals seemed preoccupied with their duties, and there was a sense of hesitation in spending time together, making it challenging to engage in meaningful conversations.

> *"Being alone, negative thoughts can overwhelm me. Having some communication with other isolated patients to understand their thoughts and feelings would be nice. Unfortunately, nurses are too busy to provide that. It would be great if healthcare professionals could find time to talk and understand our emotions." (Participant 4)*

Theme 2: Struggling to accept and adapt to isolation

Theme 2 illustrates how participants coped with adversity through an internal approach. They embraced their circumstances positively, drew strength from their faith, engaged in meaningful activities, and perceived the experience as a valuable time for self-reflection.

Embracing the situation positively. Participants initially experienced negative emotions but gradually accepted and focused on positive aspects. Positive thinking helped them cope with and accept their illness.

> *"I felt pain but realized it's better to get treated and leave here soon rather than going home and getting sick. So, I reframed my thoughts positively; the situation won't change, and if I'm in pain, I'm the only one suffering. Mental strength is crucial to endure this." (Participant 4)*
>
> *"I thought, 'This is my process, too,' and I think it's important to have that mindset where you have a dream and a will and you can overcome it quickly." (Participant 12)*

Enduring day by day with divine guidance. As participants contracted COVID-19 while immunocompromised, some turned to Bible verses they read that day. They persevered by believing that staying in the isolation ward was God's will.

> *"I'm just obeying His will, and today it was about gratitude. 'Oh, let's take this time to be grateful.'" (Participant 4)*
>
> *"I feel like I won't get out of this room, but I read a Bible verse today that reminds me that the suffering in this life is not worth the glory to come. Holding onto God's promise gives me hope that my current suffering won't be in vain." (Participant 6)*

Fostering autonomy through productive routines. Despite the confined space of their isolation rooms, participants gradually discovered ways to regain their sense of autonomy through meaningful activities. They devoted themselves to remote tasks, embraced exercise routines for health preservation, and immersed themselves in reading or film-watching—activities that had been overshadowed by the intense demands of their work and parental responsibilities.

> *"I had my family bring my laptop so that I could be productive once I felt better. Engaging in work gave me a sense of purpose, making my time more fulfilling than if I just idled around. Though confined, I pushed myself to move, often sitting up and down on the side of the bed multiple times throughout the day to stay active." (Participant 4)*
>
> *"While juggling work and parenting, I rarely found time for personal relaxation. But being in isolation allowed me to indulge in long-neglected hobbies. I read books I'd always intended to and watched numerous movies." (Participant 8)*

Viewing isolation as a valuable time for self-reflection. The participants expressed that isolation provided them with the time to contemplate whether things they once deemed important were now insignificant and what valuable aspects they may have overlooked. They recognized the significance of their regular day-to-day lives and the importance of having their family by their side. This period of hospitalization became a cherished moment for them to review their past lives and make plans for their future.

> *"The current period of hospitalization and isolation represents a phase where I'm sorting out the complexities of my past life. Therefore, I see these times as really beneficial, truly valuable moments where I can prioritize and organize things from my past. That's why I believe I'm doing well here." (Participant 4)*
>
> *"I'd taken my family for granted and forgotten my gratitude toward them, but after this prolonged isolation and hospital stay, I realized that they were the ones who truly stood by me." (Participant 12)*

Theme 3: Seeking connections in isolation

Theme 3 represents a coping mechanism through external approaches in the isolation room. This process symbolizes the effort to minimize disconnection by maintaining communication with loved ones, keeping up with current events through online media, and relying on a higher spiritual presence. This theme underscores that the essence of their resilience stemmed from multifaceted connections.

Maintaining a sense of belonging through persistent communication. In the isolation ward, participants not only grappled with physical challenges due to their illnesses but also felt mentally drained primarily because of their solitude. This led to feelings of isolation and disconnection, compounded by depression and anxiety. To overcome this, they consistently communicated with those around them in various ways. Despite the physical distance, they endeavored to remind themselves that they still belonged to their existing groups or communities.

> *"My family has a group chat where we frequently pray together, share the blessings we've received that day, and where I update them about my life in the hospital. No matter where I am, it's comforting to feel that sense of belonging." (Participant 5)*
>
> *"I've never been much into social media, but the phone became my social lifeline in the hospital. It provided the information and interaction I needed to relax. Through specific online forums for patients, I connected with individuals in similar situations of similar ages and conditions. Their advice and conversations made my time in isolation more bearable." (Participant 12)*
>
> *"While I've been here, I've been participating in virtual services, posting prayer requests. To my surprise, people I know who don't usually attend church have started attending dawn prayers on my behalf. They reach out, telling me they've prayed for me during*

> *these sessions. Their actions have been a source of great encouragement and gratitude for me." (Participant 4)*

Staying engaged with the outside world online. If participants were unaware of current events outside while they were in isolation, it became challenging for them to maintain conversations with people around them. This made them feel marginalized. Therefore, some participants kept track of ongoing trends and events through the news, YouTube, social networking sites, and other sources.

> *"When talking with my family and friends, they all mentioned watching 'Extraordinary Attorney Woo' on Netflix these days. So, I became curious and thought I needed to watch it to join in on the conversation. Hence, I searched for it here, watched the entire thing, and shared my thoughts." (Participant 10)*

Finding strength and solace in spiritual connection. While many patients sought solace in sharing their lives with family and friends to bridge the isolation gap, others reached out to a higher power beyond the confines of their hospital room. Although a religious connection is deeply personal and internal, it can be interpreted as an external approach in this context. This is because it constitutes a reliance on faith or a higher power that exists outside the immediate physical environment, especially in trying times. Such a connection provided immense comfort and strength to face each day.

> *"When I wake up in the morning and feel very weak, starting with a dawn prayer, reading the Bible, and meditating makes me feel much better. It gives me the strength to face the day. It's not just the written words, but hearing God's message directed to me personally from within feels like an opportunity to live again. Sometimes, when it's hard to breathe, it's difficult even to read the scripture. In these situations, listening to hymns gives me comfort and strength. When I rely on my faith, it feels like I can distance myself from my current problems. It becomes my strength and promise, and my heart recovers." (Participant. 5)*

Discussion

During the COVID-19 pandemic, patients admitted to a single-room isolation ward experience both disease-related suffering and psychological distress due to isolation. Resilience is a crucial personal trait that can mitigate such distress. Through a mixed-methods approach, this study aimed to investigate the relationship between anxiety, depression, sleep quality, and resilience in patients hospitalized in a single-room isolation ward because of COVID-19 infections, and to identify factors affecting resilience. Furthermore, the study focused on the coping process of patients with high resilience by exploring their individual experiences related to overcoming challenges. These experiences were categorized as follows: (1) facing the reality of being isolated in a room; (2) struggling to accept and adapt to isolation; and (3) seeking connections in isolation.

The data for this study were collected after May 2022, more than 2 years after the onset of the COVID-19 pandemic. While societal fears and stigma associated with COVID-19 infections may have diminished compared to the early phases of the pandemic, our study's average resilience scores (61.64 points) were lower than those in earlier studies. Zhang et al. [23] reported an average of 69.53 points in March 2020, whereas Tsaknis et al. [38] reported 70.6 points during the 2nd national lockdown, both using the same assessment tool. Patients with physical symptoms generally show more concern about disease progression [39], and the lower resilience levels observed in this study, in contrast to previous findings, could potentially be linked to preexisting ongoing medical conditions, not solely the experience of isolation during hospitalization. The severity of the disease, along with physical symptoms, can lead to psychological symptoms, negatively impacting coping mechanisms [40]. Additionally, isolation itself causes psychological distress in patients [41]. Therefore, healthcare professionals should provide care, ensuring that such patients can adapt and cope throughout the treatment process.

Resilience negatively correlates with negative mental health indicators, such as anxiety and depression, and positively correlates with positive indicators, such as life satisfaction and positive emotions [14]. Consistent with this, our study found that lower levels of anxiety and depression were associated with higher resilience. These findings align with results from prior studies involving diverse groups, such as nurses caring for COVID-19 patients [42], breast cancer patients [43], and general adults infected with COVID-19 [23]. Additionally, our cluster analysis revealed that anxiety and depression were lower in the group with high resilience compared to the group with low resilience. Sleep quality was higher in the high resilience group. Therefore, the findings suggest that active efforts are needed to alleviate symptoms, especially in patients experiencing severe anxiety, depression, and sleep disorder.

Furthermore, the findings of this research revealed that resilience was influenced by factors such as education level, having a spouse, and levels of depression. Specifically, individuals with a spouse, a university degree, and lower levels of depression were associated with higher resilience. A possible interpretation is that higher education provides individuals with more effective problem-solving skills, access to information, and the ability to understand and adhere to medical advice. Furthermore, a spouse can offer emotional support and bonding, which can strengthen the capability to cope. These findings are consistent with prior research indicating a positive association between marital satisfaction, higher education levels, proactive coping, and resilience [43–45]. Notably, our study demonstrates that depression can lower resilience, which is consistent with previous studies [23,46]. Early identification and management of depressive symptoms in isolated patients can be a critical intervention to enhance resilience. Therefore, healthcare professionals should intervene to enhance the resilience of patients in isolation, particularly those who are single, possess lower education levels, and exhibit symptoms of depression.

Patients who participated in the interviews likened the isolation wards to a jail-like environment characterized by disconnection from the outside world, loss of autonomy, and absence of freedom. They also reported experiencing a range of negative emotions, including discomfort, anxiety, uncertainty about recovery, fear, guilt concerning their families, depression, sleep disorders, and intense loneliness. These findings are consistent with Brooks et al [10], suggesting that such negative emotions are common among isolated patients.

This study focused on the experiences of highly resilient individuals, aiming to understand the critical role of resilience in the context of isolation. Even in the face of challenging circumstances, these individuals demonstrated a tendency to positively accept their situations. They actively engaged in physical activities and tasks within the confines of their environment, striving to regain a sense of agency and reduce social isolation. Additionally, they maintained communication with family and friends, which helped restore their sense of belonging and reduced feelings of isolation. They also sought to understand societal trends, further mitigating their sense of disconnection. Notably, religion played a crucial role in the participants' coping processes. By engaging in remote religious activities and prayer, these patients strengthened their inner positive outlook, found solace, and recovered from their distress. These findings align with those of Killgore et al. [47], who explored the multiple factors that drive resilience.

The capabilities to adapt and connect, as demonstrated by these individuals, are essential in overcoming the emotional and mental challenges associated with isolation. This suggests that individuals with lower resilience may encounter more pronounced difficulties in similar situations, underscoring the need for targeted interventions to aid their coping strategies. Although this study did not directly compare groups with varying levels of resilience, the insights gleaned offer valuable directions for future research. These findings underscore the importance of developing interventions aimed specifically at enhancing resilience, particularly for those with lower levels, to facilitate more effective adaptation and coping strategies in the face of adversity.

This study employed a mixed-methods approach to provide a more comprehensive understanding of resilience in the context of COVID-19 patients admitted to single-room isolation wards. A consistent finding between the two methods was the presence of a spouse. The quantitative results confirmed it as an essential factor in enhancing resilience, while the qualitative research expanded the understanding of its content and depth. Qualitatively, spousal support extended to include support from family and colleagues. Through their support and ongoing communication, patients were able to maintain a sense of belonging, which provided them stability. This, in turn, enhanced the patient's coping ability and aided in overcoming social disconnection. Consequently, nurses should actively encourage isolated patients to maintain interpersonal relationships through digital communication, such as via phone calls, video calls, and social media, thereby leveraging family or social support systems.

Interestingly, there were inconsistencies between the findings of the two research methods in this study. While the quantitative results did not identify religion as a factor influencing resilience, the qualitative findings revealed that patients continued religious activities during isolation, drawing solace and strengthening their inner selves. This highlights religion as a crucial coping mechanism in the recovery process. This discrepancy can be attributed to the multidimensional nature of resilience, which might encompass variables that are challenging to measure quantitatively, or specific variables might be overlooked. In particular, factors such as religion can exert a more subjective and personal influence on resilience, which is best captured through qualitative analysis [48,49]. Therefore, there is a need to employ both quantitative and qualitative research methods to provide a holistic understanding of resilience.

The findings of this research confirm that connectivity is a pivotal element in the resilience of patients in a single-room isolation setting. Furthermore, this sense of connectivity is formed through interactions with healthcare professionals, especially nurses who spend a significant amount of time with them. In fact, while patients in isolation wards yearned for communication with healthcare professionals, they felt that these interactions were insufficient because of the overwhelming workload of healthcare professionals. Typically, when caring for infectious isolated patients, the burden of personal protective equipment causes healthcare professionals to feel strained, thereby reducing the direct nursing time provided to patients [50]. This can adversely affect the well-being of isolated patients [51]. Notably, during the COVID-19 pandemic, nurses faced an additional workload and found it challenging to offer comprehensive patient care [52]. Policy and institutional changes, sufficient staffing, and improvements in the hospital system are thus urgently needed.

Based on the findings of the current study and previous research, we propose the following practical intervention strategies to enhance the resilience of patients:

First, nurses should focus on connectivity and encourage isolated patients to maintain interpersonal relationships to prevent them from experiencing feelings of detachment and isolation;

Second, unlike general patients, priority should be given to interactions with patients isolated because of infectious diseases. Emphasizing nonverbal communication skills and building therapeutic relationships will ensure that the emotional needs of patients are adequately addressed [53]. This will allow regular monitoring of patients' mental health, early detection of their emotional state, and provision of appropriate support;

Third, patients should be provided with transparent information about infectious diseases [10], allowing them to consistently update themselves about their condition. This will help alleviate their anxiety, enhance their understanding, and promote adaptation to their current situation;

Fourth, it is important to ensure an ample supply of essentials during the isolation period and suggest activities tailored to individual patients' interests [10]. This will aid patients in managing the stress and psychological distress caused by isolation and focus on positive coping strategies.

All these interventions should be applied as part of personalized care that caters to each patient's unique needs and circumstances. Such an individualized approach will bolster the resilience of patients in isolation, helping them navigate the challenges of the treatment process more effectively.

Limitations and future research

This study provides valuable insights into the significance of resilience among COVID-19 patients isolated in single wards, using a mixed-methods approach. However, several limitations should be considered:

(1) The study's findings are specific to a tertiary hospital in Seoul, South Korea, which may limit their generalizability to different cultural, environmental, and medical settings worldwide. Future research in diverse contexts is recommended to validate and extend the applicability of these insights;

(2) The cross-sectional design restricts the ability to track the evolution of anxiety, depression, sleep quality, and resilience over time in COVID-19 patients. Future longitudinal studies are crucial to trace these factors throughout the disease trajectory, providing a more comprehensive understanding to enable effective nursing interventions and the development of better treatment strategies;

(3) During the pandemic, the study participants faced personal difficulties, impacting their receptiveness to research studies. While the VAS is a validated tool offering simplicity [54–56], its subjectivity and lack of standardized score thresholds may introduce bias. Additionally, it is important to note that our study did not establish specific thresholds for categorizing "high" or "low" scores on the VAS. This lack of standardized cutoff points could potentially limit the precision of our findings. Future research could define these thresholds for improved interpretability and comparability. Exploring alternative or additional validated instruments could provide a comparative perspective to results obtained through the VAS;

(4) The study primarily focused on individuals with high resilience to understand coping strategies in isolation wards. Future research should include individuals with lower resilience to obtain a more comprehensive perspective on coping mechanisms in challenging environments.

Conclusion

Resilience emerges as a crucial factor in the psychological well-being of COVID-19 patients in single-room isolation wards, particularly in addressing the social disconnection associated with isolation. Our findings underscore the protective role of resilience against mental health challenges such as anxiety, depression, and sleep disturbances in the unique context of isolation. The identified predictors of resilience—having a spouse, higher education, and lower depression levels—offer actionable insights for healthcare professionals. This research highlights the importance of personalized care that strengthens connectivity, a key aspect of resilience, especially for patients facing isolation due to infectious diseases. These insights provide a foundation for developing targeted nursing interventions to enhance resilience in isolated patients, better equipping them for potential future pandemics.

Dissertation

NA.

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Conflict of interest

The authors have no conflicts of interest to declare.

Author contributions

Study design: JSY & EYS, Data analysis: JSY, Study supervision: EYS, Writing-original draft: JSY, Writing-reviewing and editing: EYS.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical statement

This study was approved by The Institutional Review Board of Asan Medical Center where the researcher is affiliated [IRB No. 2022-0583]. All participants provided written informed consent prior to participation in the study.

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