Aims and Scope
The Korean Journal of Women Health Nursing is a primary source of information for meeting the challenges of providing optimal healthcare for women. The journal aims to be a core resource for cutting-edge advancements and clinical applications of new nursing practice, therapeutic protocols for managing health problems in women, and innovative research on gender-based issues that impact treatment and nursing care.

Its scope includes the latest clinical and research papers on health issues that affect women throughout their lifespan. The emphasis is on clinical nursing practice and education on the social science components relevant to women's health issues. It also includes nursing care, education, and research methodology for ante-, intra-, and post-partum women, middle-aged and elderly women's health, socio-cultural issues, and therapies. Its regional focus is mainly Korea, but it also welcomes submissions from researchers all over the world.

About the Journal
The Korean Journal of Women Health Nursing (KJWHN) is a peer-reviewed official journal of the Korean Society of Women Health Nursing of the Republic of Korea (South Korea). It was launched in 1995 under its previous title, the Journal of Korean Women's Health Nursing Academic Society (Vol. 1, No. 1 in 1995 to Vol. 6, No. 1 in 2000, pISSN: 1225-9543), and the Journal of Korean Academy of Women's Health Nursing (Vol. 6, No. 2 in 2000 to Vol. 7, No. 2 in 2001, pISSN: 1225-9543).

Since June 2012 it has continued under the current title, the Korean Journal of Women Health Nursing (Vol. 18, No. 2 in 2012 to present, pISSN: 2287-1640, eISSN: 2093-7695). The official abbreviated title is Korean J Women Health Nurs. It is published quarterly on the last day of every March, June, September, and December. Any supplementary or special issues may be published. The number of print copies per issue is 60. The copyright, including the right of online transmission, is owned by the Korean Society of Women Health Nursing. This journal is supported by a Korean Federation of Science and Technology Societies grant funded by the Korean government (Ministry of Science and ICT).

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Marking the inclusion of the *Korean Journal of Women Health Nursing* in PubMed Central and strategies to be promoted to a top-tier journal in the nursing category

Sun Huh

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Celebrating the *Korean Journal of Women Health Nursing* for inclusion in PubMed Central

I heard from Dr. Sue Kim, the editor-in-chief of the *Korean Journal of Women Health Nursing* (KJWHN), that the PubMed Central (PMC) Full-Participation Agreement and PMC banner for the journal were dispatched to PMC, and PMC received them on July 30, 2022. I was thrilled to hear the news because this is the first case of PMC accepting a non-English life science journal published in Korea. Seeing a Korean-language journal be accepted by PMC has always been my goal since August 2006, when I succeeded in producing PMC XML files [1]. It is also an event worth celebrating because it is the second of more than 20 nursing journals in Korea to be included in PMC. The first journal was *Child Health Nursing Research*, which only publishes in English [2].

Language policy of the journal

In retrospect, I was invited as a speaker at the 15th Summer Seminar of the Korean Society of Women Health Nursing on May 27, 2010. I suggested changing the journal’s language to English-only to add the journal to PMC. I made this suggestion because biomedical journals published in Korea began to be listed in PMC in 2008, and at the time, PMC only accepted English-language journals [1]. Any journals indexed in PMC are also searchable from PubMed, the largest free literature database that provides English abstracts of life science journals. This is the shortest way for a local nursing journal to become an international journal. The frequency of citations by articles published in other journals increases dramatically after being indexed in PMC, by two to 10 times [3]. Furthermore, inclusion in PMC leads to more frequent submissions from international researchers. However, this suggestion was not attempted because of the difficulty of recruiting English manuscripts. Most society members who wrote manuscripts in English submitted them to international journals. Therefore, English-only journal was not feasible for the Society.

However, PMC changed its language policy in 2019, and it now accepts non-MEDLINE, non-English journals. PMC began to review these journals if their primary content was largely in English. Although the exact amount required for “largely in English” is not fixed, more than half of the journal content would be a reasonable target.
KJWHN stated in June 2021 that it would continue to value Korean-language submissions to serve the Korean scholarly community while simultaneously offering high-quality English-language articles from researchers in Korea and abroad [4]. This statement was also accompanied by a marked increase in English-language articles, which surpassed the number of Korean-language articles. Aside from KJWHN, it is not easy to find non-MEDLINE, non-English language journals—including those published in Chinese, Japanese, French, and Spanish—that had been newly listed in PMC since 2020. The change of language policy in 2019 by PMC has greatly benefited non-English journal editors who are eager to promote their international journals. I am hopeful that KJWHN’s success will encourage other non-English nursing journals.

**What is the meaning of a journal becoming a PMC journal?**

KJWHN is the first case of a non-MEDLINE, non-English journal in Korea to be indexed in PMC. Its inclusion makes it possible to disseminate valuable nursing information on women’s health from Korea to the world. Another non-MEDLINE, non-English journal is at the forthcoming stage: Taehan Yongang Uihakhoe Chi (https://www.ncbi.nlm.nih.gov/nlmcatalog/101479271). Therefore, these journals can serve as excellent examples for other non-MEDLINE, non-English journals in Korea. More than 20 Korean-language nursing journals are published in Korea, only two of which are published in English: Asian Nursing Research and Child Health Nursing Research. Although both journals are open-access, Child Health Nursing Research was only included in PMC in January 2022 [2]. Seeing these examples, those non-English nursing journal editors can have the confidence to add their journals to PMC.

**How long can a Korean-language journal survive?**

The Journal of the Korean Medical Association (https://jkma.org/), published in Korean by the Korean Medical Association (KMA), may be able to survive for more than 100 years. The reason for this is that it is the official journal of the KMA, the official organization of all physicians in Korea, and the editorial board invites most articles. This journal’s scope mainly relates to education and training for self-employed physicians, general practitioners, medical residents, and the general public. However, the reality of many Korean-language journals is that the number of submissions has decreased, even for training purposes. In other words, researchers want to be recognized for a higher-valued achievement if they spend time writing papers. Therefore, it is challenging to recruit authors unless the journal is listed in international indexing databases. Korean-language life science journals have gradually converted to English-only since 2008 and are usually added to PMC. For the promotion of the journal to a top-tier international level, many editors have changed the journal’s language to English. However, KJWHN’s success in PMC inclusion has now shown that it is possible for Korean-language journals to be added to PMC if the amount of English articles is more than 50% per issue. The survival of Korean-language journals is essential to maintain Korean as a scientific language, although English has already been positioned as the main scientific language. Even while keeping the original language, expanding the number of English articles, although difficult, will be essential preparation for the promotion of academic society journals.

**International Asian nursing journals’ performance**

There are 33 nursing journals published in Asia indexed in the following databases: PMC, MEDLINE, Scopus, Web of Science Core Collection (SCIE and ESCI) (Supplementary material 1). Out of them, 12 journals are published in Korea; seven journals in Iran; three journals in Indonesia; two each from China, Taiwan, and Turkey; and one each from Japan, Hong Kong, Philippines, India, and Thailand. Out of these 33 journals, the 12 PMC or MEDLINE journals will show outstanding performance because they are searchable in PubMed. In PMC or PubMed, articles’ quality is the most critical factor determining whether they will be cited by other researchers. Journal brand is not a consideration by researchers in citing articles. PubMed (PMC or MEDLINE) journals have already shown high performance in their citation frequencies. The average cites per document (2 years) of 16 non-PubMed journals in the 2021 SCImago Journal Rank (SJR; https://www.scimagojr.com) was 0.731; while that of nine PubMed journals was 1.703 (Supplementary material 1), excluding seven journals for which the metrics were not counted yet in the 2021 SJR.

**Strategies to be promoted to a top-tier journal in the nursing category**

Now that KJWHN will be searchable in PubMed and PMC, article quality offers its best chance to compete with other interna-
tional journals. Therefore, the editor’s job is to recruit high-quality manuscripts from researchers both in Korea and worldwide. What are high-quality manuscripts? A manuscript should be scientifically sound by adopting the following style and format: the study design should be specified; the hypothesis could be defined and answered; manuscripts should be described according to the appropriate reporting guidelines (e.g., CONSORT for randomized controlled trials, STROBE for observational studies, PRISMA for systematic reviews and meta-analyses, and TREND for quasi-experimental studies, and COREQ for qualitative studies; statistical power should be verified through study size estimation [5]; and the interpretation of the results should not be overstated. KJWHN has already realized the above strategies to be scientifically sound, which is why PMC has accepted the journal. I trust that current and future editors will continue the high-quality peer review and editing.

KJWHN has adopted most publishing policies adequately by adhering to the Principles of Transparency and Best Practice in Scholarly Publishing (3rd version), like many other scientific journals in Korea [6]. The journal website also provides a top-tier user-friendly interface. I suggest a mandatory data-sharing policy to enhance other researchers' use of shared data. Data sharing is currently optional, so not all data are shared, and data are usually available by contacting corresponding authors. Some authors have shared their research data in Harvard Dataverse (https://dataverse.harvard.edu/) [7,8]. It remains uncertain whether data sharing can provide an incentive for other researchers to use the shared data as their research materials, and there is still no evidence of the advantages of data sharing for further use by other researchers. However, mandatory data sharing should be pursued more actively to confirm the reproducibility of results.

The Journal Impact Factor, manually calculated from Web of Science and cites per document (2 years) from Scopus, is presented in Figure 1. The values for KJWHN in 2021 were 0.44 and 0.60, respectively. This is a fantastic result, even though KJWHN was just recently indexed in PMC. Although these values are still not high enough for KJWHN to be a top-tier journal, the citation frequencies in both databases will soar soon, like other PMC journals in Korea [4].

Fulfillment of the aims of the journal

KJWHN aims to be “a core resource for cutting-edge advancements and clinical applications of new nursing practice, therapeutic protocols for managing health problems in women, and innovative research on gender-based issues that impact treatment and nursing care.” By being indexed in PMC, the journal will be able to meet worldwide readers and nurses to provide them with invaluable nursing experiences. This is another way to complete the aims and mission of the journal. The past and present editors have done their best to refine manuscripts and publishing policies to reach the present accomplishments for the journal. I applaud them for their enormous and endless devotion and sacrifice for this academic society journal that is small, yet like a gem in its contribution to women’s health nursing in Asia.

Supplementary materials

Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2022.08.19).

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Authors’ contributions

All work was done by Huh S.

Conflict of interest

Sun Huh has been president of the Korean Council of Science Editors since January 2020 and president of the Korean Association of Medical Journal Editors since April 2020. The Korean
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References
Gender issues in nursing research

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Introduction

Sex and gender-based analysis (SGBA) is a recommended framework and methodology that enhances critical accuracy in research. Scientific research aims to create objective and universally valid knowledge that transcends cultural constraints in terms of methods, experimental techniques, and epistemology. However, when it comes to gender, race, and other social concepts, science is not value-neutral. When taking a scientific approach, the act of identifying correlations between scientific concepts and gender-related social structures can expand the scope of typical critical research pursued in scientific studies. SGBA begins by including women in studies of human subjects as well as evaluating sex and gender differences in basic scientific research. Health status and treatment outcomes related to biological (sex) and sociocultural (gender) differences will not only improve our understanding of the health and well-being of men and women but also enhance our healthcare environment and direction of future research.

In medical research, sex and gender biases and imbalances are typically caused by flawed sampling methods when designing and conducting experiments. It is well-known that the results of studies involving only men are often assumed to apply equally to women under the premise that women are equivalent to men. The inconvenient truth, however, is that studies that consider both men and women or only women are often considered impractical, too expensive, and/or potentially unsafe. Consideration of women’s hormonal cycles is often thought to complicate research design and analysis and result in unnecessary research expenses, constituting a methodological problem [1]. As such, the results of studies on men (diagnosis, preventive measures, and treatment) are often erroneously applied to women. As a result, drug side effects occur 1.5 to 2 times more frequently in women. If a different sampling method that considers sex and/or gender were applied, problems due to bias in existing medical and health research could be reduced. Therefore, there is an increasing demand for the development of a standard method that entails the inclusion of an appropriate proportion of women and minorities.

Sex and gender are recognized as important determinants of health and well-being and both should be thought of as ethically important considerations in nursing research. In addition to the simple biological sex-based distinction between male and female, researchers should be mindful that gender encompasses the roles, behaviors, and identities of various members of society, and gender issues influence how people interact and perceive each other [2].

As such, gender issues are highly significant since they open up a diverse and extensive research environment related to nursing in terms of the social, cultural, political, and economic aspects of re-
search beyond the level of individual patients or medical consumers. Therefore, gender-related research will help nursing researchers understand the broader societal context. Gender research can also help identify and resolve social inequality in nursing research and healthcare and address the needs of marginalized groups and minorities in terms of medical rights [3].

Gender research is considered a very important factor for expanding possibilities to improve nursing practice, health outcomes, and, more broadly, social and political changes to achieve social justice in the healthcare system. The intersection of nursing and gender research is suggested as a strong pairing that can challenge current sex and gender-related imbalances and highlight important questions. In addition, nursing research must change alongside gender research and address social and cultural questions related to gender issues.

Sex and gender equity in nursing research

The field of nursing, which was mainly developed by women, unfortunately appears to have been considered at a low status within academia. However, recent efforts to fully recognize the role of gender within nursing have led to the following impacts on the overall development of nursing education and research [4].

Gender research helps us understand the sociopolitical context of nursing research

Gender research is an important factor that considers social, cultural, political, and economic differences related to race, gender, and class. Gender research in nursing provides an analytic method for understanding the structure of healthcare and social and cultural contexts, thereby illuminating many issues, including discriminatory practices, inequality, and cultural differences. Gender research can expand the knowledge base of nursing education and determine future directions in professional nursing research. Adopting a feminist approach in nursing is a meaningful attempt to expand the body of nursing knowledge and improve the quality of nursing services by revising the existing, male-oriented knowledge base and providing a vision for empowering women. Furthermore, in nursing, the feminist approach presumably contributes to the development of nursing knowledge by combining feminist research and qualitative research. Nursing knowledge will ultimately play an important role in providing an interactive relationship that goes beyond “male-centered” and “human-centered” by introducing feminism in the field extended by subjective experience derived from a qualitative approach [5].

Gender research does not just advance traditional nursing research, but also pioneers new fields

Nursing research has carved out its contributions to improving patient care and adding to the knowledge base of health research. Adapting a gender research framework will encourage collaboration between nursing and researchers in other fields to identify gaps in current research and advance new research areas through mutual collaboration.

Gender research should exist as a form of critique within nursing research

Nursing research that fails to consider gender research lacks perspective in terms of gender, as seen in many existing studies across various fields that fall short of considering gender bias or gender sensitivity; thus, limited to ‘half the picture.’ To identify limitations in existing nursing research and move toward change and innovation, it is essential to incorporate gender research into nursing research.

The lack of SGBA, including the insufficient proportion of female study participants, poses a barrier to our understanding of health. For example, while about half of coronary heart disease (CHD) patients are women, women only comprised around 25% of participants in CHD trials [6]. To address these issues, it is important to consider (1) factors such as age, socioeconomic status, race, and ethnicity in research and reports; as well as (2) sex and gender and their interactions [7]. Research ethics committees (RECs; any committee established by an organization or institution to review the ethical aspects of research with human beings) can play a pivotal role in designing studies and identifying sex and gender gaps in the early stages of research protocol development. A study investigating whether RECs deliberate on sex and gender analysis in health-related research pointed out a lack of awareness of the importance of gender in research design and gender-related education offered by RECs [8].

The Canadian Institutes of Health Research introduced an SGBA policy in 2009, and the European Commission has called for an integrated approach to incorporating “gender dimension” in biomedical research for the analysis of sex and gender [9]. Given such international trends, the active response of nursing research encompasses SGBA would serve to expand the scope of research and spur its action.
Sex and Gender Equity in Research guidelines

The Sex and Gender Equity in Research (SAGER) guidelines play an important role in helping RECs strengthen health-related research methods from the conception of research protocols to publication. These recommendations provide guidance to journal editors (Figure 1), as well as authors and publishing professionals to ensure that sex and gender are considered and reported appropriately in journals. The SAGER guidelines have also been translated into Korean and can be found on the European Association of Science Editors website. The recommendations of the guidelines delineate what needs to be specified in reporting for the title and abstract, introduction, methods, results, and discussion sections. Meanwhile, potential issues can be divided into five categories: (1) concerns about mandating; (2) lack of time, capacity, and resources; (3) resistance or lack of awareness; (4) technical challenges; and (5) looking ahead.

Concerns about mandating
According to the SAGER guidelines, gender-based analysis requires a different approach than usual, requiring additional time and expenses to use as large a sample as possible. Several research funding agencies have provided funding/grants for this type of analysis, which led to the establishment of the SAGER guidelines as a successful model.

Lack of time, capacity, and resources
Journal editors may lack the time, ability, and resources to compel authors to comply with SAGER guidelines. In addition, journals with relatively few published works per year may find it very difficult to enforce SAGER guidelines. However, efforts should be made to implement these guidelines to improve the scientific quality of research papers.

Resistance or lack of awareness
Some journals may refuse to comply with SAGER guidelines or find them inapplicable to their fields. All journals, however, should perform routine education and promotion for peer re-

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Figure 1. Sex and Gender Equity in Research (SAGER) flowchart guiding editors’ initial screening of submitted manuscripts. Adapted from Heidari et al. according to the Creative Commons License.
viewers related to sex and gender. Online training courses developed by the Canadian Institutes of Health Research (training resources at https://cihr-irsc.gc.ca/e/50509.html; sex and gender training modules at https://www.cihr-irsc-igh-isfh.ca/) will help enhance the understanding of sex and gender inclusion in health research.

**Technical challenges**
To minimize technical challenges, journal editors or publishers can implement checklists in their submission systems to integrate or customize the form for authors and peer reviewers to comply with SAGER guidelines.

**Looking ahead**
The SAGER guidelines provide journals with an opportunity to improve their research and reporting practices. In the short-term, many journals have incorporated the SAGER guidelines into their author instructions, but a broader understanding and further efforts are needed to ensure better implementation of the SAGER guidelines. In addition, efforts to include age, race, ethnicity, social identity, and geographic diversity in the SAGER guidelines should continue to positively affect health and societal outcomes. Although it is important for publishers and journals to implement the SAGER guidelines, this should not just be their responsibility, but rather the responsibility of everyone involved in a published work, especially the authors.

**Conclusion**
In conclusion, SGBA is a timely and significant issue for nursing research and the SAGER guidelines provide a frame of reference for adequate reporting of research on sex and gender. The *Korean Journal of Women Health Nursing* currently encourages accurate use of terms and reporting analysis of sex and/or gender, as appropriate (https://www.kjwhn.org/authors/authors.php). I hope more nursing journals and nurse researchers, especially those in Korea, actively adapt this framework and lead the way to making SGBA the norm, not the exception.

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**Authors’ contributions**
All work was done by Yun CH.

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**Conflict of interest**
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The effects of maternal-child nursing clinical practicum using virtual reality on nursing students’ competencies: a systematic review

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Purpose: This study aimed to investigate the effects of virtual reality used in maternal-child nursing clinical practicums on nursing students’ competencies through a systematic review.

Methods: The inclusion criteria were peer-reviewed papers in English or Korean presenting analytic studies of maternal-child nursing practicums using virtual reality. An electronic literature search of the Cochrane Library, CINAHL, EMBASE, ERIC, PubMed, and Research Information Sharing System databases was performed using combinations of the keywords "nursing student," "virtual reality," "augmented reality," "mixed reality," and "virtual simulation" from February 4 to 15, 2022. Quality appraisal was performed using the RoB 2 and ROBINS-I tools for randomized controlled trials (RCTs) and non-RCTs, respectively.

Results: Of the seven articles identified, the RCT study (n=1) was deemed to have a high risk of bias, with some items indeterminable due to a lack of reported details. Most of the non-RCT studies (n=6) had a moderate or serious risk of bias related to selection and measurement issues. Clinical education using virtual reality had positive effects on knowledge, skills, satisfaction, self-efficacy, and needs improvement; however, it did not affect critical thinking or self-directed learning.

Conclusion: This study demonstrated that using virtual reality for maternal-child nursing clinical practicums had educational effects on a variety of students’ competencies. Considering the challenges of providing direct care in clinical practicums, virtual reality can be a viable tool that supplements maternal-child nursing experience. Greater rigor and fuller reporting of study details are required for future research.

Keywords: Maternal-child nursing; Nursing education; Nursing students; Systematic review; Virtual reality

주요어: 모아간호; 간호교육; 간호학생; 체계적 문헌고찰; 가상현실
Introduction

4차 산업혁명의 물결이 교육 분야에도 빠르게 확산하여 다양한 정보통신 기반 프로그램이 적용되고 있다. 특히, 가상현실(virtual reality, VR)을 이용한 교육은 직접 체험하기에는 위험하거나 비용이 많이 드는 교육 및 훈련을 현실과 유사하게 설계된 가상의 공간에서 간접적으로 체험함으로써 다양한 교육적 경험을 얻을 수 있도록 하는 것이 가능하다[1]. 향후 실감 콘텐츠 기술의 지속적 발전은 미래의 교육환경을 혁신적으로 변화시킬 것으로 전망된다[2].

간호교육 분야는 이론을 기반으로 임상상황에서 대상자의 상황에 맞게 지식을 체계적으로 적용하고 문제를 해결할 수 있는 역량을 기우는 현장 실습교육이 매우 중요하다[3]. 그러나 최근 COVID-19 감염병으로 인해 대면 실습교육이 불가한 경우가 발생하고 있으며, 교내 실습교육 역시 제한적으로 운영되고 있는 실정이다[4]. 저출산 사회현상으로 인한 분만 건수 급감으로 우수한 모아간호 (maternal-child) 실습 기관 확보가 매우 어려운 상황이며[5], 환자의 인권 보호와 사생활 존중 문화 확산으로 임상에서는 입원 의무를 요구하고 있는 실정이다[6]. 현 상황은 실습교육의 제한점을 해결하기 위해 다양한 대체 실습프로그램이 고안되고 있으며[7-9], 가상현실을 이용한 실습교육 중재를 시도하고 있는 시점이므로 실습역량에 미치는 효과를 고찰할 필요가 있다[10].


가상현실을 이용한 실습교육은 학습만족도, 자신감, 모아간호 실습의 장점을 극대화하고 향후 임상 간호학 교육의 전달을 보장할 수 있으며, 이를 바탕으로 가상현실을 이용한 간호교육의 효과를 평가하고 추후 연구를 방향을 제시할 필요가 있다. 그러므로 본 연구에서는 가상현실 교육의 효과를 고찰하고자 한다. 세제적 문헌고찰은 모아간호 가상현실 교육 중재의 다양한 주제의 탐색하고, 최적의 기술적 방법론에 대하여 파악하며, 간호 대학생 실습역량에 미치는 영향을 확인할 수 있게 해 준다.

본 연구의 목적은 가상현실을 이용한 모아간호 실습교육이 간호 대학생의 실습역량에 미치는 영향을 조사한 분석 연구(\textit{analytic study})로, 이론적 모형을 고안하고, 실험 결과를 분석하고, 이를 바탕으로 추후 연구의 방향을 제시하는 것이 목적이다.

Summary statement

• What is already known about this topic?
  Nursing education using virtual reality has been reported to have positive effects on knowledge, skills, and attitudes of nursing college students in non-face-to-face situations. However, several studies have reported inconsistent results regarding the educational effects.

• What this paper adds
  Maternal-child nursing practical education using virtual reality had positive effects on knowledge, skills, satisfaction, educational needs improvement for virtual reality, and self-efficacy, and negative effects on anxiety and confidence, but no effects on critical thinking or self-directed learning.

• Implications for practice, education, and/or policy
  This study supports using virtual reality as a supplemental educational tool for maternal-child nursing clinical practicums. Future applications should be expanded to normal and high-risk pregnancies and childbirths.

문헌 검색

대상
연구의 대상자는 간호 대학생으로 하였으며, 간호사를 대상으로 한 연구는 제외하였다.

중재
중재는 가상현실을 이용한 모아간호 실습교육으로 하였으며, 증강현실, 혼합현실, second life, mirror world, 3-dimensional environment, meta-verse를 이용한 교육을 포함하였다. 사물인터넷을 활용한 연구는 배제하였다.

비교 대상
비교 대상은 대조군에게 가상현실 교육을 적용하지 않고 대면 교육을 제공한 연구였다. 비교 대상이 없이 가상현실 교육의 효과를 검증하는 단일군 연구도 선정하였다.

결과
연구 결과로 간호 대학생의 실습역량으로 설정하였고, 실험학반은 지식, 기술, 태도를 포함하였다 [12]. 각자반수는 지식, 기술, 태도의 직접적 간호역량으로 [12]. 이자반수는 교육으로 인한 심리·사회적

Methods

Ethics statement: This study was exempted by the Institutional Review Board of Kongju National University as this study analyzed existing literature.
성으로 불안, 자신감, 만족감, 자아효능감 등이 포함되었다.

장소
장소는 가상현실 비대면 원격 교육이었고, 다양한 교육을 훈련한 경우, 주요 교육이 가상현실로 이루어진 연구는 포함하였다.

평가 시점
교육 후에만 결과를 측정하거나, 교육 전후의 결과 측정 연구를 모두 포함하였다. 또한, 결과를 반복 측정한 연구도 포함하였다.

연구 설계
연구 설계는 가상현실 교육을 적용한 분석 연구를 포함하였다. 즉 실험 연구, 코호트 연구, 환자대조군 연구였으며, 무작위 실험연구, 통제 전후 연구(controlled before and after study), 단속 시계열 연구(interrupted time series), 유사 실험연구 quasi experimental study가 포함되었다.[23]. 프로토콜 연구는 제외하였다.

문헌의 질 평가
선택된 문헌의 최종 질 평가는 2016년 발표된 Risk-Of-Bias In Non-randomized Studies of Interventions (ROBINS-I) [23]와 Risk of Bias 2 (RoB 2) [26] 도구를 활용하여 시각화하였다.[27]. ROBINS-I는 Cochrane 연합에서 비무작위 연구의 비뚤림 평가를 위하여 개발한 점 평가 도구로서, 코호트 연구, 환자-대조군 연구, 통제 전후 연구, 단속 시계열 연구, 완전한 무작위 배정에 미치지 못하는 유사 실험연구, 관찰 연구를 평가할 수 있는 도구이다. ROBINS-I는 8가지의 정해진 비뚤림 영역에서 판단에 도움이 되는 신호질문 (signalling questions)에 따라 비뚤임 평가를 위한 방법을 제시해 준다. 8가지의 평가 영역은 교란으로 인한 비뚤림 평가, 연구 대상자 선택의 비뚤림, 중재 변수의 비뚤림, 의도한 중재에서 발생된 비뚤림, 중재 결과 측정의 비뚤림, 보고된 연구 결과와 선택의 비뚤림, 전체 비뚤림 위험 판단이다. 각 영역은 2명의 연구자들이 독립적으로 코딩되며 각 평가 도구 누설률을 활용해[25] 평가하였다. 세부 신호질문에 대한 평가로서 비뚤림의 위험은 낮음, 중등도, 높음, 매우 높음, 정보 없음 중에 해당하는 결과를 문헌별로 기록하였다. 1영역의 8가지 신호질문은 효과의 교란 가능성, 추적 관찰기간의 구분, 중재의 중단이나 교환의 의미, 교란을 통제하는 분석 방법, 교란영역의 통계, 중재 후 변수의 통계, 시간-변동 교란을 보정하는 분석, 교란 영역의 보정에 대한 질문이다. 2영역의 5가지 신호질문은 연구 대상자의 선택, 선택에 영향을 준 변수와의 관련성, 선택과 중재 결과의 영향, 추적 관찰의 중재의 시각적 측정, 선택 비뚤림을 평가하는 보정 방법이다. 3영역의 신호질문은 중재군의 조성, 중재군을 정의하는 정도, 중재 결과가 중재 분류에 미치는 영향에 대한 질문이다. 4영역의 신호질문은 중재의 이탈, 이탈이 중재 결과에 미치는 영향, 공동 중재의 중재 군 간 균형, 중재의 성공적 시행, 배정된 중재법의 준수, 중재 준수의 효과를 추정하는 분석에 대한 질문이다. 5영역의 신호질문은 모든 대상자의 결과 자료 사용, 중재 실패에 대한 결과 자료, 결과 자료로 인한 대상자의 배제, 결과 연구자의 비toFloat만 원인, 결과자에 관계없는 연구 결과의 값이에 대한 질문이다. 6영역의 신호질문은 결과 측정이 중재의 지속에 의해 받은 영향, 평가자들의 중재에 대한 인식, 중재 결과 평가 방법의 유사성, 중재 결과 측정의 제계적 요법에 대한 내용이다. 7영역의 신호질문은 중재 결과 영역 내에서 여러 개의 중재 결과 측정, 중재 결과 분석에서의 다중 분석, 다른 하위군의 중재 결과 보고에 대한 내용이다. 8영역은 1-7영역의 결과를 통합하여 연구의 전체적 비뚤림을 평가하는 것이다. RoB 2는 Cochrane 연합에서 무작위 실험연구의 질 평가를 위하여 개발한 도구로, 무작위 배정 과정에서 발생하는 비뚤림, 의도한 중재에서 발생한 비뚤림, 중재 결과 자료의 결과를 인한 비뚤림, 중재 결과 측정의 비뚤림, 보고된 연구 결과와 선택의 비뚤림 등 전체 평가의 6가지 영역으로 되어 있다. 연구자는 각각 독립적으로 무작위 실험연구를 평가하고 비뚤임의 위험이 낮음, 높음, 불확실 중에 해당하는 결과를 기록하였다.[26]. 평가 결과에 대한 연구자간 일치도는 kappa 계수를 사용하여 0.80 이상의 강한 일치도를 보이 는 영역만 채택하였다.[23].

자료 분석
선택된 최종 7편의 논문은 각 논문의 분석을 병합 프로그램을 사용하여 사례보고서로 작성하여 질성적 분석을 시행하였다. 사례 보고의 항목은 일반적 특성(제1저자, 연도, 국가, 중재 장소, 연구 설계, 대상자 특성, 대상자의 최종 분석 수, 대상자 선정 기준), 교육 방법(요법, 명칭, 형태, 대조군 교육, 배경, 기간, 회수), 교육 주제(주 제, 1차 결과변수, 2차 결과변수, 측정 도구), 교육 효과의 유효성(실수, 백분율, 평균, 표준편차, p값)이었다.

Results
가상현실을 이용한 모야간호 실습교육의 일반적 특성
검색된 논문의 수는 335편(Cochrane Library, 49; CINAHL, 111; EMBASE, 39; ERIC, 40; PubMed, 59; RISS, 37)이었으며, 검색된 논문들은 1984년부터 2021년 사이에 발행되었다. 참고문헌 목록과 Google Scholar로부터 수치 검색으로 9편의 논문을 추가하여 344편이 검색되었다. 이들의 연구 제목, 저자, 출판언어의 선택조건으로 한 문헌 목록으로부터 중복문헌 13편을 제거하여 331편이 남았다. 이들의 제목은 모두 가상현실이 아닌 245편을 제외하여, 83편이 남았다. 이들의 초록을 읽어 적합하지 않은 것으로 발췌한 69편이 제거되어 142편이 남았다. 14편 문헌의 전문(full text)을 검토한 결과 질적 연구 2편[28-30], 조사연구 1편[31], 고찰연구 1편 [32], 대상자가 가족 전문 간호사학생인 1편[33], 조사사 과정 학생
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인 1편[34] 등 총 7편을 제거하여 최종 7편[35-41]을 추출하였다 (Figure 1). 선택된 논문의 시기는 2014년 1편(14.3%) [35], 2016년 2편(28.6%) [36, 37], 2020년 1편(14.3%) [38], 2021년 3편 (42.9%) [39-41]이었다. 국가별로는 미국 [35, 40], 캐나다 [37, 39], 한국 [38, 41]이 각각 2편씩 있었고, 인도가 1편(14.3%) [36]이었다.

대상자의 최종 포함 수는 최소 35명에서 [39] 최대 111명이었다 [40]. 대상자의 학년은 학기 2편(28.6%) [35, 39], 학기 3편(28.6%) [37, 40], 학기 4편(28.6%) [36, 41]이었다. 대상자의 학년은 [35], 연구 설계는 단일군 사전사후 실험연구가 3편(42.9%) [35, 36, 38], 유사 실험연구가 2편(28.6%) [39, 41], 무작위 실험 연구가 1편(14.3%) [37], 코호트 연구가 1편(14.3%) [40]이었다. 중재 장소는 가상 시뮬레이션 센터가 4편(57.1%) [37-39, 41], 가상 시뮬레이션 클래스룸이 2편(28.6%) [35, 36], 학습관리 시스템(learning management system, LMS)이 1편(14.3%) [40]이었다 (Table 1).

가상현실을 이용한 모아간호 실습교육 방법

중재 명칭은 VPM (virtual pregnancy model) [35], ‘HirNIC VR (high-risk neonatal infection control)’ [41], ‘virtual LMS’ [40], ‘MNH (maternal and newborn health)’ [36], ‘newborn virtual simulation’ [39], ‘VCS (virtual clinical simulation)’ [37], ‘vSim for Nursing (virtual simulation for nursing)’ [38]의 7편이었다. 연구 형 태는 원격 웹 기반 중재가 7편이었다. 대조군 교육은 대면 임상 실습이 2편, 전통적 교내 실습이 1편 [39], 대면 시뮬레이션 실습이 1 편 [37], 대면 임상실습이 2편 [40, 41]이었고, 대조군이 없는 연구가 3편 [35, 36, 38]이었다. 매체는 가상 현실 시뮬레이션 프로그램이 4편 [37-39, 41], 유튜브 가상 현실 프로그램이 1편 [35], 가상현실 LMS 가 1편 [40], virtual classroom objective structured clinical examination (OSCE)가 1편 [36]이었다. 중재기간은 최소 72시간에서 [36] 최대 1학기[37, 39]였으며, 중재회수는 최소 1회에서 [35] 최대 5회 [38]였다 (Table 2).

문헌의 질 평가 결과

불일치가 나타나는 모든 항목은 연구자 회의를 거쳐 논문을 재검토하여 질 평가를 확정하였다. 1편의 무작위 연구는 [37] RoB 2로 평가하였고, 나머지 6편 [35, 36, 38-41]의 ROBINS-I 평가 결과는 질

![Figure 1. PRISMA 2020 flow diagram for the literature search.](https://doi.org/10.4069/kjwhn.2022.09.13)
Table 1. Characteristics of selected studies (N=7)

<table>
<thead>
<tr>
<th>First author (year)</th>
<th>Reference No</th>
<th>Country</th>
<th>Setting</th>
<th>Study design</th>
<th>Participants</th>
<th>No. of participants (Exp/Cont)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrawal (2016)</td>
<td>[36]</td>
<td>India</td>
<td>Virtual classroom</td>
<td>One-group pre- and post-test intervention design</td>
<td>Fourth-year students</td>
<td>83</td>
</tr>
<tr>
<td>Cobbett (2016)</td>
<td>[37]</td>
<td>Canada</td>
<td>Virtual simulation</td>
<td>Randomized controlled trials</td>
<td>Third-year students</td>
<td>55 (27/28)</td>
</tr>
<tr>
<td>Kang (2020)</td>
<td>[38]</td>
<td>Korea</td>
<td>Virtual simulation</td>
<td>One-group pre- and post-test study</td>
<td>Unspecified students</td>
<td>47</td>
</tr>
<tr>
<td>Riley (2021)</td>
<td>[40]</td>
<td>United States</td>
<td>Learning management system</td>
<td>Two-group cohort study</td>
<td>Third-year students</td>
<td>111 (59/55)</td>
</tr>
<tr>
<td>Yu (2021)</td>
<td>[41]</td>
<td>Korea</td>
<td>Virtual simulation</td>
<td>Non-equivalent control group design</td>
<td>Third-year students</td>
<td>50 (25/25)</td>
</tr>
</tbody>
</table>

Cont: Control group; Exp: experimental group.

Table 2. Intervention characteristics of selected studies (N=7)

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Reference No</th>
<th>Title of intervention</th>
<th>Intervention comparator</th>
<th>Intervention tool</th>
<th>Measurement scales</th>
<th>Time span</th>
<th>Number of sessions</th>
<th>Themes of intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobbett (2016)</td>
<td>[37]</td>
<td>Virtual clinical simulation</td>
<td>High-fidelity mannequin simulation (face to face)</td>
<td>vSim</td>
<td>Test &amp; survey</td>
<td>Maternity nursing course</td>
<td>-</td>
<td>Caring for pregnant women with preeclampsia</td>
</tr>
<tr>
<td>Kang (2020)</td>
<td>[38]</td>
<td>vSim for Nurses</td>
<td>-</td>
<td>vSim</td>
<td>Survey</td>
<td>4-day class</td>
<td>5 phases</td>
<td>Maternal nursing scenarios, Respiratory assessment, evaluating environmental scans, hand hygiene</td>
</tr>
<tr>
<td>Hudder (2021)</td>
<td>[39]</td>
<td>Newborn virtual simulator</td>
<td>Traditional lab-based group</td>
<td>VR</td>
<td>Questionnaire &amp; rubric</td>
<td>Fall semester</td>
<td>-</td>
<td>Infants of mothers with diabetes, women’s health, childbearing experience, maternal care, and neonatal care</td>
</tr>
<tr>
<td>Riley (2021)</td>
<td>[40]</td>
<td>Virtual LMS</td>
<td>In person clinical learning</td>
<td>Combined simulation experience</td>
<td>Student performance</td>
<td>Course semester 7.5 weeks</td>
<td>Twice every spring semester</td>
<td>Infants of mothers with diabetes, women’s health, childbearing experience, maternal care, and neonatal care</td>
</tr>
<tr>
<td>Yu (2021)</td>
<td>[41]</td>
<td>High-risk neonatal infection control</td>
<td>Only NICU clinical practice</td>
<td>VR simulation program</td>
<td>HirNIC knowledge &amp; self-efficacy Learner satisfaction</td>
<td>90 minutes</td>
<td>5 sessions</td>
<td>Introduction, use of VR, basic care, feeding, skin care, and environmental management discussion</td>
</tr>
</tbody>
</table>

HirNIC: high-risk neonatal infection control; LMS: learning management system; NICU: neonatal intensive care unit; OSCE: Objective structured clinical examination; VR: virtual reality.
Figure 2. Risk of bias graph and summary for randomized controlled trials (RCTs) (A) and non-RCTs (B).
가상현실을 이용한 모아간호 실습교육 주제
교육 주제는 산모소생의 간호가 1편 [36], 산모가 일반 간호와 피부간호가 1편 [41], 임신과 산모간호가 1편 [35], 임신상 당뇨 여 성의 출산간호와 산모간호가 1편 [40], 산모의 활력간호, 위생술, 환경관리가 1편 [39], 자간증증 임신간호가 1편 [37], 그리고 임상 임부 간호가 1편 [38]이었다(Table 2).

교육의 1차 결과변수는 산모간호 간호사가 2편 [39, 41], 자간증 증과 감염 간호간호사가 1편 [37], 학습능력(여성의 요구 예측영역, 임신 불안감 인식, 위험신호 인식, 차이점 인식)이 1편 [35], 고위험 산모 간호수행도가 1편 [40], 모아간호 수행도가 1편 [36]이었다. 2차 결과변수는 만족도가 2편 [39, 40], 자간증이 2편 [37, 39], 교육요구도 [36], 불안 [37], 비판적 사고 [38], 자아효능감 [41], 자기주도 학습이 각각 1편 [38]이었다(Table 3). 결과변수는 측정도구는 사후 통제의 1.3 점수, 만족도가 2.32.41 점수, 자아효능감 [41] 1.37 점수로 통계적으로 유의하게 높았다 [p < 0.01] [41] (Table 3).

가상현실을 이용한 모아간호 실습교육은 교육요구도에 긍정적 효과를 나타내었고, 불안에 부정적 효과를 나타내었으며, 비판적 사고, 자기주도 학습에 효과를 나타내지 않았다. 교육요구도는 실험군의 100%, 대조군의 22.8%에서 만족하여 통계적으로 유의한 차이가 있었다 [p < 0.01] [36]. 불안은 실험군 73.26 (±19.95)점, 대조군 57.75 (±15.25)점으로 실험군이 통계적으로 유의하게 높았다 [p < 0.01] [37]. 비판적 사고는 사후 98.83 (±9.44)점, 사후 97.96 (±9.81)점으로 통계적으로 유의한 차이가 있었다 [p < 0.01] [37]. 자아효능감은 사전 154.91 점 (±17.89)점, 사후 155.45 (±16.44)점으로 통계적으로 유의한 차이가 있다 [p < 0.01] [38] (Table 3).

Discussion
문헌의 체계적 문헌고찰 결과 선정된 7편 논문이 2014-2021년에 발표되었고, 이 중 4편이 최근 2년 사이(2020-2021) 발표되어 가상 현실을 이용한 교육이 최근 활발하게 이루어지고 있음을 알 수 있 었으며, 연계한 기반 교육의 증가 추세와 함께 간호학 실습교육 요 구도가 향후에도 증가될 것으로 예측되는 보고를 반영하였다 [20]. 본 장에서는 가상현실을 이용한 모아간호 실습교육이 어떠한 방향으로 나아가야 하는지 함의를 파악하기 위해 연구의 방법, 결과, 추세, 우수성에 관하여 논의하고자 한다.

학문의 기반 연구의 방법으로는 주로 실험연구가 많았고, 무작위 실험 연구도 비율이 높았기에 연구 방법론적인 점이 낮았다. 그러나 근거 수준을 높이기 위한 무작위 배정 평가 실험연구가 축적됨을 필요가 있다. 대상자는 간호 대학생 2-4학년이 각각 2편씩으로 고르 게 분배되었으며 결과는 범위에서 사용할 수 있다는 점을 시 사한다. 증감의 기간에서 자주적으로 접근할 증가는 없었다. 의 학, 간호학 학생의 이론적 사고 연구에 따르면 90.7%의 학생들이 이 림 정의를 이용하여 스스로 타당함을 증명하여 대상자에게 도움을 받고자 하는 것을 나타났다 [39]. 가상현실을 프로그램에 언제 어디서나 접속하여 실습환경을 향상할 수 있도록 하는 것이 필요하다 [42].

본 연구에서 고찰한 문헌의 질 평가 결과, 교육 효과의 교란변수 를 통제하는 위험이었으므로 추후 연구에서는 증가 효과의 비타 밸을 상쇄하기 위해 통제변수에서 자가주도, 학습능력, 학습능력, 자아주도 학습을 6편에서 증가율로 나타내었다. 그러므로 추후

https://doi.org/10.4069/kjwhn.2022.28.3.174-186
<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Reference No</th>
<th>Intervention format</th>
<th>Primary outcomes</th>
<th>Secondary outcomes</th>
<th>Experimental group, Mean ± SD or n (%)</th>
<th>Control group, Mean ± SD or n (%)</th>
<th>t or F</th>
<th>p or 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weideman (2014)</td>
<td>[35]</td>
<td>Virtual patients</td>
<td>Learning competency</td>
<td>-</td>
<td>Total 91.10 ± 22.03</td>
<td>Total 183.68 ± 12.87</td>
<td>22.89</td>
<td>.01</td>
</tr>
<tr>
<td>Agrawal (2016)</td>
<td>[36]</td>
<td>Competency-based training using a virtual classroom</td>
<td>① Performance of maternal newborn nursing skill ② Educational needs improvement for VR</td>
<td>Pre ① 21.3 ② 83 (100.%)</td>
<td>Post 62</td>
<td>21 (22.8%)</td>
<td>① Pre &lt;.001 (95% CI, 19.9–22.6) Post &lt;.001 (95% CI, 60.3–63.7)</td>
<td></td>
</tr>
<tr>
<td>Cobbett (2016)</td>
<td>[37]</td>
<td>Virtual simulation (vSim)</td>
<td>① Knowledge of preeclampsia ② Knowledge of group B Streptococcus ③ Anxiety ④ Self-confidence</td>
<td>Pre ① 4.12 ± 1.54 ② 6.40 ± 1.73 ③ 73.26 ± 19.95 ④ 104.89 ± 17.52</td>
<td>Post 4.80 ± 1.54 1.75 ① .09 ② .31 ③ .002 ④ .059</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kang (2020)</td>
<td>[38]</td>
<td>Virtual simulation (vSim)</td>
<td>① Critical thinking ② Self-directed learning ability</td>
<td>Pre ① 98.83 ± 9.44 ② 154.91 ± 17.89</td>
<td>Post 97.96 ± 9.81 155.45 ± 16.44</td>
<td>0.439 1.93</td>
<td>.872 .091</td>
<td></td>
</tr>
<tr>
<td>Hudder (2021)</td>
<td>[39]</td>
<td>Virtual simulation film</td>
<td>① Knowledge of newborn assessment ② Satisfaction and self-confidence</td>
<td>Pre ① 2.80 ± 1.90 ② 49.08 ± 5.42</td>
<td>Post 1.18 ± 2.01 56.23 ± 6.35</td>
<td>① .3 ② .001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riley (2021)</td>
<td>[40]</td>
<td>Learning management system</td>
<td>① Performance of high-risk newborn care ② Satisfaction</td>
<td>Pre ① 51.46 ± 5.32 ② 4.53 (-)</td>
<td>Post 51.44 ± 3.77 4.70 (-)</td>
<td>t = .03 z = –2.26 (95% CI: 50.42–52.45)</td>
<td>.95 &lt; .24 (r = .04)</td>
<td></td>
</tr>
<tr>
<td>Yu (2021)</td>
<td>[41]</td>
<td>Virtual reality simulation application</td>
<td>① Knowledge of newborn care ② Self-efficacy ③ Satisfaction</td>
<td>Pre ① 23.44 ± 2.15 ② 8.57 ± 0.98 ③ 4.79 ± 0.35</td>
<td>Post 23.29 ± 1.92 7.72 ± 1.37 4.13 ± 0.47</td>
<td>t = .03 z = –2.16 (95% CI: 50.42–52.45)</td>
<td>① .213 ② .018 ③ &lt; .001</td>
<td></td>
</tr>
</tbody>
</table>

VR: Virtual reality.
연구에서는 대상자 선택에서 교육 시작 전에 관찰된 특성에 대하여 동질성 검정, 공변량 분석 등이 필요할 것이다[23]. 또한 추출 분류의 비율에 따라 중등도가 4편에서 나타나, 교육 시작 전에 프로토콜 단계에서 중증의 유형, 장소, 빈도, 강도, 시기가 명확하고 명시적이어야 할 것이다. 의도한 교육에서 이발되어 나온다는 특이 상태에 대한 검정, 공변량 분석 등이 필요할 것이다[23]. 또한 중재 분류의 비율에 대해 중등도가 4편에서 나타나, 교육 시작 전에 프로토콜 단계에서 중재의 유형, 장소, 빈도, 강도, 시기가 명확하고 명시적이어야 할 것이다. 의도한 교육에서 이발되어 나온다는 특이 상태에 대한 검정, 공변량 분석 등이 필요할 것이다[23].

이와 같이 가상현실을 이용한 교육의 증가에도 불구하고 모든 실험역량에 효과가 있었던 것에 비하여, 임상현장 교육을 기본으로 제공하고, 가상현실에서 효과가 있던 것, 적극, 기술, 만족도, 자아 효능감의 항상성을 목표로 설정하는 것이 바람직하다. 가상현실을 이용한 모아간호 실습교육의 방법을 살펴보면, 전통적인 LMS 기반의 온라인 교육과 짧은 연구도 1편 있었다[40]. 주로 가상현실 프로그램 제공을 위한 센터와 웹사이트가 구축되어 있음은 알 수 있다[35-39,41]. 그러므로 가상현실을 이용한 웹이나 플랫폼 구축이 선천되어야 하므로 교육 방법의 인터페이스 구축이 기본 요원임을 알고 전략을 세워야 할 것이다.

본 연구의 의의는 첫째, 가상현실을 이용한 모아간호 실습교육의 경향과 유효성을 확인할 수 있었다는 점이다. 둘째, 간호교육자가 가상현실 실습 교육을 시행하였을 때, 간호 대학생의 지식, 기술, 만족도, 교육요구도, 자아효능감 중간에 유효하였다는 근거를 확인 할 수는 있는 것이다. 치료, 모아간호 분야에서는 조사 신생아 간호 실험의 주제에 대하여 연구되어 정상임신, 보통, 만한 교육에 모아간호 분야의 가상현실을 이용한 실습 교육을 개발할 필요성을 확인하였다 는 것이다. 넷째, 가상현실을 이용한 실습교육의 간호 대학생에게 불안을 높이게 하므로 자아감을 저하시킬 수 있으므로 제계적인 교육 프로그램 설정이 필요하다는 점이다.

본 연구의 한계점으로는 첫째, 고찰된 문헌의 언어가 영어로만 되어 있는 점, 둘째, 학위논문 등의 회색 문헌을 포함하지 않았으므로 출판 비율이 있다는 점이다. 본 연구는 가상현실을 이용한 모아간호 실습교육이 간호 대학생 실습역량에 미치는 영향의 실험연구를 체계적으로 고찰하는 연구로서, 7편의 문헌을 분석하였다. 교육의 특성과 내용을 분석하고, 교육은 간호선생, 유아 간호사, 간호사, 만한 교육의 각각의 가상현실 교육을 개발할 필요성을 확인하였다. 고찰 결과 간호 대학생의 지식, 기술, 침여도, 만족도, 교육요구도, 자아효능감 등도 균등한 효과를 보였다. 하지만 간호 대학생의 불안은 자아감에는 부정적인 효과를 보였다. 문헌들은 전체 가상현실 교육에 높은 연구가 4편 있었고, 세부 영역의 비율에 의한 합의가 낮은, 증단도, 용도가 고르게 분석하였으나, 문헌의 수가 많지 않아 일반화에는 어려움이 있다. 본 연구를 통하여 다음을 제언하고자 한다. 첫째, 문헌고찰 결과 가상현실을 이용한 모아 간호 실습교육이 부족하였다므로, 임신, 분만, 교육에 모아간호 주제로 실습교육을 적용할 것을 제안한다. 둘째, 교육을 적용할 때는 적정한 교육 순서의 반복 제공과 관련한 연구도 1편 있었다[35-39,41]. 그러므로 가상현실을 이용한 교육의 증가에도 불구하고 모든 실험역량에 효과가 있었던 것에 비하여, 임상현장 교육을 기본으로 제공하고, 가상현실에서 효과가 있던 것, 적극, 기술, 만족도, 자아 효능감의 항상성을 목표로 설정하는 것이 바람직하다. 가상현실을 이용한 모아간호 실습교육의 방법을 살펴보면, 전통적인 LMS 기반의 온라인 교육과 짧은 연구도 1편 있었다[40]. 주로 가상현실 프로그램 제공을 위한 센터와 웹사이트가 구축되어 있음은 알 수 있다[35-39,41]. 그러므로 가상현실을 이용한 웹이나 플랫폼 구축이 선천되어야 하므로 교육 방법의 인터페이스 구축이 기본 요원임을 알고 전략을 세워야 할 것이다.

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던 결과에 대하여 방법론적으로 잘 설계된 실험연구를 통하여 검증 할 것을 제언한다. 셋째, 본 연구의 결과를 토대로 간호 대학생에게 가상현실 실습교육을 위한 지침을 제공하여 지식, 기술, 태도에 긍정적 영향을 줄 수 있도록 세심하게 계획할 것을 제언한다.

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**Authors' contributions**

Conceptualization: Hwang S, Kim HK; Formal analysis: Kim HK; Writing–original draft: Hwang S, Kim HK; Writing–review & editing: Kim HK.

**Conflict of interest**

Hyun Kyoung Kim has been Associate editor of *Korean Journal of Women Health Nursing* since 2022. She was not involved in the review process of this manuscript. Otherwise, there is no conflict of interest to declare.

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**Data availability**

Please contact the corresponding author for data availability.

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Factors associated with levels of health-related quality of life in elderly women: secondary data analysis of the Korea National Health and Nutrition Examination Survey 2019

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**Purpose:** The purpose of this study was to investigate factors related to the levels of health-related quality of life (HRQoL) in elderly women based on Wilson and Cleary’s HRQoL model.

**Methods:** This study analyzed data from the eighth Korea National Health and Nutrition Examination Survey 2019 on 868 women over the age of 65 years. Based on the HRQoL model, parameters were categorized as personal, environmental, and physiological characteristics; symptom status; functional status; and perception of health status. The data were analyzed by quantile regression.

**Results:** The overall level of HRQoL was 0.87. Factors related to HRQoL in the 10% quantile were higher education level, higher economic status, economic activity, more walking days, fewer diseases, lower stress, less activity limitation, and higher perceived health status. Factors related to the 25% quantile of HRQoL were more walking days, fewer diseases, less activity limitation, and higher perceived health status. Factors related to the 50% quantile were age, economic activity, more walking days, fewer disease, lower stress, less activity limitation, and higher perceived health status. Factors related to the 75% quantile of HRQoL were smoking, more walking days, fewer diseases, lower stress, less activity limitation, and higher perceived health status.

**Conclusion:** While differing parameters were identified according to the level of HRQoL of elderly women in Korea, there were five common factors. Interventions that focus on increasing walking, mitigating diseases, stress, and activity limitations, and improving perceived health status can improve HRQoL.

**Keywords:** Aged; Health status; Quality of life; Women

주요어: 노인, 건강상태, 삶의 질, 여성
Introduction

우리나라는 2017년에 만 65세 이상의 고령인구 비율이 14% 이상을 차지하는 고령사회로 진입하였으며, 2025년에는 고령인구의 비율이 20% 이상을 차지하는 취급을 받게 될 것으로 예상되고 있다[1]. 이와 함께 우리나라의 평균 기대수명은 2020년 기준 남성은 80.5세, 여성은 86.5세이나, 건강수명은 남성 65.6세, 여성 67.2세로[2] 노년기에 여성이 남성에 비해 건강하지 않은 상태로 보내는 기간이 길어지고 있어 여성노인의 건강증진에 대한 관심이 필요하다.


건강관련 삶의 질 측정을 위한 대표적 도구인 EuroQol 5-Dimension (EQ-5D) 척도는 건강한 상태를 의미하는 최대값으로 치우친 분포를 보인다[15]. 이에 건강관련 삶의 질과 관련요인들의 관계를 파악하기 위해서 선형회귀모형을 적용하는 데 한계가 있다. 그러나 노인의 건강관련 삶의 질에 대한 선형연구들은 대부분 선형회귀모형을 적용하여 건강관련 삶의 질과 관련요인들과의 관계를 분석하여[3,4,8,9] 정규분포하지 않는 건강관련 삶의 질의 특성을 고려하지 않고 있다. 따라서 정규분포하지 않는 건강관련 삶의 질의 관련요인을 파악하기 위해 분위회귀분석 (quantile regression)을 적용하여 건강관련 삶의 질 수준별로 관련 있는 요인을 분석할 필요가 있다[15]. 분위회귀분석은 각 분위 지점에서 다른 분위에 별도로 가중치를 주어 분위별로 회귀모형을 추정하는 분석방법으로, 수준별로 표본을 임의로 분할하여 분석하는 방식을 이용할 수 있다.

Summary statement

• What is already known about this topic?
  Health-related quality of life (HRQoL) in women is negatively impacted by aging. The HRQoL of elderly women is lower than that of elderly men.

• What this paper adds
  Applying Wilson and Cleary's model of HRQoL, we found that different factors were related to different levels of HRQoL in elderly women in Korea. Common related factors were the number of diseases (biological and physiological characteristics), stress (a symptom), activity limitations (a functional factor), health perceptions, and the number of walking days (an individual characteristic).

• Implications for practice, education, and/or policy
  To develop nursing strategies to manage HRQoL in elderly women, interventions should focus on five common factors. However, since differences were identified in the influencing factors, it is also necessary to employ a distinctive approach for each level of HRQoL.
법과 달리 모든 표본을 이용하여 분석하므로 표본 크기가 작아지면 임의로 표본을 선택하는 문제가 생기지 않는다[16].


Methods

Ethics statement: Obtaining informed consent was exempted by the Institutional Review Board of Wonkwang University (WKIRB-202202-SB-012) because this study was secondary data analysis of existing data and the data were provided in anonymized form.

연구 설계
본 연구는 여성노인의 특성에 따른 건강관련 삶의 질의 차이를 확인하고 건강관련 삶의 질과 관련된 요인을 파악하기 위해 국민건강영양조사의 자료를 이용한 이차자료 분석연구로 기술적 상관성 연구설계이다. 연구의 기술은 STROBE 보고지침(http://www.strobe-statement.org/)에 따라 작성하였다.

연구 대상
본 연구는 질병관리청에서 실시한 국민건강영양조사 제8기 1차년도(2019) 조사 자료[17]를 이용하였다. 국민건강영양조사는 조사구 및 가구를 추출단위로 하여 중화집락 표본추출방법을 적용하여 표본을 추출하였다. 국민건강영양조사의 원시자료는 건강실험조사, 검진조사 및 영양조사로 이루어져며, 본 연구에서는 건강실험조사 자료를 이용하였다. 건강실험조사는 이동검진센터에서 면접 방식으로 조사되었으며, 흡연 및 음주 등의 건강행태 영역은 대상자 스스로 자기보고하는 방식으로 조사되었다. 제8기 국민건강영양조사 1차년도(2019)의 전체 대상자는 8,110명이었으며, 본 연구에서는 만 65세 이상 여성 991명 중 건강관련 삶의 질 조사에 참여한 868명을 분석 대상자로 선정하였다(Figure 1).

자료 수집

연구 도구

건강관련 삶의 질
건강관련 삶의 질은 한국판 EQ-SD[18] 척도로 측정한 점수를 이용하였다. 본 척도는 운동능력, 자기관리, 일상활동, 통증/불편, 불안/우울, 5개 하위영역으로 구성되어 있다. 각 하위영역은 3점 척도이며, ‘지장이 없다’, ‘다소 지장이 있다’, ‘심하게 지장이 있다’로 구성되어 있다. 각 하위영역에 가중치를 적용하여 단일 점수로 계산하고, 5개 하위영역 모두 ‘지장이 없다’로 응답한 경우 1점으로 계산된다. 점수가 1점에 가까울수록(가능한 범주: -0.17에서 1점) 건강관련 삶의 질 수준이 높음을 의미한다. Lee[19]의 연구에서 본 척도의 신뢰도는 overall percent agreement 값이 79%–97%, kappa 값이 0.32–0.64, intraclass correlation coefficient의 값은 0.61이었다.

개인적 특성
개인적 특성은 나이, 교육수준, 가구소득수준, 경제활동 여부, 흡연 및 음주, 건강 이상 자료를 이용하였다. 흡연은 ‘현재 담배를 피우십니까’라는 문항에 대한 응답을 이용하였으며, ‘흡연(매일 피움, 가끔 피움)’과 ‘비흡연(피운 적 없음, 과거에는 피웠으나 현재 피유지 않음)’으로 재분류하여 분석하였다. 음주는 ‘최근 1년 동안 술을 얼마나 자주 마셨나요?’라는 문항에 대한 응답을 이용하였으며, 음

Figure 1. Flow chart of the study.

KNHANES: Korea National Health and Nutrition Examination Survey; HRQoL: health-related quality of life.
주(한 달에 1번 미만, 1번 미만, 1번 정도, 2~4번, 일주일에 2~3번, 4번 이상)와 ‘비음주(술을 마시서 본 적 없음, 최근 1년간 전혀 마시지 않음)’로 재분류하여 분석하였다. 각 기일수는 ‘최근 1주일 동안 한 번에 적어도 10분 이상 걸은 날은 머칠입니까?’라는 문항에 대한 응답(0~7일)을 이용하였다.

환경적 특성
환경적 특성에는 가구형태를 포함하였다. ‘세대 유형은 다음 중 무엇이 해당합니까?’에 대한 응답을 ‘1인 가구’와 ‘다인 가구(부부, 부부와 미혼자녀, 편부모와 미혼자녀, 기타)’로 재분류하여 분석하였다.

생리적 요인
생리적 요인에는 동반질환 수를 포함하였다. 30개의 질환(고혈압, 어려지침질환, 뇌졸중, 심근경색증, 혈압상승, 당뇨병, 위암, 간암, 대장암, 유방암, 자궁경부암, 폐암, 감상선암, 기타 암, 우울증, 야토피피부염, 알레르기비염, 부비동염, 중이염, 신부전, B형 간염, C형 간염, 동반질환, 통증)에 대해 ‘현재 없고 있음(현재 유병 여부)’ 문항에 ‘있음’이라고 응답한 질환의 수(0~30개)를 이용하였다.

증상상태
증상상태에는 스트레스를 포함하였다. 스트레스는 ‘평소 일상생활 중에 스트레스를 어느 정도 느끼고 있습니까?’라는 문항에 대해 1점에서 4점까지의 Likert 척도로 대단히 많이 느낄, 많이 느낄, 조금 느낄, 거의 느낄지 않음으로 응답한 것을 이용하였다.

기능상태
기능상태에는 활동제한 여부를 포함하였다. ‘현재 건강상의 문제나 신체 혹은 정신적 장애로 일상생활 및 사회활동에 제한을 받고 계십니까?’라는 문항에 대해 ‘예’, 아니오로 응답한 것을 이용하였다.

전반적인 건강지각
전반적인 건강지각에는 주관적 건강상태를 포함하였다. ‘表彰에 건강은 어떻다고 생각하지십니까?’라는 문항을 이용하였으며, ‘좋음(예 우 좋음, 좋음), 보통’, ‘나쁨(나쁨, 매우 나쁨)’으로 재분류하여 분석하였다.

지로 분석
지로 분석을 위해 IBM SPSS ver. 26.0 (IBM Corp., Armonk, NY, USA)을 이용하였다. 대상자의 건강관련 삶의 질과 개인적 특성, 환경적 특성, 생리적 요인, 증상상태, 기능상태, 전반적인 건강지각에 해당하는 요인의 변도 및 백분율, 평균 및 표준편차를 가중치를 적용하여 구하였다. 각 요인에 따른 건강관련 삶의 질의 차이는 복합표본 일반선형모형으로 분석하였다. 복합표본 일반선형모형은 분산분석(analysis of variance, ANOVA)과 t-test 분석이 가능하다. ANOVA의 경우 독립변수 효과가 유의한지에 대해 검정한 것이고, t-test의 경우 독립변수의 각 계수 값이 유의한지에 대해 검정한 것이다. 건강관련 삶의 질 수준별 관련요인을 파악하기 위해 분위회귀분석을 시행하였다. 분위수 설정을 위해 선행연구(15)를 참고한 결과, 10%, 25%, 50%, 75%, 90% 분위수로 나누어 분석을 하였다. 그리고 EQ-5D 최도로 측정한 건강관련 삶의 질의 경우 최대값으로 치우치는 치료효과(ceiling effect)를 보여 본 연구에서는 90% 분위수를 제외한 10%, 25%, 50%, 75% 분위수로 나누어 상중하, 최하위 집단을 대상으로 분석을 시행하였다.

Results
여성노인의 특성에 따른 건강관련 삶의 질의 차이
본 연구의 대상자는 총 688명이었으며, 여성노인의 건강관련 삶의 질은 0.87±0.17점으로 높지 않은 수준이었다(Table 1).

여성노인의 건강관련 삶의 질은 나이, 교육수준, 가구소득수준, 경제활동 상태, 음주 여부, 걷기 일수가, 가족유형, 동반질환 수, 스트레스, 활동제한 여부, 주관적 건강상태에 따라 유의한 차이가 있었 다(Table 1). 65~74세 여성은 75세 이상의 여성보다 건강관련 삶의 질이 높았으며(t=4.02, p<.001), 교육수준이 초등학교 졸업 중이하인 경우가 고등학교 졸업 이상인 경우보다 건강관련 삶의 질이 낮은 것으로 나타났다(t=-7.40, p<.001). 가구소득수준이 ‘하이’인 경우보다 ‘상’인 경우(t=3.47, p<.001)와 ‘중상’인 경우(t=3.10, p<.001)에 건강관련 삶의 질이 높았으며, 경제활동에 참여한 경우(t=2.26, p=.025)는, 걷기 일수가 많은수록(t=7.91, p<.001) 건강관련 삶의 질이 높은 것으로 나타났다. 1인 가구인 경우(t=-3.43, p<.001), 동반질환 수가 많은수록(t=-8.15, p<.001) 건강관련 삶의 질이 낮은 것으로 나타났다. 스트레스를 매우 많이 느낀 경우가 거의 느낄지 않는 경우보다 건강관련 삶의 질이 낮았으며(t=-3.38, p<.001), 우울감을 느낀 경우(t=-2.48, p=.014) 유의한 차이가 있었다. 활동제한이 있는 경우(t=-7.54, p<.001) 건강관련 삶의 질이 낮은 것으로 나타났다. 주관적 건강상태가 나쁜 경우보다 좋은 경우(t=11.45, p<.001), 보통인 경우(t=9.67, p<.001)가 건강관련 삶의 질이 낮은 것으로 나타났다. 여성노인의 휴면 및 음주 여부에 따른 건강관련 삶의 질의 차이는 유의하지 않았다(Table 1).

여성노인의 건강관련 삶의 질 수준별 관련요인
여성노인의 건강관련 삶의 질 수준별 관련요인을 파악하기 위해 분위회귀분석을 실시한 결과 (Table 2). 10% 분위 여성노인의 경우 소득수준이 ‘상’인 경우(B=0.06, p=.045), 경제활동에 참여하는 경우(B=0.04, p=.10), 걷기 일수가 많은수록(B=0.01, p=.001)이 주관적 건강상태가 좋은 경우(B=0.22, p<.001)와 보통인 경우
<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>n (%) or mean ± SD</th>
<th>Weighted n (weighted %)</th>
<th>Health-related quality of life mean ± SD</th>
<th>t (p)</th>
<th>F (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristics of the individual</strong></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>0.87 ± 0.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (year)</td>
<td>65–74</td>
<td>522 (60.1)</td>
<td>2,148,817 (55.1)</td>
<td>0.89 ± 0.15</td>
<td>4.02 (&lt; .001)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 75</td>
<td>346 (39.9)</td>
<td>1,753,393 (44.9)</td>
<td>0.83 ± 0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>≤ Elementary</td>
<td>587 (67.8)</td>
<td>2,613,722 (67.1)</td>
<td>0.85 ± 0.18</td>
<td>-7.40 (&lt; .001)</td>
<td>28.00 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Middle school</td>
<td>124 (14.3)</td>
<td>548,233 (14.1)</td>
<td>0.89 ± 0.16</td>
<td>-1.54 (125)</td>
<td></td>
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<tr>
<td></td>
<td>≥ High school</td>
<td>155 (17.9)</td>
<td>735,857 (18.8)</td>
<td>0.92 ± 0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic status</td>
<td>Very high</td>
<td>64 (7.4)</td>
<td>287,288 (7.4)</td>
<td>0.91 ± 0.17</td>
<td>3.47 (001)</td>
<td>5.21 (002)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>128 (14.8)</td>
<td>638,551 (16.4)</td>
<td>0.90 ± 0.14</td>
<td>3.10 (002)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>227 (26.2)</td>
<td>991,669 (25.5)</td>
<td>0.89 ± 0.14</td>
<td>1.93 (055)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very low</td>
<td>446 (51.6)</td>
<td>1,970,301 (50.7)</td>
<td>0.84 ± 0.18</td>
<td></td>
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</tr>
<tr>
<td>Economic activity</td>
<td>Yes</td>
<td>256 (29.5)</td>
<td>1,157,951 (29.7)</td>
<td>0.89 ± 0.14</td>
<td>2.26 (025)</td>
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<tr>
<td></td>
<td>No</td>
<td>611 (70.5)</td>
<td>2,740,946 (70.3)</td>
<td>0.85 ± 0.17</td>
<td></td>
<td></td>
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<tr>
<td>Smoking</td>
<td>Yes</td>
<td>24 (2.8)</td>
<td>125,580 (3.2)</td>
<td>0.86 ± 0.14</td>
<td>0.34 (734)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>842 (97.2)</td>
<td>3,769,363 (96.8)</td>
<td>0.87 ± 0.17</td>
<td></td>
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<tr>
<td>Drinking</td>
<td>Yes</td>
<td>314 (36.3)</td>
<td>1,431,448 (36.8)</td>
<td>0.89 ± 0.14</td>
<td>0.19 (852)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>552 (63.7)</td>
<td>2,463,494 (63.2)</td>
<td>0.86 ± 0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking days per week</td>
<td>4.45 ± 2.75</td>
<td></td>
<td></td>
<td></td>
<td>7.91 (&lt; .001)</td>
<td></td>
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<tr>
<td><strong>Characteristics of the environment</strong></td>
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<tr>
<td>Living alone</td>
<td>Yes</td>
<td>275 (31.7)</td>
<td>1,068,489 (27.4)</td>
<td>0.83 ± 0.19</td>
<td>-3.43 (001)</td>
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<tr>
<td></td>
<td>No</td>
<td>593 (68.3)</td>
<td>2,833,720 (72.6)</td>
<td>0.88 ± 0.15</td>
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<tr>
<td><strong>Biological and physiological variables</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Number of diseases</td>
<td></td>
<td>2.28 ± 1.52</td>
<td></td>
<td></td>
<td>-8.15 (&lt; .001)</td>
<td></td>
</tr>
<tr>
<td><strong>Symptom status</strong></td>
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<tr>
<td>Stress</td>
<td>Very high</td>
<td>38 (4.4)</td>
<td>141,820 (3.6)</td>
<td>0.74 ± 0.26</td>
<td>-3.38 (001)</td>
<td>7.83 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>156 (18.0)</td>
<td>713,465 (18.3)</td>
<td>0.83 ± 0.18</td>
<td>-1.81 (071)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>444 (51.3)</td>
<td>2,017,528 (51.8)</td>
<td>0.88 ± 0.15</td>
<td>1.21 (227)</td>
<td></td>
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<tr>
<td></td>
<td>Very low</td>
<td>228 (26.3)</td>
<td>1,022,131 (26.3)</td>
<td>0.88 ± 0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
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<tr>
<td>Activity limitation</td>
<td>Yes</td>
<td>149 (17.2)</td>
<td>555,468 (14.2)</td>
<td>0.72 ± 0.21</td>
<td>-7.54 (&lt; .001)</td>
<td></td>
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<tr>
<td></td>
<td>No</td>
<td>719 (82.8)</td>
<td>3,346,742 (85.8)</td>
<td>0.90 ± 0.14</td>
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<tr>
<td><strong>General health perceptions</strong></td>
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<tr>
<td>Perceived health status</td>
<td>Good</td>
<td>175 (20.2)</td>
<td>796,361 (20.4)</td>
<td>0.94 ± 0.09</td>
<td>11.45 (&lt; .001)</td>
<td>65.39 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>434 (50.0)</td>
<td>2,028,907 (52.0)</td>
<td>0.91 ± 0.11</td>
<td>9.67 (&lt; .001)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>259 (29.8)</td>
<td>1,076,942 (27.6)</td>
<td>0.75 ± 0.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(B = 0.19, p < 0.001) 건강관련 삶의 질이 높은 것으로 나타났으며, 교육수준이 초등학교 졸업 이하인 경우(B = 0.05, p = 0.016), 동반질환 수가 많을수록(B = 0.01, p = 0.021), 스트레스를 매우 많이 느끼는 경우(B = -0.12, p = 0.002) 및 활동제한이 있는 경우(B = -0.19, p < 0.001) 건강관련 삶의 질이 낮은 것으로 나타났다. 25% 분위의 여성노인은 걓 이수가 많을수록(B = 0.01, p < 0.001), 주관적 건강 상태가 좋은 경우(B = 0.14, p < 0.001)와 보통인 경우(B = 0.11, p < 0.001) 건강관련 삶의 질이 높은 것으로 나타났으며, 동반질환 수가 많을수록(B = -0.02, p < 0.001) 및 활동제한이 있는 경우(B = -0.12, p < 0.001) 건강관련 삶의 질이 낮은 것으로 나타났다. 50% 분위의 여성노인은 65-74세인 경우(B = 0.03, p = 0.007), 경제활동에 참여하는 경우(B = 0.02, p = 0.043), 걓 이수가 많을수록(B = 0.01, p < 0.001), 주관적 건강 상태가 좋은 경우(B = 0.10, p < 0.001)와 보통인 경우(B = 0.08, p < 0.001) 건강관련 삶의 질이 낮은 것으로 나타났으며, 동반질환 수가 많을수록(B = -0.01, p < 0.001). 스트레스를 매우 많이 느끼는 경우(B = -0.10, p < 0.001) 및 활동제한이 있는 경우(B = -0.10, p < 0.001) 건강관련 삶의 질이 낮은 것으로 나타났다. 75% 분위의 여성노인은 걓 이수가 많을수록(B = 0.01, p < 0.001), 주관적 건강 상태가 좋은 경우(B = 0.09, p < 0.001)와 보통인 경우(B = 0.09, p < 0.001) 건강관련 삶의 질이 낮은 것으로 나타났으며, 흡
연하는 경우 \( B = -0.01, \; p = .008 \), 동반질환 수가 많을수록 \( B = -0.01, \; p < .001 \), 스트레스를 매우 많이 느끼는 경우 \( B = -0.04, \; p < .001 \) 및 활동제한이 있는 경우 \( B = -0.09, \; p < .001 \) 건강관련 삶의 질이 높은 것으로 나타났다.

### Discussion

본 연구 결과 건강관련 삶의 질과 관련된 요인 중 수준별 공동요인은 개인적 특성 중 경기 일수, 생활적·생리적 요인인 동반질환 수, 증상상태인 스트레스, 기능상태인 활동제한 여부, 전반적인 건강지각인 주관적 건강상태, 보수적·생리적 요인인 비만도, 경제활동이 없는 경우 \( B = 0.04, \; p = .010 \) 및 전반적인 건강지각이 좋은 경우 \( B = -0.03, \; p < .001 \) 건강관련 삶의 질이 높은 것으로 확인되었다. 이는 노인의 활동지역이 적을수록 \( B = 0.01, \; p < .001 \) 및 경제활동에 참여하는 경우 \( B = 0.01, \; p < .001 \) 건강관련 삶의 질이 증가하는 것으로 보고한 연구들과 유사한 결과이다. 75% 분위 위 여성노인의 흡연 여부가 건강관련 삶의 질과 관련된 요인으로 나타났다. 이러한 결과는 노인의 흡연을 하지 않는 경우 \( B = 0.01, \; p = .008 \) 건강관련 삶의 질이 높은 것으로 확인되었다.

Table 2. Factors associated with different levels of health-related quality of life (N=868)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>B (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of the individual</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Age*</td>
<td></td>
<td>-0.00 (.888)</td>
</tr>
<tr>
<td>Education*</td>
<td></td>
<td>-0.06 (.091)</td>
</tr>
<tr>
<td>Elementary or below</td>
<td></td>
<td>-0.02 (.349)</td>
</tr>
<tr>
<td>Middle school</td>
<td></td>
<td>-0.01 (.685)</td>
</tr>
<tr>
<td>Economic status*</td>
<td></td>
<td>0.02 (.484)</td>
</tr>
<tr>
<td>Very high</td>
<td></td>
<td>0.06 (.045)</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>0.01 (.818)</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>0.01 (.685)</td>
</tr>
<tr>
<td>Economic activity*</td>
<td></td>
<td>0.04 (.010)</td>
</tr>
<tr>
<td>Smoking*</td>
<td></td>
<td>-0.00 (.955)</td>
</tr>
<tr>
<td>Drinking*</td>
<td></td>
<td>0.01 (.714)</td>
</tr>
<tr>
<td>Walking days per week</td>
<td></td>
<td>0.01 (&lt; .001)</td>
</tr>
<tr>
<td>Characteristics of the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living alone*</td>
<td></td>
<td>-0.03 (.120)</td>
</tr>
<tr>
<td>Biological and physiological variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of diseases</td>
<td></td>
<td>-0.01 (.221)</td>
</tr>
<tr>
<td>Symptom status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td></td>
<td>-0.12 (.002)</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>-0.02 (.494)</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>0.00 (.843)</td>
</tr>
<tr>
<td>Functional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity limitation*</td>
<td></td>
<td>-0.19 (&lt; .001)</td>
</tr>
<tr>
<td>General health perceptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived health status*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>0.22 (&lt; .001)</td>
</tr>
<tr>
<td>Fair</td>
<td></td>
<td>0.19 (&lt; .001)</td>
</tr>
<tr>
<td>Pseudo R-square</td>
<td></td>
<td>0.33</td>
</tr>
</tbody>
</table>

*Reference variables were age (≥ 75), education (high school or above), economic status (very low), economic activity (no), smoking (no), drinking (no), living alone (no), stress (very low), activity limitation (no), and perceived health status (poor).
건강에도 긍정적인 영향을 미칠 수 있다[14,23]. 따라서 여성노인의 건강관련 삶의 질을 향상시키기 위해 건강증진과 같은 신체활동이 중요한 역할을 할 수 있으므로 여성노인에게 이러한 활동에 참여하는 것이 중요한 이유를 교육하고, 여성노인의 신체활동을 위한 지역사회 노력이 필요하다.

본 연구 결과, 여성노인의 건강관련 삶의 질도 모든 수준에서 생물학적·생리적 요인, 인지적 요인, 사회심리적 요인, 경제적·사회적 요인, 교육수준, 소득수준, 경제활동에 보유하는 변수들 중에서 생물학적·생리적 요인과 경제적·사회적 요인, 교육수준, 소득수준, 경제활동에 보유하는 변수들 중에서 신체적, 정신적, 사회적 요인을 통해 건강관련 삶의 질에 영향을 미칠 수 있다[4,14,25]. 따라서 여성노인에게 발생 가능한 질환을 조기에 발견하고 예방함으로써 질환에 이환되지 않도록 관리하고, 이미 이환된 질환의 경우 적절히 관리하여 전반적인 건강상태나 건강관련 삶의 질 저하를 아끼지 않도록 중재를 제공할 필요가 있다.

여성노인의 스트레스 수준도 건강관련 삶의 질과 관련된 요인으로 나타났다. 여성노인의 경우 건강문제, 가족과의 관계, 경제적 어려움, 음주, 음식에 대한 관심, 건강관리, 그리고 성취감 등으로 인한 신체적·사회적·정신적 불안과 스트레스 상황에 대처하는 능력, 그리고 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여성을 관리할 수 있는 활동, 스트레스 상황에 대처하기 위한 여상을 관리하고, 이를 통해 건강관련 삶의 질을 향상시킬 수 있는 방법이 필요하다.
율을 높이기 위한 정책적 지원을 통해 건강관련 삶의 질을 향상시킬 수 있으리라 생각한다.

흡연은 건강 문제뿐만 아니라 신체활동 등의 건강증진활동과 관련된 주요 요인 중 하나이다[19]. 특히 본 연구결과 건강관련 삶의 질이 높은 수준인 75% 분위 여성노인에서 흡연 여부가 건강관련 삶의 질과 관련된 것으로 나타났다. 이는 건강관련 삶의 질이 높은 여성노인의 경우 비흡연이나 금연과 같은 건강생활을 실천하면서 자신의 건강에 대해 긍정적으로 인식하고 적극적으로 건강관리를 하여 건강관련 삶의 질이 더욱 향상될 수 있음을 의미하는 것으로 볼 수 있다[26]. 이에 높은 수준의 건강관련 삶의 질을 보이는 여성노인의 경우 높은 수준을 유지하는 데 비흡연과 금연 등의 건강생활 활성화의 필요성을 도출이 될 수 있으므로 여성노인의 건강생활 신천을 위한 지원 사업의 마련이 필요하다.


여성노인은 남성노인에 비해 기대수명은 길고 건강수명은 짧아 이들의 건강관련 삶의 질에 관심을 가질 필요가 있다. 노인기 여성은 건강관련 삶의 질은 단순히 신체적 건강과 관련된 요인뿐만 아니라 다양한 요인들에 의해 복합적인 영향을 받으므로 포괄적으로 접근해야 한다. 여성노인의 건강관련 삶의 질 수준별 관련된 요인은 공통적인 부분도 있으나 수준별로 차이가 있는 관련요인도 있으므로 건강관련 삶의 질의 수준에 따라 차별화된 접근이 필요하다. 여성노인의 건강관련 삶의 질은 이와 같은 질환이나 스트레스나 활동제한 등의 취약성이 있는 경우에 더욱 중요하게 된다. 따라서, 건강관련 삶의 질이 감소하는 경우, 그러한 취약성을 극복하기 위한 대책이 필요하다. 이러한 점을 고려하여 본 연구에서는 다양한 건강관련 삶의 질을 수준별로 나누어 분석한 결과, 동일한 수준의 건강관련 삶의 질을 보이는 여성노인의 경우 이와 더불어 건강관련 삶의 질을 유지하는 차별화된 접근이 필요하다고 생각한다.

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**Authors' contributions**

All work was done by Son M.

**Conflict of interest**

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**References**


Son M • Health-related QoL in elderly Korean women


Do spouse burden of care, family resilience, and coping affect family function in gynecologic cancer in Korea?: a cross-sectional study

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**Introduction**

Among gynecologic cancers in Korea, cervical cancer ranked first with 52.9% per 100,000 people, uterine cancer ranked second with 26.2%, and ovarian cancer ranked third with 20.9% [1]. As for the 5-year observed survival rate of gynecologic cancer, it has increased in all three cancers from the 1993–1995 period to the 2014–2018 period: from 75.7% to 78.1% for cervical cancer, 80.3% to 86.8% for uterine cancer, and 58.4% to 63.6% for ovarian cancer [1]. As the survival rate increases along with the increase in gynecologic cancer incidence, nurses need to help gynecologic cancer patients and their families effectively manage the long-term cancer treatment process [2].

Women with gynecologic cancer experience symptoms related to reproductive function, such as abdominal discomfort, urination and bowel dysfunction, vaginal dryness, and decreased sexual function [3]. In addition, gynecologic cancer patients experience difficulties in performing their role as mother and/or wife...
Summary statement

• What is already known about this topic?
High family resilience and coping of cancer patients and caregivers are associated with better family function. While studies on breast cancer patients and their family have been conducted, there is a paucity of research on gynecologic cancer patients and family, especially on family resilience and family functioning.

• What this paper adds
The spouses of Korean gynecologic cancer patients showed higher family function when the total treatment period took longer, problem-solving communication was higher, and coping was better. Problem-solving communication was the most influencing factor.

• Implications for practice, education, and/or policy
Nurses can use findings to assess spouse's coping and communication patterns. This study provides initial insight to develop a family intervention program specialized for women's cancer that includes the spouse to help family function.

due to health problems [4]. As a result, gynecologic cancer patients may experience negative physical, psychological, and social reactions from the time of cancer diagnosis to the progression of the disease, treatment, and cure [3,4].

In gynecologic cancer patients, the family is not only a primary source of physical, mental, and social support but can also be an active participant in their treatment and recovery. In addition, considering the situation in Korea, where families often shoulder a large part of caring for patients, the family of gynecologic cancer patients can face various difficulties: such as imbalance of the family system due to the disease, role changes due to the patient's condition, and lack of knowledge in patient care [5]. In addition, the experience of enduring pain from the treatment process and resulting patient complications have been reported to present burden of caring in family [6].

Family caregivers of cancer patients generally had to shoulder the responsibility to take care of their family despite their physical, mental, social, and spiritual suffering and economic difficulty [7]. Family members also experienced burden of caring due to psychological and economic instability [8], which became a source of stress [9]. If the burden of cancer patients' family continues to accumulate, family tend to become passive in caring for the patient, which can lead to difficulties in family recovery, such as indifferent reactions to the patient’s pain, and can cause changes in family relationships or family function [10]. Higher resilience of patients and care providers is associated with better family functions and can exert a positive effect [11]. In addition, family problem-solving communication and coping can positively affect family functions [12], which can need to examine the family function according to burden of care in the family of gynecologic cancer patients.

McCubbin and McCubbin [13] defined family resilience as the ability of a family to adapt to stress and recover from adversity, and describe it as a family quality that allows families to adapt more positively in the face of a crisis. In their Family Resilience Model [14], social support, family strength, and problem-solving communication strategies are presented as factors of family resilience, and recovery and adaptation through interaction between these factors are emphasized. In particular, Korean culture is family-centered and has unique attributes based on collectivist culture, and considers relational values as very important. As such, the diagnosis and treatment process of gynecologic cancer greatly affects the entire family of cancer patients, and is a major crisis event in which the burden and stress felt as the main care provider increases [15]. Prior studies have reported a significant correlation between family resilience and family function of liver cancer patients and caregivers in China [11] and a direct and positive relationship between family function and resilience in Chinese lung cancer patients and caregivers [11]. While research on breast cancer patients and family is active in Korea [16,17], studies on gynecologic cancer patients are limited, even more so for family resilience and family function.

Families of gynecologic cancer patients use coping methods to maintain equilibrium against physical and mental difficulties while caring for the patient, and such coping methods differ from family member to family member [18]. While there are families who use active coping methods with the aid of social support systems to actively resolve the family’s crisis situation, other families may use emotional coping to reduce emotional pain in stressful situations [19]. Prior studies in Korea have focused on
the relationship of stress, coping method, and burnout in family members caring for cancer patients [18], and the positive effect of breast cancer survivors’ family coping on family function [17]. However, there is a lack of studies on family coping and family function in gynecologic cancer patients and their family.

Of the studies conducted on gynecologic cancer patients in Korea, many focused on the patients’ health problems and quality of life [20-22]. While studies exploring family functions for gynecologic cancer patients have been confirmed overseas [23], little has been explored in Korea. In studies on families of general cancer patients in Korea [7-9], most of the family members were wives or adult children (female); and in the case of female cancers, two studies reported the main caregiver as the spouse. One evaluated the relationship between social support, family coping, and family function as perceived by spouses of breast cancer patients [17]. Another reported that when the spouse of a young breast cancer patient is actively involved in caring, difficulties such as lack of income, lack of social exchange, and lack of parental care in the child’s growth process can arise [16]. Although a study noted that spouses of Korean gynecologic cancer patients expressed struggles such as feeling sorry for the wife, regret for not having been more available, wanting to run away from having to watch the patient’s pain, and psychological stress from the loss of fertility [5], there is a sore lack of research on family functions.

There were studies abroad that looked at differences in research variables according to general characteristics such as caregiver’s age, care-related characteristics such as nursing period [11], and studies that looked at differences between patients and spouses on characteristics of cancer patient’s disease in Korea [17]. Therefore, among the factors influencing the family function of cancer patients, research is needed to consider changes in occupational status, disease characteristics (cancer stage, total treatment period), and care characteristics (alternative manpower) of gynecologic cancer patients. Therefore, this study aimed to identify care burden, family resilience, coping, and family function in spouses of gynecologic cancer patients.

The purpose of this study was to understand the impact of burden of care, family resilience, and coping on family function in spouses of women with gynecologic cancer. Specific objectives were as follows:

1) To identify family function, spouse burden of care, family resilience, and coping
2) To identify family function according to spouses’ characteristics and patients’ disease-related characteristics
3) To determine the relationships among family function, burden of care, family resilience, and coping
4) To identify the factors that affect family function of spouses of gynecologic cancer patients

Methods

Research design
This study employed a correlational design using a cross-sectional survey, to identify the effects of burden of care, family resilience, and coping on family function in spouses of gynecologic cancer patients. This study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines (https://www.strobe-statement.org/).

Sample
Spouses of women with gynecologic cancer who were undergoing surgery, chemotherapy, radiation therapy, and/or hormone therapy, or were under follow-up observation after treatment, were the target population. Inclusion criteria were spouses of aged 20 years or older who agreed to participate in the study. Cancer patients diagnosed with terminal cancer or under hospice treatment were excluded.

As a preceding study [17] reported that social support and family coping accounted for 42%, and a correlation r of .66, these were used to calculate the effect size for this study. Using the G*power program, significance level (α) = 0.05, power (1–β) = 0.8, and effect size f² = .15, and using 10 predictive factors (cancer stage, total treatment period, spouse occupational status change, number of children, presence or absence of alternative help if necessary, care burden, social support, family strength, problem-solving communication, coping), at least 118 participants were required. Considering a potential loss of 10% due to incomplete responses, 130 spouses were recruited via convenience sampling and 123 people (94.6%) who submitted complete data to the online survey were analyzed for the study.

Measurement
All study instruments were used after contacting the developer of the original tool for their consent.

Burden of care
Burden of care was measured by the Caregiver Reaction Assessment.
ment Scale developed by Given et al. [24], using the Korean version [25]. This 24-item instrument consists of questions on self-esteem (seven questions), life pattern change (five questions), lack of family cooperation (five questions), economic burden (three questions), and physical burden (four questions). A 5-point Likert (1, absolutely not to 5, very much) is used and after reverse coding for some self-esteem items, scores are summed (possible range, 24–120). Higher scores indicate a greater degree of care burden. The internal reliability of the original tool [24] was .88 and in this study, it was .69.

Family resilience
Social support, family hardiness, and problem-solving communication were selected as constituting family resilience based on McCubbin and McCubbin's [14] resilience model of family stress, coordination, and adaptation to disease stress-induced crises. This framework postulates that resilience is an internal and external resource of the family system, which has components including family strength, family management, family problem solving, and response strategies.

- Social support: The Korean version [26] of the 17-item Social Support Index (SSI) developed by McCubbin et al. [27] was used. Items are rated on a 5-point Likert (1, not at all to 5, very much so) and higher summed scores (possible range, 17–85) indicate a greater degree of social support. Cronbach's α of the SSI [26] was .82, .75 in a study of Korean cancer patient families [27], and .73 in this study.

- Family hardiness: The Family Hardiness Index (FHI) was developed by McCubbin et al. [28], and its Korean version [29] was used in this study. Each of the 20 questions is rated on a 4-point Likert (1, not at all to 4, very much so) and summed (possible range, 20–80). The higher the FHI score, the stronger the family. Cronbach's α was .82 for the original tool [28], .91 in a Korean study [29], and .83 in this study.

- Problem-solving communication: The Korean version [27] of the Family Problem Solving Communication (FPSC) [30] was used. Two types of communication are identified: ‘aggressive problem-solving communication’ that tends to worsen stress situations or ‘positive problem-solving communication’ that conveys support and interest and aims for a calming effect. The 10 questions are rated on a 4-point scale (1, not at all to 4, very much) and summed (possible range, 10–40). Cronbach's α of the FPSC [30] was .89, .76 in a Korean study [27], and .75 in this study.

Coping
The 69-item Ways of Copying (WOC) developed by Lazarus and Folkman [19] was translated into Korean [31] and its modified 24-item version [32] was used. This WOC has 12 questions on active coping (six for problem-oriented coping, six for social support pursuing coping) and 12 questions on passive coping (six for emotion-oriented coping, six for aesthetic thinking coping). Rated on a 4-point Likert (1, not used to 4, used very much), scores are summed (possible range, 24–96) and higher scores mean that particular coping style is used more often. Cronbach’s α for active coping and passive coping were .86 and .76, respectively, for the original tool [18], .80 and .69 in a previous study [32], and .84 and .75 in this study. The Cronbach’s α for active and passive coping altogether was .87 in this study.

Family function
The Korean Family Functioning Scale [33], which measures family function under the stress of chronic disease in family members, was used. This 26-item tool consists of six subareas: affective cohesion of family functions, relationship with external resources, family norms, roles and responsibilities, communication, and financial resources. A 4-point Likert (1, not at all to 4, very much so) is used for summed scores (possible range, 26–104). Higher scores indicate better family function. Cronbach's α of the original tool [33] was .87 and .90 in this study.

Characteristics of spouses and patients
Based on the literature, the following were assessed: spouse's age, education level, occupational status change, monthly income, and number of children. For disease-related characteristics of the gynecologic cancer patient, spouse was asked about wife’s age, cancer type, cancer stage, recurrence, total treatment period, and treatment type were investigated. Also, the following care characteristics were assessed: existence of alternative help, alternative help providers, period and time of caring for the wife, changes in spouse’s life after diagnosis of the cancer, presence of spouse’s health problems, person covering medical costs, and monthly medical expenses.

Data collection
Data collection for this study was conducted from October 20, 2021 to January 30, 2022 from three online communities for gynecologic cancer patients in Korea. After obtaining permission from the administrator of the online community, a recruitment flyer was posted and interested participants could voluntarily contact the research team. After screening for eligibility, potential par-
Participants were sent a link to the online questionnaire. The survey took 15 to 20 minutes and to those who chose to share personal contact information, a mobile gift card (worth approximately 4 US dollars) was provided after completing the questionnaire.

Data analysis
Using IBM SPSS Statistics for Windows, ver. 26.0 (IBM Corp., Armonk, NY, USA) with the significance level set at $p < .05$, descriptive statistics were done for the spouse's general characteristics, the patient's disease-related characteristics, care characteristics, burden of care, family resilience, coping, and level of family function. Differences in family function according to the characteristics of spouse and patient were analyzed by independent t-test and one-way analysis of variance, and the Scheffé test was used for post-analysis. Pearson correlation coefficient was calculated for the relationships among care burden, family resilience, coping, and family function. Finally, hierarchical multiple regression analysis was performed to identify the factors influencing family function.

Results

Characteristics of the sample

Characteristics of gynecologic cancer patients
Most patients were in the 41 to 50 years of age category ($n = 55, 44.7\%$). Cervical cancer was the most common ($n = 46, 37.4\%$), followed by ovarian cancer ($n = 38, 30.9\%$) and uterine cancer ($n = 34, 27.6\%$). Stage I gynecologic cancer was close to half ($n = 55, 44.7\%$) and 90.2% ($n = 111$) were not recurred cancer. Treatment duration was mainly 6–12 months ($n = 42, 34.1\%$) or 3–6 months ($n = 38, 30.9\%$), followed by > 12 months ($n = 27, 22.0\%$). For treatment, most had experienced surgery ($n = 88, 71.7\%$), as well as chemotherapy ($n = 62, 50.8\%$) and radiation ($n = 37, 30.8\%$); some had received target therapy ($n = 19, 15.8\%$), and antihormonal therapy ($n = 15, 11.7\%$) (Table 1).

Spouse characteristics
Similar to the patient, most spouses were in the 41 to 50-year age range ($n = 58, 47.2\%$). Most were college graduates ($n = 102, 82.9\%$) and 1/4 had experienced work changes since their wife’s diagnosis of cancer ($n = 30, 24.4\%$), e.g., being absent from work, leaving early, or resigning. Monthly household income was in the 3 million to 5 million Korean Won (KRW) category (approximately 2,400–4,000 US dollars) for roughly half ($n = 62, 50.4\%$), which is comparable to the national household average for 2021 (4.73 million KRW) [34] and one child was the most common

<table>
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<tr>
<th>Table 1. Characteristics of gynecologic cancer patients and spouses (N=123)</th>
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<td><strong>Characteristics of care</strong></td>
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Table 1. Continued

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<tr>
<th>Variable</th>
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<tr>
<td>Duration of caring for wife (months) (n = 120)</td>
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<td>47 (39.2)</td>
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<td>7–12</td>
<td>45 (36.6)</td>
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<td>&gt; 13</td>
<td>28 (22.8)</td>
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<tr>
<td>Time spent caring for wife (hours/day) (n = 118)</td>
<td>1–5</td>
<td>88 (74.6)</td>
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<td>≥ 6</td>
<td>30 (25.4)</td>
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<tr>
<td>Changes in spouse’s life after cancer diagnosis (n = 97)</td>
<td>Lack of free time</td>
<td>39 (40.2)</td>
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<td>Change in life values</td>
<td>26 (26.8)</td>
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<td>Physical and mental burden</td>
<td>13 (13.4)</td>
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<td></td>
<td>Housework and childcare burden</td>
<td>13 (13.4)</td>
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<td>Economic burden</td>
<td>6 (6.2)</td>
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<td>Own health problems</td>
<td>No</td>
<td>106 (86.2)</td>
</tr>
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<td>Yes</td>
<td>17 (13.8)</td>
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<tr>
<td>Family paying medical bills†</td>
<td>Spouse</td>
<td>113 (91.7)</td>
</tr>
<tr>
<td></td>
<td>Patient</td>
<td>23 (19.2)</td>
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<tr>
<td></td>
<td>Parents, brothers, sisters</td>
<td>14 (11.7)</td>
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<tr>
<td></td>
<td>Children</td>
<td>7 (5.8)</td>
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<tr>
<td>Monthly medical expenses (KRW)</td>
<td>&lt; 1 million</td>
<td>35 (28.5)</td>
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<td></td>
<td>1–2.9 million</td>
<td>68 (55.3)</td>
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<td>3–4.9 million</td>
<td>17 (13.8)</td>
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<td>≥ 5 million</td>
<td>3 (2.4)</td>
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</tbody>
</table>

KRW: Korean won (1 million is approximately 800 US dollars).
†Multiple response; †fallopian tube cancer, vaginal cancer.
*(n = 75, 61.0%) *(Table 1).

Care-related characteristics
Roughly 2/3 (n = 82, 66.7%) were able to seek alternative help when caregiving support was needed, of which 57.3% (n = 47) were their parents. The number of months of caring for the wife was 1 to 6 months (n = 47, 39.2%), and 1 to 5 hours was most common (n = 88, 74.6%). Among the changes in spouse’s life after the diagnosis of gynecologic cancer, lack of leisurely time was most common (n = 39, 40.2%), followed by having new appreciation for wife and family (n = 26, 26.8%). Physical/mental burdens and housework/childcare burdens (both n = 13, 13.4%), as well as economic burdens (n = 6, 6.2%) were also noted. Seventeen spouses (13.8%) had health problems and medical costs were mostly covered by the spouse (n = 113, 91.7%) although parents or siblings also participated (n = 14, 11.7%). About half (n = 68, 55.3%) responded their monthly medical expenses were in the 1 million to 3 million KRW range (roughly 800–2,400 US dollars), and 17 people (13.8%) in the 3 million won to 5 million KRW (roughly 2,400–4,000 US dollars) range (Table 1).

Family function, family burden of care, family resilience, and coping
Family function was 75.83 ± 9.34 points out of 104 points, which was higher than midpoint. The burden of care perceived by the spouse was 74.00 ± 7.72 points out of 120 points, which was higher than midpoint. For family resilience, (1) social support was 57.85 ± 6.89 points out of 85 points, suggesting moderate or higher level; (2) family hardiness was 58.45 ± 6.75 points out of 80, suggesting moderate or higher level; and (3) problem-solving communication was 26.05 ± 2.07 points out of 40, suggesting moderate or higher level. Coping was 64.54 ± 9.37 points out of 96 points suggesting moderate or higher level (Table 2).

Differences in main variables according to the characteristics of spouse and patient
The burden of care (F = 2.49, p = .047) and coping (F = 2.49, p = .047) differed according to the spouse’s age. Spouses who had experienced work changes had significantly higher care burden (t = 3.22, p = .002), used more coping (t = 2.25, p = .026), and had higher family function scores (t = 2.72, p = .007) compared to spouses with no changes.

For the subcomponents of family resilience, there was a significant difference in social support by monthly income, and in family strength by number of children. Spouses with monthly income of 3 million to 5 million KRW (roughly 2,400–4,000 US dollars) had better social support than those in the < 3 million KRW ( < 2,400 US dollars) range by post-hoc test (F = 3.44, p = .035). Also by post-hoc analysis, families with two children showed higher family hardiness than those with one child (F = 5.46, p = .005).

Among the wife’s disease characteristics, the burden of care differed by gynecologic cancer stage (F = 3.01, p = .033). Family resilience in social support, family hardiness, and family function also differed by duration of the total treatment period. Post-hoc test of the total treatment period found that the degree of social support was higher in cases of > 1 year than those of 3- to 6 months (F = 4.48, p = .005); the degree of family hardiness was higher in cases of ≥ 13 months compared to those of 7- to 12 months (F = 3.54, p = .017); and family function was higher in cases of ≥ 13 months compared to 7- to 12 months (F = 4.14, p = .008). Also, burden of care, problem-solving communication, and coping were significantly different by monthly medical expenses (F = 3.29, p = .023). Post-hoc test of monthly medical expenses show that burden of care was higher in cases of 1 million
to 3 million KRW (roughly 800–2,400 US dollars) \( (F = 4.58, p = .005) \); and women in 1 million to 3 million KRW used more problem-solving communication than those in the \(< 1 \) million KRW \( (< 800 \) US dollars) group \( (F = 3.82, p = .012) \).

As for care characteristics, there were significant differences in social support, family strength, problem-solving communication, and family function according to availability of alternative help when needed. Those who had alternative help had higher social support \( (t = 2.64, p = .009) \), greater family hardiness \( (t = 2.62, p = .010) \), problem-solving communication \( (t = 3.09, p = .002) \), and family function \( (t = 2.02 \text{ and } p = .048) \) compared to their counterparts. The number of months of caring for wife was also significantly related to burden of care, social support, family strength, and coping. Spouses who cared for their wife for 7- to 12 months had a greater burden of care than those with 1 to 6 months of caring \( (F = 5.93, p = .004) \). Spouses with \( \geq 13 \) months of caring had more social support than those with 1- to 6 months \( (F = 3.51, p = .033) \), higher family hardiness than those with 7- to 12 months \( (F = 4.67, p = .011) \), and a higher degree of family coping than those with 1- to 6 months of caring \( (F = 3.21, p = .044) \) (Table 3).

### Relationships among family care burden, family resilience, coping, and family function

Family function in gynecologic cancer patient’s family was positively correlated with social support \( (r = .44, p < .001) \), family hardiness \( (r = .49, p < .001) \), problem-solving communication \( (r = .73, p < .001) \), and coping \( (r = .56, p < .001) \). However, burden of care was not significantly related to family resilience, coping, or family function. Family coping had a positive weak correlation with social support \( (r = .33, p < .001) \), family hardiness \( (r = .27, p = .002) \), and problem-solving communication \( (r = .43, p < .001) \). Among the subcomponents of family resilience, social support had a positive moderate correlation with family strength \( (r = .68, p < .001) \), problem-solving communication \( (r = .51, p < .001) \), and family hardiness \( (r = .62, p < .001) \) (Table 4).

### Factors affecting family function

Before multiple regression analysis, suitability of the data was confirmed through the assumption of the regression equation (normality, linearity multicollinearity) and residual diagnosis (normality of residuals, independence of errors, and equal variance). The Durbin-Watson value was 1.85, which was close to reference 2, securing the independence of the error. The tolerance limit \( (0.42–0.97) \) and the variance inflation factor \( (VIF) \), which was in the range of 1.02 to 2.37, indicated no problem in multicollinearity of the independent variables.

In Model 1, characteristics that were significant for family function were entered, i.e., spouse’s work change, total treatment period of wife, and alternative help when needed. This model was significant \( (F = 7.14, p < .001) \), with an explanatory power of 13.1%. Of the variables, spouse’s work change \( (\beta = .18, p = .036) \) and total duration of treatment \( (\beta = .26, p = .004) \) affected family function. Adding burden of care in Model 2, the total treatment period of the wife \( (F = 19, p = .003) \) and alternative help when needed \( (\beta = .18, p = .044) \) predicted family function with an explanatory power of 14.1% \( (F = 6.03, p < .001) \). Further adding social support, family hardiness, and problem-solving communication, as subcomponents of family resilience, in Model 3, the total duration of treatment for the wife \( (\beta = .19, p = .003) \) and problem-solving communication \( (\beta = .65, p < .001) \) had an explanatory power of 57.7% for family function \( (F = 24.55, p < .001) \). In Model 4, coping was added and the final regression model found that problem-solving communication \( (\beta = .56, p < .001) \) had the greatest influence on family function of gynecologic cancer families, followed by coping \( (\beta = .24, p < .001) \) and total treatment period of the wife \( (\beta = .17, p = .006) \). In other words, the higher the problem-solving communication, the higher coping, and total treatment period of \( \geq 1 \) year, the higher family function of the gynecologic cancer patient’s family could be expected. Model 4
<table>
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<tr>
<th>Variable</th>
<th>Categories</th>
<th>Family functioning</th>
<th>Burden of care</th>
<th>Problem-solving</th>
<th>Communication</th>
<th>Social support</th>
<th>Family resilience</th>
<th>Family hardness</th>
<th>p</th>
<th>t/F</th>
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<td>Age (year)</td>
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<td>41–50</td>
<td>51–60</td>
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<td>Monthly income (KRW)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer stage</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Characteristics of wives</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>KRW: Korean won (1 million is approximately 800 US dollars).</td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Table 3.** Comparison of family functioning, burden of care, family resilience and coping according to characteristics (N=123).

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Comparisons of family functioning, burden of care, family resilience and coping according to characteristics (N=123). The table presents various metrics such as age, work status, monthly income, cancer stage, and monthly medical expenses, along with statistical comparisons using t-tests and F-tests. The data includes mean and standard deviation values for each category.
Table 4. Relationships among study variables (N=123)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Burden of care</th>
<th>Family resilience</th>
<th>Coping</th>
<th>Family functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r (p)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family resilience</td>
<td>.01 (.964)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>-.11 (.225)</td>
<td>.68 (&lt;.001)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Family hardiness</td>
<td>.01 (.918)</td>
<td>.51 (&lt;.001)</td>
<td>.62 (&lt;.001)</td>
<td>1</td>
</tr>
<tr>
<td>Problem-solving communication</td>
<td>.17 (.063)</td>
<td>.33 (&lt;.001)</td>
<td>.27 (.002)</td>
<td>.43 (&lt;.001)</td>
</tr>
<tr>
<td>Coping</td>
<td>.14 (.130)</td>
<td>.44 (&lt;.001)</td>
<td>.49 (&lt;.001)</td>
<td>.73 (&lt;.001)</td>
</tr>
</tbody>
</table>

Table 5. Factors influencing family functioning (N=123)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β    t (p)</td>
<td>β    t (p)</td>
<td>β    t (p)</td>
<td>β    t (p)</td>
</tr>
<tr>
<td>Job status change</td>
<td>.18  2.12 (.036)</td>
<td>.14  1.54 (.126)</td>
<td>.09  1.32 (.188)</td>
<td>.06  .87 (.384)</td>
</tr>
<tr>
<td>Total treatment period</td>
<td>.26  2.98 (.004)</td>
<td>.27  3.12 (.002)</td>
<td>.19  3.06 (.003)</td>
<td>.17  2.78 (.006)</td>
</tr>
<tr>
<td>Alternative help when needed</td>
<td>.15  1.78 (.078)</td>
<td>.18  2.04 (.044)</td>
<td>-.00 -.07 (945)</td>
<td>.02  .31 (.760)</td>
</tr>
<tr>
<td>Burden of care</td>
<td>.14  1.56 (.122)</td>
<td>.12  1.83 (.070)</td>
<td>.09  1.49 (.140)</td>
<td></td>
</tr>
<tr>
<td>Family resilience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>.06  .74 (.460)</td>
<td>.01  .16 (.877)</td>
<td>.06  .38 (.704)</td>
<td></td>
</tr>
<tr>
<td>Family hardiness</td>
<td>.01  .12 (.902)</td>
<td>.03  .38 (.704)</td>
<td>.06  .71 (.001)</td>
<td></td>
</tr>
<tr>
<td>Problem-solving communication</td>
<td>.65  8.23 (.001)</td>
<td>.58  7.11 (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td></td>
<td></td>
<td></td>
<td>.24  3.71 (&lt;.001)</td>
</tr>
<tr>
<td>F (p)</td>
<td>7.14 (&lt;.001)</td>
<td>6.03 (&lt;.001)</td>
<td>24.55 (&lt;.001)</td>
<td>25.58 (&lt;.001)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.131</td>
<td>.141</td>
<td>.575</td>
<td>.617</td>
</tr>
<tr>
<td>ΔAdjusted R² (p)</td>
<td>.010 (.122)</td>
<td>.434 (&lt;.001)</td>
<td>.042 (&lt;.001)</td>
<td></td>
</tr>
</tbody>
</table>

The indicator groups were as follows: job status change (yes), total treatment period (> 1 year), and alternative help when needed (yes).

Discussion

The main factors affecting family function of gynecologic cancer patients identified through hierarchical multiple regression analysis were problem-solving communication, coping, and total treatment period of ≥ 1 year. Social support, family hardiness, and problem-solving communication, which were subareas of family resilience, were related to family function; and problem-solving communication was found to be the most important influencing factor on family function. These findings are in line with a previous study on families of cancer patients, that found level of social support of care providers had a significant positive correlation with their resilience [35], and another study on breast cancer survivors [29], which reported that higher family resilience was related to more use of problem-solving communication patterns. Our study provides further evidence for the literature on family function being linked to high resilience in families of terminal cancer patients [35], and family hardiness directly affecting family function in families of children with cancer [27]. As family communication is an important part of cognitive family function [33], our findings emphasize the importance of open communication within the family dealing with gynecologic cancer. As such, nursing interventions to strengthen family resilience can help affirm internal resources and improve family function through external support, such as a family resilience program for gynecologic cancer patients and family.

The level of coping of spouses was the second most significant influential factor on family function in gynecologic cancer. In the correlation analysis, coping had a positive relationship with social
support, family hardiness, and problem-solving communication, which are subfactors of family resilience. These findings further support prior literature that family hardiness supported caregiver’s positive coping in families of breast cancer patients [36] and that more social support indirectly affected family coping in families of breast cancer patients [17]. Our study also adds to existing knowledge from a prior study on breast cancer survivors, which found that the more positive patterns of problem-solving communication were used by the family, the more likely problem-solving and behavioral-coping strategies were used [29]. Therefore, nurses should be able to provide family education and counseling approaches that can improve the family’s coping skills in the midst of gynecologic cancer.

This study is also consistent with reports that the longer the treatment period of gynecologic cancer, the more positive effect on family function improvement [17], and that having alternative help available was linked with higher social support and lower care burden in families of cancer patients [37]. Given that the uncertain nature and progress of gynecologic cancer often requires long-term treatment and may cause changes in family function, this further underscores the need for supportive care of the family [38] and more studies that closely examine family function in gynecologic cancer.

On the other hand, there was no independent effect of the burden of care on gynecologic cancer family’s function, nor were there significant correlations with other independent variables. This finding differs from a previous study that reported a significant negative correlation of moderate strength between family function and family burden [39]. Our result may be interpreted that while spouses indeed have burden of care when the wife has gynecologic cancer, it does not appear to affect changes in family function, which may be related to family dynamics.

The burden of care in our sample was an average of 74.00 ± 7.72 points out of 120 points, showing a higher level of burden compared to the ‘normal’ level of care burden of 72 points [25]. Considering the age profile of the spouses (most in the 41–50-year age group), that 24.4% had experienced work changes, 68% had monthly medical expenses of < 3 million KRW, and 39.2% had a care period for 1 to 6 months, these factors to have increased the burden of caring. This level of care burden is similar to a study on breast cancer patients [16], which reported a moderate burden of care. As such, it seems that spouses of female cancer patients have a burden of care not only due to the wife’s cancer treatment but also linked to having to take on child rearing and housework-related care activities. However, since the burden of care may vary depending on family resilience [16,27,28,40–42], coping [18,38,43], and other characteristics of care [16,17,29,40,41,44,45], further study is necessary to explore these factors.

The levels of family resilience in our samples were all at moderate or higher scores for social support, family hardiness, and problem-solving communication. This is similar to another study that reported greater than midpoint scores of social supports of families of cancer patients that included breast cancer, uterine cancer, and ovarian cancer [40]. It also aligns with another study that found breast cancer patients’ spouses solve problems through social support asking for help to relieve the burden of multiple roles [41], and another study on spouses of young women with breast cancer [16] in which family support was high among social support subdomains. This suggests that when faced with stress and family crisis stemming from cancer, the family of gynecologic cancer patients has the resources to ask for help from neighboring groups and social. The level of family hardiness in this study is also similar to the moderate or higher level reported for cancer patient families [42]. This is because the strength of the family is the family’s resistance to stress and an adaptive resource, and supports how internal strength and durability of the family can overcome life tensions [28]. Finally, the level of problem-solving communication in this study was also similar to that in pediatric cancer families [27]. Spouses of gynecologic cancer patients appear to overcome the family’s difficulties by promoting family solidarity through communication, particularly aimed at problem solving.

For gynecologic cancer families, coping level was also greater than midpoint, similar to the level of coping reported for families of patients with various cancers, such as digestive, respiratory and genitourinary cancers [18]. Family function was also above medium level and was similar to the family function level reported by Korean spouses of breast cancer patients [43].

In this study, spouses noted significant differences in work status changes in caring burden, coping, and family function. Being absent from work or leaving work early to care for family may result in economic loss and possible medical cost burden [16,40]. Accordingly, if the spouse is the main care provider, the longer period of caring for the wife and greater burden of care such as housework, can lead to work changes. Our finding that the total treatment period affected significant differences in social support, family hardiness, and family function, supports a previous study that a longer treatment period makes the need for a social support system and stronger ties within the family all the more important, which is needed to strengthen overall family function [17]. As for the significant differences in burden of care, social
support, family hardiness, and coping according to the number of months of caring for wife, considering that family caregivers of cancer patients are required to learn adaptive care behaviors along the cancer process and face many difficulties without any preparation [44], as the wife’s care is prolonged, the spouse tries to relieve the burden of multiple roles by seeking social support [41]. Family hardiness also acts as the internal strength and durability in cancer patient families, especially with increasing care periods, and can be a driving force to overcome the crisis by cooperating with each other [29]. Our finding on gynecologic cancer spouses is similar to prior research on breast cancer, which found significant differences in spouse burden and coping according to the treatment stage, with spouses using more coping behaviors to reduce caring burden as caregiving months increased [45].

Among the characteristics related to care, there were significant differences in social support, family hardiness, problem-solving communication, and family function according to availability of alternative help when needed. This is similar to the result that family hardiness and communication improved when there were three caregivers as opposed to one [37]. Given that in families with high family function, more family members participate in the care of patients [37], alternative help from within and outside the family can be a great source of social support.

Thus, assessing whether supportive help is available may be needed to understand and promote family function, in addition to the possibility of change in spouse’s work patterns, and disease and treatment characteristics of gynecologic cancer patients.

This study focused specifically on spouses of gynecologic cancer patients rather than vaguely observing ‘family’ and was thus able to suggest directions for a spouse-focused family function study. However, as this study was conducted through convenience sampling through internet communities related to cancer, representation of the target sample may be insufficient. Also burden of care was measured as limited to the spouse’s experience, this may have affected why burden of care was not an influential factor for family function of gynecologic cancer patients. As such, future research that includes other family members’ role and caregiving burden is needed. Since the degree of care burden may vary depending on the cancer stage and treatment mode, future studies may also benefit from recruiting participants according to treatment completed and/or ongoing treatment status to better understand the burden of care and family function.

In conclusion, in order to help family function of gynecologic cancer patients, it is necessary to first assess the spouse’s care burden, and in particular, to check level of family resilience, coping, and family function; as an integrative way to see whether the couple with gynecologic cancer and family members function as a single system. In addition, strengthening the family’s individual support system by checking the degree of mobilizing support from relatives, neighbors, friends, colleagues, and public social services can reduce the burden on cancer families. This study confirmed that spouses of gynecologic cancer patients can have a positive effect on family function through positive communication and coping focused on problem-solving. Therefore, nurses can use findings to develop appropriate programs aimed at improving problem-solving communication and coping skills between the gynecologic cancer patient and spouse during the long-term treatment process.

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Authors’ contributions
Conceptualization, Formal analysis: Kim MK, Ahn SH; Data collection: Kim MK; Writing–original draft: Kim MK, Ahn SH; Writing–review & editing: Kim MK, Ahn SH.

Conflict of interest
Sukhee Ahn has been president of the Korean Society of Women Health Nursing since January 2022, and her term will continue until the end of 2023. The author is also statistical editor of Korean Journal of Women Health Nursing but was not involved in the review process. No other conflicts of interest are declared.

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Data availability
Please contact the corresponding author for data availability.

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None.
References


A menopausal transition model based on transition theory

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Purpose: The purpose of this study was to construct a hypothetical model based on Meleis and colleagues’ Transition Theory and a literature review to explain women's menopausal transition, constructing a modified model considering previous studies and model fit and testing the effects between variables.

Methods: With a correlational survey design, middle-aged Korean women aged 40 to 64 years who had experienced menopausal symptoms were recruited and filled out a self-administered study questionnaire. Measures included menopausal symptoms, resilience, social support, menopause management, menopause adaptation, and quality of life. The data were analyzed using SPSS 24.0 and AMOS 24.0.

Results: The model fit indices were considered acceptable: \( \chi^2 / \text{degree of freedom} = 2.93 \), standardized root mean residual = .07, comparative fit index = .90, and parsimonious normed fit index = .73. All eight direct-effect paths—from menopausal symptoms to support and adaptation, from support to adaptation and resilience, from resilience to adaptation and management, from management to quality of life, and from adaptation to quality of life—were significant. The explanatory power of the menopause transition model was 63.6%.

Conclusion: Women who experience menopausal symptoms may be able to maintain and improve their quality of life if menopause management and menopause adaptation are successful through resilience and social support. Future research is needed to confirm whether strengthening facilitation as a nursing intervention strategy may promote healthy response patterns.

Keywords: Middle-aged; Psychological adaptation; Psychological resilience; Quality of life; Social support

주요어: 중년; 적응; 회복탄력성; 삶의 질; 사회적 지지
**Summary statement**

- **What is already known about this topic?**
  Few studies have been conducted to explain how menopausal women try to overcome difficulties in management and adaptation through the menopause transition process.

- **What this paper adds**
  Development of a menopausal transition model based on Meleis and colleagues' Transition Theory and the literature found that resilience as an internal factor and social support as an external factor promoted a healthy menopause transition.

- **Implications for practice, education, and/or policy**
  The menopausal transition model is a useful framework for developing programs to strengthen resilience and social support for a healthy menopause transition.

**Introduction**

여성은 폐경을 경험하면서 월경의 변화와 더불어 안면홍조와 같은 신체적 증상, 집중 장애와 같은 정신적 증상, 가족 내 역할 변화, 사회적 지지체계 변화, 대인관계 상실로 인해 불안정한 상태를 경험한다[1,2]. 이에 간호사는 폐경이행을 경험하는 여성 대상을 대상으로 폐경증상 관리와 더불어 폐경 전·후 단계를 경험하며 통과하는 과정인 '이행'을 여성 생애주기의 정상적인 발달단계로 이해하고, 이들의 폐경기 적응과 삶의 질을 증진하려는 건강요구도에 부응할 수 있어야 한다.


- **Summary statement**
  - **What is already known about this topic?**
    Few studies have been conducted to explain how menopausal women try to overcome difficulties in management and adaptation through the menopause transition process.
  - **What this paper adds**
    Development of a menopausal transition model based on Meleis and colleagues' Transition Theory and the literature found that resilience as an internal factor and social support as an external factor promoted a healthy menopause transition.
  - **Implications for practice, education, and/or policy**
    The menopausal transition model is a useful framework for developing programs to strengthen resilience and social support for a healthy menopause transition.


1) 폐경이행기 여성의 폐경이행 과정을 설명하는 모형을 구축하고 실제 자료적 적합성을 검증한다.
2) 폐경이행의 구성요소인 폐경이행 속성, 폐경이행 조건, 폐경이행 반응패턴 관계에서 직접 및 간접 영향의 경로를 규명한다.

Meleis 등의 [17]의 이행이론에서 이행은 변화에 직면할 때 안정된 상태들 사이의 기간으로 한 상황에서 다른 상황으로의 통과라고 정의된다. 이행이론은 이행의 속성, 이행의 조건(촉진요소 및 장애요소), 반응패턴, 간호중재의 4가지 주요개념으로 구성된다. 이행이론을 기반으로 한 이행이행에 대한 개념적 기틀 및 가설모형은 Figures 1, 2와 같다.

폐경증상은 폐경이행 속성을 반영할 개념으로 대입할 수 있다. 이는 생애 주기인 중년기 여성의 내분비계 불균형으로 인한 신체 변화를 경험하는 발달과정이기에, 이행 유형과 불안정한 변화에 대해 적응과 관리가 미흡할 경우 질병으로 진행될 가능성이 있다[9]. 폐경이행은 신체적, 심리적, 사회적 조건으로 사라지지 않고 정서적, 논리적 변화를 경험할 때 발생한다[1]. 따라서 본 연구는 폐경증상은 폐경이행 속성으로, 외부적변화와 사회적 지지, 간호중재의 3가지 주요개념으로 구성된다. 이학문헌은 이행의 이행이론에 근거하여 폐경이행을 설명하기 위한 이론적 개념들을 구축하였다(Figure 1).

이러한 이론적 개념들을 기반으로 다음과 같은 가설모형을 구축하였다. 폐경증상은 외생변수로, 회복탄력성, 사회적 지지, 폐경기 적응, 폐경관리, 삶의 질을 내생변수로 구성하였다. 변수간의 관계는, 폐경증상은 사회적 지지에, 사회적 지지는 회복탄력성에, 회복탄력성은 폐경기적응과 폐경관리에, 폐경관리와 폐경기적응은 삶의 질에 영향을 미치는 경로를 설정하였다(Figure 2). 연구가설은 다음과 같다.

가설 1. 폐경증상은 사회적 지지에 직접적인 효과를 나타낼 것이다.
가설 2. 사회적 지지는 회복탄력성에 직접적인 효과를 나타낼 것이다.
가설 3. 회복탄력성은 폐경기적응에 직접적인 효과를 나타낼 것이다.
가설 4. 회복탄력성은 폐경관리에 직접적인 효과를 나타낼 것이다.
가설 5. 폐경기적응은 삶의 질에 직접적인 효과를 나타낼 것이다.
가설 6. 폐경관리는 삶의 질에 직접적인 효과를 나타낼 것이다.

Methods

Ethics statement: This study was approved by the Institutional Review Board of Chungnam National University (201801-SB-002-01). Informed consent was obtained from the participants.

연구 설계
축한 후 집중하는 상관성 조사 연구이다.

연구 대상
본 연구의 대상자는 폐경이행을 경험하는 여성이다. 대전광역시에 거주하는 만 40~64세의 중년여성 중 폐경증상을 경험하는 기혼 여성을 근접 모집단으로 하였다. 대상자 선정 기준은 주폐경기인 만 40~64세의 기혼이며 Menopause Rating Scale [25]로 평가한 폐경 증상 점수가 5점 이상으로 불규칙한 원경을 경험하거나 폐경 후 5년 이내인 여성이다. 대상자 제외기준은 자궁적출술이나 난소절제술로 인공 폐경이 된 자, 여성 호르몬 요법을 받고 있는 자, 만 42세 이전에 조기 폐경된 자이다. 연구자는 연구의 목적을 이해하고 자발적으로 참여에 동의하는 자를 선정 및 제외기준에 따라 임의 표
폐경관리는 연구 참여에 동의하고 설문지에 응답한 388명 중 불문한 응답자들을 제외한 359명의 여성을 이용한다. 이를 위해 우선도법을 가정한 구조방정식 모형에서 모델 적합도가 높도록 모델 적합도가 높아져 모델 적합도가 높아진 모델을 선택하였다. 본 도구는 정서적 지지도, 사회적 지지도, 물질적 지지도, 평가적 지지도, 정보적 지지도, 자가조절과 전문적 건강 관리 3문항, 자가조절과 식생활 관리 1문항과 자가조절 3문항으로 구성된다. 4점 Likert 척도로 '전혀 안 함' 1점에서 '항상 함' 4점으로 점수 범위는 21-84점이고 점수가 높은수록 폐경 관리를 잘 수행하는 것임을 의미한다. 도구 개발 당시 신뢰도는 Cronbach’s α=.82 [33]이었고, 본 연구의 신뢰도는 .80이었다.

폐경기 적응
폐경기 적응은 Bae [34]에 기반한 폐경기 적응 측정 도구로 측정하였다. 본 도구는 신체적 변화에 대한 적응 11문항, 자가노력 변화에 대한 적응 4문항, 역할 기능 변화에 대한 적응 11문항, 상호의존성 변화에 대한 적응 3문항의 4개 하위영역 총 29문항으로 구성되어 있다. 연구자가 직접 대면 모집을 하거나 연구보조원의 도움을 받아 연구 대상자를 모집하였다. 설문지 작성시간은 최대 35분이며, 총 130명 이상의サン플을 사용하여 연구의 목적과 방법을 설명하고 서면 동의서를 획득한 후 연구참여에 동의한 대상자에게 설문지를 배부하였다. 최종 대상자는 연구 참여에 동의하고 설문지에 응답한 359명 중 131명의 여성을 포함한 215배의 표본이 필요하다고 하였으므로 [26], 본 연구의 관측변수 21개의 15배인 315개 문항으로 측정하였다. 본 도구는 신체적 증상, 사회적 지지, 회복탄력성으로 구성된 총 3문항으로 점수 범위는 0~44점이고 점수가 높음을 의미한다. 도구 개발 당시 신뢰도는 Cronbach’s α=.86 [27]이었고, 본 연구의 신뢰도는 .84였다.

회복탄력성
회복탄력성은 Connor와 Davidson [18]에 기반한 탄력성 척도(Connor-Davidson Resilience Scale) 25문항을 Campbell과 Stein이 10문항으로 수정한 도구 [28]를 타당화한 한국어판 도구 [29]로 측정하였다. 본 도구는 신체적 증상, 정신적 증상, 비뇨생식기 증상, 3문항의 세 가지 하위영역으로 구성된 11문항의 5점 Likert 척도이며, '전혀 그렇지 않다' 0점에서 '매우 그렇다' 5점으로 점수 범위는 0~44점이고 점수가 높음을 의미한다. 도구 개발 당시 신뢰도는 Cronbach’s α=.85 [28]이었고, 본 연구의 신뢰도는 .84였다.

사회적 지지
사회적 지지는 Park [30]이 상인을 대상으로 개발한 사회적 지지 척도를 이용하여 25문항을 Kim [31]이 16문항으로 수정 보완한 도구로 측정하였다. 본 도구는 정서적 지지 4문항, 평가적 지지 5문항, 정보적 지지 3문항, 물질적 지지 4문항의 4개 하부 영역으로 구성되었다. 5점 Likert 척도로 '전혀 아니다' 0점에서 '매우 그렇다' 5점으로 점수 범위는 0~80점이고 점수가 높을수록 사회적 지지가 높음을 의미한다. 도구 개발 당시 신뢰도는 Cronbach’s α=.94 [31]이었고, 본 연구의 신뢰도는 .96이었다.

폐경관리
폐경관리는 Song [32]이 개발한 폐경관리 17문항 척도를 Choi 등 [33]이 21문항으로 추가 보완한 도구로 측정하였다. 이 도구는 활동과 운동 관리 3문항, 식생활 관리 3문항, 성생활 관리 4문항, 전문적 건강 관리 3문항, 자가조절 4문항에 식생활 관리 1문항과 자가조절 3문항으로 구성된다. 4점 Likert 척도로 '전혀 안 함' 1점에서 '항상 함' 4점으로 점수 범위는 21-84점이고 점수가 높음을 폐경 관리를 잘 수행하는 것임을 의미한다. 도구 개발 당시 신뢰도는 Cronbach’s α=.82 [33]이었고, 본 연구의 신뢰도는 .80이었다.

대상자 일반적 특성
대상자의 연령, 교육수준, 직업 여부, 소득수준, 거주형태, 월경 관행 특성, 건강행위 등을 설문지로 조사하였다.

자료수집 방법
자료수집 전에 도구 개발 또는 변역 저자로부터 이메일과 전화를 통해 최종도구에 대한 사용 허락을 받았다. 자료수집 기간은 2018년 4월 1일부터 2018년 6월 30일까지로, 40~64세 폐경증상이 있는 기존의 연구대상자에게 연구의 목적과 방법을 설명하고 서면 동의서를 획득한 후 연구참여자에 동의한 대상자에게 설문지를 배포하였고, 자가작성법을 통해 자료를 수집하였다. 설문 작성시간은 20~40분으로 설문지 작성 후 개인별로 봉투에 밀봉하여 수집하여 서류화하였고, 자발적 참여와 성실한 응답에 대한 보상으로 답례품을 제공하였다. 동의서와 설문지는 별도로 보관하였으며 수집된 자료는 코드 생성하여 자료를 보호하였다. 

출처: https://doi.org/10.4069/kjwhn.2022.08.16
화하고 파일은 암호를 지정하여 저장하여 연구 목적 외에는 연구자
외의 타인이 사용할 수 없도록 개인정보를 보호하였다.

자료분석 방법
수집된 자료는 IBM SPSS for Windows ver. 24.0과 AMOS ver.
24.0 (IBM Corp., Armonk, NY, USA)를 이용하여 분석하였다.
SPSS 프로그램을 이용하여 기술 통계, 차이검정, 상관관계, 신뢰도
분석을 하고, AMOS 프로그램을 이용하여 확인적 요인 분석과 경
로 분석을 시행하여 변수의 타당도, 모형적합도, 변수 간 직접효과, 간접효과, 종 효과, 설명력 등 구조방정식모형을 검증하였다.

측정변수 간 다중공선성을 확인하기 위하여 상관계수, 공차(
(standardized factor loading; standardized estimates), 잠재변수의 유의성(critical ration [C.R.] > 1.965), 개념신뢰도(construct reliability), 평균분산추
출(average variance extracted, AVE)을 통해 타당도 검증을 하였다.
가설모형의 적합도는 절대적합지수인 \( \chi^2 \), \( \chi^2 \)/degree of freedom (df), goodness of fit index (GFI), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), 증분적합지수인 Tucker–Lewis index (TLI), comparative fit index (CFI), incremental fit index (IFI), 간결합적지수인 parsimonious normed fit index (PNFI), Akaike information criterion (AIC) 등을 이용하여 평가하였다. 경로 분석은 경로계수의 유의성을 통해 검증
하였고, 부트스트래핑(bootstraping) (500회)을 적용하여 직접, 간
접, 종 효과의 유의성을 확인하였다.

Results
대상자의 일반적 특성
본 연구 대상자는 40–61세로 평균 연령은 47.80세였다. 교육수준
은 대학교 졸업이 231명(64.3%)이었고, 기록형태는 308명(85.8%)
이 가족과 함께 거주하였다. 경제상태는 286명(79.7%)이 중간으로,
직업이 있는 경우는 204명(56.8%)으로 응답했다. 월평 상법은 단
격적인 상법이 152명(42.3%), 불규칙적인 상법이 140명(39.0%), 폐경
후 상법이 67명(18.7%)이었으며 폐경 연령은 46–59세로 평균
52.03세였다. 대상자의 일반적 특성과 따른 삶의 질 차이검정 결과,
학력과 수입에 따라 삶의 질에 유의한 차이가 있었다. 즉 중학교 졸
업 이하 학력을 가진 여성의 삶의 질이 고등학교, 대학교, 대학원
졸업 학력을 가진 여성의 삶의 질보다 낮았다(F=8.56, p < .001). 또한
경제상태가 높은 군에 비해 중간 및 낮은 수준인 군에서 삶의 질이
낮았다(F=12.52, p < .001) (Table 1).

Table 1. Characteristics of the participants (N=359)
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>n (%)</th>
<th>Mean ± SD (range)</th>
<th>Quality of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td></td>
<td></td>
<td>Mean ± SD</td>
<td>t or F(p)</td>
</tr>
<tr>
<td>Level of education</td>
<td>≤ Middle school</td>
<td>7 (1.9)</td>
<td>70.14 ± 16.92</td>
<td>8.56 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>57 (15.9)</td>
<td>87.51 ± 12.47</td>
<td>a &lt; b, c, d</td>
</tr>
<tr>
<td></td>
<td>College</td>
<td>231 (64.3)</td>
<td>91.29 ± 12.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ Graduate school</td>
<td>64 (17.8)</td>
<td>93.11 ± 12.30</td>
<td></td>
</tr>
<tr>
<td>Living arrangement</td>
<td>As a couple</td>
<td>51 (14.2)</td>
<td>91.41 ± 15.67</td>
<td>0.49 (628)</td>
</tr>
<tr>
<td></td>
<td>With multiple families</td>
<td>308 (85.8)</td>
<td>90.47 ± 12.35</td>
<td></td>
</tr>
<tr>
<td>Economic status</td>
<td>Low</td>
<td>39 (10.9)</td>
<td>82.69 ± 13.21</td>
<td>12.52 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>286 (79.6)</td>
<td>90.91 ± 12.53</td>
<td>a &lt; b &lt; c</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>34 (9.5)</td>
<td>97.06 ± 10.85</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>No</td>
<td>155 (43.2)</td>
<td>89.31 ± 12.67</td>
<td>-1.67 (097)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>204 (56.8)</td>
<td>91.58 ± 12.93</td>
<td></td>
</tr>
<tr>
<td>Menstruation</td>
<td>Regular</td>
<td>152 (42.3)</td>
<td>91.44 ± 11.78</td>
<td>1.02 (361)</td>
</tr>
<tr>
<td></td>
<td>Irregular</td>
<td>140 (39.0)</td>
<td>90.58 ± 13.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Menopause</td>
<td>67 (18.7)</td>
<td>88.75 ± 13.73</td>
<td></td>
</tr>
</tbody>
</table>

†Bonferroni correction. *Age at menopause.
간의 상관관계 계수의 절대값은 0.59이하, 공차는 0.54에서 0.99, VIF는 1.02에서 1.86로 나타나, 상관관계 계수의 절대값 0.80 미만[20], 공차 0.1 이상, VIF 10 미만의 기준을 충족하여 다중공선성은 없는 것으로 판단하였다.

폐경이행 설명 모형의 검증
확인적 요인 분석
확인적 요인 분석을 통해 집중타당성과 판별타당성을 통한 측정모형의 타당도를 검증하였다. 우선 집중타당성은 표준화된 요인부하량과 임계치의 유의성, AVE와 개념신뢰도로 확인하였다. 요인부하량은 0.50에서 0.95, 유의성은 C.R. = 1.96 이상, 개념신뢰도는 0.70 이상, AVE는 0.50 이상일 때의 기준에 따라 집중타당성을 평가[26]한 결과, 모든 연구변수는 집중타당성을 갖고 있었다. 판별타당성은 가장 높은 변수 간 상관을 택하여 ’AVE는 상관계수의 제곱 값보다 크다’의 기준에 따라 판별타당성을 평가[26]한 결과, 본 연구의 변수도 판별타당성을 갖고 있음을 확인하였다(Table 2).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Standardized estimate</th>
<th>CR</th>
<th>AVE</th>
<th>MS</th>
<th>Re</th>
<th>SS</th>
<th>MA</th>
<th>MM</th>
<th>QoL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menopausal symptoms (MS)</td>
<td>12.88 ± 6.42</td>
<td></td>
<td>0.84</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somatic</td>
<td>4.62 ± 2.83</td>
<td></td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological</td>
<td>5.17 ± 2.74</td>
<td></td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urogenital</td>
<td>3.09 ± 2.34</td>
<td></td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resilience (Re)</td>
<td>26.04 ± 5.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support (SS)</td>
<td>61.33 ± 9.52</td>
<td></td>
<td>0.97</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional</td>
<td>15.45 ± 2.48</td>
<td></td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appraisal</td>
<td>19.30 ± 3.29</td>
<td></td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informational</td>
<td>11.28 ± 2.06</td>
<td></td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental</td>
<td>15.30 ± 2.65</td>
<td></td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menopause adaptation (MA)</td>
<td>96.35 ± 11.52</td>
<td></td>
<td>0.85</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>34.19 ± 5.94</td>
<td></td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self concept</td>
<td>14.57 ± 3.02</td>
<td></td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role function</td>
<td>36.85 ± 4.58</td>
<td></td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-dependence</td>
<td>10.73 ± 2.40</td>
<td></td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menopause management (MM)</td>
<td>50.97 ± 7.97</td>
<td></td>
<td>0.83</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity and exercise</td>
<td>6.97 ± 2.24</td>
<td></td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal</td>
<td>10.54 ± 2.39</td>
<td></td>
<td>0.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual life</td>
<td>7.94 ± 2.19</td>
<td></td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulating</td>
<td>19.72 ± 3.34</td>
<td></td>
<td>0.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>5.80 ± 2.10</td>
<td></td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of life (QoL)</td>
<td>90.60 ± 12.85</td>
<td></td>
<td>0.95</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>24.70 ± 4.37</td>
<td></td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological</td>
<td>20.62 ± 3.35</td>
<td></td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>27.57 ± 4.74</td>
<td></td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>10.67 ± 1.70</td>
<td></td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

AVE: Average variance extracted; CR: construct reliability.
가설적 모형의 검정 및 수정
가설적 모형의 적합도를 검증한 결과 절대적합지수인 $\chi^2/df=3.94$있으며 GFI = .84, RMSEA = .09, SRMR = .12였다. 중분적합지수인 CFI = .85이고 TLI = .82, IFI = .85있으며, 간명적합지수인 PNFI = .71, AIC = 818.29으로 적합도 지수는 권장기준에 충족되지 않았다. 이에 모형의 적합도를 높이기 위해 수정지수를 참조하여 사회적 지지가 폐경기 적용에 영향을 미치는 것[22]과 변수간 관계에 대한 경험적 근거를 탐색하여 폐경증상에 폐경기 적용에 대해 영향을 미치는 것[35]을 바탕으로 가설모형에 2개의 경로를 추가하고, 오차 간의 상관관계를 설정하는 등 수정모형을 설정하였다. 우선 수정지수 35.934, parameter change (Par Change) 0.157과 사회적 지지가 폐경기 적용에 영향을 미치는 [22] 선행연구를 근거로 폐경증상에서 사회적 지지로의 경로를 추가하였다. $\chi^2=653.93, \chi^2/df=3.57$, GFI = .85이고 RMSEA = .09, 중분적합지수인 CFI = .87, TLI = .85, IFI = .87이었으며 간명적합지수인 PNFI = .72, AIC = 749.93이었다. 폐경증상에서 폐경기 적용으로의 이론적 근거 [35]에 의한 경로를 추가하였다. $\chi^2=605.33, \chi^2/df=3.33$, GFI = .85이고 RMSEA = .08, 중분적합지수인 CFI = .88, TLI = .86, IFI = .88이었으며 간명적합지수인 PNFI = .73, AIC = 703.33이었다. 수정지수 26.26, Par Change 0.042를 근거로 오차인 e7과 e8을 연결하는 경로를 추가하였다. $\chi^2=574.48, \chi^2/df=3.17$, GFI = .86이고 RMSEA = .08, 중분적합지수인 CFI = .89, TLI = .87, IFI = .89있으며 간명적합지수인 PNFI = .73, AIC = 674.48이었다. 수정지수 18.87, Par Change -.077를 근거로 오차인 e14와 e17을 연결하는 경로를 추가하였다. $\chi^2=552.97, \chi^2/df=3.07$, GFI = .87이고 RMSEA = .08, 중분적합지수인 CFI = .89, TLI = .88, IFI = .89였으며 간명적합지수인 PNFI = .73, AIC = 654.97이었다. 수정지수 11.73, Par Change 0.037을 근거로 오차인 e1와 e16을 연결하는 경로를 추가하였다. $\chi^2=538.92, \chi^2/df=3.01$, GFI = .87이고 RMSEA = .08, 중분적합지수인 CFI = .90, TLI = .88, IFI = .90였으며 간명적합지수인 PNFI = .73, AIC = 642.92였다. 최종적으로 수정지수 7.45, Par Change 0.029를 근거로 오차인 e10과 e12를 연결하는 경로를 추가하였다 최종 수정모형의 적합도는 절대적합지수 $\chi^2=522.26, \chi^2/df=2.93$, GFI = .88, RMSEA = .07, SRMR = .07, 증분적합지수 CFI = .90, TLI = .88, IFI = .90, 간명적합지수 PNFI = .73, AIC = 628.2로 보여, 가설모형에 비해 향상되었다.

수정모형의 경로 분석 및 효과 검증
수정모형에서는 8개의 경로가 모두 유의하여 직접효과를 지지하였 다(Figure 3). 수정지수를 통한 수정모형의 가설에 대한 결과는 다음과 같다.
가설 1. 폐경증상은 사회적 지지에 직접적인 효과를 나타낼 것이다. 심한 폐경증상은 사회적 지지에 대하여 $\beta = -.32$로 부정적인 직접효과를 나타내므로 지지되었다.

![Figure 3. Modified hypothetical model.](https://doi.org/10.4069/kjwhn.2022.08.16)
가설 2. 사회적 지지는 회복탄력성에 직접적인 효과를 나타낼 것이다. 사회적 지지는 회복탄력성에 대하여 $\beta = .61$로 긍정적인 직접효과를 나타내므로 지지되었다.

가설 3. 회복탄력성은 폐경기 작용에 직접적인 효과를 나타낼 것이다. 회복탄력성은 폐경기 작용에 대해 $\beta = .20$으로 긍정적인 직접효과를 나타내므로 지지되었다.

가설 4. 회복탄력성은 폐경관리에 직접적인 효과를 나타낼 것이다. 회복탄력성은 폐경관리에 대해 $\beta = .52$로 긍정적인 직접효과를 나타내므로 지지되었다.

가설 5. 폐경기 작용은 삶의 질에 직접적인 효과를 나타낼 것이다. 폐경기 작용은 삶의 질에 대해 $\beta = .66$으로 긍정적인 직접효과를 나타내므로 지지되었다.

가설 6. 폐경관리는 삶의 질에 직접적인 효과를 나타낼 것이다. 폐경관리는 삶의 질에 대해 $\beta = .30$으로 긍정적인 직접효과를 나타내므로 지지되었다. 수정된 가설인 심한 폐경증상이 폐경기 작용에 대해 $\beta = -.44$로 부정적인 직접효과를 나타내므로 지지되었다. 사회적 지지가 폐경기 작용에 대해 $\beta = .48$로 긍정적인 직접효과를 나타내므로 지지되었다.

또한 수정모형의 내생변수에 대한 설명력을 삶의 질에 대해 63.6%, 폐경관리의 경우 27.5%, 폐경기 작용의 경우 76.0%였다.

간접효과를 나타낸 경로를 살펴보면, 심한 폐경증상은 사회적 지지를 통해서 회복탄력성($\beta = -.19$), 폐경기 작용($\beta = -.19$), 회복탄력성을 통해서 폐경기 관리($\beta = -.10$), 폐경기 작용과 관리로 대해 삶의 질 ($\beta = -.45$)에 부정적인 효과를 보였다. 반면 사회적 지지는 회복탄력성을 통해서 폐경기 작용($\beta = .12$) 및 폐경관리($\beta = .32$)에, 폐경기 작용 및 폐경관리를 통해서 삶의 질($\beta = .49$)에 긍정적 효과를 보였다. 또한 회복탄력성은 폐경기 작용과 폐경관리를 통해서 삶의 질($\beta = .29$)에 긍정적 효과를 보였다(Table 3).

통제변수가 포함된 수정모형의 분석 결과

대상자의 삶의 질에 유의한 차이를 보인 교육수준과 경제상태를 통제변수로 포함하여 수정모형을 분석한 결과, 이행반응 패턴에 대해 수정모형 경로에 유의한 차이가 나타나지 않았다. 즉 수정모형에 대한 통제변수의 영향력은 나타나지 않았다.

Discussion

본 연구는 이행이론을 기반으로 폐경이행을 설명하기 위해 문헌고찰에 따라 문헌고찰에 따른 가설모형을 구축하였고, 가설모형과 수정한 모형을 검증하였다. 수정모형 검증 결과 폐경증상이 사회적 지지와 회복탄력성을 통해 폐경관리와 폐경기 작용을 통과하여 삶의 질에 도달하게 되는 과정을 확인하였기에 이에 대해 논의하고자 한다.

본 연구의 이행이론을 근거로 한 가설모형은 집중타당성과 판별타당성을 통해 연구변수의 타당성을 검증하였다. 모델적합도를 측정한 결과 본 연구의 가설모형은 모델적합도 지수의 권장기준을 충족하지 못하였다. 이에 수정지수에 근거하여 사회적 지지가 폐경기 작용을 촉진하고, 폐경증상이 심하게 호소함수로 폐경기 작용 수준은 낮을 때는 선행연구에 근거하여 폐경기 작용에 각각 직접 경로를 추가한 결과, 수정모형의 적합도가 향상되었다. 이행이론을 기반으로 부분적인 이행이행 조건이 자아정체감과 삶의 질로 설정된 폐경이행 반응패턴에 직접 효과를 나타낼 검증한 Hong과 Kang [1]의

### Table 3. Standardized direct, indirect, and total effects in the modified theoretical model

<table>
<thead>
<tr>
<th>Endogenous variable</th>
<th>Exogenous variable</th>
<th>SMC</th>
<th>Standardized direct effect, $\beta$ (CI)</th>
<th>Standardized indirect effect, $\beta$ (CI)</th>
<th>Standardized total effect, $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social support</td>
<td>Menopausal symptoms</td>
<td>.10</td>
<td>-0.32 (–0.44 to –0.19)</td>
<td>-0.19 (–0.27 to –0.11)</td>
<td>-0.32</td>
</tr>
<tr>
<td>Resilience</td>
<td>Menopausal symptoms</td>
<td>.37</td>
<td>-0.19 (–0.30 to –0.01)</td>
<td>-0.12 (–0.19)</td>
<td>-0.61</td>
</tr>
<tr>
<td>Menopause adaptation</td>
<td>Menopausal symptoms</td>
<td>.76</td>
<td>-0.44 (–0.60 to –0.30)</td>
<td>-0.19 (–0.27 to –0.12)</td>
<td>-0.63</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>.61</td>
<td>-0.03 (0.53–0.68)</td>
<td>-0.12 (0.06–0.19)</td>
<td>-0.60</td>
</tr>
<tr>
<td>Resilience</td>
<td></td>
<td>.48</td>
<td>-0.34 (0.34–0.61)</td>
<td>-0.10 (0.10–0.32)</td>
<td>-0.20</td>
</tr>
<tr>
<td>Menopause management</td>
<td>Menopausal symptoms</td>
<td>.28</td>
<td>-0.10 (–0.15 to –0.06)</td>
<td>-0.32 (0.23–0.41)</td>
<td>-0.40</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>.52</td>
<td>-0.40 (0.40–0.65)</td>
<td>-0.65 (0.40–0.65)</td>
<td>-0.80</td>
</tr>
<tr>
<td>Resilience</td>
<td></td>
<td>.64</td>
<td>-0.45 (–0.54 to –0.34)</td>
<td>-0.49 (0.19–0.60)</td>
<td>-0.54</td>
</tr>
<tr>
<td>Quality of life</td>
<td>Menopausal symptoms</td>
<td>.66</td>
<td>-0.49 (0.39–0.60)</td>
<td>-0.29 (0.20–0.39)</td>
<td>-0.78</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>.30</td>
<td>-0.54 (0.54–0.77)</td>
<td>-0.66</td>
<td>-0.40</td>
</tr>
<tr>
<td>Resilience</td>
<td></td>
<td>.30</td>
<td>-0.14 (0.14–0.44)</td>
<td>-0.30</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

SMC: Squared multiple correlations.
연구와 달리, 본 연구에서는 이행조건, 반응패턴까지 통과하는 이행이론의 몫을 유도한 설명모형을 검증하여 이론의 유용성을 확인하였다.

수정모형의 경로에 대해 모두 유의한 직접, 간접 효과를 검증하여 폐경이행 과정의 경로 설정이 적절한 것으로 확인하였다. 회복탄력성과 사회적 지지가 폐경기 적응과 폐경관리에 유의한 영향을 미친 것으로, 이행모형의 조건이 이행과정에서 중간 효과를 지니는 것이다. 폐경기 적응과 폐경관리가 삶의 질에 영향을 미친 것은 폐경기행의 틀을 유도한 설명모형을 검증하여 이론의 유용성을 확인하였다.

수정모형의 경로에 대해 모두 유의한 직접, 간접 효과를 검증하여 폐경이행 과정의 경로 설정이 적절함을 확인하였다. 회복탄력성과 사회적 지지가 폐경기 적응과 폐경관리에 유의한 영향을 미친 것으로, 이행모형의 조건이 이행과정에서 중간 효과를 지니는 것이다. 폐경기 적응과 폐경관리가 삶의 질에 영향을 미친 것은 폐경기행의 틀을 유도한 설명모형을 검증하여 이론의 유용성을 확인하였다.

폐경기행조건인 회복탄력성과 사회적 지지는 폐경관리와 폐경기 적응을 통해 삶의 질에 영향을 미친 것으로, 이행모형의 조건이 이행과정에서 중간 효과를 지니는 것이다. 폐경기행조건의 틀을 유도한 설명모형을 검증하여 이론의 유용성을 확인하였다.
Data availability

Please contact the corresponding author for data availability.

Acknowledgments

None.

References


Comparison of health behaviors of adult women in Korea before and during the COVID-19 pandemic: secondary analysis of the Korea National Health and Nutrition Examination Survey 2019–2020

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Purpose: This study investigated the changes in the health-related behaviors of adult women in Korea during the coronavirus disease 2019 (COVID-19) pandemic.

Methods: Data from the eighth Korea National Health and Nutrition Examination Survey (2019-2020) were analyzed. The participants were 4,848 women aged 19 to 64 years in 2019 and 2020. Data analysis using the complex sampling design was performed using SPSS 20.1.

Results: Positive changes during the pandemic compared to before the pandemic in Korean adult women were found for improved subjective oral health perceptions (odds ratio [OR], 1.77; \( p < .001 \)), increased moderate-intensity exercise in work and leisure activities (OR, 1.75; \( p < .001 \) and OR; 1.29, \( p = .004 \)), and a decrease in secondhand smoke exposure at the workplace and in public places (OR, 0.64; \( p = .004 \) and OR, 0.60; \( p < .001 \)). However, the following negative health behavior changes were found: decreased frequency of walking 5 days a week (OR, 0.81; \( p = .011 \)) and an increase in unhealthy daytime sleep durations (OR, 1.40; \( p = .006 \)).

Conclusion: Compared to before the COVID-19 pandemic, Korean adult women perceived their subjective dental health more positively during the COVID-19 pandemic, decreased their exposure to secondhand smoke at work and in public places, decreased walking, and increased sleep duration during the week. Since this study only compared data between 1 year before and after the start of the pandemic, it is necessary to investigate a longer period of time in the future. A future study should attempt to identify the factors related to changes in health behaviors caused by the pandemic.

Keywords: COVID-19; Health behavior; Pandemics; Republic of Korea; Women

Introduction

The spread of coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and considered the largest global health crisis of the 21st century, first started in Wuhan, China, in December 2019 and quickly spread around the world. On March 11, 2020, the World Health Organization (WHO) officially declared it a pandemic [1,2]. As of June 29, 2022, more than 545 million people have been infected worldwide and more than 6.33 million people have died of COVID-19 worldwide; thus, COVID-19 has been confirmed as a strongly contagious, fatal, and serious acute respiratory syndrome [2,3]. Although therapeutics and prophylactic vaccines for this novel virus have been developed and applied, grad-
Summary statement

• What is already known about this topic?
The coronavirus disease 2019 (COVID-19) pandemic has had a wide range of effects around the world. In this crisis situation, vulnerable populations in society are likely to experience inequalities in health care.

• What this paper adds
Changes in health-related behavior of Korean adult women during the COVID-19 pandemic were identified using data from before and after the start of the COVID-19 pandemic. Decreased walking and increased sleep duration may suggest potential health problems in the future.

• Implications for practice, education, and/or policy
These data should be used to inform strategies for promoting women’s health by analyzing more diverse influencing factors in pandemic situations.
and health have generally focused on the pandemic's effects on mental health [1,16], and the study participants were often limited to older adults or children and adolescents [8,17]. No study has yet investigated health behaviors in all Korean adult women during the pandemic through a comparison of data collected in the first year of the spread of COVID-19 with data obtained before the pandemic. As such, in this study, we attempted to understand changes in adult women's health behaviors in association with the pandemic. This study compared and analyzed data from the 2019 Korea National Health and Nutrition Examination Survey (KNHANES), which was not affected by COVID-19, and from the 2020 KNHANES, which was conducted after the start of the COVID-19 pandemic, to examine changes in adult women's health behaviors during the pandemic. Since the KNHANES contains data on representative samples of the Korean people, these surveys could provide reliable data on the health behaviors of Korean women in the first year of the pandemic.

The purpose of this study was to identify changes in the health behaviors of Korean women during the COVID-19 pandemic for use as basic data to establish strategies to improve women's health in a similar global or national emergency in the future. The specific objectives of this study were as follows:

1. To compare the general characteristics of Korean adult women before and after the start of the COVID-19 pandemic.
2. To compare the health behaviors of Korean adult women before and after the start of the COVID-19 pandemic.
3. To identify changes in health behaviors of Korean adult women during the COVID-19 pandemic compared to their health behaviors before the pandemic.

**Methods**

**Ethics statement:** This study was a secondary analysis using the National Health and Nutritional Survey data and the data were received in an anonymous format. As such, Institutional Review Board approval was not sought, but the study adhered to the principles of the Helsinki Declaration.

**Study design**

This study is a secondary analysis using 2 years of data from the eighth KNHANES conducted by the Korea Disease Control and Prevention Agency in 2019 (before the COVID-19 pandemic) and in 2020 (during the COVID-19 pandemic) to identify changes in the health behaviors of Korean adult women during the COVID-19 pandemic. The study was reported in compliance with the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines (https://www.strobe-statement.org/).

**Study participants**

This study included a total of 4,848 adult women aged 19 to 64 years who participated in the first year of the eighth KNHANES (2019) conducted from January 2019 to December 2019 by the Korea Disease Control and Prevention Agency and the second year of the eighth KNHANES (2020) conducted from January 2020 to December 2020. In the first year of the eighth KNHANES (2019), there were a total of 8,110 participants, of whom 4,381 were women and 2,534 were adult women aged 19 to 64 years. In the second year of the eighth KNHANES (2020), the total number of participants was 7,359, of whom 3,945 were women and 2,314 were adult women aged 19 to 64 years (Figure 1).

**Measurements**

**General characteristics**

The general characteristics analyzed in this study were age, total household income, education level classification, marital status, occupation classification, unemployment/no financial activity, the number of household members, and head of household status recorded in the health questionnaire of the KNHANES. Age was classified as 19–29 years, 30–39 years, 40–49 years, 50–59 years, and 60–64 years. Income was divided into five levels according to the monthly average equalized household income based on the household income investigated using an open-ended question: low, middle-low, middle, middle-high, and high. Education level was classified into ≤ elementary school, middle school, high school, and ≥ university. Marital status was classified depending on whether the participant had ever been married into unmarried and married, and the married category was further divided into “married, with spouse” for cases of spousal cohabitation and “married, without spouse” for cases of separation, bereavement, and divorce. Based on the occupation classification and unemployment/economic inactivity status, occupation was denoted as “no” for the unemployed and “yes” for the rest. Household type was classified as one-person for single-person households and multi-person for the rest. The head of household status was classified as “yes” or “no.”

**Health behaviors**

Health behaviors were assessed using the following data from the health questionnaire and health examination survey of the KNHANES: subjective health perception; self-perception of dental
health status; perceived stress level; fulfillment of necessary medical services; history of unmet dental needs, health checkup, dental examination, cancer screening, and vaccination against influenza; frequency of drinking and binge drinking in one year; damage caused by someone else’s drinking in the past 1 year (noise, assault, sexual harassment, accidents at work or in daily life, drunk driving accidents, and others); history and current status of cigarette smoking; exposure to indoor secondhand smoke at home, work, or public places; history of obesity; high- and moderate-intensity physical activity (work, leisure); number of days of walking per week; number of days of strength training per week; time spent sitting per day; and average sleep duration per day on weekdays and weekends.

Subjective perception of health: Subjective perception of health and dental health were classified as “good” for responses of “good” and “excellent,” “ordinary” for a response of “ordinary,” and “poor” for responses of “poor” and “very poor,” referring to previous studies on perceptions of one’s own health and dental health [18,19]. Referring to previous studies on perceived daily stress [20], perceived stress was classified as “yes” for responses of “severe” and “a lot” of stress and as “no” for responses of “a little” and “hardly stressed.”

Health care service use: For experiences of missed medical care and dental treatment during the previous year, responses regarding whether hospital and clinic (excluding dentistry) visits were needed but skipped during the past year and experience in which dental treatment was necessary but not received were classified into “yes” or “no.” For health checkups and cancer screening, experiences of health checkups and cancer screening over the past 2 years were classified as either “yes” or “no,” and participants’ experiences of dental checkups were classified as “yes” or “no” based on the past 1-year history of dental checkups. Influenza vaccination was classified as “yes” and “no” according to whether or not participants had received an influenza vaccination during the last year.

Alcohol consumption: This was categorized using the frequency of drinking and the frequency of female binge drinking in the past year (the number of having more than five drinks on one occasion, regardless of whether it was soju or a Western alcoholic beverage) as “non-drinking” if there was no history of drinking in the past year, “drinking” if there was a history of drinking but no binge drinking in the past year, and “risky drinking” if there was a history of drinking and binge drinking in the past year. Damage caused by others’ drinking was classified as “yes” if there was at least one experience of damage caused by someone else’s drinking in the past year (noise, assault, sexual harassment, accidents at work or daily life, drunk driving accidents, and others) and “no” if there was no such experience.

Smoking: Smoking was classified as “yes” for daily and occasional smoking and “no” for past history of smoking but no current smoking and no lifetime history of smoking based on a question about participants’ cigarette smoking status. Exposure to second-hand smoke at home, work, and public places was classified as “yes” or “no” depending on whether or not they had inhaled oth-
Body mass index: Body mass index was classified as obese for stage 1, 2, and 3 obesity, overweight for one stage below obesity (≥ 23 and < 25 kg/m²), “normal” for normal (≥ 18.5 and < 23 kg/m²), and “low” for underweight (< 18.5 kg/m²), according to standard classifications used to analyze the prevalence of obesity [21].

Physical activity: High-intensity physical activity (work) was classified as “yes” or “no” depending on whether participants engaged in high-intensity physical activities that cause intense shortness of breath and a fast heart rate for 10 minutes or more (e.g., lifting or carrying heavy objects, digging, working at a construction site, carrying objects upstairs, etc.). Moderate-intensity physical activity (work) was classified as “yes” or “no” depending on whether participants engaged in moderate-intensity physical activities that cause slight shortness of breath and a slightly fast heart rate for 10 minutes or more (carrying light objects, cleaning, and child-rearing [bathing, lifting, hugging, etc.]).

High-intensity physical activity (leisure) was classified as “yes” and “no” depending on whether participants engaged in high-intensity sports, exercises, and leisure activities (other than work-related activities) that cause intense shortness of breath and a fast heart rate for 10 minutes or more on a regular basis (running, rope jumping, hiking, basketball, swimming, badminton, etc.). Moderate-intensity physical activity (leisure) was classified as “yes” or “no” depending on whether participants engaged in moderate-intensity sports, exercises, and leisure activities that cause slight shortness of breath and a slightly fast heart rate for 10 minutes or more on a regular basis (running, weight training, golf, dance sports, Pilates, etc.).

Walking and strength training: For walking and strength training, data on the number of days of walking (walking for 10 minutes or over) and strength training (push-ups, sit-ups, dumbbells, weights, and iron bars, etc.) per week were used. Since the WHO recommends engaging in aerobic exercise at least five times a week and strength training at least two times a week for adults [22], the number of walking days per week was classified into ≤ 4 days and ≥ 5 days, and the number of days of strength training per week was classified into < 2 days and ≥ 2 days.

Sitting time: This was analyzed using data on the time spent sitting on a daily basis (the time spent sitting or lying down per day, excluding the time for sleeping). Since the death rate is reported to increase when the sitting time is more than 10 hours per day [23], we classified open-ended responses for the usual amount of time spent sitting per day into < 10 hours and ≥ 10 hours.

Sleep duration: Regarding weekday/weekend sleep duration, data on sleep duration on weekdays (or working days) and weekends (or nonworking days, the days before nonworking days) were used. Long or short sleep influences health. Referring to a previous study [24] that classified a sleep duration ≤ 6 hours as short sleep and a sleep duration ≥ 9 hours as long sleep, we classified open-ended responses for weekday and weekend sleep duration as ≤ 6 hours, 7–8 hours, and ≥ 9 hours.

Data collection and analysis

The data of this study were basic data downloaded from the raw database of 2019 and 2020 after completing the statistical data user compliance requirement form and user information registration on the KNHANES website. The downloaded data were analyzed using IBM SPSS ver. 20.1 (IBM Corp., Armonk, NY, USA). Since the sample of the KNHANES was extracted using the two-step stratified cluster sampling, data analysis was performed using complex sample analysis considering the layer, cluster, and weight. Since the 2019 and 2020 data were combined, combined weights were calculated and applied. The Rao-Scott composite sample chi-square test was conducted to analyze differences to compare general characteristics and health behaviors of adult women in 2019 (before the COVID-19 pandemic) and in 2020 (during the COVID-19 pandemic). Complex sample logistic regression analysis was performed to examine the health behavior changes of adult women in 2020 (during the COVID-19 pandemic) and 2019 (before the COVID-19 pandemic).

Results

General characteristics

The largest number of participants belonged to the 50- to 59-year-old age group, accounting for 24.8% in 2019 and 24.7% in 2020, and the most common income group was “high,” in 29.0% of the participants in 2019 and in 29.2% in 2020. Almost half of the participants had university degrees or higher (48.8% in 2019 and 48.0% in 2020). Married and living with a spouse was the most common marital status, at 69.2% in 2019 and at 65.4% in 2020. The majority of participants were employed (61.3% in 2019 and 60.1% in 2020), and there were more

https://doi.org/10.4069/kjwhn.2022.08.22
multi-person households (92.8% in 2019 and 93.9% in 2020) than one-person households. Most participants were not the head of the household (67.7% in 2019 and 68.4% in 2020). None of the general characteristics of the participants showed statistically significant differences between 2019 and 2020 (Table 1).

Differences in the health behaviors of adult women between before and during the pandemic

In adult women, health behaviors in 2020 (during the pandemic) showed differences from those in 2019 (before the pandemic) in terms of subjective perception of dental health, unmet dental needs, exposure to secondhand smoke at work and in public places, moderate-intensity work and leisure activities, walking, and weekday sleep duration.

Subjective dental health perceptions of “ordinary” and “poor” decreased from 2019 to 2020, whereas “good” perceptions increased from 13.8% to 22.0% ($\chi^2 = 50.15$, $p \leq .001$). Missed dental treatment increased from 30.1% in 2019 to 42.6% in 2020 ($\chi^2 = 65.97$, $p < .001$). Exposure to secondhand smoke at work decreased from 12.1% in 2019 to 8.1% in 2020 ($\chi^2 = 12.65$, $p = .004$), and exposure to secondhand smoke in public places also decreased from 17.5% in 2019 to 11.2% in 2020 ($\chi^2 = 38.63$, $p < .001$). The percentage of women engaged in moderate-intensity work activities increased from 4.9% in 2019 to 8.2% in 2020 ($\chi^2 = 21.26$, $p < .001$). The percentage of women who engaged in moderate-intensity leisure activities increased from 23.5% in 2019 to 24.4% in 2020 ($\chi^2 = 12.87$, $p = .011$). The percentage of women who slept 7 to 8 hours during weekdays decreased, while that of women who slept $\geq 9$ hours increased from 9.1% in 2019 to 12.3% in 2020 ($\chi^2 = 14.91$, $p = .007$) (Table 2).

Changes in the health behaviors of adult women during the pandemic

Complex sample logistic regression analysis was conducted for the health behaviors of adult women that showed significant differences between 2019 and 2020, including subjective perception of dental health, unmet dental needs, exposure to secondhand smoke at work and in public places, moderate-intensity work and leisure activities, walking, and weekday sleep duration.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>2019 (n = 2,534)</th>
<th>2020 (n = 2,314)</th>
<th>$\chi^2$ ($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>19–29</td>
<td>362 (20.5 (1.1))</td>
<td>401 (20.9 (1.1))</td>
<td>0.58 (.980)</td>
</tr>
<tr>
<td></td>
<td>30–39</td>
<td>503 (20.4 (1.2))</td>
<td>430 (19.8 (1.1))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40–49</td>
<td>630 (23.6 (1.1))</td>
<td>550 (23.4 (1.2))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50–59</td>
<td>697 (24.8 (0.9))</td>
<td>580 (24.7 (1.0))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60–64</td>
<td>342 (10.7 (0.7))</td>
<td>353 (11.2 (0.7))</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>Low</td>
<td>161 (6.2 (0.7))</td>
<td>153 (6.2 (0.7))</td>
<td>6.58 (.560)</td>
</tr>
<tr>
<td></td>
<td>Middle-low</td>
<td>415 (15.7 (1.0))</td>
<td>321 (13.2 (1.0))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>563 (22.5 (1.2))</td>
<td>539 (23.3 (1.1))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Middle-high</td>
<td>661 (26.7 (1.1))</td>
<td>642 (28.1 (1.2))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>721 (29.0 (1.7))</td>
<td>655 (29.2 (1.9))</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>≤ Elementary school</td>
<td>179 (6.2 (0.6))</td>
<td>141 (4.8 (0.6))</td>
<td>6.13 (.366)</td>
</tr>
<tr>
<td></td>
<td>Middle school</td>
<td>186 (6.3 (0.6))</td>
<td>177 (6.3 (0.6))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>926 (38.7 (1.3))</td>
<td>867 (40.9 (1.5))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ University</td>
<td>1,149 (48.8 (1.6))</td>
<td>1,022 (48.0 (1.7))</td>
<td></td>
</tr>
<tr>
<td>Marriage</td>
<td>Unmarried</td>
<td>452 (22.4 (1.2))</td>
<td>532 (26.5 (1.2))</td>
<td>11.03 (.054)</td>
</tr>
<tr>
<td></td>
<td>Married, without spouse</td>
<td>253 (8.4 (0.7))</td>
<td>239 (8.1 (0.7))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married, with spouse</td>
<td>1,829 (69.2 (1.3))</td>
<td>1,541 (65.4 (1.4))</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>No</td>
<td>979 (38.7 (1.3))</td>
<td>899 (39.9 (1.4))</td>
<td>0.78 (.522)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1,555 (61.3 (1.3))</td>
<td>1,415 (60.1 (1.4))</td>
<td></td>
</tr>
<tr>
<td>Household type</td>
<td>One-person</td>
<td>207 (7.2 (0.7))</td>
<td>169 (6.1 (0.8))</td>
<td>2.05 (.366)</td>
</tr>
<tr>
<td></td>
<td>Multi-person</td>
<td>2,327 (92.8 (0.7))</td>
<td>2,145 (93.9 (0.8))</td>
<td></td>
</tr>
<tr>
<td>Household head</td>
<td>No</td>
<td>1,672 (67.7 (1.2))</td>
<td>1,532 (68.4 (1.3))</td>
<td>0.25 (.709)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>862 (32.3 (1.2))</td>
<td>782 (31.6 (1.3))</td>
<td></td>
</tr>
</tbody>
</table>

¹Unweighted and valid frequency, ²valid percentage.
Table 2. Differences in health behaviors in 2019 and 2020

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>2019 (n = 2,534)</th>
<th>2020 (n = 2,314)</th>
<th>χ² (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n †</td>
<td>% ‡ (SE)</td>
<td>n †</td>
</tr>
<tr>
<td>Perceived health status</td>
<td>Poor</td>
<td>387</td>
<td>15.4 (0.9)</td>
<td>389</td>
</tr>
<tr>
<td></td>
<td>Ordinary</td>
<td>1,328</td>
<td>54.2 (1.2)</td>
<td>1,183</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>728</td>
<td>30.4 (1.1)</td>
<td>637</td>
</tr>
<tr>
<td>Perceived dental health status</td>
<td>Poor</td>
<td>765</td>
<td>34.4 (1.4)</td>
<td>662</td>
</tr>
<tr>
<td></td>
<td>Ordinary</td>
<td>1,154</td>
<td>51.8 (1.7)</td>
<td>961</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>300</td>
<td>13.8 (1.2)</td>
<td>472</td>
</tr>
<tr>
<td>Perceived stress</td>
<td>No</td>
<td>1,748</td>
<td>68.4 (1.0)</td>
<td>1,546</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>757</td>
<td>31.6 (1.0)</td>
<td>758</td>
</tr>
<tr>
<td>Unmet medical needs</td>
<td>No</td>
<td>2,229</td>
<td>92.9 (0.6)</td>
<td>1,948</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>187</td>
<td>7.1 (0.6)</td>
<td>184</td>
</tr>
<tr>
<td>Unmet dental needs</td>
<td>No</td>
<td>1,376</td>
<td>51.8 (1.4)</td>
<td>1,094</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>625</td>
<td>48.2 (1.5)</td>
<td>816</td>
</tr>
<tr>
<td>Medical checkup</td>
<td>No</td>
<td>779</td>
<td>51.5 (1.2)</td>
<td>767</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1,662</td>
<td>48.5 (1.2)</td>
<td>1,527</td>
</tr>
<tr>
<td>Dental checkup</td>
<td>No</td>
<td>1,402</td>
<td>51.2 (1.2)</td>
<td>1,293</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1,033</td>
<td>48.8 (1.2)</td>
<td>897</td>
</tr>
<tr>
<td>Cancer screening</td>
<td>No</td>
<td>801</td>
<td>36.8 (1.2)</td>
<td>801</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1,640</td>
<td>63.2 (1.2)</td>
<td>1,406</td>
</tr>
<tr>
<td>Influenza vaccination</td>
<td>No</td>
<td>1,516</td>
<td>62.9 (1.3)</td>
<td>1,318</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>925</td>
<td>37.1 (1.3)</td>
<td>899</td>
</tr>
<tr>
<td>Drinking</td>
<td>Non-drinking</td>
<td>676</td>
<td>26.3 (1.0)</td>
<td>655</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
<td>795</td>
<td>30.1 (1.1)</td>
<td>673</td>
</tr>
<tr>
<td></td>
<td>Risky drinking</td>
<td>1,033</td>
<td>43.6 (1.2)</td>
<td>976</td>
</tr>
<tr>
<td>Damage caused by others’ drinking</td>
<td>No</td>
<td>2,304</td>
<td>92.1 (0.6)</td>
<td>2,109</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>201</td>
<td>7.9 (0.6)</td>
<td>195</td>
</tr>
<tr>
<td>Smoking</td>
<td>No</td>
<td>2,351</td>
<td>93.5 (0.7)</td>
<td>2,164</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>154</td>
<td>6.5 (0.7)</td>
<td>140</td>
</tr>
<tr>
<td>Secondhand smoke exposure in the home</td>
<td>No</td>
<td>201</td>
<td>56.1 (3.7)</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>172</td>
<td>43.9 (3.7)</td>
<td>134</td>
</tr>
<tr>
<td>Secondhand smoke exposure in the workplace</td>
<td>No</td>
<td>1,337</td>
<td>87.9 (1.0)</td>
<td>1,273</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>177</td>
<td>12.1 (1.0)</td>
<td>110</td>
</tr>
<tr>
<td>Secondhand smoke exposure in public places</td>
<td>No</td>
<td>2,072</td>
<td>82.5 (1.2)</td>
<td>2,050</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>433</td>
<td>17.5 (1.2)</td>
<td>254</td>
</tr>
<tr>
<td>Body mass index</td>
<td>Low weight</td>
<td>156</td>
<td>7.2 (0.7)</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>1,224</td>
<td>50.3 (1.3)</td>
<td>1,048</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>467</td>
<td>17.4 (0.8)</td>
<td>431</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>649</td>
<td>25.1 (1.1)</td>
<td>666</td>
</tr>
<tr>
<td>Physical activity: high-intensity work</td>
<td>No</td>
<td>2,422</td>
<td>99.4 (0.2)</td>
<td>2,188</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>18</td>
<td>0.6 (0.2)</td>
<td>19</td>
</tr>
<tr>
<td>Physical activity: moderate-intensity work</td>
<td>No</td>
<td>2,313</td>
<td>95.1 (0.5)</td>
<td>2,043</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>127</td>
<td>4.9 (0.5)</td>
<td>164</td>
</tr>
<tr>
<td>Physical activity: high-intensity leisure</td>
<td>No</td>
<td>2,252</td>
<td>92.0 (0.7)</td>
<td>2,013</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>188</td>
<td>8.0 (0.7)</td>
<td>194</td>
</tr>
<tr>
<td>Physical activity: moderate-intensity leisure</td>
<td>No</td>
<td>1,858</td>
<td>76.5 (1.1)</td>
<td>1,611</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>582</td>
<td>23.5 (1.1)</td>
<td>596</td>
</tr>
<tr>
<td>Walking (days/week)</td>
<td>≤ 4</td>
<td>1,282</td>
<td>50.5 (1.3)</td>
<td>1,214</td>
</tr>
<tr>
<td></td>
<td>≥ 5</td>
<td>1,159</td>
<td>49.5 (1.3)</td>
<td>993</td>
</tr>
</tbody>
</table>

(Continued to the next page)
hand smoke at work and in public places, moderate-intensity work and leisure activities, walking, and sleep duration during the week. The complex sample logistic regression analysis was performed on individual variables by setting the year as the independent variable and the variables showing significant differences in the analysis presented above as the dependent variables to calculate the odds ratios. The health behaviors of adult women that significantly changed in 2020 (during the pandemic) compared to 2019 (before the pandemic) were subjective perception of dental health, exposure to secondhand smoke at work and in public places, moderate-intensity work and leisure activities, walking, and sleep hours during the week. However, no statistical significance was found for unmet dental needs.

The odds ratio of having good perceived dental health increased 1.77 times in 2020 \((p < .001)\) and medium-intensity leisure activities increased 1.29 times in 2020 \((p = .004)\), but walking more than 5 days a week decreased by 0.81 times in 2020 \((p = .011)\). The odds of a weekday sleep duration of \(\geq 9\) hours increased 1.40 times in 2020 \((p = .006)\) (Table 3).

**Discussion**

This is a secondary analysis using the data of the eighth KNHANES, conducted twice by the Korea Disease Control and Prevention Agency before and during the COVID-19 pandemic (2019–2020) to understand the changes in the health behaviors of South Korean adult women during the COVID-19 pandemic. In this study, there was an increase in the number of adult women perceiving their dental health as good in 2020 (during the pandemic) compared to 2019 (before the pandemic). In the second round of the sixth KNHANES, which was conducted in 2014, the subjective dental health perception of adult women

---

**Table 2. Continued**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>2019 ((n = 2,534))</th>
<th>2020 ((n = 2,314))</th>
<th>(\chi^2 (p))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight training (days/week)</td>
<td>&lt; 2</td>
<td>2,068 (84.6 (0.8))</td>
<td>1,840 (83.0 (0.9))</td>
<td>2.32 (.173)</td>
</tr>
<tr>
<td></td>
<td>(\geq 2)</td>
<td>373 (15.4 (0.8))</td>
<td>367 (17.0 (0.9))</td>
<td></td>
</tr>
<tr>
<td>Sitting time (hours/day)</td>
<td>&lt; 10</td>
<td>1,453 (55.8 (1.4))</td>
<td>1,242 (52.6 (1.3))</td>
<td>5.10 (.118)</td>
</tr>
<tr>
<td></td>
<td>(\geq 10)</td>
<td>1,081 (44.2 (1.4))</td>
<td>1,072 (47.4 (1.3))</td>
<td></td>
</tr>
<tr>
<td>Weekday sleep duration (hours/day)</td>
<td>(\leq 6)</td>
<td>1,026 (40.3 (1.2))</td>
<td>949 (40.7 (1.1))</td>
<td>14.91 (.007)</td>
</tr>
<tr>
<td></td>
<td>7–8</td>
<td>1,283 (50.6 (1.3))</td>
<td>1,104 (47.0 (1.1))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(\geq 9)</td>
<td>225 (9.1 (0.8))</td>
<td>261 (12.3 (0.9))</td>
<td></td>
</tr>
<tr>
<td>Weekend sleep duration (hours/day)</td>
<td>(\leq 6)</td>
<td>633 (24.5 (1.0))</td>
<td>603 (24.7 (0.9))</td>
<td>4.55 (.171)</td>
</tr>
<tr>
<td></td>
<td>7–8</td>
<td>1,280 (49.4 (1.3))</td>
<td>1,095 (46.9 (1.2))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(\geq 9)</td>
<td>621 (26.1 (1.1))</td>
<td>616 (28.6 (1.0))</td>
<td></td>
</tr>
</tbody>
</table>

\(^{1}\) Unweighted and valid frequency, \(^{2}\) valid percentage.

**Table 3. Changes in health behaviors in 2020 compared to 2019**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived dental health status(^{3})</td>
<td>Good</td>
<td>1.77</td>
<td>1.35–2.31</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unmet dental needs(^{3})</td>
<td>Yes</td>
<td>1.20</td>
<td>0.92–1.56</td>
<td>.183</td>
</tr>
<tr>
<td>Secondhand smoke exposure in the workplace(^{4})</td>
<td>Yes</td>
<td>0.64</td>
<td>0.47–0.87</td>
<td>.004</td>
</tr>
<tr>
<td>Secondhand smoke exposure in public places(^{4})</td>
<td>Yes</td>
<td>0.60</td>
<td>0.47–0.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Physical activity: moderate-intensity work(^{5})</td>
<td>Yes</td>
<td>1.75</td>
<td>1.28–2.38</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Physical activity: moderate-intensity leisure(^{5})</td>
<td>Yes</td>
<td>1.29</td>
<td>1.08–1.53</td>
<td>.004</td>
</tr>
<tr>
<td>Walking(^{6})</td>
<td>(\geq 5) days/week</td>
<td>0.81</td>
<td>0.69–0.95</td>
<td>.011</td>
</tr>
<tr>
<td>Weekday sleep duration(^{6})</td>
<td>(\geq 9) hours/day</td>
<td>1.40</td>
<td>1.10–1.78</td>
<td>.006</td>
</tr>
</tbody>
</table>

\(^{3}\) Dummy variable references were perceived dental health (poor and ordinary), unmet dental needs (no), secondhand smoke exposure in the workplace (no), secondhand smoke exposure in public health (no), physical activity: moderate-intensity work (no), physical activity: moderate-intensity leisure (no), walking (<5 days/week), weekday sleep duration (<9 hours/day).
over 19 years of age was good in 18.0% and ordinary or poor in 82.0% of participants [25]. Considering that 22.0% of the women perceived their dental health as good in the current study, it seems that there was an increasing tendency in adult women’s likelihood of perceiving their dental health as good during the pandemic compared to before the pandemic. In a study on dental health behaviors conducted among college students during the COVID-19 pandemic, the average frequency of brushing per day increased, as well as the use of oral care products such as dental floss and interdental toothbrushes, indicating a higher level of interest in dental hygiene [4]. Due to the lack of previous studies on the dental health behavior of adults during the pandemic, it is difficult to make a direct comparison. However, as mask wearing became mandatory as a simple and effective method to reduce the spread of COVID-19 [26], based on reports showing the main route of infection of COVID-19 was close contact (within 2 m) due to droplets that are emitted during coughing or speaking [27], this change in dental health behavior cannot be viewed as a phenomenon limited only to college students because dental hygiene management has become important due to mask wearing, as well as for COVID-19 prevention. Therefore, it can be inferred that adult women had more positive perceptions of their dental health status as they paid more attention to dental hygiene during the pandemic and took good care of it. Subjective dental health perception is related to objective dental health status [18,25] and the overall quality of life in adults [18]. Since COVID-19 has had a major influence on work, home, and social life throughout the world, it may have also affected dental health, but no studies have specifically investigated its effects on dental health behaviors [4]. Therefore, it is necessary to identify the changes in dental health behavior during the pandemic, investigate the reasons for these changes, and reflect them in future dental health management policies.

In this study, adult women showed a decrease in exposure to secondhand smoke at work and in public places in 2020 (during the pandemic) compared to 2019 (before the pandemic). This is consistent with a previous study [28] that reported that adolescents’ exposure to secondhand smoke in schools and public places decreased from 2019 to 2020 based on a comparison of the health behaviors of adolescents before and during the pandemic. However, in that previous study, exposure to secondhand smoke at home also decreased [28], showing a difference from the current study. In our study, exposure to secondhand smoke at home decreased from 43.9% in 2019 to 35.6% in 2020, but the difference was not statistically significant. Secondhand smoke, which refers to nonsmokers inhaling cigarette smoke exhaled by smokers [29], increases the risk of respiratory diseases, cardiovascular diseases, and cancer due to toxic substances [30]. It is estimated that 1% of annual mortality worldwide is related to secondhand smoke [31], and associations of secondhand smoke with mental illnesses such as depression, as well as physical diseases, have been reported [19]. Accordingly, many countries are making efforts to reduce the damage caused by secondhand smoke, and Korea is also expanding nonsmoking facilities to reduce the damage caused by secondhand smoke [27]. However, exposure to secondhand smoke continues even in nonsmoking facilities, such as exposure to ultrafine particles leaked from smoking rooms in nonsmoking facilities [32]. In this sense, the decrease in exposure to secondhand smoke after COVID-19 in the previous study [28] and the current study is significant. This decrease in exposure to secondhand smoke may be explained by a decrease in smoking during the COVID-19 pandemic, as reported in a previous study [33]. Furthermore, a decrease in face-to-face contact in public places due to mask wearing and social distancing may have also contributed to the reduced exposure to secondhand smoke. However, since this phenomenon occurred as a way to protect oneself from COVID-19, not a way to avoid the harm caused by secondhand smoke to others, continuing attention should be paid to exposure to secondhand smoke. In addition, as various measures associated with COVID-19 are lifted, it would be necessary to prepare for the possibility of an increase in exposure to secondhand smoke. In this study, exposure to secondhand smoke at home showed a tendency to decrease during the pandemic, but without statistical significance. Considering the increased frequency of working from home due to the pandemic, exposure to secondhand smoke at home can be an important threat to women’s health; therefore, it is necessary to clarify the actual situation and provide appropriate interventions. In particular, it may be necessary to focus on women who have no occupation as they spend more time at home and thus have higher chances of being exposed to secondhand smoke at home.

In this study, adult women showed increased moderate-intensity work and leisure activities in 2020 (during the pandemic) compared to 2019 (before the pandemic). Most preceding studies on changes in physical activity before and during the pandemic reported a decreasing tendency during the pandemic [34], unlike this study. This may have been due to differences in the measurement of physical activity in previous research and our study. In our study, moderate-intensity work was defined as an activity that caused at least 10 minutes of shortness of breath or a slightly rapid heartbeat, such as carrying light objects, cleaning, and activities performed as part of parenting. After the outbreak of
COVID-19, as more office workers worked from home and more students took classes from home, they spent more time at home, and as a result, women also became directly responsible for family care and education [7,10]. This may explain the increase in moderate-intensity work, including cleaning and child-rearing activities, compared to pre-COVID-19 among women. In addition, in our study, moderate-intensity leisure activities, excluding work-related physical activities, were defined as sports, exercises, and leisure activities that cause continuous shortness of breath or slightly fast-paced heart rate for at least 10 minutes, such as light jogging, weight training, golf, sports dancing, and Pilates. Due to government policies to prevent COVID-19, the time spent at home has increased, while restrictions on work, school, and social activities have increased [3]. The frequency of at-home training has increased as the time spent at home has risen, especially among women [35]. Considering that weight training was included in moderate-intensity leisure activities in this study, the increase in at-home training may have resulted in the increased moderate-intensity leisure activities.

In contrast, the decrease in walking during the pandemic in this study is consistent with a previous study [34] that also reported a decrease in physical activity. The decrease in physical activity during the pandemic may have resulted from social distancing measures implemented by the government to stop the spread of COVID-19 in community [4,34]. Social distancing is a basic method to curb the spread of COVID-19 [34], but it has resulted in negative phenomena such as decreased physical activity and increased sedentary behavior [36]. Research related to physical activity has emerged as an urgent public health topic during the COVID-19 pandemic [37], as decreased physical activity has been reported to be related to various factors such as sex, age, occupation, stress, and obesity [38]. In the COVID-19 pandemic, to maintain the same level of physical activity as before the pandemic, physical activity at home is encouraged [20]. Studies have described using web-based data for physical activity at home [39] and have found that at-home training increased during the pandemic among adolescents [40]. Therefore, it will be necessary to develop and disseminate physical activity programs that can be used at home in consideration of individual characteristics. In addition, with the recent easing of measures associated with COVID-19, including social distancing, it is necessary to identify resultant changes in physical activity and encourage people to appropriately combine physical activities that can be done at home with those that can be done outside of the home depending on the situation.

In this study, the percentage of adult women who had 9 hours or more of sleep per day increased in 2020 (during the pandemic) compared to 2019 (before the pandemic). A previous study reported that the COVID-19 pandemic increased sleep duration [41], consistent with this study. This can be attributed to the increased time spent at home due to social distancing and the increased frequency of working from home due to COVID-19 [42]. However, in adolescents, the sleep satisfaction rate [28] and recovery from sleep fatigue [43] increased during the pandemic, improving the quality of sleep, whereas the quality of sleep decreased in adults during the pandemic [41,42]. This can be attributed to the increase in stress for adults due to the economic blows caused by COVID-19 [43] or increased child-rearing hours due to school closures [42]. Therefore, although only sleep duration was investigated in the current study, the quality of sleep should also be measured and the causes of changes in sleep patterns should be identified in further studies to understand the influence of the pandemic on sleep and provide appropriate interventions.

Taken together, this study found that there were both positive and negative changes during the COVID-19 pandemic in adult women in Korea. Specifically, they perceived their subjective dental health more positively during the COVID-19 pandemic than before the COVID-19 pandemic, their exposure to secondhand smoke at work and in public places decreased, and their moderate-intensity work and leisure activities increased, while walking decreased, and sleep duration during the week increased. Therefore, it is necessary to provide guidelines for physical activities such as walking according to the severity of the pandemic so that appropriate physical activities can be performed even during the pandemic. It is also advised to encourage the maintenance of appropriate sleep duration through education on appropriate sleep duration and lack of sleep or oversleeping. In addition, in order to ensure that the positive changes caused by the pandemic, such as reduced exposure to secondhand smoke, are maintained, it is necessary to strengthen education on secondhand smoke and identify factors related to reduction in exposure to secondhand smoke to reflect in future health management policies.

This study has the following limitations. In this study, data from 2019 (before the COVID-19 pandemic) and 2020 (during the COVID-19 pandemic) were compared. Since only data from 1 year before and during the pandemic were compared, it is difficult to conclude that the observed changes were due to the COVID-19 pandemic. We suggest that a study comparing 2 years of data from before and during the COVID-19 pandemic should
be conducted. In addition, this study only compared the observed differences before and during the COVID-19 pandemic without identifying the factors that caused these differences. Therefore, future studies should investigate factors related to the occurrence of these differences due to the COVID-19 pandemic. Lastly, this study did not take into account differences according to women's life cycle, since all women aged 19 to 64 years were the study participants. Therefore, future research should explore differences by age group.

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Authors' contributions

Conceptualization: Kim M, Chae H; Formal analysis: Kim M, Chae H; Writing–original draft: Kim M, Chae H; Writing–review & editing: Kim M, Chae H.

Conflict of interest

The authors declared no conflict of interest.

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Data availability

Please contact the corresponding author for data availability.

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Informed choice of pregnant women regarding noninvasive prenatal testing in Korea: a cross-sectional study

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**Purpose:** This study explored the degree to which pregnant women in Korea made informed choices regarding noninvasive prenatal testing (NIPT) and investigated factors influencing whether they made informed choices.

**Methods:** In total, 129 pregnant women in Korea participated in a web-based survey. Multidimensional measures of informed choice regarding NIPT and decisional conflict were used to measure participants’ levels of knowledge, attitudes, deliberation, uptake, and decisional conflict related to NIPT. Additional questions were asked about participants’ NIPT experiences and opinions.

**Results:** All 129 pregnant women were recruited from an online community. Excluding those who expressed neutral attitudes toward NIPT, according to the definition of informed choice used in this study, only 91 made an informed choice (n=63, 69.2%) or an uninformed choice (n=28, 30.8%). Of the latter, 75.0% had insufficient knowledge, 39.3% made a value-inconsistent decision, and 14.3% did not deliberate sufficiently. No difference in decisional conflict was found between the two groups. A significant difference was found between the two groups in the reasons why NIPT was introduced or recommended (p=.021). Multiple logistic regression analysis showed that pregnant women who were knowledgeable (odds ratio [OR], 4.77; 95% confidence interval [CI], 2.17–10.47) and deliberated (OR, 0.74; 95% CI, 0.57–0.98) were significantly more likely to make an informed choice.

**Conclusion:** The results of this study help healthcare providers, including nurses in maternity units, understand pregnant women's experiences of NIPT. Counseling strategies are needed to improve pregnant women's knowledge of NIPT and create an environment that promotes deliberation regarding this decision.

**Keywords:** Cell-free DNA; Conflict, psychological; Counseling; Decision making; Prenatal care

**Introduction**

Noninvasive prenatal testing (NIPT) is a method to screen for chromosomal abnormalities in the fetus, such as Down syndrome, Patau syndrome, and Edward syndrome, using cell-free DNA fragments from the fetus that are circulating in a pregnant woman's blood [1]. In particular, NIPT has been reported to have high sensitivity and specificity in assessing the risk of Down syndrome [2] and reduce the necessity of invasive prenatal testing, such as chronic villus biopsy and amniocentesis [3]. NIPT is possible from the 10th week of gestational age. Due to its safety for the fetus, the accuracy of its results, and the convenience of testing [4], NIPT has become commercially available in more than 60 countries, including South Korea (hereafter, Korea), since it was first introduced to clinical practice in Hong Kong in 2011 [5].
Summary statement

• What is already known about this topic?
Pregnant women in Korea are highly interested in noninvasive prenatal testing (NIPT) due to its safety, accuracy, and earlier timing during pregnancy; thus, NIPT has been widely used among pregnant women, including those with high-risk pregnancies.

• What this paper adds
Only 69.2% of pregnant women made an informed choice about NIPT. Those who were knowledgeable, deliberated, and received prenatal care at a tertiary or general hospital were significantly more likely to make an informed choice. Those who made an uninformed choice had insufficient knowledge about NIPT and value inconsistency, and they were more likely to have been recommended NIPT due to a high-risk pregnancy.

• Implications for practice, education, and/or policy
There is a need for counseling strategies, such as utilizing decision aids that enhance informed choice by improving knowledge about NIPT and creating an environment that promotes deliberation.

In 2019, the Korean Society of Maternal Fetal Medicine prepared medical guidelines for NIPT, with recommendations to inform and offer NIPT choice to all pregnant women, preferentially for women with high-risk pregnancies, to screen for trisomy 21, 18, and 13 and sex chromosome aneuploidy [6]. In Korea, high-risk pregnancies, including those in women with advanced maternal age (35 years or older), are steadily increasing [7], and it is expected that the use of NIPT will expand among these women.

Internationally, since NIPT has been introduced, various studies have examined knowledge and attitudes regarding NIPT among healthcare providers [8], pregnant women [9], women of childbearing age [10], and parents of children with Down syndrome [11]. Based on these studies, proactive discussions have been held on the ethical, legal, and social implications of NIPT and the role of healthcare providers [12]. In particular, the potential challenges and concerns about NIPT reported by healthcare providers, social science and humanities researchers, patient rights advocates, and religious group experts are as follows: proper consultations for pregnant women, pressure to undergo NIPT and elective abortion, discrimination against people with disabilities and reduction of social support, and making NIPT a routine prenatal test [4]. These studies emphasized informed decision-making and informed choice as the most important principles in the clinical practice of NIPT to promote women’s reproductive autonomy [13].

Informed choice, which is crucial for all treatments and medical tests, is based on the relevant knowledge, consistent with the values of the individual who makes decisions, and behaviorally practiced accordingly [14]. Marteau et al. [14] presented knowledge, attitudes, and uptake as three concepts that are important for making an informed choice based on the theory of planned behavior, and developed an instrument measuring informed choice during prenatal testing based on the multifaceted relationship among these variables. In addition, with an emphasis on the importance of deliberation before making a certain decision, Lewis et al. [15] added the concept of deliberation to the instrument developed by Marteau et al. [14] and developed a multidimensional instrument measuring informed choice in NIPT situations based on the relationship among these variables. According to the instrument, informed choice for a specific test involves (1) accepting the test with a positive attitude and deliberation with sufficient relevant knowledge about the test or (2) declining the test due to a negative attitude toward the test, despite having sufficient relevant knowledge about the test and having deliberated. In other words, a woman makes an uninformed choice with a lack of relevant knowledge and/or when her attitude is not reflected in her behavior such as declining the test with a positive attitude or accepting the test with a negative attitude. Therefore, in order to promote informed choice for NIPT, it is crucial for healthcare providers, who have sufficient knowledge of NIPT, to provide accurate information about the risks, benefits, procedures, and costs of NIPT with a value-neutral attitude and to support pregnant women to make decisions consistent with their values after sufficient deliberation. Meanwhile, various efforts have been made to aid pregnant women’s decision-making to promote informed choice in prenatal testing, including NIPT, and it was reported that these interventions reduced decisional conflict and promoted informed choice [16].

Decisional conflict refers to the uncertainty experienced in deciding upon a certain behavior [17]. It is more likely to occur
when making a risky or uncertain decision, when a compromise is made between values during the process of decision-making, and when making a decision for which one expects regret regarding the positive aspects of a refused option [17]. In particular, uncertainty increases when an individual feels that there is a lack of information about alternatives, benefits, and risks, personal values are unclear, and there is no support to make a certain decision or pressure to make a decision [18]. Since prenatal testing, particularly NIPT, is accompanied by uncertainty about the fetal condition, decisional conflict may occur [19]. According to O’Connor [18], this uncertainty can be reduced by providing information about alternatives, benefits, risks, and side effects, helping individuals to clarify the values that they consider important and supporting the deliberation process.

Healthcare providers, including nurses who provide prenatal management, should help pregnant women make autonomous informed choices without decisional conflict. In particular, nurses are in an optimal position to perform this role [20]. In addition, the role of nurses as advocates is now increasingly emphasized [21]. Although a study attempted to examine the proper clinical applications and nursing implications of NIPT at the initial stage of the introduction of NIPT in Korea [22], since then, only one study has examined healthcare providers’ attitudes toward NIPT and its implementation [23]. To our best knowledge, there are yet no studies on pregnant women’s NIPT-related experiences in Korea.

Meanwhile, web-based data collection has been used in various academic fields since it was introduced in the late 1990s, and its proactive use has been expected in epidemiology, which studies various factors affecting health and disease within specific populations [24]. Since internet use in Korea reached 96.5% in 2020 [25], the proper use of carefully designed web-based questionnaires can complement or serve as an alternative to traditional data collection [24]. In fact, in response to limitations of face-to-face contact due to coronavirus disease 2019 (COVID-19), many health-related studies have been conducted using web-based methodologies. In particular, since social desirability bias can affect pregnant women’s responses to questions about attitudes toward prenatal testing [24], a web-based survey that can elicit honest answers is appropriate.

Therefore, by examining pregnant women’s informed choice of whether to undergo NIPT, factors influencing their informed choice, and NIPT-related experiences through a web-based questionnaire, this study aimed to provide basic data to help healthcare providers, including nurses, establish counseling strategies for NIPT that can promote informed choice by pregnant women. The detailed goals are as follows: (1) to identify the general and obstetric characteristics of pregnant women; (2) to examine the characteristics of pregnant women’s NIPT-related experiences; (3) to identify the scores for main variables and the degree to which pregnant women made informed choices regarding NIPT; (4) to examine the level of informed choice according to pregnant women’s general and obstetric characteristics; (5) to examine differences in the main variables according to informed choice; and (6) to identify factors associated with informed choice.

Methods

Ethics statement: This study was approved by the Institutional Review Board of Kyungpook National University (2022-0003). Informed consent was obtained from the participants.

Study design

This correlational study using a cross-sectional survey was conducted to investigate pregnant women’s level of informed choice of whether to undergo NIPT and factors influencing informed choice. The reporting of this study followed the STROBE (STrengthening the Reporting of OBServational studies in Epidemiology) reporting guidelines (https://www.strobe-statement.org/).

Participants

The participants of this study were pregnant women who had requested NIPT or had been introduced to or recommended NIPT by their healthcare provider. The other inclusion criteria were pregnant women aged 19 years or older living in Korea who were at a gestational age of 10 weeks or higher during the study period and voluntarily agreed to participate in the study after understanding its purpose. Since this study examined the level of knowledge about NIPT, it excluded foreigners, marriage migrant women, and pregnant women with difficulties in reading and understanding Korean. The number of participants required for analysis was calculated to be 121 using G*Power 3.1.9.7, with settings of a two-tailed test, significance level of .05, power of .95, and an odds ratio (OR) of 2.37 [26] in logistic regression analysis. Among 150 responses to the questionnaire, excluding 21 cases with insincere or incomplete responses, 129 cases were used for the final analysis, and the number of participants satisfied the minimum sample size.

https://doi.org/10.4069/kjwhn.2022.09.10
Instruments

General and obstetric characteristics
The general characteristics include age, educational level, financial status, employment status, religion, and individual experience with people with chromosomal disabilities. The obstetric characteristics consisted of gestational age (weeks), method of pregnancy, parity, reason for being introduced to or recommended NIPT, and the place of prenatal care.

Informed choice of whether to undergo noninvasive prenatal testing
The multidimensional measure of informed choice of whether to undergo NIPT (MMIC-NIPT) developed by Lewis et al. [15] comprises a total of 24 items on knowledge (12 items), attitudes (five items), deliberation (six items), and uptake (one item). The items on knowledge include participants’ knowledge of NIPT, Down syndrome, and others, which is classified as good or poor based on a cutoff of 9 out of 12 points. The items on attitudes ask about attitudes toward conducting NIPT, and responses are classified into positive (0–6 points), neutral (7–13 points), and negative (14–20 points). Participants with a neutral attitude are excluded when classifying them into groups according to the level of informed choice. The items on deliberation relate to whether participants deliberated about alternative evaluations, results, and the advantages and disadvantages of NIPT, and a score of 12 points or lower out of a possible score of 24 is considered to indicate that a participant has sufficiently deliberated. Lastly, the item on uptake asks about choices regarding NIPT.

In this study, after receiving approval from the developer of the original instrument, the instrument was translated and reviewed, back-translated, and reviewed by experts, and a preliminary study was conducted following the standard procedure [27] presented by the World Health Organization. Twenty-three modified items that fit the domestic situation were finally used for measurements. Two people whose native languages were Korean and who were proficient in English translated the instrument into Korean, and two bilingual experts compared the original and translated instruments and reviewed inappropriate expressions or conflicts of meaning. The back-translation was conducted by a person whose native language was English and who was proficient in Korean, but had no knowledge of the instrument. A native speaker of English confirmed the consistency of meaning of 24 items in the original and back-translated instruments. The expert group, which consisted of three professors in nursing and two nurses with 9 or more years of work experience in the delivery room, confirmed the content validity index of the translated instrument. When the content validity of each item is 0.78 or higher and the content validity of the entire instrument is 0.90 or higher, it is considered good [28]. In this study, the content validity of the entire instrument was 0.96, except for one item with a content validity of less than 0.8. Using the 23 modified items after the expert content validity review, a preliminary study was conducted on 14 pregnant women at a gestational age of 10 weeks or higher who had been introduced to or recommended NIPT. Based on the results of the preliminary study, the expressions in the multiple-choice responses of one item measuring knowledge were partially modified.

The final modified items used in this study consisted of 23 items on knowledge (11 items), attitudes (five items), deliberation (six items), and uptake (one item). For items measuring knowledge the answer “do not know” was considered incorrect, and the highest possible summed score was 11 points. A higher score indicated higher knowledge about NIPT. In the study of Lewis et al. [15], a good level of knowledge was defined as a score of 9 points or higher, whereas this study set a cutoff score of 8 points or higher (corresponding to approximately 70%) out of 11 after the expert group discussion. Scores for attitudes and deliberation were classified according to the criteria of the original instrument. The items on attitudes measured how the pregnant women felt about NIPT using a 5-point Likert scale (e.g., 0, beneficial to 4, harmful). A lower summed score (possible range, 0–20) indicated a positive attitude toward NIPT. The items on deliberation were measured using a 5-point Likert scale (0, very to 4, not at all), and a lower summed score (possible range, 0–24) indicated a higher level of deliberation on NIPT. Finally, the item on uptake asked whether NIPT was conducted. Cronbach’s α of reliability in the study of Lewis et al. [15] was 0.69 for knowledge, 0.94 for attitudes, and 0.84 for deliberation, and the corresponding values in this study were 0.70, 0.87, and 0.86, respectively. When analyzing pregnant women’s level of informed choice according to their scores of knowledge, attitudes, deliberation, and uptake, those who reported neutral attitudes are excluded based on the concept of value consistency [15]. Informed choice included participants who (1) agreed to undergo NIPT after sufficient deliberation (12 points or lower) with good knowledge (8 points or higher) and a positive attitude (6 points or lower) or (2) declined NIPT with a negative attitude (14 points or higher) despite having good knowledge and sufficient deliberation. Uninformed choice included cases of having insufficient knowledge, not deliberating, and/or value inconsistency such as having a positive attitude but declining NIPT or having a negative attitude but accepting NIPT.
**Decisional conflict on noninvasive prenatal testing**

In this study, the decisional conflict scale (DCS) developed by O’Connor [17] and translated into Korean by Yun et al. [29] was used. The original scale was developed for the development and evaluation of ancillary interventions in order to reduce uncertainty in health-related decision-making that individuals feel in various clinical environments, and it has been used in several previous studies on NIPT [19,30]. The DCS consists of five sub-factors (uncertainty, informed, values clarity, support, and effective decision), with 16 items in total. Each item is measured using a 5-point Likert scale (0, strongly agree to 4, strongly disagree) and the total score is divided by 16 and multiplied by 25 such that 100 points constitute a perfect score. A lower score indicates a lower level of decisional conflict on NIPT, and decisional conflict is considered to occur when the score is 37.5 points or higher. The Cronbach’s α of reliability was 0.78 when the scale was developed, 0.90 in the study of Yun et al. [29], and 0.94 in this study.

**Noninvasive prenatal testing-related experiences**

Referring to previous studies [19,30], an 11-item questionnaire was prepared about experiences of NIPT from various perspectives (e.g., satisfaction with explanations about NIPT, reasons for accepting or declining NIPT) and opinions on when NIPT should be conducted. The level of satisfaction with the explanations on NIPT was evaluated through five items on the degree of difficulty, quantity, delivery method, content, and usefulness of the information provided by healthcare providers. The other items dealt with the most important reason for accepting NIPT (one item), the most important factor in the choice of whether to undergo NIPT (one item), the most important reason to decline NIPT (one item), the person with the most influence on the choice of whether to undergo NIPT (one item), satisfaction with choice of whether to undergo NIPT (two items), and opinions on when NIPT should be conducted (one item).

**Data collection**

After receiving approval from the institutional review board of the researcher’s affiliated university, data were collected in January 2022. An online format was used due to COVID-19-related restrictions on face-to-face contact and to elicit honest responses. A recruitment notice including the research purpose and methods was posted on a domestic online community for expecting mothers, and participants who were interested in the study could directly access the questionnaire with a URL or QR code. Participants were able to start the questionnaire only after agreeing to participate in the study. If participants did not agree to participate in the study or the exclusion criteria applied to them, they were not allowed to start the questionnaire. If participants met the inclusion criteria, they could respond to the questionnaire after providing online consent. The survey took 10–15 minutes, and the participants received a small gift (worth 4 US dollars).

**Data analysis**

The collected data were analyzed using IBM SPSS ver. 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to identify the general and obstetric characteristics of pregnant women, pregnant women’s experiences regarding NIPT, the level of the main variables, and informed choice according to the participant characteristics. The chi-square test or the Fisher exact test was conducted to identify the level of informed choice according to the general and obstetric characteristics of pregnant women. The Mann-Whitney U-test was conducted to identify differences in informed choice according to the main variables. To identify factors influencing informed choice, univariate logistic regression analysis and multiple logistic regression analysis were conducted.

**Results**

**General and obstetric characteristics of pregnant women**

The mean age of the 129 pregnant women was 34.08±3.47 years (range, 25–44 years), and 48.1% were 35 years of age or older. Most (89.1%) had an educational level of university or higher, and 88.4% reported a financial status of middle or higher. Housewives accounted for 59.7% of the participants, and 65.1% were not religious. Most of the pregnant women (81.4%) did not have individual experience with people with chromosomal disabilities. The gestational age ranged from 10 weeks and 2 days to 38 weeks and 5 days, and 55.8% and 35.7% were in the second trimester and third trimester, respectively. Ninety-three percent of participants had a spontaneous pregnancy, and 69.0% were nulliparous. The most common single reason for being introduced to or recommended NIPT by healthcare providers was the pregnant woman’s wishes (42.6%), while 57.4% were introduced to or recommended NIPT by healthcare providers was the pregnant woman’s wishes (42.6%), while 57.4% were introduced to or recommended NIPT by healthcare providers was the pregnant woman’s wishes (42.6%), while 57.4% were introduced to or recommended NIPT by healthcare providers was the pregnant woman’s wishes (42.6%).
Table 1. Informed choice by general and obstetric characteristics (N=129)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Categories</th>
<th>Total (N = 129)</th>
<th>Informed choice (n = 63)</th>
<th>Uninformed choice (n = 28)</th>
<th>χ²(𝑝)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (year)</td>
<td>≤ 34</td>
<td>67 (51.9)</td>
<td>41 (65.1)</td>
<td>15 (53.6)</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>≥ 35</td>
<td>62 (48.1)</td>
<td>22 (34.9)</td>
<td>13 (46.4)</td>
<td></td>
</tr>
<tr>
<td>Educational level</td>
<td>≤ College</td>
<td>14 (10.9)</td>
<td>4 (6.3)</td>
<td>4 (14.3)</td>
<td>1.52†</td>
</tr>
<tr>
<td></td>
<td>≥ University</td>
<td>115 (89.1)</td>
<td>59 (93.7)</td>
<td>24 (85.7)</td>
<td></td>
</tr>
<tr>
<td>Financial status</td>
<td>High/middle-high</td>
<td>49 (38.0)</td>
<td>24 (38.1)</td>
<td>11 (39.3)</td>
<td>0.01†</td>
</tr>
<tr>
<td></td>
<td>Middle/middle-low</td>
<td>80 (62.0)</td>
<td>39 (61.9)</td>
<td>17 (60.7)</td>
<td></td>
</tr>
<tr>
<td>Job</td>
<td>No</td>
<td>77 (59.7)</td>
<td>37 (58.7)</td>
<td>16 (57.1)</td>
<td>0.02†</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>52 (40.3)</td>
<td>26 (41.3)</td>
<td>12 (42.9)</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>No</td>
<td>84 (65.1)</td>
<td>40 (63.5)</td>
<td>19 (67.9)</td>
<td>0.16†</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>45 (34.9)</td>
<td>23 (36.5)</td>
<td>9 (32.1)</td>
<td></td>
</tr>
<tr>
<td>Individual experience with people</td>
<td>No</td>
<td>105 (81.4)</td>
<td>47 (74.6)</td>
<td>24 (85.7)</td>
<td>1.40†</td>
</tr>
<tr>
<td>with chromosomal disability</td>
<td>Yes</td>
<td>24 (18.6)</td>
<td>16 (25.4)</td>
<td>4 (14.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Obstetrical characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>Nulliparous</td>
<td>89 (69.0)</td>
<td>45 (71.4)</td>
<td>18 (64.3)</td>
<td>0.46†</td>
</tr>
<tr>
<td></td>
<td>Parous</td>
<td>40 (31.0)</td>
<td>18 (28.6)</td>
<td>10 (35.7)</td>
<td></td>
</tr>
<tr>
<td>Reason for introducing NIPT</td>
<td>Wanted</td>
<td>55 (42.6)</td>
<td>39 (61.9)</td>
<td>10 (35.7)</td>
<td>5.35†</td>
</tr>
<tr>
<td></td>
<td>Reasons related to a high-risk</td>
<td>74 (57.4)</td>
<td>24 (38.1)</td>
<td>18 (64.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place of prenatal care</td>
<td>Tertiary or general hospital</td>
<td>37 (28.7)</td>
<td>24 (38.1)</td>
<td>6 (21.4)</td>
<td>4.44†</td>
</tr>
<tr>
<td></td>
<td>Women’s hospital</td>
<td>59 (45.7)</td>
<td>28 (44.4)</td>
<td>12 (42.9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obstetrical/gynecologic clinic</td>
<td>33 (25.6)</td>
<td>11 (17.5)</td>
<td>10 (35.7)</td>
<td></td>
</tr>
</tbody>
</table>

NIPT: Noninvasive prenatal testing.
† Fisher exact test.

Pregnant women’s experiences of noninvasive prenatal testing

**Satisfaction with noninvasive prenatal testing explanations**
The NIPT information provided by healthcare providers was easy or somewhat easy to understand for 64.4% of pregnant women, while 75.2% responded that the amount of NIPT information was appropriate. Furthermore, 64.3% of pregnant women responded that the NIPT information was presented in a way that they could understand and 69.0% acknowledged that the NIPT information covered topics they wanted to know about. The percentage of pregnant women who responded that the NIPT information assisted in their decision-making was 78.3% (Table 2).

**Reasons for accepting or declining noninvasive prenatal testing**
The most important reason for accepting NIPT was making sure that their child did not have a chromosomal abnormality (61.9%), followed by getting as much information about their baby as possible (14.4%), getting help on the decision of whether to continue the pregnancy (12.4%), and preparing and planning the delivery of a baby with a chromosomal abnormality (10.3%). The most important factor in choosing NIPT was safety for the fetus (42.3%), followed by the possibility of early testing (27.8%), accuracy of results (25.8%), and convenience of the test (4.1%). The most important reason for declining NIPT was its high cost (50.0%), followed by the probability of false-negative and false-positive results (40.6%) (Table 2).

**The person with the greatest influence on the noninvasive prenatal testing choice and satisfaction with the choice of whether to undergo noninvasive prenatal testing**
As the person with the greatest influence on the NIPT choice, pregnant women noted themselves (42.6%), followed by healthcare providers (34.1%), spouses (16.3%), and family members and friends (7.0%). The majority of pregnant women (77.6%) were satisfied with their choice of whether to undergo NIPT, while 20.2% and 2.3% reported neutral feelings and dissatisfac-
Table 2. Experiences of pregnant women related to NIPT (N=129)

<table>
<thead>
<tr>
<th>Questions, reasons, or opinions</th>
<th>Categories</th>
<th>n (%) or n only</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Satisfaction with NIPT explanation</td>
<td>How easy was the NIPT information to understand?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Easy</td>
<td>22 (17.1)</td>
</tr>
<tr>
<td></td>
<td>Somewhat easy</td>
<td>61 (47.3)</td>
</tr>
<tr>
<td></td>
<td>Somewhat hard</td>
<td>44 (34.1)</td>
</tr>
<tr>
<td></td>
<td>Hard</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>The amount of NIPT information</td>
<td>Too much</td>
<td>17 (13.2)</td>
</tr>
<tr>
<td></td>
<td>The right amount</td>
<td>97 (75.2)</td>
</tr>
<tr>
<td></td>
<td>Too little</td>
<td>15 (11.6)</td>
</tr>
<tr>
<td>The NIPT information was presented in a way that I could understand</td>
<td>Strongly agree</td>
<td>15 (11.6)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>68 (52.7)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>40 (31.0)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>5 (3.9)</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>The NIPT information covered things I wanted to know</td>
<td>Strongly agree</td>
<td>16 (12.4)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>73 (56.6)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>34 (26.4)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>6 (4.7)</td>
</tr>
<tr>
<td>The NIPT information assisted in my decision-making</td>
<td>Strongly agree</td>
<td>20 (15.5)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>81 (62.8)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>25 (19.4)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>(2) Reasons for accepting or declining NIPT</td>
<td>The most important reason for accepting NIPT (n = 97)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To prepare and plan the delivery of a baby with a chromosomal abnormality</td>
<td>10 (10.3)</td>
</tr>
<tr>
<td></td>
<td>To get help with decision of whether to continue the pregnancy</td>
<td>12 (12.4)</td>
</tr>
<tr>
<td></td>
<td>To make sure my child does not have a chromosomal abnormality</td>
<td>60 (61.9)</td>
</tr>
<tr>
<td></td>
<td>To get as much information about my baby as possible</td>
<td>14 (14.4)</td>
</tr>
<tr>
<td></td>
<td>Because the test is not at all dangerous to the baby</td>
<td>1 (1.0)</td>
</tr>
<tr>
<td>The most important factor in choosing NIPT (n = 97)</td>
<td>Safety for fetus</td>
<td>41 (42.3)</td>
</tr>
<tr>
<td></td>
<td>Possibility of early testing</td>
<td>27 (27.8)</td>
</tr>
<tr>
<td></td>
<td>Accuracy of the result</td>
<td>25 (25.8)</td>
</tr>
<tr>
<td></td>
<td>Convenience of the test</td>
<td>4 (4.1)</td>
</tr>
<tr>
<td>The most important reason for declining NIPT (n = 32)</td>
<td>High cost</td>
<td>16 (50.0)</td>
</tr>
<tr>
<td></td>
<td>Religious belief</td>
<td>1 (3.0)</td>
</tr>
<tr>
<td></td>
<td>Possibility of false-negative and false-positive results</td>
<td>13 (40.6)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2 (6.3)</td>
</tr>
<tr>
<td></td>
<td>Strong will to give birth (n = 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experience of giving birth to the first child without any issue (n = 1)</td>
<td></td>
</tr>
<tr>
<td>(3-1) The person with the greatest influence on NIPT choice</td>
<td>Myself</td>
<td>55 (42.6)</td>
</tr>
<tr>
<td></td>
<td>Spouse</td>
<td>21 (16.3)</td>
</tr>
<tr>
<td></td>
<td>Healthcare provider</td>
<td>44 (34.1)</td>
</tr>
<tr>
<td></td>
<td>Family and friend</td>
<td>9 (7.0)</td>
</tr>
<tr>
<td>(3-2) Satisfaction with choice of whether to undergo NIPT</td>
<td>Strongly agree</td>
<td>18 (14.0)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>82 (63.6)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>26 (20.2)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>3 (2.3)</td>
</tr>
</tbody>
</table>

(Continued to the next page)
Choi H. Pregnant women’s informed choice for NIPT

Opinions on when noninvasive prenatal testing should be conducted

According to the results of a multiple-choice question, the most frequent response regarding when NIPT should be conducted was "when pregnant women wish to be tested" (n=84) followed by "for pregnant women over age 35" (n=69), "when pregnant women are at high risk on standard screening tests" (n=66), "when abnormal findings are found on fetal ultrasonography" (n=50), "for pregnant women who have had chromosomal abnormalities in the past" (n=41), "for all pregnant women" (n=39), and "if either parent has a chromosomal abnormality" (n=35) (Table 2).

Values of main variables and frequency of making an informed choice regarding noninvasive prenatal testing

The score for knowledge on NIPT of all pregnant women was 7.87±2.62 points on average, and 64.3% showed good knowledge (≥8 points). The average score for attitudes toward NIPT was 5.53±3.84 points (positive, 68.2%; neutral, 29.5%; and negative, 2.3%). The average score for deliberation on NIPT was 6.90±4.28 points, and 86.8% (≤12 points) reported sufficient deliberation. The percentage of pregnant women who accepted NIPT was 75.2%, while 24.8% declined NIPT. The average score of decisional conflict was 26.88±12.96 points, and 18.6% (n=24) noted having decisional conflict related to NIPT (≥37.5) (Table 3).

With the exclusion of 38 pregnant women who reported neutral attitudes, the frequency of informed choice was calculated for 91 pregnant women. Among them, 69.2% (n=63) made an informed choice, i.e., these women accepted NIPT with good knowledge, positive attitudes, and sufficient deliberation. There were no pregnant women who declined NIPT with good knowledge and sufficient deliberation, but negative attitudes. However, 30.8% of pregnant women (n=28) made an uninformed choice. Among them, 75.0% (n=21) made a decision with insufficient knowledge, 14.3% (n=4) did not deliberate, and 39.3% (n=11) made a value-inconsistent choice (Table 4).

The frequency of making an informed choice regarding noninvasive prenatal testing according to pregnant women’s general and obstetric characteristics

There was no significant difference in informed choice according to the general characteristics of pregnant women. However, among the obstetric characteristics, significant difference between two groups was found in the reason for being introduced to or recommended NIPT (p=.021). Specifically, 61.9% of pregnant women themselves requested information about NIPT in the informed choice group, whereas in the uninformed choice group, 64.3% of pregnant women were introduced to or recommended NIPT due to factors indicative of a high-risk pregnancy, such as advanced maternal age (35 years or older) and high-risk findings on standard prenatal blood tests (Table 1).

Differences in main variables according to whether participants made an informed choice regarding noninvasive prenatal testing

The pregnant women who made an informed choice had significantly higher average knowledge scores than the pregnant women who made an uninformed choice (p<.001) and deliberated more (p=.019). There was no significant difference in the total score for decisional conflict between the two groups. However, the pregnant women who made an uninformed choice were significantly less likely to consider their decisions to be effective than the pregnant women who made an informed choice (p=.013) (Table 3).

Factors influencing whether pregnant women made an informed choice regarding noninvasive prenatal testing

According to the results of univariate logistic regression on the

### Table 2. Continued

<table>
<thead>
<tr>
<th>Questions, reasons, or opinions</th>
<th>Categories</th>
<th>n (%) or n only</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) Opinions on when NIPT should be conducted (multiple choice)</td>
<td>Pregnant women wishing to be tested</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Pregnant women over 35 years of age</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Pregnant women who are at high risk on standard screening tests</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Pregnant women with abnormal findings on fetal ultrasonography</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Pregnant women who have had chromosomal abnormalities in the past</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>All women</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>If either parent has a chromosomal abnormality</td>
<td>35</td>
</tr>
</tbody>
</table>

NIPT: Noninvasive prenatal testing.
Table 3. Level of the main variables and by informed choice (N=129)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Possible range</th>
<th>Mean ± SD Total (N = 129)</th>
<th>Informed choice (n = 63)</th>
<th>Uninformed choice (n = 28)</th>
<th>U†</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMIC-NIPT Knowledge</td>
<td>0</td>
<td>11.00</td>
<td>0–11</td>
<td>7.87 ± 2.62</td>
<td>9.59 ± 1.07</td>
<td>6.86 ± 2.17</td>
<td>216.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Good ( ≥ 8), 64.3%</td>
<td>Poor ( &lt; 8), 35.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>0</td>
<td>15.00</td>
<td>0–20</td>
<td>5.53 ± 3.84</td>
<td>3.14 ± 1.74</td>
<td>4.68 ± 3.89</td>
<td>720.5</td>
<td>.160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Positive ( ≤ 6), 68.2%</td>
<td>Neutral (7–13), 29.5%</td>
<td>Negative ( ≥ 14), 2.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliberation</td>
<td>0</td>
<td>21.00</td>
<td>0–24</td>
<td>6.90 ± 4.28</td>
<td>4.65 ± 2.35</td>
<td>7.21 ± 4.76</td>
<td>611.5</td>
<td>.019</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sufficiently ( ≤ 12), 86.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uptake</td>
<td></td>
<td></td>
<td></td>
<td>Accepted†, 75.2%</td>
<td>Declined, 24.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MMIC: Multidimensional measure of informed choice; NIPT: noninvasive prenatal testing.
Participants who had a neutral attitude were not included in the informed choice calculation.
†Those who underwent NIPT were counted as having accepted. †Mann-Whitney U-test.

Table 4. Types of informed choice and uninformed choice (N=91)

<table>
<thead>
<tr>
<th>Choice</th>
<th>Knowledge</th>
<th>Deliberation</th>
<th>Attitude</th>
<th>Uptake</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informed (n = 63)</td>
<td>Good</td>
<td>Yes</td>
<td>Positive</td>
<td>Yes</td>
<td>63 (69.2)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>Yes</td>
<td>Negative</td>
<td>No</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Uninformed (n = 28)</td>
<td>Poor</td>
<td>Yes</td>
<td>Positive†</td>
<td>No†</td>
<td>14 (51.4)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>Yes</td>
<td>Negative</td>
<td>No</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>Yes</td>
<td>Negative†</td>
<td>Yes†</td>
<td>2 (2.2)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>No</td>
<td>Positive†</td>
<td>No†</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>Yes</td>
<td>Positive†</td>
<td>No†</td>
<td>6 (6.6)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>No</td>
<td>Positive</td>
<td>Yes</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>No</td>
<td>Negative</td>
<td>Yes</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>No</td>
<td>Positive</td>
<td>Yes</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>Yes</td>
<td>Negative</td>
<td>No</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>No</td>
<td>Negative</td>
<td>No</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>No</td>
<td>Positive</td>
<td>Yes</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>Yes</td>
<td>Negative</td>
<td>Yes</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>No</td>
<td>Negative</td>
<td>Yes</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

†Value inconsistencies regarding noninvasive prenatal testing.
pregnant women's general characteristics (age, educational level, financial status, job, religion, and individual experience with people with chromosomal disability), obstetric characteristics (method of pregnancy, parity, reason for being introduced to or recommended NIPT, and place of prenatal care), knowledge, attitudes, deliberation, and decisional conflict, the pregnant women who had prenatal care at tertiary or general hospitals showed a 3.64 times (95% confidence interval [CI], 1.05–12.55) higher likelihood of making an informed choice than the pregnant women who had prenatal testing at obstetrical and gynecologic clinics. As the level of knowledge increased, the likelihood of making an informed choice was 3.38 times (95% CI, 2.02–5.66) greater. However, the likelihood of making an informed choice when pregnant women were introduced to or recommended NIPT for reasons related to a high-risk pregnancy was approximately 2/3 lower (OR, 0.34; 95% CI, 0.14–0.86) than women who requested NIPT. As the attitude of pregnant women was more negative, the likelihood of making an informed choice was 1/5 lower (OR, 0.80; 95% CI, 0.66–0.97). Also, the less deliber-ate the pregnant women were, the likelihood of making an in-
formed choice was approximately 1/5 lower (OR, 0.79; 95% CI, 0.67–0.93).

The results of multiple logistic regression, where all variables were entered simultaneously, showed that the regression model yielded significant results ($\chi^2=63.35, p<.001$). The Hosmer-Lemeshow test confirmed that the model was suitable ($p=.753$). The explanatory power was 50.1% according to Cox and Snell's coefficient of determination ($R^2$) and 70.7% according to Nagelkerke's coefficient of determination ($R^2$). A higher level of knowledge was associated with a 4.77 times higher likelihood (95% CI, 2.17–10.47) of making an informed choice, whereas the likelihood of making an informed choice was approximately 1/4 lower (OR, 0.74; 95% CI, 0.57–0.98) when the level of deliberation was insufficient (Table 5).

### Discussion

In Korea, as high-risk pregnancies become increasingly common

| Table 5. Logistic regression for predicting informed choice (N=91) |
|-------------------|-----------------------|-----------------------|
| Variable                  | Categories                  | Univariate OR (95% CI) | Multiple OR (95% CI) |
| Age (year)              | ≤ 34                      | 1                     | 1                     |
|                        | ≥ 35                      | 0.62 (0.25–1.53)       | 0.42 (0.03–5.86)       |
| Education level         | ≤ College                 | 1                     | 1                     |
|                        | ≥ University              | 2.46 (0.57–10.64)      | 2.25 (0.15–34.97)      |
| Financial status        | High/middle-high          | 0.95 (0.38–2.37)       | 0.89 (0.15–5.43)       |
|                        | Middle/middle-low         | 1                     | 1                     |
| Job                     | No                        | 1                     | 1                     |
|                        | Yes                       | 0.94 (0.38–2.31)       | 0.38 (0.04–3.59)       |
| Religion                | No                        | 1                     | 1                     |
|                        | Yes                       | 1.21 (0.47–3.12)       | 1.39 (0.18–11.02)      |
| Individual experience with people with chromosomal disability | No | 1 | 1 |
|                        | Yes                       | 2.04 (0.62–6.79)       | 2.02 (0.19–21.39)      |
| Parity                  | Nulliparous               | 1                     | 1                     |
|                        | Parous                    | 0.72 (0.28–1.86)       | 0.25 (0.03–2.26)       |
| Reason for introducing NIPT | Wanted            | 1                     | 1                     |
|                        | Reasons related to a high-risk pregnancy | 0.34 (0.14–0.86) | 0.57 (0.06–5.11) |
| Place of prenatal care  | Tertiary or general hospital | 3.64 (1.05–12.55)  | 15.25 (0.83–281.04) |
|                        | Women's hospital          | 2.12 (0.71–6.32)       | 9.16 (0.97–86.42)      |
|                        | Obstetrical/gynecologic clinic | 1                  | 1                     |
| Knowledge               |                           | 3.38 (2.02–5.66)       | 4.77 (2.17–10.47)      |
| Attitude                |                           | 0.80 (0.66–0.97)       | 0.89 (0.47–1.66)       |
| Deliberation            |                           | 0.79 (0.67–0.93)       | 0.74 (0.57–0.98)       |
| Decisional conflict     |                           | 0.95 (0.91–1.00)       | 1.08 (0.98–1.20)       |

CI, Confidence interval; NIPT: noninvasive prenatal testing; OR, odds ratio.

Model $\chi^2(14)=63.35$ ($p<.001$), Hosmer-Lemeshow ($p=.753$), Cox and Snell $R^2=.501$, Nagelkerke $R^2=.707$. 

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and the incidence of hereditary diseases increases with the aging of pregnant women, interest in NIPT guaranteeing the safety of the fetus among pregnant women is high. This web-based cross-sectional study—the first of its kind in Korea, to our best knowledge—was conducted to investigate the level of informed choice among pregnant women regarding whether to undergo NIPT and to identify factors influencing informed choice.

In this study, 64.3% of pregnant women showed good knowledge of NIPT, which is substantially lower than the findings of 95% in a study on pregnant women in the United Kingdom [15] and 88.3% in a study on pregnant women in Australia [30], which measured the level of knowledge using the same instrument. In addition, 68.2% of pregnant women showed positive attitudes toward NIPT in this study, which is also lower than the results of 88% and 80.9% in the United Kingdom and Australia, respectively [15,30]. Although our study identified 86.8% of pregnant women reporting sufficient deliberation on NIPT, nevertheless this is a lower percentage than that of pregnant women (92%) in the United Kingdom. Altogether, 69.2% of pregnant women made an informed choice in this study, which is also lower than the percentage of 89% reported in a study on pregnant women in the United Kingdom [15]. This result may be due to differences in participants. A previous international study [15] was conducted on pregnant women who received moderate or high-risk results in Down syndrome screening and were provided written materials on NIPT and an individual pre-consultation from a midwife before choosing NIPT. However, in this study, 42.6% of pregnant women were provided information on NIPT from healthcare providers because they wished to. Thus, it can be inferred that the characteristics of this study population are somewhat different from those who received a consultation conducted only for women with high-risk pregnancies.

Furthermore, in this study, 75% of pregnant women who made an uninformed choice made decisions without having sufficient knowledge of NIPT; this proportion is very high compared to the results (45.8%) of a previous study on pregnant women in the United Kingdom [31]. Value inconsistency between attitudes on NIPT and uptake occurred among 39.3% of pregnant women in this study, which is also higher than the percentage of 13.2% in the previous study [31]. A likely explanation for this discrepancy is that in the United Kingdom study, educated midwives provided 30-minute consultations on NIPT for pregnant women with high-risk pregnancies for Down syndrome; thus, possibly fewer women with insufficient knowledge. Another study on attitudes toward NIPT among Korean clinicians, however, found that 70.9% spent 5 minutes or less conducting consultation of prenatal testing related to fetal aneuploidy [23], and the actual outpatient treatment time in most departments, including obstetrics, was shorter than the treatment time that would satisfy patients [32]. In addition, the fact that pregnant women in the United Kingdom study [31] could choose NIPT without additional cost might explain the high level of value consistency that they reported. Even if pregnant women have positive attitudes, they may not be able to take action due to various circumstantial factors. For example, some pregnant women may prefer to have an invasive diagnostic test right away, rather than waiting 7 to 10 days for the NIPT results [31]. Therefore, in order to comprehensively understand pregnant women’s informed choice regarding NIPT, replication studies reflecting these aspects of pregnant women’s situations are necessary.

According to O’Connor [18], if the score for decisional conflict was 25 points or less, the subjects were considered to have made clinical decisions without decisional conflict, whereas a score of 37.5 points or higher indicated that the subjects experienced decisional conflict, such as delaying decision-making or feeling uncertainty in taking actions. Although 72.5% of pregnant women in this study had scores of 25 points or less and accepted or declined NIPT without decisional conflict, 18.6% had scores of 37.5 points or higher, which means that they experienced decisional conflict. Decisional conflict occurs as a result of difficulties inherent in the type of decisions, but several cognitive, emotional, and social factors can further exacerbate decisional conflict [18]. Knowledge about NIPT can act as a cognitive factor, and sufficient knowledge is essential in informed choice. Various attempts have been made internationally in order to provide sufficient knowledge to pregnant women during consultations. Dane et al. [33] investigated NIPT-related items (the accuracy, advantages, and disadvantages of NIPT compared to other tests) that pregnant women considered most important to make an informed choice, and this approach can be used effectively if the consultation should be conducted in a limited time. This is worthy to consider as this study found only 64.3% of pregnant women responded that the information on NIPT was presented in a way that they could understand, and only 77.6% of pregnant women were satisfied with decision-making on NIPT. Therefore, it is necessary to examine what information pregnant women value and how they prefer that information to be delivered.

Among the general and obstetric characteristics in this study, the likelihood of making an informed choice was low when pregnant women were introduced to or recommended NIPT by healthcare providers for reasons related to a high-risk pregnancy, whereas high when they received prenatal care at tertiary or gen-

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eral hospitals. Although the interpretation of these findings is limited since there are no previous studies using the same variables as this study, healthcare providers generally recommend NIPT in cases of advanced maternal age (35 years or older), high-risk findings from standard prenatal blood tests, and abnormal results from ultrasound [23]. In these cases, pregnant women may accept NIPT without sufficient deliberation to assure themselves of the well-being of their fetus even if it is not consistent with their own attitudes toward NIPT. This can be understood as aligning with the fact that 61.9% of pregnant women in this study accepted NIPT to make sure their child did not have a chromosomal abnormality. Meanwhile, since tertiary or general hospitals deal with high-risk pregnancies more often than obstetrical/gynecologic clinics, the education and preparation of healthcare providers on NIPT consultations might be more systematic, which likely had a positive influence on the informed choice of pregnant women. However, in this study, age, educational level, and religion, which were confirmed as influencing factors in previous studies [26,31,34,35], did not show significant influences on pregnant women’s informed choice. Therefore, in addition to the characteristics investigated in this study, replication studies including health literacy [36], which has been previously reported as a significant influencing factor, are required.

In this study, the likelihood of an informed choice among pregnant women increased with higher knowledge but decreased with insufficient deliberation. In order to increase the NIPT-related knowledge of pregnant women and help them make an informed choice, it is necessary to establish counseling strategies that can provide accurate knowledge on NIPT effectively in a limited clinical environment. The results of this study could be fairly predictable, since sufficient knowledge and deliberation were reflected when classifying whether women made an informed choice. Nonetheless, this study was significant in that the influence of knowledge and deliberation was confirmed while controlling for other general and obstetric characteristics. Beulen et al. [26] reported that the use of a web-based multimedia decision aid increased pregnant women’s level of knowledge about NIPT and was effective for promoting informed decision-making. Therefore, the proper use of decision aids can be considered when establishing NIPT counseling strategies. Moreover, the results of this study show the importance of preparing an environment where pregnant women can deliberate on NIPT sufficiently. In a previous international study [37], 66.9% of pregnant women wished to have the test on the same day when the NIPT-related consultation was conducted, whereas 70.8% of healthcare providers responded that the next visit was appropriate. Considering the differences in perspectives on the timing of testing, counseling strategies that help pregnant women sufficiently deliberate will be required.

The person with the greatest influence on NIPT choice in this study was pregnant women themselves (42.6%), followed by healthcare providers (34.1%). In comparison, a study on pregnant women in Canada [38] reported more than 80% of pregnant women responded that healthcare providers had an influence on their NIPT choice to some extent, and 74% responded that disagreement with their spouse did not have a significant influence on NIPT choice. In other words, although pregnant women themselves are the most important influence on accepting or declining NIPT, healthcare providers can have a significant influence on pregnant women’s decisions. In this study, 10.3% and 12.4% of pregnant women accepted NIPT to prepare and plan the delivery of a baby with a chromosomal abnormality and to get help with the decision of whether to continue the pregnancy, respectively. Hence, in order for pregnant women to have autonomy in accepting or declining NIPT, healthcare providers should be able to support an informed choice by providing necessary information (e.g., balanced information on people with Down syndrome [39]) through nondirective counseling.

The pregnant women in this study expressed the opinion that all pregnant women, including those with high-risk factors, who wish to be tested should be able to receive NIPT. However, 50% of pregnant women in this study who declined NIPT did so due to high costs. A previous international study also suggested that test cost is a factor influencing NIPT choice, reporting that the level of NIPT acceptance among pregnant women living in regions with low socioeconomic levels was significantly lower than among women from other regions [40]. The cost of NIPT varies from country to country [13]. The Health Insurance Review and Assessment Service announced that average cost of NIPT in Korea was about 600,000 Korean Won (approximately 450 US dollars), and pregnant women have to cover this cost since the test is not covered by insurance [41]. Some European countries provide political support for NIPT; for instance, Belgium and the Netherlands provide NIPT to all pregnant women and compensate part or all of the cost [42]. NIPT should be accessible to all pregnant women wishing to be tested to ensure women’s reproductive autonomy. However, there are also substantial ethical concerns about the routinization of NIPT as prenatal testing by policy or social pressure, as it could lead to elective terminations of pregnancies [43]. Recently in Korea, the abortion law has been amended and legal restrictions on abortion under the crim-
inal law disappeared [44]. Therefore, an informed choice of whether to undergo NIPT and deliberation in that process became even more important. In order to help pregnant women make an informed choice, it is necessary to establish appropriate counseling strategies and simultaneously hold proactive discussions on the ethical and social impacts of NIPT.

This web-based cross-sectional study investigated pregnant women’s level of informed choice regarding NIPT, as well as factors influencing their likelihood of making an informed choice. However, caution is needed when making causal inferences or generalizing the findings to all pregnant women. This study confirmed that knowledge related to NIPT and deliberation were important factors associated with making an informed choice. Pregnant women’s knowledge about NIPT may be affected by various factors, such as NIPT experiences in previous pregnancies, but not all possible factors were considered in this study. Another limitation is that when a pregnant woman has sufficient knowledge and deliberates with a positive attitude, but declines NIPT due to high cost, that decision cannot be distinguishable from an uninformed choice. Nonetheless, this exploratory study reflects the first attempt to explore the NIPT experiences of pregnant women in Korea, where survey studies on NIPT in pregnant women are lacking. This study makes a significant contribution by elucidating pregnant women’s experiences with NIPT and presenting basic data that will help prepare counseling strategies to promote informed choices by pregnant women regarding whether to undergo NIPT in the future.

This study found a difference in the level of informed choice of pregnant women according to the reasons for being introduced to or recommended NIPT, and higher knowledge was associated with a higher likelihood of making an informed choice-NIPT. Based on these results, this study suggests the need to prepare counseling strategies on NIPT to enhance pregnant women’s knowledge, as well as considering measures to create an environment suitable for deliberation within the limitations of the clinical setting. Furthermore, since factors such as the educational level and religion of pregnant women [35] and the experience of prenatal testing for Down syndrome [31] have been identified as factors influencing informed choice in previous international studies, replication studies with expanded samples of participants are suggested.

**Authors’ contributions**

All work was done by Choi H.

**Conflict of interest**

Hyunkyung Choi has been an editorial board member of the Korean Journal of Women Health Nursing since January 2022. She was not involved in the review process of this manuscript. Otherwise, there was no conflict of interest.

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None.

**Data availability**

Please contact the corresponding author for data availability.

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None.

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26. Beulen L, van den Berg M, Faas BH, Feenstra I, Hageman M,


Development and effects of a webtoon education program on preventive self-management related to premature labor for women of childbearing age: a randomized controlled trial

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Purpose: The purpose of this study was to develop a webtoon education program on preventive self-management related to premature labor (PSM-PL) for women of childbearing age, to evaluate its effects, and to assess the usability of webtoon education for women of childbearing age.

Methods: The study design was a stratified randomized trial with repeated measures. The participants were Korean women of childbearing age (between the ages of 19 and 49 years), with 49 participants each. The preventive health management self-efficacy related to premature labor (PHMSE-PL) scale, the preventive self-management knowledge related to premature labor (PSMK-PL) scale, and usability of webtoon education were assessed. The intervention group read six episodes of the PSM-PL webtoon within 2 days after clicking an online link. The control group did not receive anything but was given the webtoon after the last measurement. To test the effect of the repeatedly measured variables, a generalized estimating equation model was used.

Results: The experimental group had statistically significantly greater increases in PHMSE-PL and PSMK-PL scores from baseline to immediately after and 2 weeks later than the control group. The average score for usability of webtoon education was high (4.52; standard deviation, 0.62) on a scale of 1–5.

Conclusion: This webtoon education program on PSM-PL was a feasible and acceptable program that increased self-efficacy and knowledge of preventive health management of premature labor in women of childbearing age. Future studies that adopt a webtoon format can be beneficial for childbearing women with other risk factors.

Keywords: Cartoons as topic; Health education; Knowledge; Premature obstetric labor; Self-efficacy

Introduction

On average, 5% to 18% of births worldwide are preterm [1]. Spontaneous premature labor is the most common cause of premature birth, accounting for 40% to 45% of cases, followed by premature labor after preterm premature rupture of membranes (25% to 30%) and various health problems in pregnant women and fetuses for which premature delivery is the best option rather than maintaining pregnancy [2]. In South Korea (hereafter, Korea), the proportion of patients receiving medical treatment for premature labor, relative to all births in the corresponding year, increased steadily from about 5.86% in 2016 to 6.61% in 2018 and 6.75% in 2020 [3-6]. In addition, medical expenses also increased from 37 billion Korean Won (KRW) (approximately 33 million US dollars) in 2016 to 46.5 billion KRW (roughly 42 million US dollars) in 2016 to 46.5 billion KRW (roughly 43
Summary statement

- **What is already known about this topic?**
  Women of childbearing age are often unaware of the risk factors for premature labor, and this issue is only addressed during prenatal care or after symptoms of premature labor occur.

- **What this paper adds**
  This education program developed a webtoon (six episodes) for women of childbearing age, based on narratives of women with premature labor, and the educational content focused on preventive self-management of premature labor. The program increased self-efficacy and knowledge of preventive health management for premature labor.

- **Implications for practice, education, and/or policy**
  The webtoon education program was feasible and acceptable and clinicians can apply it to improve self-efficacy and knowledge related to premature labor.

million US dollars) in 2020, despite the continuing decrease in the number of births [3-6].

Premature labor refers to the onset of uterine contractions before 37 weeks of pregnancy. A clinical diagnosis is made when cervical dilatation and effacement have progressed along with regular uterine contractions [7]. Premature labor can have a single cause, such as an infection in the amniotic fluid, but it can also result from multiple pathological processes involving multiple causes [8]. Premature labor does not always lead to premature birth, and full-term delivery is often possible with good prevention, early detection, and prompt management [7]. Since prepregnancy health status affects pregnancy outcomes, preventive management is necessary before pregnancy to improve pregnancy outcomes and reduce health care expenditures for mothers and newborns [9,10]. It is also necessary to identify risk factors for premature labor before pregnancy and manage them according to the degree of risk [7]. In other words, prepregnancy health care to prevent premature labor should not be limited to women who are already aware of and manage an underlying disease, but should also be received by women who are unaware of an underlying disease, have high-risk factors such as obesity and smoking, and have a history of premature labor and cervical surgery [9]. If a woman with high-risk factors becomes pregnant, she should receive regular, early prenatal care and proactive preventive treatment [9]. When receiving preconception care or after childbirth, it is an appropriate time to educate women who have high-risk factors for premature labor to control those factors [11]. In addition, even women at low risk for premature labor can prevent premature birth if they are aware of the symptoms of premature labor in advance and know how to respond appropriately [11].

Women of childbearing age should be able to learn about the risk factors of premature labor before conception in a self-directed way, to manage their health according to these risk factors and develop their preventive self-management capabilities.

Since the incidence of premature birth due to premature labor in developed countries is low, around 9% [1], most women expect and imagine only a normal pregnancy [12,13]. If women are not aware of the term “premature labor” in advance, they might first hear this phrase from a medical professional when they visit a hospital with abnormal symptoms of premature labor [12,13]. Therefore, the opportunity for an early and appropriate response may be missed at the time of symptom onset. A previous study found that women of childbearing age desired individually tailored prepregnancy health information, preferred sources of prepregnancy health information, and learned through the experiences of other women when planning pregnancy [14]. Education using webtoons, a type of digital comics that readers can access via computer or smartphones, can present various stories of women’s experience of premature labor and offer an alternative to personalized learning from others’ experiences.

The term “webtoon” was first used in Korea in 2000 [15] to refer to cartoons published online; these are also called digital comics or website cartoons [16,17]. Webtoons emerged as a comics genre unique to Korea and have now become a representative form and medium of the comics industry [15]. Webtoons are representative areas of the “snack culture” trend, and unlike printed comics, webtoons can be viewed conveniently in a short period of time, regardless of time and place, as long as the user has a device capable of accessing the internet [15]. Therefore, webtoons can be used as a medium for health education that can be easily spread in daily life [18]. In addition, webtoons were reported to have potential educational and cultural value due to

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their visual stimulation, narratives that can be practical and realistic. In other words, webtoons can provide a better understanding of factual information and give readers a greater understanding of the social and psychological aspects of the illness through the use of narrative, characterization, and images [18]. A prior study reported that using cartoons in the educational process provided learners with an educational environment that was enjoyable, interesting, and motivating to learn, and also facilitated comprehension, developed intelligence, ensured permanent learning, and facilitated evocatory [19]. In addition, webtoons were reported to have interactivity that draws upon their characteristics of openness, participation, and sharing [20,21]. Korean women of childbearing age are familiar with the use of internet devices and webtoons [15]. Furthermore, Korean women use the internet almost every day [22], and about 74% reportedly view webtoons at least once a week [23]. Therefore, Korean women of childbearing age may be open to webtoon learning, done on their own initiative at a time and place that is suitable for them.

To date, premature labor intervention studies have focused on early labor assessment and support at home [24], uterine monitoring for the detection of premature labor at home [25], support for women hospitalized for premature labor [26,27], and relaxation therapy for women hospitalized for premature labor [28-32]. These studies were all conducted among women hospitalized for premature labor, and most of them explored the use of relaxation therapy as a psychological intervention. No studies have yet targeted women at high risk of premature labor before pregnancy and before the onset of premature labor, and to our knowledge, no webtoon-based education on premature labor has been developed. Just as health care before pregnancy is recommended because prepregnancy health care affects pregnancy outcomes [9,10], preventive health education for women with high-risk factors for premature labor can affect pregnancy outcomes.

Therefore, this study developed a webtoon education program for preventive self-management related to premature labor (PSM-PL) for women of childbearing age and evaluated its effectiveness and usability to determine the future potential for wider applicability. The primary hypothesis of this study is as follows: the experimental group participating in the PSM-PL webtoon education program would have significantly higher levels of preventive health management self-efficacy related to premature labor (PHMSE-PL) than the control group immediately after education and at 2 weeks after baseline. The secondary hypothesis is that the experimental group participating in the PSM-PL webtoon education program would have significantly higher levels of preventive self-management knowledge related to premature labor (PSMK-PL) than the control group immediately after education and at 2 weeks after baseline.

Methods

**Ethics statement:** This study was approved by the Institutional Review Board of Daegu Catholic University (CUIRB-2020-0031). Written consent was obtained from the participants, who indicated that they participated voluntarily. In addition, the same webtoon education program was provided through social networking services (SNS) to provide the control group with the same educational opportunity as the experimental group after the follow-up survey was completed.

**Study design**
This study was a stratified randomized controlled design with parallel groups and repeated measures, with a 1:1 allocation ratio of the experimental and control group. The participants were stratified by age and the number of deliveries. The experimental and control groups were assigned using block randomization with a block size of four. This study was conducted in two stages; the first stage was the development of the webtoon education program, and the second stage was evaluation of its effectiveness and usability. The study adhered to the CONSORT (Consolidated Standards of Reporting Trials) guidelines (https://www.consort-statement.org/).

**Development of the webtoon education program**
First, the literature was reviewed on the prevention and self-management of premature labor for the purpose of improving self-efficacy and knowledge on preventive self-management of premature labor for women of childbearing age. For the literature search, MEDLINE, Cochrane Library, and CINAHL databases were used, for publications after 2010, and 62 studies were identified and reviewed. Text word and controlled language such as ‘premature labor,’ ‘prevention & control,’ ‘management,’ and ‘intervention’ were combined. The contents of education on risk factors of premature labor, preventive risk factor management, preventive daily life management, symptoms of premature labor, and early response methods when symptoms appear were extracted and preselected.

Next, an advisory group consisting of two nursing professors, four nurses who worked in the delivery room of a tertiary hospital, and one obstetrician finalized the contents by selecting important and relevant content and confirmed their validity. All sev-
en experts were women, and the ages were 31 to 59 years old with 2 to 23 years of clinical experience in the field of women's health. The experts advised adding support of family and acquaintances, which was thereby added to the educational content.

Six story themes were composed that addressed high-frequency triggers of premature labor. The educational contents to be included in the story of the main character for each topic were allocated. With the advice of one webtoon writer, the researcher directly wrote the title, background, and plot of the webtoon scenario. The title of the webtoon scenario was “Early Detection of Premature Labor,” and it was set in the background of a multi-person room in a high-risk maternity intensive care unit at a tertiary hospital in the modern era, in Korea, and in springtime; also, a sequential linear storytelling manner was chosen. Except for the selected educational contents, the personalities of all characters, the plot for each topic, and the overall plot composition were developed on a purely creative basis.

Based on the story, a webtoon draft was produced through a process of consultation with three webtoon writers. The content validity and comprehension of the webtoon were evaluated by five women of childbearing age, two nursing professors, and two obstetricians. The five women were aged 21–42 years old, four were married and had children, while one was unmarried and had never had children. The clinical experts were aged 34–56 years old, had 6–19 years of educational experience, and 5–20 years of clinical experience in women’s health field.

After modifying for facial expressions, actions, words, and the severity of the symptoms of premature labor according to the opinions of the webtoon draft evaluators, the webtoon education program was finalized. Table 1 shows the topics of the final webtoon education program (Supplementary Figure 1; https://postype/sla9i0h).

**Table 1. Main themes and contents of the webtoon stories**

<table>
<thead>
<tr>
<th>Episode</th>
<th>Themes</th>
<th>Contents</th>
</tr>
</thead>
</table>
| 1       | Prolonged excessive activities in the early third trimester are a risk factor for premature labor | - Introduction to a maternal–fetal intensive care unit  
- Risk factors of premature labor: prolonged excessive activities in the early third trimester  
- Medical diagnostic tests: non-stress test, ultrasound to check the cervical length, vaginal discharge analysis  
  - Medical treatment: corticosteroid treatment to accelerate fetal lung maturation and treatment with medications to relieve uterine contractions  
- Prevention and early management  
  - Distinguishing between false and true labor pain  
  - Reduce body fatigue during pregnancy, adjust daily activities or tasks, and follow a regular daily life so as not to overwhelm the body  
  - If you suspect premature labor, contact or visit the hospital immediately  
- Support from self-help groups promotes psychological stability |
| 2       | Genital infections and excessive activity at the end of the second trimester are risk factors for premature labor | - Risk factors of premature labor: genital infections or urinary tract infections that have not been completely treated, physically vigorous activity, and intensive work  
- Medical diagnostic tests: non-stress test, ultrasound, vaginal discharge analysis  
- Medical treatment: antibiotics, corticosteroids to accelerate fetal lung maturation, and tocolytic drugs  
- Prevention and early management  
  - If you have a genital infection that causes premature labor, visit a hospital frequently to manage it and treat it completely  
  - Distinguish between false and real labor pain  
  - Take a break immediately when you first notice the symptoms of premature labor  
  - If you suspect premature labor, contact or visit the hospital immediately  
- Support from self-help groups promotes psychological stability |

(Continued to the next page)
Table 1. Continued

<table>
<thead>
<tr>
<th>Episode</th>
<th>Themes</th>
<th>Contents</th>
<th>No. of squares</th>
</tr>
</thead>
</table>
| 3       | A twin pregnancy at the beginning of the third trimester with a history of premature labor is a risk factor for premature labor | • Risk factors of premature labor: multiple pregnancies, short birth intervals  
• Medical diagnostic test: ultrasound: to check the degree of shortening of the cervix  
Medical treatment  
- Pregnant women with a short cervix are administered progesterone starting in the second trimester  
- Tocolytic drugs and their side effects  
• Prevention and early management  
- If you are pregnant with multiple gestations, visit the hospital frequently for management  
- Sensitive observation and protection of the body during pregnancy  
- Self-check for uterine contractions during pregnancy  
- If you suspect premature labor, contact or visit the hospital immediately  
• Support from self-help groups promotes psychological stability | 28 |
| 4       | Excessive amniotic fluid and amniotic membrane rupture due to gestational diabetes are risk factors for premature labor | • Risk factors of premature labor: excessive amniotic fluid caused by gestational diabetes causes excessive enlargement of the uterus, amniotic membrane rupture, and psychological stress  
• Medical treatment: antibiotics, corticosteroids for accelerating fetal lung maturation, tocolytic drugs, and minimal daily activities at a hospital  
• Prevention and early management  
- If you have a disease that causes premature labor (excessive amniotic fluid, premature rupture of the membrane), visit a hospital frequently to manage it  
- If there is a risk factor for premature labor, avoid severe exercise as much as possible  
- Control psychological stress to prevent premature labor  
- If you suspect premature labor, or leakage of the amniotic fluid, contact or visit the hospital immediately  
• Support from family and self-help groups promotes psychological stability | 28 |
| 5       | Intrauterine infection is a cause of premature birth | • Risk factors of premature birth: intrauterine infection  
• Medical treatment: premature delivery by cesarean section  
• Support from health professionals, family, and self-help groups promotes psychological stability | 33 |
| 6       | Progesterone medication in the treatment of cervical incompetence prevent premature labor Be sensitive to the symptoms of premature labor | • Risk factors of premature labor: past experience of premature birth, short cervix length, and physically excessive activity  
• Medical diagnostic test: ultrasound  
• Preventive medical treatment: progesterone hormonal treatment  
• Prevention and early management  
- Sensitive observation and protection of the body during pregnancy  
- Follow a regular daily routine so that the body is not overwhelmed  
- Distinguish between false and true labor pain  
- If premature labor is suspected, carefully observe the changes in labor pain  
- If you suspect premature labor, contact or visit the hospital immediately | 29 |

untarily agreed in writing to participate in the study. The exclusion criteria were a previous experience of premature birth due to premature labor or having learned about premature labor in nursing or medical college.

In this study, the primary endpoint was PHMSE-PL. There was no previous study that used the PHMSE-PL or self-efficacy in similar webtoon, comic, or cartoon programs. Therefore, the effect size of PHMSE-PL was set to the medium effect size to estimate the sample size in this study. Using G’Power version 3.1.0 for the independent t-test to compare pre-post differences between the experimental group and the control group, and using a one-sided test, a significance level of .05, a power of .80, and an effect size of 0.50, the sample size was estimated as 51 women for each group. For repeated-measures analysis of variance, the total sample size was determined to be 34 when the power was .80, the significance level was .05, and the effect size was 0.25. Therefore, to ensure reliable statistical results after data collection, the target sample size was set at 102. Based on an assumed
dropout rate of 10%, 114 women were considered adequate (57 in each group).

2) Data collection/procedure
To recruit research participants, a data collection assistant posted a promotional message on an online community for pregnant women and women who had given birth (called ‘Mom café’) and through SNS to acquaintances. Applicants who wanted to participate voluntarily were guided to participate in the online survey (first round) by clicking the provided URL.

For data collection, an online survey administered through SNS was repeated three times at 2-week intervals from February 22 to March 24, 2021. For the first survey, participants were requested to read the research description online, click and sign the voluntary study participation agreement, check whether the inclusion criteria were met, and then click the URL to complete the first survey (time 0). The contents of the baseline survey were demographic and childbirth-related characteristics, PHMSE-PL, and PSMK-PL. One research assistant who did not participate in the experiment stratified the participants by age (20s, 30s, 40s) and the number of deliveries (0, 1, 2, 3, or more) from the baseline response data, and then applied random numbers to identify the participants in Excel (Microsoft, Redmond, WA, USA). Two weeks later, the experimental group received the webtoon URL through SNS and read the webtoon voluntarily within 2 days, after which they responded to the online survey (time 1). The second survey contained the PHMSE-PL scale, the PSMK-PL scale, and items on the usability of webtoon education. After 2 weeks, the third online survey was conducted (time 2), using the PHMSE-PL and PSMK-PL scales.

The control group was not offered anything but completed the same surveys at the same time as the experimental group, except for the usability of webtoon education. The control group received the webtoon URL after completing the third survey. Both the experimental and the control group received remuneration (worth 3 US dollars) each time they completed the questionnaire. Except for randomization, the first to third surveys and the provision of the webtoon education program were conducted by one researcher.

3) Protocol adherence
In total, 111 people participated in the first round of data collection. One of them experienced premature birth and was excluded. Therefore, 110 people were assigned to the experimental and the control groups (n = 55 each). Two weeks after the first survey, 49 women (89.1%) in the experimental group responded to the second survey, and six did not complete all the webtoon educational materials or did not respond to the questionnaire by the deadline. In the control group, 49 women (89.1%) responded to the second survey, whereas six did not respond to the questionnaire. In the third survey, all 49 people in the experimental and the control group responded (Figure 1).

4) Intervention
The webtoon education program on PSM-PL consisted of 30 to 52 squares per episode, with a total of six episodes, and could be viewed anywhere by clicking the link on an internet device. The webtoon was published on a blog created by the webtoon artist specifically for the publication of the “Early Detection of Premature Labor” webtoon, using TISTORY (https://www.tistory.com/), an open application programming interface provided by Kakao Corp. (Jeju, Korea). No other content was posted. In the preliminary survey, it took about 3 to 5 minutes to read each episode, and 18 to 30 minutes to read all six episodes. One author reached out to the participants in the experimental group individually through SNS, instructing them to use the URL to read all six webtoon episodes within 2 days.

5) Measurements/instruments
(1) Preventive health management self-efficacy related to premature labor scale
The PHMSE-PL scale was developed by Kim and Lee [34], and its content validity and construct validity were confirmed. The scale contained 34 items across five subcategories. The subcategories were information-seeking about premature labor (seven items), preventive risk factor management (six items), preventive daily life management (six items), preventive high-risk health behavior management (three items), and early coping during symptom onset (twelve items). The responses to each item are on a Likert scale ranging from 1 (“I can’t do it at all”) to 5 (“I can do it very well”). The average ratings for each item are calculated. At the time of the tool’s development, Cronbach’s alpha for the overall PHMSE-PL was .96 [34], and .94 in this study.

(2) Preventive self-management knowledge related to premature labor scale
The PSMK-PL scale was developed by Kim and Lee [35], who evaluated the content validity using item response theory. The scale contained 24 items across three subcategories. The subcategories were risk factors for premature labor (ten items), preventive management (eight items), and symptoms and symptom management of premature labor (six items). Each item has a re-
response of “correct” (1 point), “wrong” (0 points), and “do not know” (0 points). The total score is the sum of all item scores. At the time of the tool’s development, Cronbach’s alpha for the overall scale was .89 [35], and .88 in this study.

(3) Usability of webtoon education

For usability, to evaluate the user’s experience of webtoon education, the author developed and used items based on the honeycomb model [36]. This consisted of seven items: one item each for desirability, valuableness, accessibility, usefulness, convenience, merit for the future, and credibility of webtoon education. Each item has a response on a Likert scale ranging from 1 (“not at all likely”) to 5 (“extremely likely”). The average ratings for each item are calculated. Cronbach’s alpha of the overall tool was .97 in this study.

6) Data analysis

The collected data were analyzed using IBM SPSS ver. 25 (IBM Corp., Armonk, NY, USA). The frequency, percentage, mean, and standard deviation (SD) were calculated to identify the general characteristics of the participants, and the normality of the distribution of data for the variables was evaluated with the Shapiro-Wilk test. The general characteristics of the experimental and control groups showed a non-normal distribution; therefore, the chi-square test and the Mann-Whitney U-test were used to verify the homogeneity. The major effect measurement variables (PHMSE-PL, PSMK-PL, usability of webtoon education) were presented as the mean and SD. The baseline scores of the major effect measurement variables were normally distributed, the t-test was used for the baseline homogeneity test, and all scores of the second and third-time points of the experimental and control groups were not normally distributed. Therefore, to test the effects of the repeatedly measured variables, a generalized estimating equation model was used. The results of the model were presented as the model coefficient (β), standard error, and 95% confidence interval. The reliability of all measurement tools was analyzed using Cronbach’s α. All hypothesis tests involved a one-sided significance level of α = .025, and the baseline homogeneity test between two groups involved a two-sided significance level of α = .05.
Results

Development of the webtoon education program

The themes and contents of the webtoon education program are shown in Table 1. The theme of episode 1 was that prolonged excessive activities in the early third trimester are a risk factor for premature labor. The theme of episode 2 was that genital infection and excessive activity at the end of the second trimester is a risk factor for premature labor. The theme of episode 3 was that a twin pregnancy at the beginning of the third trimester with a history of premature labor is a risk factor for premature labor. The theme of episode 4 focused on excessive amniotic fluid and amniotic membrane rupture due to gestational diabetes, as risk factors for premature labor. The theme of episode 5 was on intrauterine infection as a cause of premature birth. Finally, the theme of episode 6 focused on progesterone medication in the treatment of cervical incompetence to prevent premature labor and being sensitive to the symptoms of premature labor.

Table 2. Homogeneity of general characteristics between two groups (N=98)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>n (%) or mean ± SD</th>
<th>Test statistics</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total (n=98)</td>
<td>Exp (n=49)</td>
<td>Cont (n=49)</td>
</tr>
<tr>
<td>Age (years)†</td>
<td></td>
<td>30.60 ± 8.31</td>
<td>30.31 ± 8.57</td>
<td>30.90 ± 8.12</td>
</tr>
<tr>
<td>Education‡</td>
<td>High school or below</td>
<td>36 (36.7)</td>
<td>21 (42.9)</td>
<td>15 (30.6)</td>
</tr>
<tr>
<td></td>
<td>Bachelor</td>
<td>55 (56.1)</td>
<td>24 (49.0)</td>
<td>31 (63.3)</td>
</tr>
<tr>
<td></td>
<td>Master or more</td>
<td>7 (7.2)</td>
<td>4 (8.2)</td>
<td>3 (6.1)</td>
</tr>
<tr>
<td>Occupation†,§†</td>
<td>None</td>
<td>55 (57.3)</td>
<td>29 (59.2)</td>
<td>26 (55.3)</td>
</tr>
<tr>
<td></td>
<td>Permanent position</td>
<td>21 (21.9)</td>
<td>11 (22.4)</td>
<td>10 (21.3)</td>
</tr>
<tr>
<td></td>
<td>Temporary position</td>
<td>11 (11.4)</td>
<td>2 (4.1)</td>
<td>9 (19.1)</td>
</tr>
<tr>
<td></td>
<td>Others (self-employment)</td>
<td>9 (9.4)</td>
<td>7 (14.3)</td>
<td>2 (4.3)</td>
</tr>
<tr>
<td>Marital status</td>
<td>Single</td>
<td>53 (54.1)</td>
<td>26 (53.1)</td>
<td>27 (55.1)</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>45 (45.9)</td>
<td>23 (46.9)</td>
<td>22 (44.9)</td>
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<tr>
<td>Currently pregnant‡</td>
<td>Yes</td>
<td>7 (7.1)</td>
<td>5 (10.2)</td>
<td>2 (4.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>91 (92.9)</td>
<td>44 (89.8)</td>
<td>47 (95.9)</td>
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<tr>
<td>Number of pregnancies‡</td>
<td></td>
<td>0.84 ± 1.13</td>
<td>0.86 ± 1.15</td>
<td>0.82 ± 0.11</td>
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<td>Experience of pregnancy complications among those who had been pregnant‡</td>
<td>Yes</td>
<td>7 (16.7)</td>
<td>3 (15.8)</td>
<td>4 (17.4)</td>
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<td></td>
<td>No</td>
<td>35 (83.3)</td>
<td>16 (84.2)</td>
<td>19 (82.6)</td>
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<tr>
<td>Number of deliveries‡</td>
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<td>0.65 ± 0.89</td>
<td>0.65 ± 0.90</td>
<td>0.65 ± 0.88</td>
</tr>
<tr>
<td>Number of children‡</td>
<td></td>
<td>0.66 ± 0.90</td>
<td>0.65 ± 0.90</td>
<td>0.67 ± 0.90</td>
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<tr>
<td>Educated experience in pregnancy and childbirth</td>
<td>Yes</td>
<td>40 (40.8)</td>
<td>20 (40.8)</td>
<td>20 (40.8)</td>
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<tr>
<td></td>
<td>No</td>
<td>58 (59.2)</td>
<td>29 (59.2)</td>
<td>29 (59.2)</td>
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<tr>
<td>Experience in reading webtoons</td>
<td>Yes</td>
<td>57 (58.2)</td>
<td>29 (59.2)</td>
<td>28 (57.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>41 (41.8)</td>
<td>20 (40.8)</td>
<td>21 (42.9)</td>
</tr>
</tbody>
</table>

Cont: Control group; Exp: Experimental group.
†Mann-Whitney U-test, ‡Fisher exact test. §Data were analyzed with the number of controls set to 47 due to the two missing values.

Evaluation of the effectiveness and usability of the webtoon education program

Comparison of demographic and childbirth characteristics and outcome variables at baseline

The average age of the participants was 30.60 years (SD, 8.31 years); 56.1% were college graduates, 57.3% of the participants had no job, and 54.1% of respondents were single. Most participants (92.9%) were not currently pregnant, and the average number of pregnancies of respondents was 0.84 (SD, 1.13). Most of the women who had been pregnant (83.3%) had no pregnancy complications. The average number of deliveries was 0.65 (SD, 0.89) times, their average number of children was 0.66 (SD, 0.90), and 40.8% had experienced pregnancy and childbirth education. More than half (58.3%) reported having viewed webtoons before.

There were no statistically significant differences between the experimental and control groups in any general characteristics (Table 2). In addition, there were no statistically significant differences in the PHMSE-PL (t = –0.33, p = .745) and the PHMK-PL (t = –0.36, p = .717) between the experimental and control...
Table 3. Mean and standard deviation values of outcome variables between both groups across study time points and the baseline comparisons (N=98)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Experimental group (n = 49)</th>
<th>Control group (n = 49)</th>
<th>Comparison of groups at T0, t (p)†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>PHMSE-PL</td>
<td>Time 0</td>
<td>3.92</td>
<td>0.57</td>
<td>3.95</td>
</tr>
<tr>
<td></td>
<td>Time 1</td>
<td>4.26</td>
<td>0.58</td>
<td>4.02</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>4.37</td>
<td>0.45</td>
<td>4.15</td>
</tr>
<tr>
<td>PSMK-PL</td>
<td>Time 0</td>
<td>15.53</td>
<td>4.77</td>
<td>15.86</td>
</tr>
<tr>
<td></td>
<td>Time 1</td>
<td>21.00</td>
<td>2.32</td>
<td>17.41</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>21.49</td>
<td>2.75</td>
<td>18.39</td>
</tr>
</tbody>
</table>

PHMSE-PL: Preventive health management self-efficacy related to premature labor; PSMK-PL: preventive self-management knowledge related to premature labor; Time 0 (T0): baseline test; Time 1: after education; Time 2: 2 weeks after education.

Table 4. Generalized estimating equation analysis regarding the effects of webtoon education on preventive self-management related to premature labor (N=98)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Beta</th>
<th>SE</th>
<th>95% Confidence interval</th>
<th>Wald χ²</th>
<th>One-sided p</th>
</tr>
</thead>
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<td></td>
<td>Exp</td>
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<td>.027</td>
<td>–0.06</td>
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<td></td>
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<td></td>
<td>Time 1</td>
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<td></td>
<td>Group × time§</td>
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<td>.024</td>
<td>0.01</td>
<td>0.11</td>
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<tr>
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<td>Exp</td>
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<td>.06</td>
<td>–0.13</td>
<td>0.09</td>
<td>0.13 (.357)</td>
</tr>
<tr>
<td></td>
<td>Time§</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>Time 1</td>
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<td>.03</td>
<td>0.04</td>
<td>0.15</td>
<td>12.32 &lt; .001</td>
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<tr>
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<td>Time 2</td>
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<td>.03</td>
<td>0.1</td>
<td>0.2</td>
<td>31.97 &lt; .001</td>
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<tr>
<td></td>
<td>Group × time§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Group (Exp) × time 1</td>
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<td>.05</td>
<td>0.12</td>
<td>0.3</td>
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<td>Group (Exp) × time 2</td>
<td>0.18</td>
<td>.05</td>
<td>0.09</td>
<td>0.27</td>
<td>14.42 &lt; .001</td>
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</table>

Exp: Experimental group; PHMSE-PL: preventive health management self-efficacy related to premature labor; PSMK-PL: preventive self-management knowledge related to premature labor; time 1: after education; time 2: 2 weeks after education.

Reference was control group; *reference was baseline score; †references were Exp group×time 0 and control group×time 0, 1, and 2.

Preventive self-management knowledge related to premature labor

Table 3 shows PSMK-PL scores at time 0, time 1, and time 2 of the webtoon education program on PSM-PL. The intervention group showed significantly greater improvements in PSMK-PL at both time 1 (χ² = 20.09, p < .001) and time 2 (χ² = 14.42, p < .001) with respect to time 0, when compared to the control group (Table 4).
**Usability of webtoon education for preventive self-management related to premature labor**

The average score for usability of webtoon education for PSM-PL for all questions was high at 4.52 (SD, 0.62), and usefulness and convenience had the highest scores (4.57 [SD, 0.61] for both), while desirability had the lowest score (4.43 [SD, 0.82]) (Table 5).

**Discussion**

This webtoon education program consists of a total of six episodes and 200 number of squares, telling the story of five pregnant women with premature labor. The risk factors for premature labor in these women were selected as the most common cases based on the literature and expert opinions, and the risk factors were different for each woman. This webtoon education program included risk factors of premature labor, preventive risk factor management, preventive daily life management, symptoms of premature labor, early response methods when symptoms appear, and support from family and self-help groups. Because webtoons can be accessed easily through smartphones, computers, and laptops through the internet, they have the advantage of being conveniently viewed in a short time [17]. Thus, webtoons are a valuable medium for health education in places where the internet is easy to access, such as in Korea [18]. Humans most naturally organize their experiences and knowledge through the narrative form [37]. Narrative learning helps students to obtain learning results through the process of exploring and solving problems at the individual or social level in various stories that already exist in the real-life context [37]. Webtoons not only deliver story-based learning content, but also foster self-awareness, reassurance, empathy, and companionship due to the cartoon elements of characters and images [18]. Webtoons are also a valuable health information medium [18] because they facilitate improvements in academic interest, immersion, learning [20,38], and metacognition [20]. Therefore, as a narrative medium based on realistic stories, webtoons help readers naturally organize the delivered knowledge [37]. It is also possible to create metacognitive sensitivity that can be applied in close connection with the real-world context of one’s life through the narrative learning method [37]. The present study developed and administered a webtoon-based intervention because of its advantages in terms of both learning effects and the delivery method. Since the main characters were ordinary women who presented their individual experiences of premature labor as a story, indirect experiential learning was naturally induced while participants read the story, instead of a one-sided method of passively receiving information from the educator. Many educational materials have been developed using cartoons, but these have not generally presented realistic stories; instead, they have generally used formats such as an educator character presenting one-sided explanations [39], story-based comic books [38,39], cartoon media characters presenting information [40], and video formats [41]. Unlike the passive nature of these formats, webtoons allow posting opinions and “likes” which encourage bidirectional engagement, while presenting stories that readers can relate to. A recent study used a webtoon to provide education on COVID-19 infection prevention and reported that webtoon education had an educational effect on knowledge development and positive attitude formation through emotions and inducing preventive behavior [42]. Meanwhile, another study reported that women of childbearing age wished for individually tailored pre-pregnancy health information, preferred sources of prepregnancy health information, and preferred learning through the experiences of other women when planning pregnancy [14]. In medical education, both instructors and students preferred cartoons because they believed that cartoons create a positive learning environment, support students’ thinking, and help promote verbal communication between instructors and students [43]. Therefore, since the webtoon education program presented in this study was personalized in time and place and involved learning through case experiences, it aligns with what is expected as a preferred source of health information.

In this study, the experimental group had statistically significantly higher PHMSE-PL than the control group immediately after participating in the education program and after 2 weeks. In previous studies, prenatal education using comics was found to be partially effective in improving the environmental health behaviors of pregnant women [39]. Narrative-based educational information from comic books was more effective than tradition-

### Table 5. Usability of webtoon education for preventive self-management related to preterm labor (N=49)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
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<tr>
<td>Desirability</td>
<td>4.43</td>
<td>0.82</td>
</tr>
<tr>
<td>Valuableness</td>
<td>4.51</td>
<td>0.79</td>
</tr>
<tr>
<td>Accessibility</td>
<td>4.55</td>
<td>0.58</td>
</tr>
<tr>
<td>Usefulness</td>
<td>4.57</td>
<td>0.61</td>
</tr>
<tr>
<td>Convenience</td>
<td>4.57</td>
<td>0.61</td>
</tr>
<tr>
<td>Merit for the future</td>
<td>4.51</td>
<td>0.62</td>
</tr>
<tr>
<td>Credibility</td>
<td>4.49</td>
<td>0.65</td>
</tr>
<tr>
<td>Total items</td>
<td>4.52</td>
<td>0.62</td>
</tr>
</tbody>
</table>

https://doi.org/10.4069/kjwhn.2022.09.22
al information-based education on pregnant women’s self-efficacy in reducing climate change-related health risks [44]. Because the participants of this study participated in story-based narrative learning using webtoons, we can posit that their learning was internalized by considering high-risk factors of premature labor in the context of an individual’s life and how to seek solutions [37]. The visual images of the webtoon and the personalities of the main characters also likely contributed to enhancing the learning effect [20,38].

Furthermore, in this study, the experimental group had a statistically significantly higher PSMK-PL than the control group immediately after participation in the educational program and after 2 weeks. In previous studies, narrative-based educational information from comic books had an effect on pregnant women’s knowledge of health risks related to climate change [44] and on knowledge about the prevention and management of COVID-19 [42]. Cartoons were found to be valuable as a health information medium [18] and had an effect on students’ academic achievement in social studies [21]. It has also been argued that cartoon mnemonics are time-efficient for medical students who must memorize many facts [45]. Therefore, webtoons are thought to improve knowledge by increasing learning interest and learning immersion, making information easier to remember [20,38].

A meaningful aspect of this study is that it evaluated the usability of the webtoon health education related to premature labor based on stories, since this is one of the first studies to use a webtoon-based study to provide health information to women of childbearing age. The average score for usability of webtoon education in this study was high at 4.52 points, with generally high scores ranging from 4.43 to 4.57 across the subcategories. Particularly high scores were found for usefulness, valubleness, and merit for the future of webtoon education, reflecting the recognition that this webtoon presented effective educational material. Since the material was published as a webtoon and only one participant did not view it within the given time, it is presumed that it was convenient and accessible. In this webtoon, however, only four colors (including black and white) were used, and digital effects were not used [46], which may explain why desirability had the lowest score.

In this study, webtoon scenarios describing five cases of premature labor were composed, and their effects were confirmed. In the future, it will be necessary to develop various cases, create a program that can induce behavioral changes as well as improve self-efficacy and knowledge, and conduct evaluation studies. Another point worth noting is that the characters in the webtoons were portrayed realistically to enhance empathy and immersion. However, there are limitations in interpreting the effects of the webtoons in terms of empathy and immersion, because it was not confirmed which specific characteristics of the webtoons affected participants’ learning modalities. The webtoons developed in this study could be individually tailored in terms of time and place, but the educational content was not specifically personalized.

Some possible options for creating a truly personalized on-line webtoon education program and deepening virtual experiential learning could include developing an interactive webtoon story in which the user directly selects relevant options of risk factors for premature labor and creates the story, using movement technology for characters, or applying the technology of a three-dimensional spatial experience in which the user enters the story [16].

Blinding was not performed due to the characteristics of the webtoon education program in this study, and it was not possible to confirm long-term effects such as preventive health management practices for premature labor during actual pregnancy and indicators related to the direct occurrence of premature labor. Future research to confirm long-term, practical effects are suggested. The time of retest in this study was as short as 2 weeks after the intervention. In future studies, it is suggested to measure the effect by extending the time of the retest. Since there was no pre-existing measurement tool suitable for evaluating the effectiveness of this program, the measurement tools used in this study were not widely utilized. The interpretation of the research results is limited because these tools have not been applied to various groups or sufficiently tested for validity and reliability. It is meaningful that this study evaluated the effectiveness of the webtoon education program on PSM-PL for the first time in nursing. Unlike animation-based educational materials containing stories, which require substantial investments of time and money, webtoon educational materials are relatively time- and cost-effective. No study has yet compared the educational effectiveness of animations and webtoons, so it is expected that a comparative study on time, cost, and educational effects will be conducted in the future.

In conclusion, this study confirmed that a webtoon education program could potentially improve self-efficacy and knowledge of health management related to premature labor in women of childbearing age. As this webtoon education program was also feasible and evaluated as useful, clinicians can use it at various health education sites in the future to enhance the self-management capacity of women of childbearing age to prevent premature labor.
Supplementary materials
Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2022.09.22).

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Authors' contributions
All other work was done by Kim SH except for the task of randomly assigning participants by the research assistant.

Conflict of interest
Sun-Hee Kim has been an editorial board member of the Korean Journal of Women Health Nursing since January 2022. She was not involved in the review process of this manuscript. Otherwise, there was no conflict of interest.

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Data availability
The dataset files are available from Harvard Dataverse https://doi.org/10.7910/DVN/VIZDGR.

Acknowledgments
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References


Special Issue – Call for Papers

Digital Era Education for Women’s Health and Well-being

Aims and scope

The COVID-19 pandemic induced changes that have potentiated digital transformation on multiple levels world-wide. Although the pandemic initially created gaps in educational support for women with health issues, adapting digital technology made new teaching modalities and supportive interventions possible. Meanwhile, in clinical practicum, stricter infectious disease management protocols and privacy concerns have doubled the challenge of preparing nursing students to adequately assess and meet the needs of women. In this context, digital technologies can offer teaching solutions that can reach women more effectively and support their health and well-being, as well as prepare nursing students to learn more effectively about women’s health nursing.

The thematic scope of this special issue includes scientific issues related to the design and implementation or to the utility and usability of novel digital solutions, tools, and/or systems, provided that they contribute to women’s health.

Main topics

This special issue will focus on the design, development, evaluation, and use of digital solutions that support the health and well-being of women through education. Contributions should demonstrate how digital transformation based solutions support nurse clinicians and/or educators in enhancing women’s health.

Contributions are solicited on, but not limited to, the following topics:

- Design and implementation of digital solutions to improve reaching and teaching women to manage and promote their health and well-being.
- Design and implementation of novel tools to help nurse clinicians and/or educators adapt teaching modalities for women, nurses, and/or nursing students, to the changing needs of the digital era.
- Topics include, but are not limited to, digital transformation, artificial intelligence, mixed reality (MR) modalities, etc., applied to educational support for women's health issues.
- Various manuscript types are welcome in either English or Korean: Systematic reviews, scoping reviews, methodology papers, concept papers, experimental research, qualitative research, action research, etc.

Important dates

Deadline for submission of papers: 31st Dec 2022
Notification of acceptance: 15th Mar 2023
Deadline for submission of final version of accepted papers: 15th Apr 2023

Submission guidelines

Submissions should be prepared according to the author instructions available at the journal homepage, https://www.kjwhn.org/authors/authors.php. Typical length of a manuscript is 14–15 pages.
Instructions to Authors

Korean Journal of Women Health Nursing
Enacted in March 1995 and most recently revised in December 2021 and applied from Vol 28, No 1 (March 2022)

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This journal follows the data sharing policy described in “Data Sharing Statements for Clinical Trials: A Requirement of the International Committee of Medical Journal Editors (ICMJE)” (https://doi.org/10.3346/jkms.2017.32.7.1051). As of July 1, 2018 manuscripts submitted to ICMJE journals that report the results of interventional clinical trials must contain a data sharing statement as described below. Clinical trials that begin enrolling participants on or after January 1, 2019 must include a data sharing plan in the trial’s registration. The ICMJE’s policy regarding trial registration is explained at http://www.icmje.org/about-icmje/faqs/clinical-trials-registration/. If the data sharing plan changes after registration this should be reflected in the statement submitted and published with the manuscript, and updated in the registry record. All of the authors of research articles that deal with interventional clinical trials must submit data sharing plan of example 1 to 4 in Table 1. Based on the degree of sharing plan, authors should deposit their data after de-identification and report the digital object identifier (DOI) of the data and the registered site.

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Table 1. Examples of data sharing statements that fulfill the requirements of the International Committee of Medical Journal Editors.

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<tr>
<th>Element</th>
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<th>Example 2</th>
<th>Example 3</th>
<th>Example 4</th>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>What data in particular will be shared?</td>
<td>All individual participant data collected during the trial, after deidentification.</td>
<td>Individual participant data that underlie the results reported in this article, after deidentification (text, tables, figures, and appendices).</td>
<td>Individual participant data that underlie the results reported in this article, after deidentification (text, tables, figures, and appendices).</td>
<td>Not available</td>
</tr>
<tr>
<td>What other documents will be available?</td>
<td>Study protocol, statistical analysis plan, clinical study report, analytic code</td>
<td>Study protocol, statistical analysis plan, analytic code</td>
<td>Study protocol</td>
<td>Not available</td>
</tr>
<tr>
<td>When will data be available (start and end dates)?</td>
<td>Immediately following publication. No end date.</td>
<td>Beginning at 3 months and ending at 5 years following the article publication.</td>
<td>Beginning at 9 months and ending at 36 months following the article publication.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>With whom?</td>
<td>Anyone who wishes to access the data.</td>
<td>Researchers who provide a methodologically sound proposal.</td>
<td>Investigators whose proposed use of the data has been approved by an independent review committee (“learned intermediary”) identified for this purpose.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>For what types of analyses? Any purpose</td>
<td>To achieve aims in the approved proposal.</td>
<td>For individual participant data meta-analysis.</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>By what mechanism will data be made available?</td>
<td>Data are available indefinitely at (link to be included).</td>
<td>Proposals should be directed to xxx@yyy. To gain access, data requestors will need to sign a data access agreement.</td>
<td>Proposals may be submitted up to 36 months following article publication. After 36 months the data will be available in our University's data warehouse but without investigator support other than deposited metadata.</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td>Data are available for 5 years at a third-party website (link to be included).</td>
<td></td>
<td>Information regarding submitting proposals and accessing data may be found at (link to be provided).</td>
<td></td>
</tr>
</tbody>
</table>

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- A structured abstract of no more than 250 words, stating purpose, methods, results (including the sample size), and conclusion drawn from the study.
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The full text is freely available from the website (https://kjwhn.org) according to the Creative Commons License (https://creativecommons.org/licenses/by/4.0/). Print copies can be dispatched to members of the Korean Society of Women Health Nursing and libraries worldwide upon the policy of the Society. Those who wish to receive copies and obtain further information should contact the office of the Society (http://www.women-health-nursing.or.kr).

1-10. CONTACT US
Any inquiries regarding suitability of manuscripts according to the aims and scope of the Journal, submission, review, publication, or journal-related issues are welcomed. Please contact the Editorial Office (kjwhn@kjwhn.org).

For manuscript submission, please visit: http://submit-kjwhn.org

2. Publication Type and Manuscript Preparation

2-1. WRITING MANUSCRIPTS
All manuscripts must be prepared in accordance with the “Uniform Requirements for Manuscripts Submitted to Biomedical Journals” available at http://www.icmje.org. Manuscripts are accepted for publication with the understanding that their contents, or their essential substance, have not been published elsewhere, except in abstract form or by the express consent of the Editors. Materials taken from other sources must be accompanied by written permissions for reproduction, obtained from the original publisher. Statistical methods should be identified. Priority claims are discouraged. All materials must be written in clear, appropriate English using Microsoft Word (doc or docx). Each page must be numbered at the lower central portion. Number pages consecutively.

2-2. TITLE PAGE
On the title page include title (only capitalize first letter of the first word); subtitle (if any); running title, first name, middle initial, and last names of each author, ORCID number (required for all authors), name of department(s) and institution(s) to which the work should be attributed. The address, phone number, and email of the person responsible for correspondence concerning the manuscripts should be listed separately and clearly labeled as such. List keywords and present authors’ contributions. The journal does not limit first author status to only one person, in cases where equal contribution is evident. Describe contributions, such as the following:

Example 1:
Conceptualization: Piao H, Kim MH; Formal analysis: Piao H, Kim MH, Cui M, Choi G; Writing–original draft: Piao H, Kim MH; Writing–review & editing: Piao H, Choy JH.

Example 2: All work was done by Jeong GH.

Also, describe conflicts of interest, funding, data availability, and acknowledgements (acknowledge only those people and their institutions that have made significant contributions to the study). If applicable, state disclaimers, such as whether manuscript was adapted from thesis/dissertation.

The title page must be submitted separately from the manuscript. A template is available online (https://www.kjwhn.org/authors/authors.php).

2-3. MAIN MANUSCRIPT
Organize the main manuscript in the following order; title, abstract and keywords, summary statement, text, references, tables, figures, and pictures.

Original articles

Abstract and Keywords
An abstract of no more than 250 words should be typed double-spaced on a separate page. It should cover the main factual points, according to the following subheadings: Purpose, Methods, Results, and Conclusion. The abstract should be accompanied by a list of up to five keywords for indexing purposes. Be very specific in your word choice. Use MeSH keywords (https://meshb.nlm.nih.gov/) and present keywords in alphabetical order.

Summary Statement
Following the abstract, describe a summary statement on a separate page according to the following subheadings, with 30 words or less under each subtitle.

• What is already known about this topic?
  Example: The 75 years and older age group, with its complex health needs, is likely to make up an increasing proportion of the workload of accident and emergency strain the coming years.
• What this paper adds
Example: An alcohol-based surgical hand rub is more effective than a 6-minute surgical hand scrub using 4% chlorhexidine gluconate in terms of microbial counts immediately after scrubbing.

• Implications for practice, education and/or policy
Example: Parents’ ability and willingness to participate in their child’s care in the hospital should be thoroughly assessed and their participation needs to be supported.

Main Text
Maximum word count should be within 5,000 words, although less is preferred, excluding tables, figures, and references. The manuscript should be written on A4 sized paper, in Times New Roman 12-point font, double-spaced and have margins of at least one inch (2.54 cm). In general, the text should be organized under the following headings: Introduction, Methods, Results, and Discussion.

Introduction: Clearly state the need of this study and main question or hypothesis of this study. Summarize the literature review or background in the area of the study.

Methods: Present an “Ethics statement” immediately after the heading “Methods” in a boxed format.

Example 1:

**Ethics statement:** This study was approved by the Institutional Review Board of XXXX University (IRB-201903-0002-01). Informed consent was obtained from the participants.

Example 2:

**Ethics statement:** Obtaining informed consent was exempted by the Institutional Review Board (IRB) of YYYY University (IRB-201903-0002-01) because there was no sensitive information and the survey was anonymously treated.

Describe the study design, setting and samples, and measurements, procedure, analysis used. Authors are encouraged to describe the study according to the reporting guidelines relevant to their specific research design, such as those outlined by the EQUATOR Network (http://www.equator-network.org/home/) and the United States National Institutes of Health/National Library of Medicine (http://www.nlm.nih.gov/services/research_report_guide.html).

Ensure correct use of the terms sex (when reporting biological factors) and gender (identity, psychosocial or cultural factors), and, unless inappropriate, report the sex or gender of study participants, the sex of animals or cells, and describe the methods used to determine sex or gender. If the study was done involving an exclusive population, for example in only one sex, authors should justify why, except in obvious cases (e.g., ovarian cancer). Authors should define how they determined race or ethnicity and justify their relevance.

Results: Describe the main results in a concise paragraph. This section should be the most descriptive. Note levels of statistical significance and confidence intervals where appropriate.

Discussion: Make discussions based only on the reported results. Describe conclusions and recommendations for further study needed. Do not summarize the study results.

Abbreviations: Use standard abbreviations and units recommended in the publication manual of the to the NLM Style Guide for Authors, Editors, and Publishers (2007), 2nd ed., National Library of Medicine, Bethesda, MD, USA (http://www.nlm.nih.gov/citingmedicine). Non-standard abbreviations should be defined the first time they appear in the text. At first usage, spell out terms and give abbreviations in parentheses. Thereafter, use only abbreviations. It is not necessary to spell out standard units of measure, even at first usage.

Review article
An invited review will be published on an interesting or a new topic. Also submitted reviews are welcomed on any field according to the aims and scope, including systematic review and meta-analysis, scoping reviews, and integrative reviews. The main text is composed of introduction, methods, results, and discussion. There is no limit to the total number of references for a review article. The word count for the main text should be within 8,000 words.

Invited paper
It is a commissioned article for specific purpose only with request base. The topics were discussed between editors and authors before submission. The main text is composed of 3 sections: introduction, text, and conclusion. The total number of references article is recommended to be equal to or less than 30. The word count for the main text should be within 8,000. An abstract is optional and is limited to 250 words.

Issues and perspectives
Issues and Perspectives is usually an invited short article, which deals with the present hot issues in women's health nursing, al-
though not limited to this field. Authors of general interest to nursing and health care are also invited. Its format consists of introduction, main content, and conclusion. Length of the main text is limited to 2,000 words and keywords are limited to 5, preferably in MeSH terms. Number of references is limited to 20 and figures and tables are limited to 10 in total.

**Special essay**

It is a commissioned publication type for the presentation of experiences in nursing or health field. Authors are invited by the editor-in-chief. Topics are discussed upon request. There is no specific format.

**Editorials**

An editorial is usually invited by the Editorial Board. It provides the brief review and comments on pressing developments and events in the field of women's health nursing. It also may deal with a change in the journal's style and format and communication with an outside organization or professional. Other various topics shall be dealt by the Editorial Board as deemed appropriate. Divisions in the body of an editorial are not required. The total number of references is recommended to be equal to or less than 10. The word count of the main text should be less than 2,500 words.

**Letter to the editor**

Any opinion or inquiry on a paper published can be addressed to the editor. Title, author, affiliation, main text and the references are the required sections. The total number of references is recommended to be less than 10. The word count of main text should be equal to or less than 1,000 words.

**In reply**

As the reply to “Letter to the editor” its format is same to the “Letter to the editor” and will be published simultaneously.

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### 2-4. References

In the text, references should be cited with Arabic numerals in brackets (e.g. [1]), numbered in the order cited.

In the references section, the references should be numbered in order of appearance in the text and listed in English citation form. Journal titles should be described in NLM style.

References within the past 5 years are encouraged, and unpublished PhD or master’s thesis are not recommended as reference.

Other types of references not described below should follow the NLM Style Guide for Authors, Editors, and Publishers (http://www.nlm.nih.gov/citingmedicine). There are no limits to the number of references. However, limit supporting citations in text to 1-2 per statement. Note the DOI in URL form, if available.

#### Journal article with up to six authors:


#### Journal article with more than six authors:


#### Book:


#### Book Chapter:

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in

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**Table 2. Recommended maximums for articles submitted to the Korean Journal of Women Health Nursing**

<table>
<thead>
<tr>
<th>Publication type</th>
<th>Abstract (word count)</th>
<th>Text (word count)a</th>
<th>References</th>
<th>Tables &amp; figures</th>
<th>Invited or unsolicited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original articles</td>
<td>250</td>
<td>5,000</td>
<td>No limit</td>
<td>6</td>
<td>Unsolicited</td>
</tr>
<tr>
<td>Review articles</td>
<td>250</td>
<td>8,000</td>
<td>No limit</td>
<td>6</td>
<td>Invited or unsolicited</td>
</tr>
<tr>
<td>Invited papers</td>
<td>Optional (250)</td>
<td>8,000</td>
<td>30</td>
<td>10</td>
<td>Invited</td>
</tr>
<tr>
<td>Issues and Perspectives</td>
<td>None</td>
<td>2,000</td>
<td>20</td>
<td>10</td>
<td>Invited</td>
</tr>
<tr>
<td>Special essays</td>
<td>None</td>
<td>3,000</td>
<td>20</td>
<td>10</td>
<td>Invited</td>
</tr>
<tr>
<td>Editorials</td>
<td>None</td>
<td>2,500</td>
<td>10</td>
<td>5</td>
<td>Invited</td>
</tr>
<tr>
<td>Letter to the editor</td>
<td>None</td>
<td>1,000</td>
<td>10</td>
<td>3</td>
<td>Unsolicited</td>
</tr>
<tr>
<td>In reply</td>
<td>None</td>
<td>1,000</td>
<td>10</td>
<td>3</td>
<td>Invited</td>
</tr>
</tbody>
</table>

*aMaximum number of words excludes the abstract, references, tables, and figure legends

Above limitations are negotiable. If more word count or number of figures and tables are required, authors can contact the editor-in-chief.

Unpublished thesis or dissertation:

Web reference:

2-5. Tables/Figures/Pictures
Each table, figure, and picture should be placed on a separate sheet. Number tables consecutively and supply a brief title at the top for each. Footnotes to tables should be indicated by superscript symbols (†, ‡, §, ¶, ††, ‡‡…) unless abbreviations are explained in which case superscripts are not required. All abbreviations used should be described in table footnote by writing the abbreviation followed by colon sign and definition, placed in alphabetical order.

Tables and figures are printed only when they express more than can be done by words in the same amount of space.

Do NOT indicate placement of tables of figures in the text. The editor will automatically place your tables and figures.

3. How The Journal Handles Complaints and Appeals
The policy of Korean Journal of Women Health Nursing is primarily aimed at protecting the authors, reviewers, editors, and the publisher of the journal. If not described below, the process of handling complaints and appeals follows the COPE guidelines available from: https://publicationethics.org/appeals

Who complains or makes an appeal?
Submitters, authors, reviewers, and readers may register complaints and appeals in a variety of cases as follows: Falsification, fabrication, plagiarism, duplicate publication, authorship dispute, conflicts of interest, ethical treatment of animals, informed consent, bias or unfair/inappropriate competitive acts, copyright, stolen data, defamation, and legal problem. If any individuals or institutions want to inform the cases, they can send a letter via the contact page on our website (https://kjwhn.org/about/contact.php). For the complaints or appeals, concrete data with answers to all factual questions (who, when, where, what, how, why) should be provided.

Who is responsible for resolving and handling complaints and appeals?
The Editor, Editorial Board, or Editorial Office is responsible for them. A legal consultant or ethics editor may be able to help with decision making.

What may be the consequence of the remedy?
It depends on the type or degree of misconduct. The consequence of resolution will follow the guidelines of COPE.

4. Direct Marketing
Journal propagation has been done through the journal website and distribution of an introduction pamphlet. Invitations to submit a manuscript are usually focused on the presenters at conferences, seminars, or workshops if the topic is related to the journal’s aims and scope.
Research and Publication Ethics

For the policies on research and publication ethics that are not stated in these instructions, the Good Publication Practice Guidelines for Medical Journals (https://www.kamje.or.kr/board/view?b_name=bo_publication&bo_id=13&per_page=) or the Guidelines on Good Publication Practice (https://publicationethics.org/guidance/Guidelines) can be applied.

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2. Statement of Human And Animal Rights

Clinical research should be done in accordance with the Ethical Principles for Medical Research Involving Human Subjects, outlined in the Declaration of Helsinki (https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/). Clinical studies that do not meet the Declaration of Helsinki will not be considered for publication. Research participants’ rights to privacy must be protected, and personal identifiable information should not be disclosed unless absolutely necessary. Human subjects should not be identifiable, i.e., patients’ names, initials, hospital numbers, dates of birth, photographs, or other protected healthcare information should not be disclosed. If such personal information is needed as scientific data for publication, this should be explained to participants (or legal guardians) and written consent must be obtained. The possibility of online information sharing (not only printed publications) must also be explained. For animal subjects, research should be performed based on the National or Institutional Guide for the Care and Use of Laboratory Animals, and the ethical treatment of all experimental animals should be maintained. For studies using literature review and meta-analysis, Institutional Review Board (IRB) approval is not required. For secondary data analysis studies, the editorial committee will decide whether IRB approval is needed.

3. Statement of Informed Consent

Copies of written informed consents and IRB approval for clinical research should be kept. If necessary, the editor or reviewers may request copies of these documents to resolve questions about IRB approval and study conduct.

4. Authorship

All authors, including the co-authors, should be responsible for a significant part of the manuscript. All authors and co-authors should have taken part in writing the manuscript, reviewing it, and revising its intellectual and technical content. Any author whose name appears on a paper assumes responsibility and accountability for the results.

5. Originality and Duplicate Publication

All submitted manuscripts should be original and should not be considered by other scientific journals for publication at the same time. Manuscripts are accepted for publication with the understanding that their contents, or their essential substance, have not been published elsewhere, except in abstract form or by the express consent of the Editors. Any part of the accepted manuscript should not be duplicated in any other scientific journal without the permission of the Editorial Board. The duplication will be checked through SimilarityCheck powered by iThenticate (https://www.crossref.org/services/similarity-check/) before review. If duplicate publication related to the papers of this journal is detected, the authors will be announced in the journal and their institutes will be informed, and there also will be penalties for the authors. Materials taken from other sources must be accompanied by writ-
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Title page
☐ Please follow the title page template available online

Manuscript preparation
☐ A4, 12 point font Times New Roman in MS Word file
☐ Line space: Double spacing / Margins of at least 1 inch (2.5 cm)
☐ Within 5,000 words (excluding figures, tables, references)
☐ Author information is removed

Abstract
☐ 250 words or less (240-250 words are suggested)
☐ Subheadings of Purpose, Methods, Results, and Conclusion

Summary Statement
☐ 30 words or less under each subtitle

Main Text
☐ Subheadings of Introduction, Methods, Results, and Discussion
☐ Permission to use instruments should have been obtained
☐ Specify Ethics statement under Methods subheading. Avoid redundant descriptions in the text

References
☐ References follow NLM style
☐ Limit supporting references to 1-2 per statement

Table, figure, and picture
☐ No more than 6 figures, tables, and pictures altogether
☐ According to Instructions to Authors
☐ Abbreviations are noted under the table, in alphabetical order, and are congruent with text descriptions
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