**Aims and Scope**

The *Korean Journal of Women Health Nursing* is the primary source of information for meeting the challenges of providing optimum healthcare for women. This authoritative peer-reviewed journal publishes the latest clinical and research papers on health issues that affect women throughout their lifespan. The Journal aims to be the core resource for cutting-edge advancements and clinical applications of new nursing practice, therapeutic protocols for the management of health problems in women, and innovative research in gender-based issues that impacts treatment and nursing care.

The emphasis of the journal is on clinical nursing practice and education on the social science components relevant to women's health issues. Topics covered include nursing care, education and research methodology for ante-, intra-, and post-partal women, for middle aged and elderly women's health, and for socio-cultural issues and therapies.

**About the Journal**

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According to the State of the World’s Midwifery 2021 report, there are about 1.9 million midwives worldwide, but a shortage of 900,000 midwives remains. The workforce of midwives is insufficient in European countries, the United States, Australia, and Japan, where midwives help with childbirth, as well as in Africa, where the maternal mortality rate is high [1].

In Korea, where 99.5% of newborns are born in hospitals, midwives are also facing a crisis due to the deteriorating circumstances in the field of obstetrics and gynecology resulting from the ultra-low birth rate [2]. As apprenticeships for midwives have disappeared, it has become difficult to train midwives. Midwives are also losing their jobs and closing birth centers in response to the decreasing number of midwife-assisted births, after an earlier period of growth due to the popularity of natural childbirth. Accordingly, this article was written to shed light on the role of midwives during the transition process of the Korean midwifery system and to explore ways of broadening the role of Korean midwives in the future by analyzing examples of the expansion of midwives’ role in other countries.

Expanding the role of midwives in Korea
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Midwifery policy in Korea

The profession of midwifery in Korea began with the introduction of Western medicine in the early 20th century. In the past, there were “three-grandmothers (samshin)” and “umbilical cord-cutting grandmothers,” who simply helped give birth and cut the umbilical cord. However, as their actions were considered superstitious and unsanitary, lay midwives (sanpa) appeared. Unlike the traditional “grandmothers,” midwives (sanpa) acted as mothers’ assistants, helping with prenatal and postpartum management and childbirth, as well as checking the infant’s health [3]. The term for midwives (sanpa) was changed to josamwon in 1951 and josansa in 1987 [4].

During the Japanese colonial period, a midwife’s license could be obtained after completing a course at a midwife training center. After Korea’s liberation, graduates from nursing school were also eligible to get a midwifery license. Those who did not attend a midwife training center or nursing school could take a midwife qualification examination, but this examination was difficult to pass [3]. For nursing school graduates, the nursing-midwife policy was implemented, allowing nurses to obtain a midwife’s license if they assisted 20 childbirths [4]. This policy enabled nurses who received nursing education to become midwives upon completion of midwifery training. This reflected the American system, wherein midwives contributed to lowering maternal and infant mortality by engaging in childbirth-related work. These goals were also pursued by the U.S. Military Government [5].

This system continues to this day. Today, midwives in Korea must pass the midwives’ national examination after completing a 1-year midwifery probationary course after holding a nursing license [6]. Midwives are medical personnel and nurse midwives, and their role is greater than that of tradi-
tional midwives and nurses separately.

The role of midwives

The Medical Service Act of Korea states that midwives are tasked with providing health and health guidance for childbirth, pregnant women, and newborns [6]. Midwives are mainly responsible for childbirth-related tasks, but in the 1950s, they were also responsible for managing infectious diseases and basic health care, as well as checking population-level dynamics such as population movements, deaths, and births due to the Korean War. Midwives in Korea have consistently performed midwifery duties, but the midwifery probationary course was operated as a special hospital course; therefore, the curriculum and midwives’ roles were not evaluated. In 2003, core competencies were developed through a midwifery work analysis [7]. More recently, a midwifery work guideline was developed for midwives and has been made available to the public to promote a wider understanding of the actual conditions of midwives’ jobs. According to the work guidelines for on-site midwives, midwives perform 56 tasks in 7 areas: pregnancy management, childbirth management, postpartum management, newborn care, primary health care, law/ethics, and general management [8].

The role of midwives in pregnancy management has focused on pregnancy discomfort management, self-care education/counseling, physical assessment, fetal assessment, and history taking. In delivery management, their role involves caring for the first, second, third, and fourth stages of childbirth and pain management. Postpartum care includes postpartum assessment, postpartum home visits, maternal education, maternal self-care, breastfeeding, and newborn care (including both newborn health assessment and normal newborn care) [7,8]. Primary health care encompasses women’s health management, counseling, and education. Furthermore, midwives serve as women’s health professional nurses capable of assessing women’s health.

Midwives have faced changes in their role and an occupational crisis as hospital treatment and hospital births surged in Korea [9], starting with the implementation of the national health insurance system. This is related to the expansion of analgesia-assisted labor through hospital births and the implementation of high-risk pregnancy management. However, as women complained about impersonal treatment and excessive medical interventions in the hospital birth process, women themselves re-claimed bodily agency and searched for natural childbirth methods that enable them to experience childbirth as active participants, rather than as passive subjects of medical treatment [9]. For this reason, births in birthing centers and at home increased, and midwives re-emerged as facilitators of childbirth. As midwives applied alternative delivery methods preferred by women, their roles in the existing seven areas expanded and changed. Midwives help women to accept labor as a physiological process and to have natural childbirths with minimal medical intervention. There is a need for education for women who want to give birth in birthing centers, as well as for their family members, and strengthening midwifery plays a meaningful role in supporting these initiatives [10].

Recently, however, Korean midwives are once again facing a crisis involving role change. Due to women’s preference for natural and self-directed childbirth, the number of birthing centers in Korea increased from 13 in 2012 to 20 in 2014, and the number of childbirths at these centers also reached 1,679 in 2013 [11]. However, as the total fertility rate fell to 1.05 in 2017 and 0.92 in 2019, the number of birthing centers dropped to 15 in 2019, and the number of natural births at these centers decreased by nearly 1,000 to 683 [12]. As midwives’ role has been mainly focused on childbirth and health care for mothers and infants, the falling birth rate has made it difficult for midwifery to be sustainable as a medical profession in Korea. This underscores the need to expand the role of midwives.

Expansion of midwifery roles in other countries

As Korea’s low total fertility rate has threatened midwives’ position, it is meaningful to explore steps taken by several other countries that have already experienced a drop in the fertility rate, to expand the role of midwives by predicting relevant sociodemographic shifts.

In Sweden, midwives are in charge of childbirth in the hospital delivery room, and midwifery visit centers provide prenatal care including ultrasonography, health assessments, and counseling on exercise and nutrition. Maternity centers provide 1-day postpartum management, examinations at 12 to 14 weeks postpartum, contraceptive management, and postpartum management until 16 weeks (vaginal observations, checking for infections of the surgical wound after cesarean section, wound dressing managing, breastfeeding-related problems, assessing and managing postpartum depression, etc.). In addition, midwives in Sweden perform a wide range of roles, including education on parenting roles and family planning, health information education, sexual education, contraceptive education, counseling for mental disorders, and counseling on school life maladjustment for elementary school students and adolescents [13].

Midwives in the United Kingdom not only care for mothers
and infants, but also manage health problems such as domestic violence, sexual violence, mental illness, and substance abuse. Midwives visit homes to monitor children's health and safety. The level of parenting skills is identified and, if an intervention is required, linkage is provided to related institutions [14].

Midwives in Canada provide pregnancy and childcare services as well as childbirth support, promote information exchange among mothers and link mothers to services within the local community [15].

In Turkey, in addition to their role in reducing maternal and infant mortality and improving health, midwives are responsible for the health of women, infants, families and communities through a scientific process that meets modern standards in collaboration with perinatal health experts [16].

Midwives in the United States practice health promotion and disease prevention while focusing on women's primary health care for each stage in the life cycle. The work of midwives reflects changing social needs and promotes the development of knowledge through research activities [7].

In these countries, the recipients of health care provided by midwives have expanded to include all members of the community, from mothers and infants to and adults. In addition to childbirth management, midwives maintain their professional role as medical professionals by expanding the scope of their work to include that of professional nurses, encompassing the physical and mental health of community members, sexual health education and counseling, and domestic violence and substance abuse management. Moreover, the state provides a medical system in which midwives can perform professional roles while achieving the standardization of midwifery work.

**Directions for midwives’ role expansion in Korea**

Korean midwives are also seeking ways to expand their role in response to changes in childbirth patterns. First, by providing childbirth assistance to families who need midwives, they fulfill the original role of midwives stipulated in the Medical Services Act. Midwives can be in charge of prenatal and postpartum management of women in vulnerable regions, such as rural areas and fishing villages, where there is no obstetrician or gynecologist, even if a delivery room exists. The State of the World's Midwifery 2021 report [1] noted that midwives are equipped to play a pivotal role in achieving the Sustainable Development Goals set by the United Nations. This is also consistent with the expanded role that Korean midwives are currently seeking to undertake. Second, efforts are being made to expand the level of health care, education and counseling, and health assessments, which midwives mainly provided for women, to a broader range of individuals, families, and community members. In other words, midwives becoming more active in promoting health and participating in primary health care that provides integrated services for disease prevention, treatment, and rehabilitation. In addition, midwives can carry out health screening, vaccination, and preventive education and management performed by nurses in the current coronavirus disease 2019 pandemic. This is possible because Korean midwives are essentially nurses with midwifery training. Korean midwives can conduct maternal and child health programs at public health centers at the municipal and county level in the local community and are well poised to provide family planning services. Moreover, midwives have the capacity to perform the role of primary health managers by providing regular health checkups, vaccinations, and home care for pregnant women and infants.

Given that the role of midwives is expanded, people will more easily recognize midwives as medical professionals responsible for women's health care and the health of community residents. Such recognition will in turn, allow midwives to build on their rich history of contributing to maternal child health, to establish a clearer position and stronger role for promoting people's health in Korea.

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Expansion of the role of midwives in gender equity and sexual/reproductive health issues in Japan

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Issues regarding the low fertility rate in Japan

In terms of an aging society, Japan ranks the first among the 38 member countries of the Organization for Economic Co-operation and Development (OECD), with the highest proportions of the population in the ≥ 65 years (27.7%) and ≥ 80 years (8.5%) age groups in 2019 [1]. According to the Ministry of Health, Labour and Welfare of Japan, the fertility rate in Japan decreased gradually from 2.16 children per woman in 1971 to 1.36 children per woman in 2019 [2]. The number of recorded births in 2020 was 840,832, which was 24,407 less than that in 2019 [3]. There is also an increasing trend of women preferring to conceive at an older age. The average age of women at their first delivery increased from 29.1 years in 2005 to 30.7 years in 2019, thereby influencing their decisions regarding subsequent pregnancies [4]. Further, the coronavirus disease 2019 (COVID-19) pandemic has been considered a factor contributing to the decreasing birth rate [5].

The number of births using assisted reproductive technology (ART) increased after the introduction of advanced ART techniques, from 21,704 in 2008 to 56,979 in 2018 [6]. This treatment is covered by insurance only when the causes of infertility are identified and treated. Advanced treatments, such as artificial insemination by husband, in vitro fertilization (IVF), and intracytoplasmic sperm injection, are not covered and are mostly paid out of pocket due to limited funding from local governments. Women and their families have been struggling, not only with the complications and side effects of treatment, but also with its high costs, as the cost of frozen embryo transfer ranges from ¥210,000 to ¥980,000 (roughly 2,000-9,000 US dollars). Until the end of 2020, there was a subsidy of ¥150,000 (except for the first time of treatment [¥300,000]), while the current subsidy is ¥300,000 (roughly 2,800 US dollars) [7].

A recent study revealed that among the 513 Japanese women who received advanced infertility treatment, 54% showed symptoms of depression, with the rate having increased by nearly 80% when they were in their 20s [8]. The researchers pointed out that high costs may have contributed to the symptoms [8]. In 2020, the Suga administration announced that infertility treatment will be covered by health insurance starting in April 2022, either through employees’ health insurance or through the national health insurance program for self-employed individuals and people out of employment [9]. In June 2021, the Japan Society for Reproductive Medicine published the Reproductive Medicine Guideline [10] to recommend which treatments should be covered by insurance. This guideline strongly recommends the inclusion of IVF and medical treatment for males, including treatment for...
erectile dysfunction. In addition, it also recommends a preimplantation examination for women who have experienced miscarriage twice, and prescription of antidepressants for patients with ejaculation disorder. Based on this guideline, experts are expected to discuss healthcare fees at the Central Social Insurance Medical Council in early 2022. Until then, the subsidy for treatment has increased, and the upper limit of household income to receive the subsidy was abolished. Apart from health insurance, the social support system, such as coworkers and other people surrounding women affected by infertility, also plays a significant role, as treatment often requires multiple visits to clinics/hospitals to receive testing of hormone levels and to receive medications, including injections.

**Insufficient support during the postpartum period**

Another important issue in Japan that requires more attention is postpartum depression. A recent retrospective cohort study using the Diagnosis Procedure Combination database, a national database on acute-care inpatients in Japan, reported that the prevalence of suicide attempts was significantly higher among postpartum women (6.2%) than among pregnant women (0.7%; p < .001) and that postpartum patients were more likely to have depression [11]. In fact, suicide is the leading cause of maternal death in Japan [12]. During the COVID-19 pandemic, social support for pregnant women and mothers has decreased. Mothering or parenting classes were canceled, and home visits a month after birth by a public health nurse or midwife are conducted only within a very short period. Furthermore, parents with small children have avoided leaving their homes due to fear of infection. Given these circumstances that limit social interactions with their support systems, mothers do not receive the adequate support they need and deserve.

In Japan, mandatory maternity leave, called postpartum leave (sango kyuka), lasts for 8 weeks [13]. Mothers also have the option to avail themselves of childcare leave (ikuji kyuka) after postpartum leave, depending on the policies of the employers [13]. Postpartum leave is a paid leave, and they can receive childcare leave with benefits at 67% of their salary, with the exemption of some payments for social security funds [13]. Therefore, the decrease in income during leaves remains approximately 20% [13]. On June 3, 2021, the Amendment of the Childcare and Nursing Care Leave Law was passed and approved by the Diet (the parliament of Japan) [14]. This will allow men to avail themselves of leave for 4 to 8 weeks after the birth of the child [14]. There have been serious concerns regarding how to improve mothers’ experiences of “One Operation” (meaning one person, usually a mother, assumes all household and childcare responsibilities), as currently only 12.65% of Japanese fathers take paternity leave [15]. Men utilize approximately 83 minutes of average daily hours a week for household chores, childcare, and elderly care [16]. Among OECD countries, the disparity between women and men with respect to unpaid working hours is highest in Japan, with women spending 5.5 times more hours on unpaid work than men [17]. Therefore, in addition to implementing this important policy for men to take paternity leave, it is necessary to adequately provide learning opportunities for new fathers with respect to childcare so that they can understand how to appropriately begin their parenting journey with a new mother. As midwives, we often say, “Provide midwifery care for every woman.” However, in many cases, and bearing in mind the difficulties that exist, we should be more inclusive in considering the father’s role as well, and instead recognize that midwives are well-poised to “Provide care for every woman and man: every family.”

**Continuing gender disparities in Japan**

In Japan, women with children face difficulties in advancing their careers. Despite the government’s promise that they would hire more women in decision-making positions, such as in the parliament, management or executive positions in organizations, and professions with a high level of specialization, to be at 30% by the year 2020, with the slogan of “202030,” the role of working mothers in these positions remains low [18]. The Diet (Japanese parliament) consists of only 9.9% women, with 10.8% in management positions and 6.2% in executive positions [19]. The percentage of female professors was 17.7% in 2020 [19]. It has been called the “mummy’s track” when women are considered separately from the regular career ladder and are not assigned to more important roles or are not promoted after having a baby. Once a woman quits a job, it is often difficult to return to full-time employment. Among women who desire to work and are currently unemployed, their top reason for not having entered the workforce is due to childbirth and childcare [20]. There is a substantial income disparity, as illustrated by the fact that women in Japan were paid only 73.3% of what their male counterparts earned in 2018 [21]. Nurseries or daycare centers are another factor that has not been addressed for many years, as many women are not sure if they can find a nursery for their child when they return to work. Thus, these gender disparities in society tend to discourage women from conceiving at a younger age.
Pregnancy and childbirth experience

Midwives in Japan have provided quality care and support during pregnancy and childbirth. Coincidentally, I was pregnant when I was asked to author this article. I was able to go through pregnancy, childbirth, and parenting amidst the COVID-19 pandemic. Drake [22] stated the importance of storytelling, and thus I would like to share my story of how I positively experienced midwifery care in Japan. During antenatal care, most healthcare facilities provide mothers with the opportunity to have discussions with a midwife, aside from the physical consultation with the obstetrician. As most mothering or parenting classes were canceled because of the COVID-19 pandemic, it was a valuable time for pregnant women to ask questions and talk about their everyday lives. In my experience, I had itchy rashes due to pregnancy (prurigo gestationis), but I did not mention it during my obstetric consultation as I knew that it was because of my pregnancy and that it would eventually disappear after delivery. However, a midwife noticed these rashes and asked me if I took or applied any medication to treat the rashes. When I said no, she asked the obstetrician for a prescription, which relieved my stress from itchiness. Furthermore, it is important to be aware of the hospital environment before delivery, similar to when pregnant women usually visit the labor and delivery rooms during their mothering or parenting classes. Because visiting these rooms during pregnancy was not allowed due to the COVID-19 pandemic, I asked a midwife to provide images of the labor and delivery rooms and asked how time during labor is spent there. It was especially important for me to have a clear perspective on several aspects prior to actual labor and delivery: for example, room décor (if I can relax or not), decision-making in case of complications, equipment I may use during labor, and location of the operation theater in case of an emergency. Although I am a midwife who knows the general principles of pregnancy, labor, and delivery, having another midwife present with me during the process helped me better understand my concerns and prepare for the journey postpartum. I cannot describe all the details regarding the delivery of my child because of the page limit here, but overall, I faced anxiety and experienced tough labor pain, similar to those experienced by other pregnant women. Thankfully, a midwife was always with me to encourage me, provide respectful care, and deliver my baby safely. I will never forget the moment she brought my baby to my side.

Expansion of the roles of midwives

It is essential to discuss the vitally important role of midwives in addressing wider social issues, such as gender, sexual, and reproductive health, through multidisciplinary research and policymaking. To reiterate, I believe that midwives play an important role in pregnancy and childbirth with respect to the quality of care they provide. In general, women in Japan face multiple difficulties when they decide to have a child. Having said this, midwives need to expand their roles in research and policy advocacy in these areas, including promotion of gender equity and policymaking for women; otherwise, we cannot expect the low fertility rate to improve.

As mentioned earlier, women are vulnerable to depression during infertility treatment and the postpartum period. For infertility treatment, certified courses in infertility nursing started in 2003 in Japan for post-graduate specialty nurses, but the number of certified nurses in this specialty is limited, especially in local areas. As midwives in hospital settings often encounter women receiving infertility treatment, they need to strengthen their capacities in practice and research in this area so that women's needs are reflected in practice and brought to the policy level.

Regarding postpartum care, fathers and other members of the family also faced difficulties in learning proper caretaking skills because many family members were not allowed to visit the hospital, let alone attend births, during the COVID-19 pandemic in Japan. To increase support for women in the postpartum period, midwifery postpartum care (sango care) has become more important. In Asian countries, it is common to stay in care centers after birth. In Korea, these centers are called sanhujoriwon. In Japan, in sango care, midwives are the main care providers for postpartum women and are reimbursed by the government. This was highlighted in the Revised Maternal and Child Health Law in 2019, and sango care became more affordable as it was funded by the local governments [23]. It is an excellent example of the Japanese Midwives Association working with other stakeholders to effectively provide families with midwifery care, alleviating serious financial concerns. The next step is to explore how midwives can teach and involve fathers in postpartum care.

The Committee of Empowering Early Career Scientists of the Japan Academy of Midwifery, of which I am the co-leader, hosted a seminar regarding changing postpartum care to promote fathers’ involvement in September 2021. We invited a midwife, a psychologist, and a chief executive officer of a home help company to discuss the issue at hand from different points of view. In addition to this event, we have been conducting seminars on emerging topics in collaboration with young researchers in different disciplines and other stakeholders so that the audience, typically midwives in clinical areas, will learn the importance of a multidisciplinary approach.

To solve these issues at the social level, it is important to strengthen the research capabilities of midwives and discuss issues...
with different professions so that innovative ideas emerge and we can find solutions to address the current issues in society. The year 2020 was the Year of the Nurse and Midwife, which encouraged our leadership in society. Midwives can show their leadership in the above-mentioned new areas and offer professional services that make a lasting impact on women, men, and families.

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촉정도구의 심리계량적 속성 3: 수렴, 판별, 집합 및 준거타당도
이은현
 아주대학교 보건대학원

Psychometric properties of an instrument 3: convergent, discriminant, known-groups, and criterion validity
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Before evaluating convergent, discriminant, and known-groups validity, it is suggested to design an instrument that reflects hypothetical relationships or differences with other comparator instruments or groups. For criterion validity, a gold-standard instrument measuring the same construct should be carefully selected.

Keywords: Convergent validity; Discriminant validity; Known-groups validity, Criterion validity

주요어: 수렴타당도; 판별타당도; 집합타당도; 준거타당도

서론
이번 세번째 원고에서는 측정속성의 가설검정 구성타당도와 준거타당도에 대해 알아보고자 한다. 가설검정 구성타당도에서는 수렴, 판별, 및 집합타당도에 대해 알아볼 것이며, 준거타당도에서는 동시타당도와 예측타당도를 다룰 것이다.

가설검정 구성타당도 (hypothesis-testing construct validity)
가설검정 구성타당도는 검정하고자 하는 도구로 측정한 점수와 어떤 다른 개념을 측정한 점수의 관계에 대해 연구자가 가설을 세운 후 자료 수집을 통해 수집된 자료를 분석한 결과가 미리 설정한 가설을 만족했는지를 판단한다. 이처럼 연구계획 단계에서 미리 가설을 가지고 시작해야 하므로 이를 강조하기 위해 “가설검정”이란 용어가 붙어 있다. 가설검정 구성타당도에는 수렴타당도(convergent validity), 판별타당도(discriminant or divergent validity), 집합타당도(known-groups validity)가 포함된다[1].
수렴타당도를 검정하기 위해서는 검정하고자 하는 도구가 측정하는 개념과 관련이 있다고 예상되는 유사개념을 먼저 선정해야 한다. 그리고 그 관련성이 어느 정도가 될지에 대한 크기와 방향성에 대한 가설을 가지고 자료수집과 분석을 통해서, 실증적으로 그런 결과가 나왔는지를 판단해야 한다. 예를 들어, Lee 등[2]은 당뇨병 합시리터시 측정도구(Diabetes Health Literacy Scale, D HLS)의 수렴타당도를 검정하기 위해 문헌 고찰을 하였다. 그리고 선행연구에서 합스리리터시와 자기효능감은 실증적으로 중간 정도의 양의 관계가 있음을 확인하였다. 따라서 당뇨병 자가관리에 대한 자기효능감을 측정하는 Diabetes Management Self-Efficacy Scale (DMSES)를 수렴타당도의 비교측정도구(comparator instrument)로 결정하고, D HLS와 DMSES로 측정한 건강정보력과 자기효능감은
중간 정도의 양의 관계가 있을 것이라는 가설을 세웠다. 분석결과
D HLS와 D MSES는 \( r = 0.56 \) (\( p < 0.01 \))로 가설을 만족하였으므로
D HLS의 수렴타당도가 수립되었다고 하였다.
수렴타당도 검정에서 많은 연구자들이 오류를 범하는 부분은, 수
렴타당도 검정을 위해 사용하는 비교측정도구의 심리계량적 속성
을 고려하지 않은 경우이다. 위의 D HLS에서 수렴타당도 검
정을 위해 사용된 D MSES는 한국 2형 당뇨병 환자를 대상으로 내
용타당도, 요인구성타당도, 동시타당도, 내적일관성 및 검사-재검
사 신뢰도가 충족된 도구이다[3]. 이들 의의 혼란은, 수렴타당
도를 결정하려는 도구의 비교측정도구의 성과 결과 관리가 없
거나 약한 상관관계(\( r < 0.5 \))를 보였다는 설이 세웠다[5]. 한
편, 병리학적 특성에 따라 이보다 약한 관계를 설명할 수 있는
것도 있다. 예를 들어, 당뇨병 자가관리 속도도구의 수렴타당도 검정을 위해 생
의학자가(behavioral marker)인 당화혈색소(HbA1c)가 자주 사용한다. 하지만 실증적 선행연구에서 상관관계
가 그러Nearly equivalently에 없다고 보고되고 있으며, 그 기준은 \( r \geq 0.30 \)으로 사용
할 수 있다[6].
수렴타당도와 달리 병리타당도는 결정하고자 하는 측정도구점
수, 이와 다른 속성에 관한 비교측정도구의 성과 결과 관리가 없
거나 약한 상관관계(\( r < 0.30 \))를 보일 것이라고 가설을 세웠다[5]. 한
편, 병리학적 특성에 따라 이보다 약한 관계를 설명할 수 있는
것도 있다. 즉, 이론적인 관계가 없거나 약한 관계를 설명할 수
있는 것이라기보다는, 기존의 도구를 변경하여 새로운
의학적 특성에 따라 심리계량적 특성이 요구되는 경우에 사용되는
것이라고 할 수 있다. 예를 들어, 당뇨병 자가관리 속도도구의 수렴타당도 검정을 위해 생
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가 그러Nearly equivalently에 없다고 보고되고 있으며, 그 기준은 \( r \geq 0.30 \)으로 사용
할 수 있다[6].
수렴, 판별 및 집합타당도를 검정하기 위해서는 연구자가 선행연구 결과를 바탕으로 검증하고자 하는 도구와 비교측정도구로 측정한 점수의 상관관계의 정도와 방향에 대한 가설을 세우고 시행해야 한다. 분석결과가 사전에 기대한 가설을 만족하였을 때, 그 탐도가 만족하였다고 할 수 있다. 준거타당도는 검정하고자 하는 도구가 측정하는 개념과 같은 개념을 측정하는 표준화된 도구가 있는 경우에 실시한다.

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Authors' contributions

All work was done by Lee EH.

Conflict of interest

The author declared no conflict of interest.


Effects of nonpharmacological interventions on the psychological health of high-risk pregnant women: a systematic review and meta-analysis

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Purpose: This study aimed to summarize the current evidence on the effects of nonpharmacological interventions on psychological health outcomes for women with high-risk pregnancies due to conditions such as preeclampsia, gestational diabetes, or preterm labor.

Methods: The following databases were searched from January 2000 to December 2020: PubMed, Ovid Embase, CINAHL, Web of Science, DBpia, RISS, and KISS. Two investigators independently reviewed and selected articles according to the inclusion/exclusion criteria. RoB 2 and the ROBINS-I checklist were used to evaluate study quality.

Results: Twenty-nine studies with a combined total of 1,806 pregnant women were included in the systematic review and meta-analysis. Psychological health improvements were found in women with preeclampsia (Hedges’ g = –0.67; 95% confidence interval [CI], –0.91 to –0.44), gestational diabetes (Hedges’ g = –0.38; 95% CI, –0.54 to –0.12), and preterm labor (Hedges’ g = –0.73; 95% CI, –1.00 to –0.46). The funnel plot was slightly asymmetrical, but the fail-safe N value and the trim-and-fill method showed no publication bias.

Conclusion: Nonpharmacological interventions for women with high-risk pregnancies due to conditions such as preeclampsia, gestational diabetes, and preterm labor can improve psychological parameters such as anxiety, stress, and depression. Nurses can play a pivotal role in the nursing management of pregnant women with high-risk conditions and apply various types of nonpharmacological interventions to meet their needs in uncertain and anxious times during pregnancy.

Keywords: Anxiety; Gestational diabetes; High-risk pregnancy; Mental health; Premature obstetric labor

Introduction

High-risk pregnancy refers to a pregnancy that can threaten the health and life of the pregnant woman, fetus, or newborn [1]. Although precise statistical data for high-risk pregnancies have not been published, the number of women hospitalized for high-risk pregnancies increased by 3.5 times from 21,000 in 2006 to 77,000 in 2016 in Korea [2]. The proportion of premature births alone increased from 4.9% in 2006 to 7.7% in 2018 in Korea [1]. These findings indicate that high-risk pregnancies are continuing to become more common. Among the conditions that cause high-risk pregnancies, preeclampsia, gestational diabetes mellitus (GDM), and preterm labor (PTL) before 34 weeks of pregnancy are the most common [2]. The Korean Society of Obstetrics and Gynecology classifies these three as factors that cause a moderate- or higher-risk pregnancy and notes that intensive observation and
management are necessary during pregnancy or childbirth for women with these conditions [1].

High-risk pregnant women often have negative experiences due to pharmacological treatment, restriction of physical activity, and hospitalization [3]. High-risk pregnant women are also more likely to be affected by poor psychological health such as depression, anxiety, and stress than other pregnant women [4-7]. In high-risk pregnant women in Korea, the prevalence of anxiety is 16%-34% and that of depression is 7%-33.9% [8]; similar rates have been reported among high-risk pregnant women in Western countries. Depression in high-risk pregnant women aggravates anxiety and stress [8] and negatively affects pregnancy maintenance and postpartum depression [6].

Some high-risk pregnant women are hospitalized in maternal-fetal intensive care units. This results in being separated from their spouse and family members [3], which may aggravate their anxiety, depression, and stress [9]. In addition, high-risk pregnant women have been reported as being less aware of the need for psychological health management than their low-risk counterparts [9].

Many intervention studies have been conducted for high-risk pregnant women. However, those studies mainly focused on changes in physical health indicators [10-12], including reductions in blood pressure [12], improvement of blood glucose levels [13], postpartum weight loss [11], and lowering of blood glucose levels in newborns [14]. Most systematic reviews of intervention studies on pregnant women with PTL only confirmed the treatment effect by applying drugs, tests, or treatment guidelines to prevent premature birth [10,15,16].

In recent years, increasingly many intervention studies have been conducted to improve aspects of psychological health such as depression, anxiety, and stress in high-risk pregnant women. These include relaxation therapy for pregnant women with pre-eclampsia [12] and face-to-face educational interventions combined with cognitive behavioral therapy and acupressure for pregnant women with GDM [17], which were found to effectively reduce stress. In addition, health care interventions for pregnant women with GDM were effective in relieving depression and anxiety [17]. Previous studies have reported the effects of interventions on psychological health by approaching high-risk pregnant women from the standpoint of disease. Still, no systematic review of nonpharmacological interventions effective for psychological health in high-risk pregnant women has yet been reported. It is necessary to identify the evidence applicable in practice for the effects of interventions on psychological health, including anxiety, depression, and stress of high-risk pregnant women through a systematic review of the literature.

This study was conducted to confirm the effectiveness of nonpharmacological interventions applied to pregnant women experiencing preeclampsia, GDM, or PTL as high-risk conditions. The specific goals were as follows: first, to identify nonpharmacological interventions for pregnant women with pre-eclampsia, gestational diabetes, or preterm labor, and second, to present a meta-analysis of the effects of nonpharmacological interventions on anxiety, depression, and stress.

Methods

Ethics statement: This study was exempted from approval by the Institutional Review Board as it is a review of the literature using previously published studies.

Study design

This study is a systematic review and meta-analysis. It was described according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) 2020 guidelines [18].
Criteria for selection of literature
The review questions were set using the PICO-SD (participants, intervention, comparison, outcome, study design) framework for a study that applied nonpharmacological interventions to pregnant women experiencing high-risk pregnancies and confirmed their effects. Studies were searched and selected from the electronic database.

Selection criteria
- Participants: The participants were pregnant women diagnosed with preeclampsia, GDM, or PTL as a high-risk condition.
- Intervention: All nonpharmacological interventions performed prenatally for the above-mentioned high-risk conditions during pregnancy were included.
- Comparison: Receiving routine antenatal care without nonpharmacological interventions during pregnancy.
- Outcomes: Anxiety, depression, or stress level.
- Study design: Only randomized controlled trials (RCTs) and non-RCTs using nonpharmacological interventions for high-risk pregnant women were included.

Exclusion criteria
The following types of studies were excluded: survey studies, qualitative studies, literature reviews, studies in which effect sizes could not be calculated, and studies presented at conferences.

Literature search and collection

Literature search
The terms expressing interventions were identified through PubMed's MeSH database before the literature search. The start time of the search was not limited, and the search site updated the literature by December 31, 2020. A total of seven search databases were used. PubMed, CINAHL (Cumulative Index to Nursing & Allied Health Literature), Web of Science, and Embase were used as international databases. In addition, RISS (the Korea Education and Research Information Service), KISS (Korea Research Information Service), and DBpia were used as domestic databases to identify studies published in Korea.

The search terms in the database were ‘preeclampsia,’ ‘GDM,’ ‘premature labor,’ ‘anxiety,’ ‘depression,’ and ‘stress,’ in combinations with ‘intervention.’ The search term for each risk was inputted as “TX (text) preeclampsia” OR “TI (title) preeclampsia” OR “AB (abstract) preeclampsia” OR “SU (subject) preeclampsia.” GDM and PTL were searched in the same way. All three search expressions were integrated. For the “intervention” search, the following terms were used “TX intervention” OR “TI intervention” OR “SU intervention.” As terms related to the psychological health results, three search formulas were integrated by generating “TX anxiety” OR “TI anxiety” OR “AB anxiety” OR “SU anxiety” for anxiety, depression, and stress, respectively (Supplementary Data 1).

Data collection and selection
A list of documents collected through the literature search was generated. Using EndNote X9 (Clarivate Analytics, London, UK), a bibliographic management program, duplicate documents were removed from the list. The title and abstract of each study were checked to confirm whether the study met the data selection criteria. If it was difficult to decide whether to select a study based on the title and abstract, the full text of the study was reviewed. Two researchers (Yoo H and Ahn S) chose articles, discussed the results of selection, examined the content, and confirmed the final target literature.

Literature quality evaluation
The quality of the literature was evaluated independently by the two researchers using the revised Cochrane Risk of Bias tool for randomized trials (RoB 2) [19] and the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) tool [20]. RoB 2 provides a framework for judging bias in the results of various types of randomized experimental studies [19]. RoB 2 consists of five subdomains: (1) bias due to the randomization process, (2) bias due to deviations from intended interventions, (3) bias due to missing outcome data, (4) bias in measurement of the outcome, and (5) bias in selection of the reported result. ROBINS-I is a tool to evaluate the non-randomized effects of interventions and compare two or more interventions [20]. ROBINS-I consists of seven subdomains: (1) bias due to confounding, (2) bias in selection of participants into the study, (3) bias in classification of interventions, (4) bias due to deviation from intended interventions, (5) bias due to missing data, (6) bias in measurement of outcomes, and (7) bias in selection of the reported result. Two researchers evaluated the literature quality individually, and reevaluated inconsistencies through consensus after reviewing the full text.

Data analysis method
Characteristics of the literature
The characteristics of the selected studies were extracted using the framework of the following 12 items: age, pregnancy period, classification of high-risk pregnancy, sample size, intervention name, number of interventions, duration of interventions, dependent variables, research tools, research design, research results, and country.
Comprehensive effect size analysis
The effect size and homogeneity of nonpharmacological interventions were analyzed using the Comprehensive Meta-Analysis program. The mean and standard deviation or frequency were selected, and a random-effect model was applied to calculate the effect size for the results. The direction of the effect values of individual studies and the degree of overlap of the confidence intervals between studies were confirmed through forest plots. For statistical heterogeneity in the effect size, the chi-square test and I² index were calculated. A higher value of the I² index corresponds to greater heterogeneity: 0% means no heterogeneity; 50%, moderate heterogeneity; and 75% or more, high heterogeneity [21].

Publication bias test
The publication bias of the selected study was tested by the Egger linear regression asymmetry test [22], the fail-safe N coefficient [23], and the trim-and-fill method [24,25], including a funnel plot.

Results
Final literature selection
Through the search, a total of 3,535 documents were first selected, and after excluding duplicate documents, 3,024 articles remained. Among them, 70 papers were selected by reviewing the titles and abstracts. The full text of these 70 papers was checked, and finally, 29 articles were selected for analysis [26-54]. Of the 41 articles excluded, 12 did not include preeclampsia, GDM, or PTL, 10 were non-experimental studies, and 19 did not have anxiety, depression, or stress as outcome variables (Figure 1).

Quality evaluation of selected studies
Quality evaluation using RoB 2 was performed for the 17 RCTs [26-42]. The risk of bias was low for both bias due to the randomization process and bias due to missing outcome data. Bias due to deviations from intended interventions showed some concern for

![Figure 1. PRISMA 2020 flow chart for the literature review.](https://doi.org/10.4069/kjwhn.2021.09.17)
about 76% of studies. The risk of bias in measurement of outcomes was as follows: 35%, high-risk of bias; 29%, low risk; 18%, moderate risk; and 53%, very high risk. An analysis of the methodological quality of the 12 non-RCT studies [43-54], using ROBINS-I found low risks of bias due to deviations from intended interventions, bias due to missing outcome data, and bias in measurement of outcomes. The risk of bias in the allocation process was moderate in 25% of papers. The risk of bias due to deviations from intended interventions was severe in 8% of studies. The risk of bias due to missing outcome data was moderate in 8% of studies. The risk of bias in selection of the reported result was moderate in 17% of the studies. Overall, 75% of the studies had a low risk of bias, 16% had a moderate risk, and 8% had a severe risk (Figure 2).

General characteristics of selected studies

Research characteristics

- Country: Of the 29 studies, nine were conducted in Korea [43-46,48,50,52-54], all of which were non-RCT studies. Seven studies [27-29,33,35,41,47] were conducted in Iran. There were four studies each in China [26,34,42,49] and Turkey [32,37,39,40], and two each in Taiwan [30,36] and Switzerland [38]. One study was done in Australia [31] and one in Italy [51] (Supplementary Table 1).
- Year of publication: Of the 29 selected studies, seven [26,31,45,46,50,51,54] were published between 2005 and 2010. Three studies [30,48,53] were published between 2011 and 2014. The majority of studies (n = 18) were published between 2016 and 2020 [27-29,32-37,39-44,47,49,52] (Supplementary Table 1).
- Sample size: All 29 studies had one experimental group and one control group, and the average sample size was 75 people each. The smallest sample size was 17 in the experimental and 18 in the control group [44], and the largest sample size was 490 in the experimental group and 510 in the control group [31] (Table 1).
- Types of intervention and consequences: Twelve studies implemented behavioral therapy. Three studies [32,46,54] used abdominal breathing, three studies [26,39,44] used music therapy, and three studies [38,41,47] used cognitive behavioral therapy. Two studies [30,50] used relaxation therapy. Finally, one study [27] used acupressure therapy.

Characteristics of interventions

- Research design: Of the 29 studies, 17 [26-42] were RCTs. Of the remaining 12 non-RCTs [43-54], seven studies used a nonequivalent control group pre- and posttest design [45,48,49,51-53], and four studies used a nonequivalent control group non-synchronized design [43,44,50,54]. One study had a matching control group interrupted time series design [46] (Supplementary Table 1).
- Intervention strengths: Except for four studies [31,34,49,51], which did not clearly report the details, the number of interventions could be confirmed. The intervention programs were provided an average of 7.7 times, with a range from at least one time [30] up to 30 times [31]. Exempt for four studies that did not report the relevant data [31,34,42,49], the average duration of the intervention was identified as 19.5 days. In both RCTs and non-RCTs, on average 7.7 interventions were provided for 19.6 days (Table 1).

Subject characteristics

- High-risk pregnancies: Of the 29 studies, five studies [28,34,35,39,47] included women with preeclampsia. There were 11 studies [27-31,33,40,41,48,49,51-53] targeting GDM and 11 studies [26,29,30,35,38,45,46,50,54] on PTL. Two studies [42,43] were conducted on women with high-risk pregnancies including PTL, GDM, and preeclampsia (Supplementary Table 1).
- Age: The age of the subjects was reported in 21 studies [27-34,36-38,42,43,45,46,48-52,54]. With the exclusion of one study [28], which presented only the age range, the average age of the subjects was 32.1 years and at least 17 years [28] (Table 1).
- Pregnancy period: The gestation period in the 29 articles ranged from 16 weeks [31] to 41 weeks [49] (Table 1).
Figure 2. Risk of bias graphs for 17 randomized controlled trials (RCTs) (A, B) and 12 non-RCT studies (C, D). (A, C) Risk of bias summary. (B, D) Risk of bias for selected studies.
<table>
<thead>
<tr>
<th>First author (year) [reference]</th>
<th>Country</th>
<th>Study design</th>
<th>Participant Sample size</th>
<th>Intervention detail</th>
<th>Psychological outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abazamejad (2019) [28]</td>
<td>Iran</td>
<td>RCT</td>
<td>17–46 25–38</td>
<td>22</td>
<td>Psychoeducational counseling 2 45 3 days</td>
</tr>
<tr>
<td>Jiang (2019) [34]</td>
<td>China</td>
<td>RCT</td>
<td>21–48 (3.7) ≥ 20</td>
<td>84</td>
<td>Comprehensive nursing intervention ND ND ND</td>
</tr>
<tr>
<td>Kamali (2018) [35]</td>
<td>Iran</td>
<td>RCT</td>
<td>ND 34–38</td>
<td>36</td>
<td>Face-to-face education in the health care system 3 45–60 3 days</td>
</tr>
<tr>
<td>Toker (2017) [39]</td>
<td>Turkey</td>
<td>RCT</td>
<td>ND ≥ 30</td>
<td>35</td>
<td>Classical Turkish music 7 30 7 days</td>
</tr>
<tr>
<td>Ashghiari (2016) [47]</td>
<td>Iran</td>
<td>Non-RCT</td>
<td>28–34</td>
<td>31</td>
<td>Cognitive behavioral therapy 12 90 4 weeks</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamidi (2020) [33]</td>
<td>Iran</td>
<td>RCT</td>
<td>29.6 24–28</td>
<td>44</td>
<td>Mindfulness-based training 8 120 8 weeks</td>
</tr>
<tr>
<td>Ural (2020) [40]</td>
<td>Turkey</td>
<td>RCT</td>
<td>ND 34–38</td>
<td>46</td>
<td>Health-promoting lifestyle education program 3 45 3 days</td>
</tr>
<tr>
<td>Fiskin (2018) [32]</td>
<td>Turkey</td>
<td>RCT</td>
<td>31.0 24–28 (27.2)</td>
<td>32</td>
<td>Diaphragmatic breathing exercise 30 15 30 days</td>
</tr>
<tr>
<td>Bastani (2016) [27]</td>
<td>Iran</td>
<td>RCT</td>
<td>29.9 ND</td>
<td>28</td>
<td>Acupressure 9 18 3 days</td>
</tr>
<tr>
<td>Zaheri (2016) [41]</td>
<td>Iran</td>
<td>RCT</td>
<td>ND 24–32</td>
<td>40</td>
<td>Cognitive behavioral stress management intervention training 6 120 3 weeks</td>
</tr>
<tr>
<td>Crowther (2005) [31]</td>
<td>Australia</td>
<td>RCT</td>
<td>30.5 16–30</td>
<td>490</td>
<td>Ongoing care including individualized dietary advice ND ND ND</td>
</tr>
<tr>
<td>Cai (2020) [49]</td>
<td>China</td>
<td>Non-RCT</td>
<td>30.99 34–41</td>
<td>89</td>
<td>Comprehensive nursing mode ND ND ND</td>
</tr>
<tr>
<td>Kim (2019) [52]</td>
<td>Korea</td>
<td>Non-RCT</td>
<td>35.8 24–28</td>
<td>22</td>
<td>12-week web-based self-management program 12 20–30 12 weeks</td>
</tr>
<tr>
<td>Ko (2014) [53]</td>
<td>Korea</td>
<td>Non-RCT</td>
<td>ND 24</td>
<td>34</td>
<td>Coaching program on comprehensive lifestyle modification 4 20–30 4 weeks</td>
</tr>
<tr>
<td>Baek (2013) [48]</td>
<td>Korea</td>
<td>Non-RCT</td>
<td>33 24–28</td>
<td>19</td>
<td>Case management program 5 ND 2 weeks</td>
</tr>
<tr>
<td>Dalfrà (2009) [51]</td>
<td>Italy</td>
<td>Non-RCT</td>
<td>34.0 12–28</td>
<td>105</td>
<td>Telemedicine ND ND 10 weeks</td>
</tr>
<tr>
<td>Preterm labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bazrafshan (2020) [29]</td>
<td>Iran</td>
<td>RCT</td>
<td>26.1 24–28</td>
<td>36</td>
<td>Educational counseling group intervention 6 60 6 weeks</td>
</tr>
<tr>
<td>Özberk (2020) [37]</td>
<td>Turkey</td>
<td>RCT</td>
<td>27.9 29.8</td>
<td>33</td>
<td>Relaxation-focused nursing care 4 40–105 2 days</td>
</tr>
<tr>
<td>Scherer (2016) [38]</td>
<td>Swiss</td>
<td>RCT</td>
<td>32.7 18–32 (28.4)</td>
<td>31</td>
<td>Internet-based cognitive behavioral stress management 6 ND 6 weeks</td>
</tr>
<tr>
<td>Kao (2019) [36]</td>
<td>Taiwan</td>
<td>RCT</td>
<td>33.0 20–36 (27)</td>
<td>140</td>
<td>Support intervention 3–5 30–40 2 weeks</td>
</tr>
</tbody>
</table>

(Continued to the next page)
• Intervention duration: Behavioral therapy can be divided into short-term interventions and long-term interventions. Considering that high-risk pregnant women are stable after 3 days of hospitalization [30], and women with PTL are hospitalized for 5 days on average [50], short-term interventions were defined as those conducted within a week. Short-term interventions included applying relaxation therapy for 1 to 5 days for pregnant women with PTL [30,50], providing music therapy for 3 to 4 days [26,44], applying abdominal breathing for three days [46,54], and performing acupressure for 3 days in pregnant women with GDM [27]. Long-term interventions (longer than a week) included cognitive behavioral therapy for 3 to 6 weeks for pregnant women with PTL [38], preeclampsia [47], and GDM [41] and abdominal breathing for a month for women with GDM [32]. In particular, abdominal breathing effectively relieved stress, anxiety, and depression [32]. Abdominal breathing also effectively reduced anxiety [46,54] and stress [54] in pregnant women. In particular, abdominal breathing can be easily applied in clinical practice, and we therefore suggest that behavioral interventions applying abdominal breathing be actively used to improve the psychological health of high-risk pregnant women. Cognitive behavioral therapy showed improvement in stress [41] in pregnant women with GDM, alleviated depression, anxiety, and stress [47] in pregnant women with preeclampsia, and reduced anxiety and stress [38] in pregnant women with PTL.

Therefore, expanding the use of cognitive behavioral interventions in clinical practice would have the benefits of reducing anxiety, depression, and stress in high-risk pregnant women.

• Intervention place: Nonpharmacological interventions were mainly provided as in-hospital interventions, including all five


Table 1. Continued

<table>
<thead>
<tr>
<th>First author (year)</th>
<th>Country</th>
<th>Study design</th>
<th>Sample size</th>
<th>Gestational weeks</th>
<th>Study group</th>
<th>Intervention detail</th>
<th>Psychological outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuang (2011) [34]</td>
<td>Taiwan</td>
<td>RCT</td>
<td>68</td>
<td>20-24</td>
<td>Cont</td>
<td>Relaxation training program</td>
<td>Anxiety at T2 &lt; Cont, Int &lt; Cont at T1, NA</td>
</tr>
<tr>
<td>Yang (2009) [29]</td>
<td>China</td>
<td>RCT</td>
<td>60</td>
<td>26-36</td>
<td>Cont</td>
<td>Music therapy</td>
<td>NA</td>
</tr>
<tr>
<td>Kim (2010) [37]</td>
<td>Korea</td>
<td>Non-RCT CK</td>
<td>33</td>
<td>20-36</td>
<td>Cont</td>
<td>Couple-separated psychoeducational program</td>
<td>NA</td>
</tr>
<tr>
<td>Zhao (2017) [42]</td>
<td>China</td>
<td>RCT</td>
<td>167</td>
<td>≥28</td>
<td>Cont</td>
<td>Cognitive behavioral trial</td>
<td>NA</td>
</tr>
</tbody>
</table>
interventions for pregnant women with preeclampsia [28,34,35,39,47], and 10 out of 11 interventions for pregnant women with PTL [26,29,30,36,37,44-46,50,54]. Pregnant women with preeclampsia and PTL received pharmacological therapy during hospitalization and therapeutic management for ongoing monitoring of the pregnant woman and fetus after hospital discharge [3]. In pregnant women with GDM, seven out of 11 interventions [27,31-33,40,48,49,53] were applied in outpatient clinics and two interventions [27,49] were conducted in the hospital ward. This was most likely because providing integrated education and counseling on GDM self-management, such as blood glucose checks, lifestyle improvement, and drug treatment is possible in outpatient clinics.

- Measurement tools: Nine tools were used in 21 studies to measure blood pressure [26,39,46,50], and diastolic blood pressure [26,39,50], and oxygen saturation [46]. In these five studies, improvements in physiological indicators were shown by a decrease in systolic blood pressure [26,39,46,50] and diastolic blood pressure [26,39,50], a decrease in pulse or heart rate [26,50], body temperature [30,46,50], and oxygen saturation [46].

Effects of nonpharmacological interventions on psychological health

The effect size of the nonpharmacological interventions for high-risk pregnant women was calculated for the overall results including anxiety, depression, and stress; for the results of each of the three variables; according to the type of high-risk pregnancy; and according to the study design. The effect size was calculated using a random-effect model. Some studies included multiple measurements of the outcome variable. Thus, the meta-analysis of effect size included 26 sets of measurements of anxiety from 21 studies, 11 sets of measurements of depression from 12 studies, and 13 sets of measurements of stress from 11 studies.

(1) Effects by type of high-risk pregnancy

Effects on subjects with preeclampsia

A. Effects on anxiety: Nonpharmacological interventions showed an effect size of Hedge’s $g = -0.42$ (SE = .28) for anxiety in pregnant women with preeclampsia, which was not statistically significant ($p = .142$). The five studies on anxiety in pregnant women with preeclampsia were highly heterogeneous ($Q = 38.61$, df = 4, $p < .001$, $I^2 = 86.02$) [21].

B. Effects on depression: Nonpharmacological interventions had an effect size of Hedge’s $g = -0.75$ (SE = .14) for depression in pregnant women with preeclampsia ($p < .001$). The two studies on depression in pregnant women with preeclampsia showed low heterogeneity ($Q = 0.13$, df = 1, $p = .719, I^2 < .001$) [21].

C. Effects on stress: Nonpharmacological interventions showed an effect size of Hedge’s $g = -0.48$ (SE = .46) on stress in pregnant women with preeclampsia, which was not statistically significant ($p = .296$). The two studies on stress in pregnant women with preeclampsia were highly heterogeneous ($Q = 28.61$, df = 4, $p < .001$, $I^2 = 84.90$) [21] (Figure 3, Supplementary Table 2).

Effects on subjects with GDM

A. Effects on anxiety: Nonpharmacological interventions had an effect size of Hedge’s $g = -1.66$ (SE = .46) on anxiety in pregnant women with GDM ($p < .001$). The eight studies reporting 10 sets of anxiety measurements in pregnant women with GDM were highly heterogeneous ($Q = 382.15$, df = 9, $p < .001$, $I^2 = 97.65$) [21].

B. Effects on depression: Nonpharmacological interventions showed an effect size of Hedge’s $g = -0.23$ (SE = .11) for depression in pregnant women with GDM ($p = .045$). The seven studies reporting depression in pregnant women with GDM had a moderate level of heterogeneity ($Q = 11.85$, df = 6, $p = .065$, $I^2 = 49.37$) [21].

C. Effects on stress: Nonpharmacological interventions showed
an effect size of Hedge’s $g = -0.62$ (SE = .48) for stress in pregnant women with GDM and were not statistically significant ($p = .194$). The three studies reporting four sets of stress measurements in pregnant women with GDM were highly heterogeneous ($Q = 76.30, df = 3, p < .001, I^2 = 96.07$) [21] (Figure 4, Supplementary Table 2).

Effects on subjects with PTL

A. Effects on anxiety: Nonpharmacological interventions showed an effect size of Hedge’s $g = -0.97$ (SE = .31) on the anxiety of pregnant women with PTL ($p = .001$). The eight studies reporting 10 sets of anxiety measurements were highly heterogeneous ($Q = 14.72, df = 6, p = .023, I^2 = 59.24$) [21].

B. Effects on stress: Nonpharmacological interventions showed an effect size of Hedge’s $g = -0.75$ (SE = .16) on the stress of pregnant women with PTL ($p < .001$). Six studies reporting seven sets of stress measurements in pregnant women with PTL showed a moderate level of heterogeneity ($Q = 11.66, df = 5, p = .040, I^2 = 57.11$) [21] (Figure 5, Supplementary Table 2).

C. Only one of the PTL studies focused on depression.

Figure 3. Effects of nonpharmacological interventions on pregnant women with preeclampsia.

Figure 4. Effects of nonpharmacological interventions on pregnant women with gestational diabetes mellitus.
ety (I < .001). Of the 17 RCT studies, the 16 studies on anxiety were highly heterogeneous (Q = 391.45, df = 15, I < .001, I² = 96.17) [21].

B. RCT effects on depression: Nonpharmacological interventions showed an effect size of Hedge’s g = −0.52 (SE = .08) on depression in randomized experimental design subjects (p < .001). The six studies on depression showed low heterogeneity (Q = 6.73, df = 5, p < .001, I² = 25.69) [21].

C. RCT effects on stress: Nonpharmaceutical interventions showed an effect size of Hedge’s g = −0.77 (SE = .28) on subjects’ stress in randomized studies (p = .005). The six studies on stress showed high heterogeneity (Q = 39.24, df = 5, p < .001, I² = 87.26) [21] (Supplementary Table 2, Supplementary Figure 2).

Effect size for non-RCT design subjects
A. Non-RCT effects on anxiety: Nonpharmacological interventions showed an effect size of Hedge’s g = −1.14 (SE = .32) on anxiety (p < .001). Of the 12 non-RCT studies, the 10 on anxiety were highly heterogeneous (Q = 125.75, df = 9, p < .001, I² = 92.84) [21].

B. Non-RCT effects on depression: Nonpharmacological interventions showed an effect size of Hedge’s g = −0.29 (SE = .19) on depression, but it was not significant (p = .136). The five studies on depression had an intermediate level of heterogeneity (Q = 12.62, df = 4, p = .013, I² = 68.31) [21].

C. Non-RCT effects on stress: Nonpharmaceutical interventions showed an effect size of Hedge’s g = −0.49 (SE = .25) on stress (p < .001). The seven studies on stress were highly heterogeneous (Q = 54.75, df = 6, p < .001, I² = 89.04) [21] (Supplementary Table 2, Supplementary Figure 3).

Publication bias test
Funnel plots, the classic fail-safe N, and the trim-and-fill method were used to test for publication bias related to the effects of nonpharmacological interventions on psychological health of high-risk pregnant women. The funnel plot was visually asymmetrical (Supplementary Figure 1), and the significance level of the degree of asymmetry through the Egger regression test was p < .001. The safety factor (classic fail-safe N) was calculated. This parameter, which refers to the number of studies required to change the results of nonpharmacological interventions on psychological health, was 6,235. This value was greater than the 260 calculated from the standard 5k+10 formula [23]. The effect of errors on the results was checked through the trim-and-fill method. No additional study was required, and both the observed effect size and the corrected effect size were −0.80. Therefore, combining the above results, it can be concluded that the overall effect size was not affected by publication bias. (Supplementary Figure 1).

Discussion
Key results
In this study, 29 nonpharmacological intervention studies for pregnant women experiencing high-risk pregnancies were reviewed, including the method of application, the content of the intervention, and intervention effects on anxiety, depression, and stress. Furthermore, the effect size of the outcome index was evaluated. As a result of the meta-analysis, nonpharmacologic interventions showed significant effects on individual indicators of anxiety, depression, and stress.

Figure 5. Effects of nonpharmacological interventions on pregnant women with preterm labor.
Interpretation
The health problems caused by high-risk pregnancy require long-term therapeutic management to maintain pregnancy and give birth at full term [1]. As a result, pregnant women experience anxiety, depression, and stress due to the burden of self-management and uncertainty about their health [9]. This study’s results showed that nonpharmacological interventions provided for high-risk pregnant women had the largest effect size for anxiety, compared to depression or stress as individual variables.

Previous studies confirmed the effectiveness of nonpharmacological interventions on physiological health only for pregnant women with preeclampsia [12] or pregnant women with GDM [17]. However, the present study confirmed the effects of nonpharmacological interventions on specific psychological outcomes for women with high-risk pregnancies who had preeclampsia, GDM, and/or PTL. Nonpharmacological interventions showed the greatest effect on depression in women with preeclampsia. In contrast, for pregnant women with GDM, the impact on anxiety was most prominent, and for pregnant women with PTL, anxiety, and stress were reduced. Therefore, the active use of nonpharmacological interventions in clinical practice can help improve psychological health indicators in high-risk pregnant women and positively affect maternal-infant health.

Based on the findings of this study, the effectiveness of online-based interventions remains unclear. An online counseling intervention applied to pregnant women with GDM did not significantly improve depression or stress scores [51]. However, online-based self-management and counseling appeared to reduce anxiety and depression in pregnant women with GDM [52] and an online-based cognitive behavioral stress management program reduced anxiety and stress in pregnant women with PTL [38]. As the physical activity of high-risk pregnant women is restricted [9] and the number of studies is insufficient, future research is needed to confirm the effect of non-face-to-face interventions. In addition, due to the recent social distancing due to coronavirus disease 2019, some regions are operating or have plans to run non-face-to-face prenatal programs [55,56]. As such, more active use of information and communications technology-based mediations would be beneficial.

The most common intervention providers were nurses or midwives. This is most likely due to the fact that high-risk pregnant women receive focused inpatient or outpatient care and nurses and midwives are highly accessible and have a heightened understanding of high-risk pregnancy. The majority of the interventions (86.2%) were performed individually. Group-based interventions constituted 13.8% and group sizes ranged from as few as four [29] to as many as 12 women [42]. Because the treatment schedule for each high-risk individual is different and bed rest is required when hospitalized, more interventions appear to have been delivered on an individualized basis. However, a group intervention for 10 pregnant women with preeclampsia per group effectively alleviated anxiety, depression, and stress [47]. As group interventions have been shown to affect psychological health in women with high-risk conditions [42], group interventions may be a reasonable option if individual access is difficult.

Limitations
Since the results of this study were limited to anxiety, depression, and stress, the findings cannot be applied to other mental health or psychosocial health outcomes, such as uncertainty or self-efficacy. Since the Cochrane Library was not included in the literature search, it is possible that some studies may have been missed. Because most women with high-risk pregnancies who are hospitalized require bed rest, prior studies may have been faced limitations in applying physical activities or behavioral interventions. Thus, the location where intervention is applied, the intervention type, and limited activities of women with high-risk pregnancies may have affected the results of this study. The risk of bias in measurement of the outcome was high in RCTs, and randomization and blinding were not sufficiently described. These are limitations when evaluating the quality of the studies. In non-RCT studies, the risk of bias in selection of participants into the study was deemed high because the criteria and process for selection were not clearly described. The fact that the outcome variables of anxiety, depression, and stress were measured using self-report questionnaires also increases the risk of bias in measurement of the outcome. If subject blinding is not performed, there is a possibility that the intervention effect can be overestimated. Therefore, caution should be considered when interpreting the non-RCT study results.

This study presented evidence regarding whether nonpharmacological interventions improve anxiety, depression, and stress in high-risk pregnant women with preeclampsia, GDM, and/or PTL. The effectiveness of face-to-face interventions was confirmed, but the impact of online-based interventions on psychological health remains unclear. When education, counseling, and behavioral therapy were applied as single or multiple interventions for high-risk pregnant women, their psychological health improved. Nurses need to apply these nonpharmacological interventions for women with high-risk pregnancies considering their nursing needs and the environment where the intervention is provided. In further research, the effect of online-based interventions will be checked using both self-reporting questionnaires and vital signs as much as possible.
Yoo H and Ahn S • Nonpharmacological interventions for high risk pregnancy

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Authors' contributions

Conceptualization, Data collection & Formal analysis, Writing–original draft, Writing–review & editing: Yoo H, Ahn S.

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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Supplementary materials

Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2021.09.17).

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Does a nurse-led postpartum self-care program for first-time mothers in Bangladesh improve postpartum fatigue, depressive mood, and maternal functioning?: a non-synchronized quasi-experimental study

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Purpose: This study aimed to test the efficacy of a nurse-led postpartum self-care (NLPPSC) intervention at reducing postpartum fatigue (PPF) and depressive mood and promoting maternal functioning among first-time mothers in Bangladesh.

Methods: A non-synchronized quasi-experimental design was used. First-time mothers were recruited during postpartum and assigned to the experimental or control group (34 each). The experimental group received the NLPPSC in the hospital, a 1-day intervention that focused on increasing self-efficacy. The control group received usual care. Data on PPF, depressive mood, maternal functioning, self-care behaviors, postpartum self-efficacy, and self-care knowledge were collected at postpartum 2 weeks (attrition 23.5%) and 6 weeks (attrition 16.1%). Data were analyzed using descriptive statistics, bivariate statistics, and linear mixed model analysis.

Results: One-third (33.3%) of new mothers experienced depressive mood (Edinburgh Postnatal Depression Scale scores of ≥13 points). The NLPPSC intervention was statistically significant in decreasing PPF (β=−6.17, SE=1.81, t=−3.39, p<.01) and increased maternal functioning at postpartum 6 weeks in the experimental group (β=13.72, t=3.73, p<.01) compared to the control. Knowledge was also statistically significant for increased maternal functioning over time (β=.37, SE=.18, t=2.03, p<.05). However, there were no statistically significant differences in depressive mood over time.

Conclusion: The NLPPSC intervention was feasible and effective in improving fatigue and maternal functioning in Bangladeshi mothers by postpartum 6 weeks and thus supports implementing the NLPPSC intervention for new mothers after childbirth.

Keywords: Fatigue; Intervention; Postpartum depression; Postpartum period; Self-care

Introduction

Postpartum fatigue (PPF) has a negative impact on maternal depression [1] and self-care in daily functioning [2,3]. Inversely, maternal functioning has a significant positive correlation with first-time mothers’ self-efficacy (SE) [4]. Thus, less PPF can be influential in increasing maternal functioning. Nurses are in a key position to intervene to alleviate PPF [5], screen for depression [6], and increase maternal functioning [7] for the well-being of mothers and newborns in the early postpartum period. However,
The findings of a quasi-experimental study on safe motherhood [10] highlighted an urgent need for programs in Bangladesh to increase knowledge and self-efficacy (SE), and positively affecting maternal health outcomes. Complications such as PPF, depressive mood, and maternal malfunctioning are important issues that require special attention from nurses and health care professionals, especially for new mothers. Also, an earlier randomized control trial (RCT) [11] reported that compared to providing standard care, it was more feasible and cost-effective to implement a nurse-led intervention for care. In order to promote maternal health in Bangladesh, some communities and rural areas are covered by programs such as the International Center for Diarrheal Disease and Research, Bangladesh, and the Bangladesh Rural Advanced Community, which provide door-to-door services including identifying complications and arranging referrals [12]. In addition, the government is expanding health access through electronic media, especially for maternal health services. For example, national electronic health (eHealth) strategies have been initiated to incorporate information communication technologies into the Bangladesh health system to align with the Digital Bangladesh Vision 2021 [13]. Various stakeholders are involved, especially the Mobile Alliance of Maternal Action Bangladesh [14], which is a leading mobile health service for maternal health outcomes. However, these services lack opportunities for exchange and assurance of understanding, or individualized care, and cannot substitute care provided by health care professionals in the early period.

In Bangladesh, these findings underscore the need for particular attention on PPF, including access to care and increased awareness and knowledge of activities, especially among young mothers who lack resources and those with vulnerabilities such as fatigue or depression. Maternity nurses’ initiation of PPF management has been shown to increase efficacy [3], and nurses have a role to promote mothers’ knowledge and influencing mothers to undertake at home. Maternal nurses—who are mostly women—also fit the cultural expectations of Bengali women regarding care and play a strategic role in delivering postpartum care. However, there is a current lack of studies focusing on nurse-led programs in Bangladesh.

This study aimed to test the efficacy of a nurse-led postpartum self-care intervention (NLPPSC) that was developed for first-time mothers in Bangladesh, on maternal health outcomes. The specific goals were as follows:

First, it examined the differences in process indicators (SE, and postpartum care knowledge) within and between the experimental and control groups.

Second, it examined the differences of outcome indicators (PPF, depressive mood, and maternal functioning) between the experimental and control groups, over three time-points. In this study, it was hypothesized that mothers in the experimental group would demonstrate the greater decrease in PPF than the control group, greater decrease in depressive mood than the control group, and greater increase in postpartum maternal functioning than the control group.

**Summary statement**

- **What is already known about this topic?**
  First-time mothers in Bangladesh have limited opportunities to gain knowledge and self-care skills, which may have a negative impact on postpartum fatigue, depressive mood, and maternal functioning.

- **What this paper adds**
  A nurse-led postpartum self-care intervention (NLPPSC) that focused on strategies for increasing self-efficacy was feasible and effective at improving fatigue and maternal functioning in new mothers by 6 weeks postpartum.

- **Implications for practice, education, and/or policy**
  The NLPPSC can be used to support first-time mothers in Bangladesh before discharge from the hospital. Future studies that expand the intensity and/or frequency of contact, as well as longer follow-up period would be beneficial. Further exploratory and interventional studies are also needed on postpartum depressive mood and develop postpartum self-care instruments based on the Bangladeshi context.
Methods

Ethics statement: This study was approved by the Institutional Review Board of Yonsei University College of Nursing (YU-CON-IRB 2017-0021). Informed consent was obtained from the subjects.

Study design: This study employed a non-synchronized quasi-experimental design with a baseline and two post-test periods. To avoid diffusion of the intervention, data from the control group were collected first (May to June 2017), followed by the experimental group (July to September 2017). This study report followed the TREND reporting guidelines [15].

Participants: Women who delivered and received postpartum care at Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, were recruited via convenience sampling. DMCH is a large public tertiary hospital where women from across Bangladesh come to give birth.

Inclusion criteria were (1) first-time mother, (2) spontaneous vaginal delivery, (3) newborn 5 min APGAR \( \geq 6 \), (4) postpartum duration \( \leq 1 \) week; and (5) ability to read and understand written Bengali. Exclusion criteria were (1) multiple infants, (2) chronic disease (i.e., diabetes, hypertension, bronchial asthma, etc.) or any postpartum complication (i.e., postpartum bleeding, puerperal sepsis, or psychosis), (3) had received newborn's vaccines at places other than DMCH and the Expanded Program of Immunization (EPI) center in Mohakhali, Dhaka, and (4) no access to telephone. For recruitment, flyers were posted around the postpartum unit to invite new mothers to voluntarily join the study under the permission from hospital executives. Potential participants could show their interest by approaching nurses on the postpartum ward, who acted as a ‘bridge’ between the potential participants and the researcher. The ward-in-charge nurse advertised the study and performed the initial screening for potential participants.

Interventions: The conceptual framework for this study was based on the concepts of SE as a component of social cognitive theory [16] and linked to health as the final outcome. Postpartum SE has been shown to positively affect mothers’ ability to perform self-care behaviors and promote postpartum health [17,18]. A modified conceptual framework for postpartum SE was conceptualized for this study in three constructs (Figure 1): (1) personal characteristics (sociodemographic and delivery-related characteristics) was postulated to influence (2) process indicators (postpartum care knowledge, postpartum SE, and postpartum self-care); and (3) outcome indicators (PPF, depressive mood, and maternal functioning). The NLPPSC program was posited to affect process and outcome variables. The NLPPSC program built on the four sources of SE, enactive mastery, vicarious experience, verbal persuasion, and physiologic arousal, and ultimately aimed to alleviate PPF and depressive mood, and positively affect maternal functioning.

Sample size: It was calculated by using G*Power, with effect size \( d = 0.5 \); \( \alpha \) of 0.05; and Power (1-\( \beta \) error probability) 0.95, which showed a minimum of 27 participants in each group. The expected attrition rate was estimated at range 15%–25% due to possibility of drop out in 2 and 6 weeks post intervention [3]. Therefore, 68 participants were recruited allocated to the experimental group.
(n = 34) or control groups (n = 34).

Instruments
The questionnaire set consisted of 104 items, which took around 20–30 minutes to answer. Permission to use instruments was obtained from the original authors unless available for free access. For instruments not available in Bengali, translation-back translation was done and independently reviewed by Bangladesh experts (English lecturer and obstetrician) to check for appropriate meaning and to ensure the equivalence of the two versions.

Outcome indicators
**Postpartum fatigue**
The 10-item Postpartum Fatigue Scale [19] measured on a 4 point Likert scale (1 = not at all; 4 = all the time) was used. It consists of physical fatigue (four items) and mental fatigue (six items) dimensions. Total summed scores can range from 10–40, and higher scores indicate greater fatigue. Internal consistency was .77 in the original study [19] and in this study the Cronbach’s alpha ranged from .35 to .82 across the three time points.

**Depressive mood**
Depressive mood was measured by using the 10-item Edinburgh Postnatal Depression Scale [20]. A 4-point Likert (0–3) is used and higher summed scores possible (range, 0–30) indicate greater depressive symptoms. In Western countries a cutoff of greater than 12 or 13 indicates the need for professional aid [20]. Due to cultural stigmatization towards postpartum depression in Bangladesh [21] and noting prior research [3], 13 or above was used as the cutoff for this study. Cronbach’s alpha was .86 in the original study [20], .70 in a prior survey of Bangladesh new mothers [22], and ranged from .48 to .56 across the three time points in this study.

**Maternal functioning**
Postpartum maternal functioning was measured using the Barkin Index of Maternal Functioning (BIMF) [23]. The BIMF is a 20 item 7 point Likert scale (0 strongly disagree, 6 strongly agree) and scores are summed (possible range, 0–120), with higher scores indicating higher postpartum maternal functioning. The Cronbach’s alpha of this tool was .87 at development [23] and ranged from .53 to .89 across the three time points in this study.

Process indicators
**Postpartum self-care**
Denyes’(1990) 8-item Self-Care Practice Instrument (DSC-PI-90) [24] was used as a general measure of self-care actions that meet universal self-care requisites, and items were adapted for the postpartum context. A 7 point Likert (1 = strongly disagree, 7 = strongly agree) is used and items are summed with a total possible range of 18–126 points. Higher scores reflect higher levels of self-care behavior. Cronbach’s alpha coefficients have been reported as between .82 to .89 [24] and ranged from .47 to .86 across the three time points in this study.

**Postpartum self-efficacy**
Postpartum SE was measured by modifying the Postpartum Management Self Efficacy Tool [25]. From the original 16 items, one item (sitz bath use) was deleted, as it was not relevant for use in Bangladesh context. The 15 items were scored on a 4 point Likert scale (1 = not confident at all, to 4 = very confident) and higher summed scores indicated higher levels of postpartum SE (possible range,15–60). Cronbach’s alpha was .90 at development [25] and ranged from .33 to .93 across the three time points in this study.

**Postpartum Care Knowledge**
The 20-item Postpartum Self-Care Knowledge scale [26] was modified, by deleting one item on sitz bath knowledge that was not relevant to Bangladesh context. Only correct answers received a score and scores for the 19 items were added to obtain a total score (possible score range, 0–19). Higher scores indicated high level of postpartum care knowledge. The Kuder Richardson-20 of this instrument in the original study was .76 at baseline and .73 for posttest [26] and for this study ranged from .55 to .85 across the three time points.

**Personal characteristics**
Personal characteristics consisted of socio-demographic characteristics (five items) and delivery-related characteristics (seven items), derived from the literature.

Procedures
The data were collected by the first author with help from two trained local research assistants (RA), from May to December, 2017. The data were collected at baseline, postpartum 2 weeks, and postpartum 6 weeks.

1) **Baseline** (between postpartum day 1–6): Participants returned completed questionnaires in a collection box placed in the ward and the researcher checked for any missing items. Phone number were obtained for the purpose of further contact. The posttest 1 questionnaire was provided along with a stamped envelope and participants were requested to complete the second questionnaire.
and send it via mail 2 weeks later. The researcher provided a card marked with the code number to show the RA at posttest to avoid unnecessary exposure of personal information.

The NLPPSC was developed following the ADDIE model [27], according to the following phases (Supplementary material):

Analysis phase: Data on postpartum care and interventions from WHO, UNFPA, World Bank, and a literature review was done using PubMed, CINHAL, EMBASE, Cochrane, PsycInfo, and Google Scholars database, for English publications from 2000–2017. Eleven related articles were identified but none were found for Bangladesh. Interviews with three first-time postpartum mothers in Bangladesh, who were purposively selected, explored actual postpartum needs and wishes for aid from maternal nurses or midwives, especially relating to practicing self-care behaviors at home. Participants noted at least one home visit and/or telephone calls could bridge the connection with maternal nurse/midwives and mothers and would be helpful to carry out effective postpartum self-care. Design phase: Program components built on using SE sources [28] of verbal persuasion (face-to-face discussion with interpretation of the participants’ responses, supplemented by a brochure containing postpartum care information). SE enactive mastery and vicarious experiences were designed as providing opportunity for participants to demonstrate skills and role play how to perform. The intervention period was drafted to be provided in the hospital before discharge, as two 30-minute sessions to accommodate maternal attention span to avoid fatigue. The initial program consisted of two phone calls at 2nd and 4th weeks to stimulate mothers to perform self-care actions and to clarify any ambiguities. Development phase: Program content and format were reviewed by an expert panel in Bangladesh (n = 5) consisting of 2 obstetricians, 1 head nurse of the postpartum unit, and 2 women’s health nursing faculty. Panel consensus were obtained with criteria of CVI > 85% for each item (mean CVI was .94). Timing for the second follow-up was modified to occur at 6 weeks. Implementation & evaluation phase: The program was provided to 2 postpartum mothers by convenience sampling at DMCH, using the same inclusion/exclusion criteria for the main study. Based on participant suggestions, we determined a larger space was necessary for the small groups and decided to add using a model placenta and uterus and a newborn doll. Thus, the NLPPSC program was finalized.

The experimental group received the finalized NLPPSC (Table 1), face-to-face education in four 30-minute sessions (small group format of 3–5 mothers) over 2 days during hospital stay, and reinforcement by phone calls (duration 3–5 minutes each) at postpartum 2 weeks and 4 weeks. The control group received the hospital’s standard care (5-minute verbal instruction at the time of hospital discharge).

2) Posttest 1 (postpartum 2 weeks): The response rate for the mailed questionnaires was 76.4%.

<table>
<thead>
<tr>
<th>Table 1. The nurse-led postpartum self-care program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
</tr>
<tr>
<td>Postpartum day 2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
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<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Postpartum day 3</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>2nd week</td>
</tr>
<tr>
<td>4th week</td>
</tr>
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<td></td>
</tr>
</tbody>
</table>
3) **Posttest 2 (postpartum 6 weeks):** Mothers were contacted to identify date and location of the EPI center they would visit for infant vaccination. A trained research assistant met the participant and checked the card’s code number, provided the questionnaire, which was completed on site. Upon completion a gift voucher of Bangladeshi taka (BDT; approximately 4 US dollars) was given as a token of appreciation for participation. For the control group, a postpartum self-care brochure was provided at the end of data collection along with gift voucher. The response rate of participants was 83.8%.

### Data analysis

The data were analyzed by IBM SPSS statistics version 21 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, bivariate statistics t-test, chi-square was used to examine homogeneity of variables, and paired sample t-test, and independent sample t-test were used to examine differences within and between groups. Due to attrition rate in follow up (23.5% at 2 weeks, 16.1% at 6 weeks) linear mixed model (LMM) was used to adjust for covariates and examine the treatment effects over three time periods. LMM was used for repeated measurements to explore the change in PPF, depressive mood, and maternal functioning between baseline and at 2 weeks; and baseline and 6 weeks while adjusting age, living status, and family income for baseline differences in the two groups. The LMM is a powerful advanced statistics tool that can estimate changes over time despite missing data points of a subsample, and thus, data from all 68 participants were included for analysis.

### Results

**Participation flow:** Flow of participation through each stage is presented in Figure 2.

**Recruitment:** Data from the control group were collected from May to June 2017, followed by the experimental group from July to September 2017.

**Baseline data**

The average age of the participants was 20.71 years old. Most lived with their husbands without extra family members (61.8%), and did not work out of the home (85.3%). Monthly family income averaged 25,155 BDT (approximately 300 US dollars). The average gestational age at delivery was 37 weeks, and newborn conditions were generally good (APGAR scores of 8 and more, 92.6%). Forty-seven percent had participated in at least one parenting preparation class, and all had at least one antenatal care (ANC) visit, of whom 52.9% had received at least three ANC, the minimum number recommended by WHO.

The experimental group was slightly older ($t = 2.90, p < .01$), and more participants tended to live with their husband, including other family members ($\chi^2 = 3.98, p < .05$). They also showed slightly higher income compared to the control group ($t = -2.38; p < .01$). There were no differences in delivery-related information or main variables between the experimental and control groups (Table 2).

**Baseline equivalence**

For baseline PPF, both the experiment (mean ± SD, 26.32 ± 3.21) and control groups (24.68 ± 3.18) showed a moderate level and the experiment group showed statistically significantly higher fatigue ($t = -2.17, p < .05$). Depressive mood (cutoff of ≥13) was noted in both the experimental (33.3%) and control group (29.6%), although there were no statistically significant differences ($\chi^2 = -29; p = .76$). The level of postpartum maternal functioning was slightly less than midpoint, and postpartum maternal functioning was not significantly different between the groups.

**Differences from baseline to 2 weeks**

The process variables, postpartum self-care, postpartum SE, and postpartum care knowledge are conceptually meaningful for effects on the output variables. Within the experimental group between baseline and postpartum 2 weeks, all variables showed significant improvement, while for the control group, only postpartum SE was improved ($t = -9.08, p < .01$). For between group differences at postpartum 2 weeks, postpartum self-care ($M_{\text{diff}} = 10.98; t = 9.49, p < .01$), postpartum SE ($M_{\text{diff}} = 17.18; t = 18.30, p < .01$) and postpartum self-care knowledge ($M_{\text{diff}} = 8.76; t = 11.08, p < .01$) of the experiment group were significantly higher compared to the control group (Figure 3).

**Differences from baseline to 6 weeks**

From baseline to postpartum 6 weeks, the experimental group showed significantly greater differences ($p < .01$) compared to the control group (Figure 3). For within group differences, there were significant mean differences in all three variables for both the experimental and control groups: For example, the experimental group’s postpartum self-care ($M_{\text{diff}} = 15.28; t = 10.02, p < .01$), postpartum SE ($M_{\text{diff}} = 15.04; t = 19.72, p < .01$) and postpartum care knowledge ($M_{\text{diff}} = 5.82; t = 6.91, p < .01$) levels all improved by 6 weeks. The same pattern was found for the control group, which may suggest that by 6 weeks after childbirth, a natural improvement is likely for mothers in general.
**Effectiveness of the intervention over time**

For the LMM analysis to test the effectiveness of NLPPSC intervention on PPF, depressive mood, and postpartum maternal functioning, the covariates that showed statistical significance, i.e., maternal age, living status, and monthly income, were adjusted in the equation. In addition, conceptually meaningful variables of this study, i.e., postpartum self-care behavior, postpartum SE, and postpartum self-care knowledge, were also loaded as covariates (Table 3).

**Effects on PPF:** The mothers who received the NLPPSC intervention showed statistically significant levels of slightly higher fatigue ($\beta = 1.45, SE = .72, t = 1.98, p < .05$) over time when compared to the control. However, the treatment effects of NLPPSC
intervention group at 6 weeks postpartum was statistically significant in decreased fatigue (β = −6.17, SE = 1.81, t = −3.39, p < .01) compared to the control group.

**Effects on depressive mood:** The estimated treatment effects did not find significant changes related to the NLPPSC intervention for depressive mood compared to the referent group.

**Effects on postpartum maternal functioning:** For postpartum maternal functioning, the estimated treatment effects showed that living with husband but not with other family members, was statistically significant (β = 4.44, SE = 1.30, t = 3.39, p < .01) compared to women who also lived with other family members. Among other variables, more postpartum self-care knowledge was also statistically significant (β = .37, SE = .18, t = 2.03, p < .05) for maternal functioning for the NLPPSC participants. Maternal functioning at both 2 weeks (β = 12.76, SE = 1.55, t = 8.20, p < .01) and 6 weeks (β = 24.54, SE = 3.12, t = 7.84, p < .01) showed statistically significant improvement over time. Finally, the treatment effects at 6 weeks were statistically significant (β = 13.72, SE = 3.67, t = 3.73, p < .01) in increased maternal functioning in the experimental group compared to the control group.

### Table 2. Homogeneity testing of participants (N=68)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>Total (N = 68)</th>
<th>Exp (n = 34)</th>
<th>Cont (n = 34)</th>
<th>t or χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td></td>
<td>20.71 ± 2.56</td>
<td>21.61 ± 3.13</td>
<td>19.82 ± 2.00</td>
<td>2.91</td>
<td>.005</td>
</tr>
<tr>
<td>Education</td>
<td>Primary</td>
<td>31 (45.6)</td>
<td>16 (47.1)</td>
<td>15 (44.1)</td>
<td>1.00</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>26 (38.2)</td>
<td>14 (41.2)</td>
<td>12 (35.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher than secondary</td>
<td>11 (16.2)</td>
<td>4 (11.7)</td>
<td>7 (20.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living status</td>
<td>With husband only</td>
<td>42 (61.8)</td>
<td>17 (50.0)</td>
<td>25 (73.5)</td>
<td>3.98</td>
<td>.046</td>
</tr>
<tr>
<td></td>
<td>With husband and other family members</td>
<td>26 (38.2)</td>
<td>17 (50.0)</td>
<td>9 (26.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>Not employed</td>
<td>58 (85.3)</td>
<td>27 (79.4)</td>
<td>31 (91.2)</td>
<td>1.87</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>Employed</td>
<td>10 (14.7)</td>
<td>7 (20.6)</td>
<td>3 (8.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (BDT 1,000)*</td>
<td></td>
<td>25.15 ± 8.88</td>
<td>27.73 ± 9.35</td>
<td>22.58 ± 8.41</td>
<td>−2.38</td>
<td>.02</td>
</tr>
<tr>
<td>Episiotomy</td>
<td>Yes</td>
<td>56 (82.6)</td>
<td>29 (85.3)</td>
<td>27 (79.4)</td>
<td>.40</td>
<td>.52</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12 (17.7)</td>
<td>5 (14.7)</td>
<td>7 (20.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td></td>
<td>37.16 ± .98</td>
<td>37.09 ± .99</td>
<td>37.24 ± .98</td>
<td>.61</td>
<td>.54</td>
</tr>
<tr>
<td>PP duration</td>
<td></td>
<td>1.45 ± .50</td>
<td>1.47 ± .50</td>
<td>1.44 ± .50</td>
<td>−24</td>
<td>.81</td>
</tr>
<tr>
<td>General condition of newborn (APGAR)</td>
<td>Fair (6–7)</td>
<td>5 (7.4)</td>
<td>2 (5.9)</td>
<td>3 (8.8)</td>
<td>1.49</td>
<td>.47</td>
</tr>
<tr>
<td></td>
<td>Good (8)</td>
<td>33 (48.5)</td>
<td>19 (55.9)</td>
<td>14 (41.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very good (&gt; 8)</td>
<td>30 (44.1)</td>
<td>13 (38.2)</td>
<td>17 (50.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex of newborn</td>
<td>Female</td>
<td>31 (45.6)</td>
<td>15 (44.1)</td>
<td>16 (47.1)</td>
<td>.05</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>37 (54.4)</td>
<td>19 (55.9)</td>
<td>18 (52.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in parenting class (number of classes)</td>
<td>None</td>
<td>36 (52.9)</td>
<td>15 (44.1)</td>
<td>21 (61.8)</td>
<td>2.19</td>
<td>.33</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>29 (42.7)</td>
<td>17 (50.0)</td>
<td>12 (35.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3 (4.4)</td>
<td>2 (5.9)</td>
<td>1 (2.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenatal care</td>
<td>1–2</td>
<td>6 (8.8)</td>
<td>1 (2.9)</td>
<td>5 (14.7)</td>
<td>3.24</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>36 (52.9)</td>
<td>20 (58.8)</td>
<td>16 (47.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 or more</td>
<td>26 (38.2)</td>
<td>13 (38.2)</td>
<td>13 (38.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP self-care</td>
<td>Possible score range</td>
<td>18–126</td>
<td>80.53 ± 4.48</td>
<td>81.53 ± 6.03</td>
<td>.77</td>
<td>.44</td>
</tr>
<tr>
<td>PP self-efficacy</td>
<td></td>
<td>15–60</td>
<td>23.65 ± 2.79</td>
<td>24.50 ± 2.13</td>
<td>1.41</td>
<td>.16</td>
</tr>
<tr>
<td>PP care knowledge</td>
<td>0–19</td>
<td>5.41 ± 2.83</td>
<td>6.03 ± 2.64</td>
<td>.93</td>
<td>.35</td>
<td></td>
</tr>
<tr>
<td>PP fatigue</td>
<td>10–40</td>
<td>26.32 ± 3.21</td>
<td>24.68 ± 3.18</td>
<td>−2.17</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Depressive mood</td>
<td>0–30</td>
<td>11.74 ± 3.44</td>
<td>10.97 ± 3.54</td>
<td>−.90</td>
<td>.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 13</td>
<td>10 (33.3)</td>
<td>8 (29.6)</td>
<td>−.29</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Maternal functioning</td>
<td>0–120</td>
<td>54.03 ± 6.08</td>
<td>52.38 ± 7.95</td>
<td>−.95</td>
<td>.34</td>
<td></td>
</tr>
</tbody>
</table>

Values are presented as mean±standard deviation or number (%).

Cont: control group; Exp: experimental group; PP: postpartum.

*Bangladeshi taka (BDT) 1,000 is approximately 12 US dollars.
Discussion

Effectiveness of the NLPPSC intervention
The NLPPSC significantly increased scores in process indicators, postpartum care knowledge, postpartum SE, and postpartum self-care behavior; and postpartum fatigue and maternal functioning was improved among the outcome indicators. As there were no intervention studies found in Bangladesh to directly compare with this study, studies from others countries were compared in the following discussion. Discussion on outcome indicators are presented first, as they were the main study hypotheses.

NLPPSC effects on postpartum fatigue
Fatigue decreased over time in the experimental group compared to the control. Among the time points (within 2 days after delivery, postpartum 2 weeks, and postpartum 6 weeks), the decrease in fatigue at postpartum 6 weeks was statistically significant in the experimental group. This finding is similar with previous studies that used a psycho-educational program with telephone support to manage PPF with a RCT design [2,3]. Both studies encouraged mothers to prioritize their tasks, and plan for and engage in postpartum self-care behaviors. Although this study found statistically significant improvement in SE at postpartum 2 weeks and postpartum 6 weeks in the NLPPSC group, LMM analysis did not find direct influences of SE for fatigue. This suggests indirect effects of SE on fatigue, which may need to be further explored in future studies. This study found a mid-level of fatigue at baseline. Although using a different measurement of fatigue, a prior survey of new mothers in Bangladesh reported a lower mean fatigue score [22]. This may be related to measurement time or differences in sample characteristics, but further studies are needed to clarify.

NLPPSC effects on depressive mood
The NLPPSC intervention was not statistically significant in decreasing depression scores, when treated as a continuous variable. This finding is similar to a RCT study of a nurse-led postpartum discharge education program to reduce postpartum depressive mood, which did not find differences at 6 weeks nor at 3 months [29]. In contrast, Giallo’s study (2014) [3] used a fatigue management booklet, a home visit, and three telephone support sessions led by a professional, and was effective in decreasing postpartum depressive mood after 6 weeks. Differences might be due to the intensity and number of contacts, as the NLPPSC did not include home visits and had one less telephone contact. Another RCT with first-time mothers [30] reported that the treatment group (12.5%) had lower depression than the control group (25%) at 6 months postpartum. This suggests the possibility that NLPPSC participants may have shown effects over a longer period of time, assuming continued practice of self-care.

This study found a high proportion of mothers with postpartum depression (33% in the intervention group) at 2–3 days within delivery. Of these mothers, 82.4% had received an episiotomy, which may be related to their perception of fatigue. At 6 weeks, the control group showed a high proportion of postpartum de-

Ancillary analyses: There was no ancillary analysis.
pression (n = 9, 33% with scores ≥ 13), much higher than 9% reported in a previous study of Bangladeshi women at 6–8 weeks postpartum [31]. This may be due to demographic differences in the two studies. The previous study involved 100 multiparous postpartum mothers with mean age 25.5 years, of whom 54% had one child, whereas this study mostly included young first-time mothers, who may have been more sensitive to depressive mood.

When analyzing depression based on cut off categories, the pattern of depression over the three time points (up to 6 weeks) in mothers in the NLPPSC group steadily decreased, resulting in none at ≥ 13 at 6 weeks, which is in contrast to the pattern of increased depression in the control group over time (33% at ≥ 13 at 6 weeks). Future studies are needed to employ the NLPPSC program with more contact intensity and may be needed to be followed up for longer periods, to more accurately manage depressive moods of new mothers in Bangladesh.

**NLPPSC effects on maternal functioning**

In maternal functioning, maternal age and family income had a statistically significant association with increased maternal functioning. Women living with their husband only, reported significantly higher maternal functioning than women also living with other family members. As it happens that after childbirth in Bangladesh, other relatives will often come to support the new mother or she will stay at her parents’ home for some time to aid postpartum recovery, the postpartum living status may temporarily change. Thus, usual living status may not offer clear understanding of how it may be related to postpartum maternal functioning. The process indicator postpartum self-care knowledge was statistically significantly associated with increasing maternal functioning over time. The intervention was significantly effective in increased maternal functioning at 2 weeks and also at 6 weeks follow-up. These findings are supported by findings from the literature. For example, a postpartum educational intervention for first-time mothers consisting of four sessions and phone calls found improvement in maternal functioning status and self-confidence after 8 weeks [7]. In addition, another study [23] found that postpartum knowledge and efficacy influenced maternal functioning.

**NLPPSC effects on process indicators**

For the process indicators, self-care behavior, SE, and postpartum care knowledge showed statistically significant increases at both postpartum 2 weeks and 6 weeks, compared to baseline levels. This finding is similar to studies such as a nurse-led self-care intervention for primiparas after birth [32] and a prenatal and postnatal self-care educational program focused on perineal care, nutrition, and sexual activities [17], which found improvement in postpartum self-care knowledge and self-care efficacy.

Overall, the participants in this study were young age (average 20.71 years) and had completed primary to secondary level education (83.8%), which may have helped them to understand the NLPPSC content. In addition, as the majority of the mothers (85.3%) did not work out of the house they may have had sufficient time to perform self-care behaviors at home.

As such, this NLPPSC intervention offers implications for nursing practice, theory development, and research. In practice, maternal nurse caring for new mothers in Bangladesh should provide psycho-educational support using strategies for fatigue

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**Table 3. Estimated effects of the nurse-led postpartum self-care intervention (N=68)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Postpartum fatigue</th>
<th>Depressive mood</th>
<th>Postpartum maternal functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>SE</td>
<td>t</td>
</tr>
<tr>
<td>Intercept</td>
<td>22.71</td>
<td>5.21</td>
<td>4.36***</td>
</tr>
<tr>
<td>Age</td>
<td>–1.16</td>
<td>0.90</td>
<td>–1.64</td>
</tr>
<tr>
<td>Lives with husband only</td>
<td>–2.3</td>
<td>0.44</td>
<td>–5.2</td>
</tr>
<tr>
<td>Income</td>
<td>–4.06</td>
<td>2.62</td>
<td>–0.15</td>
</tr>
<tr>
<td>Self-care behavior</td>
<td>0.08</td>
<td>0.05</td>
<td>1.69</td>
</tr>
<tr>
<td>PP self-efficacy</td>
<td>–0.05</td>
<td>0.08</td>
<td>–0.66</td>
</tr>
<tr>
<td>PP self-care knowledge</td>
<td>0.02</td>
<td>0.08</td>
<td>0.25</td>
</tr>
<tr>
<td>Experimental group</td>
<td>1.45</td>
<td>0.72</td>
<td>1.98*</td>
</tr>
<tr>
<td>PP 2 weeks</td>
<td>0.47</td>
<td>0.83</td>
<td>0.56</td>
</tr>
<tr>
<td>PP 6 weeks</td>
<td>–1.66</td>
<td>1.52</td>
<td>–1.08</td>
</tr>
<tr>
<td>PP 2 weeks × experimental</td>
<td>–0.99</td>
<td>1.94</td>
<td>–0.50</td>
</tr>
<tr>
<td>PP 6 weeks × experimental</td>
<td>–6.17</td>
<td>1.81</td>
<td>–3.39*</td>
</tr>
</tbody>
</table>

†References were living status (lived with husband and other family members), group (control), PP weeks (baseline), PP weeks x group (same week x control).

PP: Postpartum.

*p<.05, **p<.01, ***p<.001.
management before hospital discharge. Although brief, the NLPPSC was influential in improving the process indicators and improving fatigue and maternal functioning. This would contribute to postpartum mothers performing self-care activities for their wellbeing and their newborns. Although the NLPPSC was planned as a brief practical intervention, in reality the allocated time for intervention took more than usual as participants required more clarification. Therefore, duration of interventional time may need to be increased for future implementation. In regards to nursing theory, the conceptual framework used in this study offers a framework for generating nursing knowledge theoretically. Finally, this study identifies recommendations for further studies. For example, exploratory studies on SE and postpartum depression, and developing culturally appropriate postpartum self-care instruments for use in Bangladesh would be beneficial.

Limitations
This study has some limitations. The low values of internal consistency for some instruments may have been a source of measurement error. This may be related to the fact that although the questionnaire was administered face-to-face to facilitate understanding and completion, the timing (immediately after childbirth) may not have been optimal. For example, ‘I am a good mother’, or ‘I hold my newborn comfortably’ may have been sources of measurement and response bias. Another limitation is that participants were recruited from only one public hospital (DMCH), and convenience sampling might be a threat of selection bias. Furthermore, as this study focused on women delivering at the hospital, it cannot be applied to the sizable proportion of Bangladesh women who deliver at home, and future studies are needed for how to pragmatically and effectively reach this needy population.

In conclusion, the NLPPSC was effective in decreasing PPF and increasing postpartum maternal functioning of first-time mothers in Bangladesh. However, it was not found to be effective in decreasing postpartum depressive mood. The NLPPSC was effective in improving SE, self-care behaviors, and postpartum care knowledge at both 2 weeks and 6 weeks. Postpartum care knowledge was effective in improved maternal functioning, the supports implementing the NLPPSC for new mothers following delivery. Although this study focused on hospital-based births, a relatively small proportion of all births in Bangladesh, this nurse-led program was found to be feasible and can be easily provided for first-time mothers who have hospital births. Further studies are needed to expand the NLPPSC in terms of intensity and/or frequency of contact, as well as consider follow up measurement for a longer period. Further exploratory and interventional studies are also needed on postpartum depression, and development of postpartum self-care instruments based on Bangladesh context.

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Conflict of interest
Sue Kim has been editor-in-chief and Ju Eun Song has been editor of the Korean Journal of Women Health Nursing since January 2020. They were not involved in the review process of this manuscript. Otherwise, the authors declare no conflict of interest.

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Data availability
Please contact the corresponding author for data availability.

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References


Khatun F et al. • Nurse-led postpartum self-care program


Experiences of hospitalization among pregnant women with preterm labor in Korea: a phenomenological study

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Purpose: The purpose of this study was to describe pregnant women's lived experiences of hospitalization due to preterm labor in Korea.

Methods: This qualitative study adopted a phenomenological approach. Individual in-depth interviews were conducted with nine participants, over the age of 20 years, who had been hospitalized for more than 1 week after being diagnosed with preterm labor. All interviews were audio-taped and verbatim transcripts were made for analysis. The data were analyzed following Colaizzi’s phenomenological method.

Results: The participants’ ages ranged from 26 to 36 years, and all were married women. They were hospitalized for 13.1 days on average. Five thematic clusters emerged from the analysis. ‘Withstanding hospitalization for the fetus’s well-being’ describes women’s feelings during preterm labor and their endurance during their prolonged hospitalization, rooted in their conviction that the fetus comes first. ‘Endless frustration in the hospital’ encompasses women’s emotions while lying in bed and quietly thinking to themselves. ‘Unmet physiological needs’ describes participants’ awareness of their inability to independently handle human physiological needs given the need for careful and limited movement. ‘Gratitude for the support around oneself’ reflects the support from family and medical staff. ‘Shifting perceptions and accepting one’s circumstances’ describes accepting hospitalization and making efforts to spend their remaining time in the hospital in a meaningful way.

Conclusion: The findings in this study provide a deeper understanding and insights into the experiences of Korean women with preterm labor during hospitalization, underscoring the need to develop interventions for these patients.

Keywords: Emotions; Hospitalization; Perception; Premature obstetric labor; Qualitative research

Introduction

The total fertility rate in Organisation for Economic Cooperation and Development countries is 1.4 to 1.9 per woman on average, whereas South Korea (hereafter, Korea) recorded a rate of less than 1 per woman in 2018, which was the lowest in the world [1]. Korea’s total fertility rate in 2019 was 0.92, indicating that it has continued to decrease every year. This decrease in the total fertility rate has been accompanied by an increasing proportion of premature births (7.6% in 2017 and 8.1% in 2019). This proportion is now 1.4 times higher than it was 10 years ago [2].

Preterm birth causes various complications, including organ immaturity, neurological damage, disability, and developmental delay in newborns [3,4]. Preterm labor is the most common cause of premature birth, and uterine contractions begin before 37 weeks of pregnancy with progressive changes such as cervical dil-
Since preterm labor substantially increases the risk of premature birth, it is emerging as a very important obstetric problem [5,6]. According to the statistics of the National Health Insurance Corporation of Korea, 35,542 pregnant women received inpatient treatment for preterm labor in 2015; this number grew to 44,282 in 2016 and has subsequently remained above 40,000 (e.g., 43,178 in 2019) [7]. Since premature birth due to preterm labor is highly preventable [8], high-quality nursing care should be provided while pregnant women with preterm labor are hospitalized and treated. In the context of the national crisis of the low birthrate, it is very important to improve the quality of prenatal pregnancy management in order to overcome and cope with the gradually increasing decrease in the fertility rate and the increase in the premature birth rate and premature infant mortality [9]. Therefore, in order to improve the health of pregnant women and newborns, specific prenatal nursing interventions for pregnant women with preterm labor should be prepared.

Pregnant women diagnosed with preterm labor are hospitalized to maintain pregnancy. During hospitalization, they are placed on bed rest, have regular testing to monitor their symptoms, and receive pharmacological treatment with uterine contraction inhibitors [6]. Bed rest is a standard component of treatment for pregnant women with preterm, as it reduces intrauterine pressure by limiting physical activity and increases intrauterine blood flow to promote growth of the fetus in the uterus, thereby reducing the risk of premature delivery [10].

Bed rest is essential for pregnant women with preterm labor, but they experience physical discomfort due to the strict limitations on their daily activities [11,12]. In addition, because preterm labor requires long-term hospitalization, pregnant women can perceive it as a crisis situation [6]. In addition to the financial burden of long-term hospitalization, pregnant women experience social difficulties (e.g., separation from family) and feel psychological anxiety due to uncertainty about their own condition and the safety of the fetus. While coping with these problems, they experience various forms of stress [6,11]. Therefore, psychological support and individualized nursing interventions are needed. However, the nursing care provided for pregnant women with preterm labor has been limited to pharmacological interventions with uterine contraction inhibitors and bed rest, focusing only on maintaining pregnancy [6]. Thus, there is a need for a qualitative study to provide comprehensive insights into the actual experiences of pregnant women with preterm labor by understanding, describing, and explaining the meaning of their hospitalization experiences from hospitalization to delivery.

Phenomenological research is suitable for the purpose of this study, since it is an approach to obtain a vivid understanding of experiences by focusing on actual events experienced by research participants in context [13]. In addition, Colaizzi’s analysis method focuses on discovering and stating common characteristics that emerge from the study subjects’ descriptions of their feelings and experiences [14].

The purpose of this study is to promote an understanding of the hospitalization experiences of pregnant women with preterm labor by grasping the meaning of those experiences in a holistic, in-depth manner. The research question of this study was ‘What is the hospitalization experience of pregnant women with preterm labor?’ The results of this study can be used as basic data for the development of practical nursing interventions so that pregnant women with preterm labor can progress through hospitalization to have a healthy delivery.
Methods

Ethics statement: This study was approved by the Institutional Review Board of Kyungpook National University (2019-0124). Informed consent was obtained from the participants.

Study design
This phenomenological qualitative study was conducted to understand the overall meaning of the hospitalization experiences of pregnant women with preterm labor in Korea. This study was prepared according to the COREQ (Consolidated Criteria for Reporting Qualitative Studies) guidelines (https://www.equator-network.org/reporting-guidelines/coreq/additional references).

Participant selection
The participants were purposively sampled according to the following criteria: pregnant women aged 20 years or older who received uterine relaxants and bed rest after being diagnosed with preterm labor at a tertiary university hospital in Daegu, Korea, and had been hospitalized for more than 1 week. A total of nine people participated, and recruitment and interviews continued until data saturation was confirmed.

Pregnant women who met the inclusion criteria were introduced through the attending physician and nurse, and a researcher directly visited those who indicated interest. The purpose of the study was explained and they could choose to participate voluntarily. Separate consent was obtained for recording the interviews.

Data collection and setting
In-depth interviews were conducted based on semi-structured questions from August 21, 2019 to March 31, 2020. The researcher checked each participant’s treatment and examination schedule on the day of the interview and approached at a quiet time when there was no schedule conflict and checked with the participant whether it would be possible to conduct the interview. After obtaining voluntary written consent, we moved to a quiet room to protect the participant’s privacy and have a more in-depth conversation while maintaining a supine position. If the participant was in a single room, the interview was conducted in the hospital room. No other person was present during the interview. The interviewer sat in a chair next to the bed and made eye contact with the study participant, paying attention to meaningful verbal expressions and nonverbal expressions such as tone, behavior, and facial expressions, and recorded them in the field notes. The main question of the interview was ‘what was your experience after being hospitalized upon being diagnosed with preterm labor?’; and the sub-questions were ‘what difficulties did you experience while being hospitalized?’ and ‘how did you solve the difficulties caused by hospitalization?’ The in-depth interviews ranged from 40 to 90 minutes. The interviewer also used field notes and recorded the interview after obtaining prior consent from the participants. One interview was conducted per day, and a small gift was provided to the study participants after the interview was completed. Transcription was done immediately and three out of the nine participants were contacted by phone (up to three times) to confirm or supplement ambiguous content. The additional interviews took between 20 and 30 minutes. At the end of one interview, meaningful expressions were selected based on the transcripts of the interview, after which the next interview was conducted. Data saturation was reached when no new topics appeared when analyzing the interview data.

Qualitative data analysis
The data transcribed in this study were analyzed according to Colaizzi’s seven-step process [14]. In the first step, the meaning of the interview was explored by repeatedly reading and underlining the transcript while recalling the circumstances of the interview on the day of the interview. Then meaningful statements were selected. In the third step, in order to clearly discover what participants wanted to reveal, we went back to the original data to uncover hidden meanings and describe them in a general form. Next, the meanings were organized into categories and compared with the supporting data to identify any contradictions or awkwardness. The consistency of the attributes and levels of each category was checked and if it was not valid, we returned to the original data and reexamined the meaning of the statements. In step 5, the theme clusters and themes were comprehensively described. The long-term hospitalization experiences of pregnant women with preterm labor were completely described in step 6, by integrating the theme clusters and thematic collections derived from participants’ statements about their experiences. Lastly, the long-term hospitalization experiences of pregnant women with preterm labor were clearly described and the structure of the meaning was described by presenting the original data of the study participants in detail, along with explanations of each topic and topic collection.

Establishing research rigor
To ensure rigor of this study, the following efforts were made according to the evaluation criteria of Guba and Lincoln [15]. For credibility, participants who were able to sufficiently share their experiences of long-term hospitalization due to preterm labor were carefully chosen for interviews. The researcher also personally interviewed each participant, and verbal and nonverbal re-
responses were recorded for accuracy. In addition, the researcher referred to internet community postings related to preterm labor to further verify that the participants’ stories were relevant, thereby upholding reliability. For transferability, two pregnant women with preterm labor who did not participate in the study were invited to read the study results in order to identify and support applicability of the study. Third, for dependability, Colaizzi’s data analysis procedure was presented and each theme and cluster was explained to support consistent and repeatable study findings. In addition, the findings were evaluated by a nursing scholar with extensive experience in qualitative research to ensure consistency. Lastly, the strategies used to secure reliability, transferability, and dependability, as mentioned above, can strengthen confirmability. We practiced bracketing to reduce prejudice as much as possible and sought neutrality in interpreting the data. Member checking was done with participants to enhance confirmability.

Qualitative research preparation of the researchers
The interviewer was a woman nurse who had worked in the delivery room of a tertiary hospital for more than 2 years, and thus had knowledge and experience about pregnant women with preterm labor and was able to establish rapport with pregnant women. She has stayed informed of the latest trends in prenatal interventions, including preterm labor, and has given poster presentations on the topic of quality management and improvement for pregnant women admitted to the delivery room, as well as participating in related conferences. The researchers completed qualitative research classes in graduate school and participated in academic conferences and workshops to study qualitative research in-depth and to become better qualified as qualitative researchers.

Relationship with participants
The researchers did not know the participants in advance, and consent was obtained through a pre-interview. Participants were informed that the researchers were nurses and understood the purpose of the study.

Results

Characteristics of participants
The nine participants’ age ranged from 26 to 36 years, all were married, and their average length of hospitalization was 13.1 days. In addition to preterm labor, additional diagnoses included gestational diabetes, placenta previa, and cervical incompetence. Six of the nine participants were primiparous women (Table 1).

Major theme clusters
Through an analysis of the data collected through in-depth interviews based on the research questions, five theme clusters, 13 themes, and 47 meaning units were derived (Table 2). The analyzed theme clusters were ‘withstanding hospitalization for the fetus’s well-being,’ ‘endless frustration in the hospital,’ ‘unmet physiological needs,’ ‘gratitude for the support around oneself,’ and ‘shifting perceptions and accepting one’s circumstances.’

Theme cluster 1: Withstanding hospitalization for the fetus’s well-being
This topic collection is about pregnant women’s feelings and perceptions of hospitalization as the hospitalization period was prolonged due to preterm labor. As the hospitalization continued, the difficulties faced by pregnant women increased day by day. In addition to physical difficulties, they felt the burden of treatment cost and continuous worries about the children left at home and the household chores. Despite these difficulties, however, they were able to endure the hospitalization because of their conviction that the fetus came first. This collection of themes includes ‘tolerating the pain and side effects of bed rest,’ ‘enduring difficulties due to treatment,’ and ‘feeling regret due to

Table 1. General characteristics of the participants (N=9)

<table>
<thead>
<tr>
<th>No.</th>
<th>Age (year)</th>
<th>Hospitalization day</th>
<th>Gestational week</th>
<th>Cervical length (cm)</th>
<th>Diagnosis</th>
<th>Baby’s birth order</th>
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<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>17</td>
<td>21.3</td>
<td>1.5</td>
<td>PTL, IIIOC</td>
<td>1</td>
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<tr>
<td>2</td>
<td>36</td>
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<td>2</td>
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<td>3</td>
<td>30</td>
<td>8</td>
<td>24.2</td>
<td>2.0</td>
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<td>2</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>10</td>
<td>31.0</td>
<td>2.3</td>
<td>PTL, IIIOC</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>15</td>
<td>35.2</td>
<td>4.0</td>
<td>PTL, GDM</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>32</td>
<td>15</td>
<td>33.2</td>
<td>2.5</td>
<td>PTL, IIOC</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>29</td>
<td>10</td>
<td>34.2</td>
<td>4.0</td>
<td>PTL</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>28</td>
<td>14</td>
<td>33.1</td>
<td>3.5</td>
<td>PTL, placenta previa</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>31</td>
<td>15</td>
<td>33.3</td>
<td>3.3</td>
<td>PTL, GDM</td>
<td>1</td>
</tr>
</tbody>
</table>

GDM: Gestational diabetes mellitus; IIIOC: incompetent internal os of cervix; PTL: preterm labor.
separation from children.’

**Tolerating the pain and side effects of bed rest**

Bed rest was essential for the participants, to the point that routine daily activities were restricted. This significant decrease in participants’ activity level caused indigestion, weight change, loss of muscle mass, muscle weakness, and lethargy. Although these physical changes were painful, participants believed they had to endure unconditionally to give birth to a healthy child, as seen in the following statements:

*I’m usually skinny, but I lost more weight because I couldn’t walk at all, not even after eating, so I can’t digest well, so I can’t eat well. I’m trying to eat a little bit because of my baby. My baby keeps growing but I’m losing weight, maybe because of muscle loss, so I wonder what strength I’ll have left to push in labor... but there is nothing I can do right now. I’m just trying to hold out as much as possible for now. (Participant 4)*

*As the weeks go by, my belly is growing a lot, my back hurts, I’m out of breath and sometimes it’s even more uncomfortable when I lie down. Since I am not active, my digestion is not working, so my stomach juices come up at night. Before I was hospitalized, my physical strength was good, but after being hospitalized and starting to lie down all the time, my physical strength seems to be dropping even more. (Participant 8)*

**Enduring difficulties caused by treatment**

Participants regularly received uterine contraction inhibitor administration, uterine contraction tests, cervical length examinations, and ultrasound examinations. Despite the side effects of these medications, such as tachycardia and hand tremor, and back pain due to testing for uterine contractions, which required them to lie for 20 minutes in one position, they were willing to maintain and endure the treatment. Some expressed embarrassment during measurements of the length of the cervix. In addition, participants were concerned about hospitalization and treatment costs, but said that the fetus came first. The following are some significant statements:

*I was using the machine (toco transducer) to watch the contractions, but it felt like my back was breaking. Then medication was started but the side effects of the uterine contraction inhibitors were severe, my pulse rate and heart palpitations were so severe that my hands were shaking. So it made me very uncomfortable. At the same time, while monitoring uterine contractions, the drug dose had to be increased, so it was very difficult. Even though it was hard, I had to endure it anyway because of my baby ... And because it was best to try to get as close to term as possible, I endured and continued with the treatment. (Participant 2)*

*When I first started the medicine, my heart was trembling, the back of my head was pounding, my shoulders felt cramped, and my head hurt. However, I have no choice but to use this drug. Because of the side effects, I took another drug (Trectosil) up to four times. I’m worried about it because insurance only covers up to the third use. But rather than focusing on that, I just hope my baby can endure it. (Participant 6)*

**Feeling regret due to separation from children**

Among participants with children at home, although they tried to relieve their longing through video calls, they still worried about the child(ren)’s well-being, repeatedly expressing that they wished to see them. For the sake of the fetus, however, they bravely faced this inevitable parting, as seen in the following excerpts:

*My mother-in-law is looking after the children, and I heard they’re having a hard time because I am not there. They can’t see their moth-

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Table 2. Experiences of hospitalization of pregnant women during preterm labor

<table>
<thead>
<tr>
<th>Theme cluster</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withstanding hospitalization for the fetus’s well-being</td>
<td>Tolerating the pain and side effects of bed rest</td>
</tr>
<tr>
<td></td>
<td>Enduring difficulties caused by treatment</td>
</tr>
<tr>
<td></td>
<td>Feeling regret due to separation from children</td>
</tr>
<tr>
<td>Endless frustration in the hospital</td>
<td>Self-blame for having preterm labor</td>
</tr>
<tr>
<td></td>
<td>Disconnection from the outside</td>
</tr>
<tr>
<td></td>
<td>Unattainable discharge</td>
</tr>
<tr>
<td>Unmet physiological needs</td>
<td>Lack of self-hygiene measures</td>
</tr>
<tr>
<td></td>
<td>Limited defecation care</td>
</tr>
<tr>
<td>Gratitude for the support around oneself</td>
<td>Being sorry and thankful to family</td>
</tr>
<tr>
<td></td>
<td>Encouraged by medical staff</td>
</tr>
<tr>
<td>Shifting perceptions and accepting one’s circumstances</td>
<td>Taking comfort in sharing similar experiences</td>
</tr>
<tr>
<td></td>
<td>Gratitude for the opportunity to look back on oneself</td>
</tr>
<tr>
<td></td>
<td>Mastering self-control over one’s time</td>
</tr>
</tbody>
</table>
The participants spent boring days lying in bed. This was very frustrating, during hospitalization, all outside activities were restricted due to disconnection from the outside care. Maybe this wouldn’t have happened. I regret this situation. (Participant 6)

One phone call came with the child crying (tears). I had to be hospitalized unexpectedly, so I couldn’t explain to my child properly. That still haunts me. My parents are watching my child, but I feel bad when he cries while we do video calls. We have visiting time but I don’t want to see my child because I think my heart will ache even more if we meet. (Participant 6)

Theme cluster 2: Endless frustration in the hospital
This collection of themes relates to the emotions that participants experienced while maintaining a lying position and thinking quietly. Participants fell into a morass of thoughts and became depressed as they tried to find the cause of preterm labor. Looking out the window of the hospital room, they longed for discharge and going home. This theme set includes ‘self-blame for having preterm labor,’ ‘disconnection from the outside,’ and ‘unattainable discharge.’

Self-blame for having preterm labor
The participants compared themselves with normal pregnant women and thought that the reason they had preterm labor was because they were not careful about their bodies after getting pregnant or had somehow triggered preterm labor. In addition, regrets for the past and self-blame were seen in the following sample statements:

At first, I was hospitalized for preterm labor and blamed my job for it. I wondered if it’s because I was standing all day, saying that what I’m doing is really hard, and if I had a strong womb, my child wouldn’t have to suffer like this. Because I have a very weak cervical neck, I don’t have the strength to support the child, so I think that uterine contractions are also occurring, and I keep blaming myself. (Participant 2)

Did I use my body too much after getting pregnant? Did I not manage it well? As a mother, I felt things like guilt. I thought I should have been more careful. Because I already had a child requiring care and I was also working, I was just carrying things. Maybe if I had been more careful, maybe this wouldn’t have happened. I regret this situation. (Participant 6)

Disconnection from the outside
During hospitalization, all outside activities were restricted due to bed rest. The curtain cut off interactions with others and the participants spent boring days lying in bed. This was very frustrating, and there were even cases where they tried to go out secretly, avoiding the eyes of the medical staff, as seen in the following:

It’s so boring here. I want to go out for a little while. The most frustrating thing is not being able to go out. The visiting hours are limited, and the only thing I can see is the wall. When I go for an ultrasound, just looking out the window for a moment gives me a breather. (Participant 3)

Being here is so mentally exhausting. I don’t know if the sun is up or if it’s raining (sigh). It was so frustrating that I heard that there was a bazaar on the first floor of the hospital, so I secretly went to the first floor with my husband to get some refreshments. However, the nurse came around and saw me and scolded me (laughs). (Participant 7)

Unattainable discharge
Participants were very eager to be discharged, but were confused about delays in their discharge and the unclear discharge plan. Participants were distressed because their hopes for discharge were shattered as the treatment plan was changed frequently according to their symptoms of uterine contractions. Some participants also expressed conflicting thoughts of wanting to hide symptoms from the medical staff in order to be discharged. Excerpts include the following:

During the doctor’s rounds, I kept saying that I would like you to discharge me, but they just say no, and they don’t tell you exactly when discharge is possible, so it’s difficult. I don’t know how long I will have to stay here, so I think it’s too much (gets emotional). Should I really give up on getting discharged? It seems like all hope is lost when you think that you have to be here until the baby arrives. (Participant 7)

How long do I have to be here? I wonder how many days I will have to be hospitalized. Originally, I was supposed to go if the medications stopped the contractions but they didn’t stop the medication, maybe because I had some contractions the other day. I can probably go home after the medication is stopped but I don’t know when. Sometimes I wonder if I should put up with the preterm labor pains, because I’m afraid I won’t be able to go home if I say I feel contraction pains. (Participant 3)

Theme cluster 3: Unmet physiological needs
This collection of topics deals with conflicts related to basic human physiological needs, as participants realized that they could not perform many activities independently due to the need for extreme care in their movements, making it necessary for them to receive help from others. This topic set includes themes of ‘lack of self-hygiene measures’ and ‘limited defecation care.’

Lack of self-hygiene measures
Showering in a standing position was prohibited because of the risk...
of uterine sagging and the possibility of the child descending. Although they were aware they had to be careful because of preterm labor, they lamented their unclean appearance and expressed distress and depressed feelings, as seen in their statements:

I have never taken a shower since I was hospitalized. When I asked for the needle to be removed to take a shower, the nurse said ‘you can’t shower here.’ So when can I wash? Yesterday, I cried because of it. I don’t want to give birth without a shower (sigh). Washing is really important for people, but it was the first time I realized how important it really is. Although the baby is important, I wish more consideration was given to us moms, in terms of cleanliness and hygiene management. Also, when I want to change clothes, I have to ask them to remove the needle, so there is nothing I can do (independently). Every time I do something, I have to get the nurse’s permission and help, one by one, so my quality of life has really deteriorated. (Participant 7)

Limited defecation care
Participants had to lie in bed to defecate and urinate, and because they could not go to the toilet themselves, they asked caregivers, nurses, and guardians to bring a bedpan and to empty it. All the participants complained of difficulty in urinating and defecating while lying down, and also said that they did not dare push because of the risk of the fetus descending. This led to constipation in some participants. Yet, they were reluctant for others to see their feces and urine, and they viewed toilet management as another source of stress, as seen in the following excerpts:

I’m lying down and being still, so there’s no activity, so I can’t have a proper bowel movement. There is a lot of stress that comes from not having a smooth bowel movement. There was one time when the stool got caught in between. If you try to force it the baby may come down and labor pains may start, so I couldn’t do anything. Eventually the intern ended up removing it and I know this is better than pushing, but it was too embarrassing. It’s not just this. You have to get permission from the nurse and ask if you can urinate. So, I couldn’t be free to urinate whenever I wanted to. There were always restrictions. (Participant 1)

I barely urinate and I couldn’t pass stool for 5 days, but you really can’t try to do it while lying down. The attempt doesn’t work. There was a risk that the child would come down if any of the postures were too strained, so I couldn’t even sit on my own. And it’s too humiliating to call someone to empty the bedpan after you urinate because you can’t even manage it yourself. (Participant 4)

Theme cluster 4: Gratitude for the support around oneself
This theme shows the emotions participants felt toward family and the medical staff. They expressed gratitude and regret to their families and medical staff for being hospitalized for a long time. This collection of themes includes subthemes of ‘being sorry and thankful to family’ and ‘encouraged by medical staff’.

Being sorry and thankful to family
Participants foremost thanked their families for their support. They also felt sorry that their husbands, family, parents-in-law, and child(ren) suffered and worried while having to adjust their lifestyles due to participants’ hospitalization. Participants also expressed regret for not being able to properly do prenatal education (taegyo, in utero care for and bonding with the baby) mixed with gratitude for emotional support. Sample statements include the following:

Because I’m having a really hard time, my family looks at me and worries whether I’ll be able to endure until it’s time to give birth. My parents were more worried about me than the children. My family also seems to accumulate a lot of anxiety and fatigue. There is also stress. So I’m always feeling sorry for my family but I’m grateful that I can rely on them. The anxiety I’ve been feeling for a long time would have been transmitted to my baby but I haven’t done prenatal education properly, so I’m sorry for my baby as well. (Participant 1)

Many family members are suffering a lot because of me. My in-laws are sacrificing to look after the children, and my husband visits every single day. He comes even it’s just for a moment, but I can imagine how difficult it is to come because he’s also working... So I am very grateful and really feel supported. My mother works, so she can’t come often but she calls me every day, so I’m thankful for her concern. She gives me a lot of support by saying that everything will be okay. (Participant 3)

Encouraged by medical staff
Participants initially were unhappy with the medical staff for restricting their daily life and for being strict about treatment, thinking that the treatment was excessive and staff were oversensitive to the signs of preterm labor. However, as time passed, they understood that the staff were trying to protect the fetus and thus felt grateful and friendly to the kind medical staff who supported them emotionally.

I really thank the medical staff for being so kind here. I think we’ve gotten to know each other a bit more now. The truth is, I used to say bad things about my doctor to my husband because I didn’t like his style. Because for my second child, when I had belly cramps and went to the emergency room, it was at a similar time of pregnancy but I didn’t need hospitalization. This time the cramps felt lighter and went away, so what’s the difference? I thought the hospital was being too sensitive, not letting me go home and telling me not to move. I was really upset with the doctor. But now that I know why they’re doing this, I can brush it off. (Participant 3)

At first, I thought that the staff here were too harsh. The doctor kept telling me to stay in the hospital and lie down, but I was very resentful.
But the staff once said, “Mom, you can get through it. You’re doing well now.” (Participant 7)

**Theme cluster 5: Shifting perceptions and accepting one’s circumstances**

This theme cluster is about the participants accepting that discharge will not be easy, and trying to cultivate their mental health during the rest of their time in the hospital. Participants comforted each other by sharing openly with other hospitalized pregnant women. In addition, they tried to accept the current situation that was given to them, interpret the meaning of hospitalization in their own way, and live their daily lives happily until childbirth. This theme set includes ‘taking comfort in shared similar experiences,’ ‘gratitude for the opportunity to look back on oneself,’ and ‘mastering self-control over one’s time.’

**Taking comfort in sharing similar experiences**

Participants showed considerable dependence on other pregnant women who were hospitalized together. Because they shared the same situation, they were comforted by and sympathized with each other, despite the limitations of being supine.

No matter how close my friends are, even if they’re pregnant, none of their words touched me. No matter what they say and I thank them, but my anxiety remains. When it was nighttime with these mothers and I spoke one word at a time, it really touched me. It was so comforting. Because they share the same pain. Even when you say the same thing, I feel it’s more sincere. In the end, it’s more comforting because I’m someone who has the same experience. (Participant 1)

I asked for the curtain (between the beds) to be opened and had a conversation for the first time (with another woman with preterm labor), and my frustration was relieved. I also clear my mind while communicating with the mothers next to me. (Participant 8)

**Gratitude for the opportunity to look back on oneself**

Participants found positive meaning through hospitalization as they looked back on themselves during the long hospitalization and were grateful they were given time to rest fully. At first, it was difficult to maintain the supine position, but they tried to accept and overcome the limitations of hospitalization by finding positive meaning for themselves, as illustrated in the following excerpts:

I’ve been working for over 10 years, but this is the first time I’ve been constantly lying down and even sleeping like this. Even though I’m lying down and on medication, I thought that this was a period for rest. It is a healing time with the thought that God is giving us a little rest to protect my baby, even in this way. It’s also a stress-reducing environment. I’ve been focusing on my work all this time, so I couldn’t fully care for my child and lived my life centered on work. It made me look back. So, I want to think of it as a precious time to spend with my baby before s/he is born. It is meaningful and the best time, a time of healing, a time of rest. (Participant 2)

The lengthy hospitalization allowed me to see life again and got me looking back because I am experiencing something I have never experienced in my life, if I hadn’t had this experience, I would have had some limits when looking at certain situations. My perspective has also broadened. It’s all acceptable. For my first child parenting felt difficult, but if this child is born I don’t think it will be difficult at all. I have this child who has endured this time well, so I don’t think parenting will be hard at all. This is the moment that really makes me feel reborn. In that sense, now is not the worst time. (Participant 9)

**Mastering self-control over one’s time**

Participants learned how to spend each day in a comfortable and meaningful way in the hope of a healthy childbirth. Religious participants used their smartphones to look up videos and listen to religious books and music, or prayed quietly with a humble attitude, relying on the power of their faith. In addition, many participants spent much of their time enjoying themselves by watching movies, listening to music, and shopping for baby products.

I spend most of my time lying down, looking at my phone, shopping for clothes for my baby on the internet, looking at baby products, and thinking about what I should do when my baby is born. If I wear earphones and watch movies or dramas occasionally and listen to my favorite music, the time passes quite well. (Participant 3)

I’m religious, and I start and spend the day listening to religious teachings or music on my mobile phone. (Being in the hospital) is boring, but I’m trying to have a good time until childbirth by watching movies on my phone, reading good articles, and making video calls frequently. If you do that, another day will pass, and my baby will spend another day in the womb. (Participant 9)

**Discussion**

This phenomenological study was conducted to understand the in-depth meaning of the vivid experiences of pregnant women who were hospitalized due to preterm labor. The five theme clusters are discussed below.

**Theme cluster 1: ‘Withstanding hospitalization for the fetus’s well-being’**

Korean society commonly views motherhood as an instinctive role, framed in a culture that emphasizes responsibility and excellence in motherhood [16]. As such, the emphasis on the maternal role and responsibilities can further intensify the burden of pregnancy [17]. In high-risk conditions such as preterm labor, if the main focus centers on medical management and compliance
with medical instructions, pregnant women may have negative perceptions of their situation and feel it to be burdensome. As such, a person-focused approach is all the more important [18].

Therefore, health care professionals should be mindful of the difficulties of preterm labor experienced by pregnant women, and thus provide strong emotional support to such pregnant women with as much attention as is given to therapeutic interventions. In this study, although women were struggling with the various difficulties they faced, the health of their unborn child was their foremost priority. In particular, women with children at home were very upset about not being able to be with them, but pulled themselves together to withstand the hospitalization for the health of the fetus. Korean women’s strong sense of responsibility and sacrifice for their children may cause them to feel guilty if they are unable to fulfill the role of caring and nurturing [19]. However, since maternal role confidence has been reported to improve the stress of preterm labor and enhance fetal attachment [20], developing a nursing intervention program that can enhance maternal confidence in pregnant women in preterm labor will be beneficial.

**Theme cluster 2:** ‘Endless frustration in the hospital.’ In most cases, the exact cause of preterm labor is unknown [21] and the uncertainty that patients experience in the treatment process hinders psychological stability [22]. This suggests that health care providers can reduce uncertainty by providing patients with sufficient explanations and information about the treatment process. Patients have high demands and expectations for informational support from health care providers about their condition and feel relief and satisfaction if they perceive that professional help has been extended [18]. Therefore, careful explanations about treatments, examinations, and the patient’s current status compared to before can provide important support for women with preterm labor. Nurses are in a good position both to provide timely information by cultivating their communication skills and to manage the emotions experienced by pregnant women during extended hospitalization.

**Theme cluster 3:** ‘Unmet physiological needs.’ Because participants’ daily activities were restricted, all activities were controlled, including going to the bathroom and showering. Greater physical discomfort experienced by pregnant women with preterm labor has been reported to be associated with a more negative emotional state [12]. Therefore, the difficulties that participants faced with basic hygiene and defecation were a major source of stress during hospitalization and adversely affected both their physical and psychological health. Considering a previous study [23] noting that higher stress increased nursing requirements in pregnant women with preterm labor, it is necessary to identify their stressors and provide adequate care. Bed rest is essential for pregnant women with preterm labor [11], but physical discomfort caused stress in this study, which has also been reported in the literature [12]. Therefore, it is necessary for health care providers to listen to pregnant women’s experiences to understand their discomfort and improve treatment measures so that they do not infringe on women’s basic needs [18]. Differentiated individual guidelines allowing partial hygiene management and defecation within a range that does not worsen preterm labor symptoms would be helpful.

**Theme cluster 4:** ‘Gratitude for the support around oneself.’ Although the participants had feelings of gratitude and regret toward their families, the emotional support from their families was a powerful force helping them to overcome their difficulties and they experienced a sense of unity in the family. In a study of 185 pregnant women in Korea, a higher degree of family support perceived by pregnant women was associated with lower stress [24]. Therefore, it is necessary for nurses to provide collaborative education to help patients’ families perform their role as a support system well and positively assist pregnant women when they are hospitalized for preterm labor. In addition, this study found that participants felt resentment and distrust of the strict treatment from health care providers, but expressed warmth and gratitude when they realized the true intentions and goals of treatment. Korean pregnant women hospitalized for preterm labor have been shown to have care needs requiring communication about the nature of preterm labor, medication, and sleep [25]. In addition, pregnant women with preterm labor mainly used emotion-focused coping during hospitalization, and educational and emotional nursing needs were higher than physical nursing needs [23]. Communication based on empathy and emotional support can provide emotional stability and comfort to the patient, which in turn, can impact the treatment process and outcome [18]. Therefore, health care providers should be mindful of the emotional status of pregnant women with preterm labor and strive to provide tailored informational support based on empathetic and therapeutic communication.

**Theme cluster 5:** ‘Shifting perception and accepting one’s circumstances.’ Pregnant women with preterm labor found strength in sharing their own experiences, which were unlike those of normal pregnancy, and they processed their accumulated emotions while comforting each other. A self-help group intervention was reported to be effective in relieving negative emotions for pregnant women on bed rest [26]. Nurses can create and guide self-help groups for pregnant women with preterm labor within the hospital to facilitate such sharing. This study also found that par-
ticipants spent much time using smartphones as a way to overcome the dreary hospitalization period until childbirth, which aligns with a study of 613 people in 24 countries that found that pregnant women with preterm labor used the internet to relieve their psychological anxiety and obtain related information [27]. However, as higher smartphone dependency in pregnant women with preterm labor was associated with lower sleep quality [28], education and support for appropriate use of smartphones may also be beneficial.

**Limitations**

This phenomenological study explored the hospitalized experience of pregnant women with preterm labor in Korea. Although two pregnant women with preterm labor who did not participate in the study were invited to read the study results, in order to identify and support applicability, the fact that our participants were only recruited from one institution may limit the transferability of the findings. As the number of multiparous women was limited, a follow-up study focusing on women with preterm labor who have children at home may be required for a further understanding of women’s experiences depending on their context.

Based on the results of this study, nurses can provide more sensitive care and consider supporting programs that facilitate self-processing and alleviate stress. We propose developing emotional support and individual counseling program that can be implemented in the hospital room and conducting a study to verify its effectiveness for minimizing stress while on bed rest for women with preterm labor during hospitalization. In addition, given that pregnant women with preterm labor are particularly concerned about their families while they are hospitalized, but they receive the greatest support from their families, family support education should be provided for the families of pregnant women who need to be hospitalized for preterm labor to increase the comfort of their hospital stay.

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**Conflict of interest**

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**Data availability**

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**References**

9. Yang MS. Preterm delivery womens’ daily living experience
Mothers’ experience of caring for home-quarantined children after close contact with COVID–19 in Korea: an exploratory qualitative study

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Purpose: The world saw a shift into a new society consequent to the coronavirus disease 2019 (COVID-19), which made home quarantine mandatory for a person in close contact with those who tested positive. For children, however, home quarantine was not limited only to themselves but parents, especially mothers were involved and required to quarantine. This qualitative study aims to explore and understand mothers’ experience and their related psychosocial issues while caring for their school-aged children in Korea, who had to home quarantine after coming in close contact with COVID-19 positive individuals.

Methods: Data were collected from October 2020 to January 2021 via in-depth, semi-structured interviews with nine mothers of children who had to home quarantine. Interviews were conducted face-to-face in an independent space near the participant’s home or workplace (n=5) or via online platforms or telephone (n=4). The data were analyzed using thematic analysis through several iterative team meetings.

Results: Thematic analysis revealed the following four themes: “Unable to be relieved due to uncertain situations surrounding me,” “Blame and hurt toward me, others, and one another,” “Pulling myself together for my children in my broken daily life,” and “Changes in the meaning of life amid COVID-19.”

Conclusion: The narratives show that mothers experienced psychosocial difficulties while caring for their children during home quarantine. It is necessary to reduce the social stigma toward individuals in home quarantine and establish policies to ensure work-family compatibility for such mothers.

Keywords: COVID-19; Mothers; Parenting; Qualitative research; Quarantine

Introduction

The world saw itself transitioning to a new society after the emergence of the ongoing coronavirus disease 2019 (COVID-19). As the number of COVID-19 patients continues to fluctuate, the Korean government is announcing and updating social distancing measures to prevent the spread of the virus [1]. As a result, events and gatherings have been restricted, and schools have switched to online learning. The government is also preventing the spread of the disease by isolating people exposed to the coronavirus [2]. The temporary suspension of societal activities and changes in operating methods have caused various crises for both individuals and families [3].

It is mostly adults who have been infected with COVID-19. However, 5.12% of children aged 0 to 9 years and 8.36% of children aged 10 to 19 years (as of August 24, 2021) have also been
infected in Korea [4], and this number continues to increase [5]. Although the incidence of COVID-19 in children is much lower compared to that in adults, policies to prevent the spread of COVID-19 among children, such as school closures and social distancing, have been affecting their physical and mental health. During the COVID-19 pandemic, children have been found to have less time to be physically active, have trouble sleeping, eat unhealthy meals, and use smartphones frequently, which has resulted in physical problems such as increased body mass index [6]. In addition, limited outdoor activities and a lack of interaction with classmates and friends have been reported to affect mental health [7].

The responsibility for childcare has also been transferred solely to the family due to school closures. COVID-19 has increased the burden of mothers as primary caregivers of school-aged children [8,9]. Since the COVID-19 vaccine is not yet recommended for children, the role of the mother, the main caregiver, is very important for the protection of children.

During the COVID-19 pandemic, mothers with school-aged children are not only experiencing changes in their daily lives, including increased parenting time, but also facing increased anxiety, depression, and stress due to those changes [10,11]. For working mothers, the double burden of work and childcare may increase as they have to manage work and childcare, while also educating their children at home [12,13]. If children are classified as having close contact with COVID-19 persons, they must be quarantined for 2 weeks in the same way as adults are [14,15]. Since it is difficult for children to comply with the home quarantine guidelines independently, if necessary, one household member must voluntarily home quarantine with the child (hereafter referred to as co-quarantine). Most typically, the mother plays this role [8], and this is expected to cause greater psychosocial difficulties for the mothers.

Children's exposure to COVID-19 due to community transmission is increasing, and home quarantine is becoming a common situation. Mothers caring for their children who were quarantined by contact with COVID-19 persons during the child's hospitalization, faced psychological problems such as anxiety, anger, depression, and suicidal ideation during the quarantine period [16]. In addition, mothers had fears about the probability of their children and herself testing as COVID-19 positive; stress about inaccurate information and difficulties in parenting; and concerns about social stigma [16]. Hence, better understanding is needed on the challenges of mothers caring for their children in home quarantine due to COVID-19, considering the lack of studies on this issue as well as the increase in the number of children getting infected with COVID-19.

The mother’s experience of taking care of their children in home quarantine has not been fully studied. Therefore, this exploratory qualitative study used thematic analysis to identify psychosocial experiences. This method is flexibly applicable than other approaches, which are relatively limited in variability within a framework. Also, it could accommodate a variety of ontological and epistemological perspectives and provides explanations for potentially rich, detailed, and complex data [17]. As a widely used qualitative analysis method, both in and beyond psychology, this approach could demonstrate the psychosocial experiences of mothers within the complex context of the COVID-19 pandemic.

This study aimed to explore mothers’ experiences of caring for their school-aged children who had to be home-quarantined after close contact with COVID-19 persons. The study will provide rich understanding for developing nursing interventions to

Summary statement

- **What is already known about this topic?**
  Persons experiencing home quarantine after close contact with COVID-19 patients have reported difficulties such as anxiety, uncertainty, health concerns, and social stigma. However, little is known about mothers’ experiences when caring for a home-quarantined child.

- **What this paper adds**
  Mothers endured social stigma against their families while caring for their children. However, an opportunity to understand uncertainty was noted. Additionally, working mothers said that their home-quarantined compatibility was a burden.

- **Implications for practice, education, and/or policy**
  When children require home quarantine, assessing the mothers’ anxiety related to COVID-19, stress from social stigma, and burden on working mothers is needed to identify and help improve their psychosocial health.
support mothers during COVID-19 as well as various new infectious diseases.

Methods

**Ethics statement:** This study was approved by the Institutional Review Board of Yonsei University Health Systems (Y-2020-0171). Informed consent was obtained from the participants.

**Study design**
This is an exploratory qualitative study to understand experiences of mothers who had children requiring home quarantine. The description of the study was reported according to the Consolidated Criteria for Reporting Qualitative Research [18].

**Participants**
The participants in this study were mothers who cared for their home-quarantined school-aged children due to close contact with COVID-19 patients. The inclusion criteria were being the child’s primary caregiver and a resident of Korea, fluent in the Korean language. The study excluded those who entered Korea after the COVID-19 outbreak and foreigners or expatriates. We used purposeful sampling and snowball sampling to recruit participants who could richly elaborate on their experiences. To recruit participants, recruitment advertisements were posted on nationwide online community for mothers, and people who were judged suitable for the study were also recommended by acquaintances. The target number of participants was estimated according to Polkinghorne [19] and nine mothers were included in this study.

**Data collection**
Data were collected through in-depth, semi-structured interviews from October 2020 to January 2021. The interviews were conducted face-to-face in an independent space near the participant’s home (n = 2) or workplace (n = 3), and via online platforms (n = 1) or telephone (n = 3) for those reluctant to participate in face-to-face interviews. The average time taken for interviews was about 60 minutes face-to-face and 40 minutes for online platform or telephone. Researchers delivered the research statement and consent form via email, and the interview schedule and location were set after submitting the consent signed by the participants to the research team. When researchers interviewed the participants face-to-face, we followed the COVID-19 prevention guidelines by wearing a mask, washing hands, and maintaining distance. Interviews were audio-recorded with permission, transcribed verbatim with IDs instead of real names, and supplemented with observational field notes. The main questions included, “How did you feel when you came to know that your child had to take a screening test for COVID-19 because of close contact? What was the situation at that time? How did you feel during the 2 weeks of home quarantine?” The questions allowed participants to freely speak about their psychosocial experiences. During the interview, probing questions were used as necessary, and any ambiguous part was reconfirmed with the participant to ensure that the content was accurate. The recordings were transcribed on the day of the interviews. We conducted an additional online platform interview with one participant to clarify some specific content. Since collection and analysis were conducted simultaneously, data collection was completed when new ideas were not being generated during the analysis process and data saturation was determined.

**Data analysis**
We identified repeated meanings and patterns of appearance and analyzed them using thematic analysis to reveal the phenomenon through interpretation [17]. The collected data were analyzed as follows: First, we independently familiarized ourselves with the data by repeating the full and partial reads of the transcripts. Second, after independently reading the transcripts of the first participant, initial coding of extracts were done, highlighting the mother’s psychosocial experience. Based on this, we formed the first coding scheme through a meeting, which was independently applied to transcripts to identify potential themes and gather all data relevant to each potential theme. Next, independent and partial reads of the transcripts was repeated and we shared impressions on whether the themes worked in relation to the coded extracts. The themes became relatively clear in this process over 10 research meetings, as similarities and differences were revealed in participants’ thoughts, feelings, and behaviors. This was followed by generating clear definitions and names for each theme. In addition, vocabulary was revised by reviewing overlapping concepts to clarify the derived themes. Research meetings were conducted weekly to revise the coding scheme, which was performed iteratively. When new themes were drawn, the process of returning to the raw data and comparing them was repeated. Finally, the manuscripts were prepared by selecting vivid statements. The themes became relatively clear in this process over 10 research meetings, as similarities and differences were revealed in participants’ thoughts, feelings, and behaviors. This was followed by generating clear definitions and names for each theme. In addition, vocabulary was revised by reviewing overlapping concepts to clarify the derived themes. Research meetings were conducted weekly to revise the coding scheme, which was performed iteratively. When new themes were drawn, the process of returning to the raw data and comparing them was repeated. Finally, the manuscripts were prepared by selecting vivid statements.

**Research rigor**
Based on trustworthiness proposed by Lincoln and Guba [20], we sought to increase rigor [20,21]. First, to ensure credibility, we transcribed the recorded interview without omission or distortion of data and conducted an interview debriefing within the research team to prevent subjective interpretation during data
analysis. In addition, the strategy of further clarifying the results of the conceptualization process was repeated by reviewing, and feedback from two participants. Second, to increase transferability, this study had no restrictions, such as of age or region, in recruiting various participants. Additionally, immediate transcription was done to ensure a dense and rich description of each participant's context and situation in this study. Third, to ensure dependability, the same interview guide was used for interview consistency and the analysis process of the study, i.e., the “interview content, meaning, and theme formation,” was specifically described. Fourth, we wrote field notes and analytical memos at the end of each interview and referred to them during analysis to increase confirmability. To have a neutral research attitude, we went through the process of asking for colleagues’ feedback on the concepts derived from within the research team.

Researcher preparation
The research team primarily consisted of doctoral students who completed a qualitative research methodology class. They participated in workshops and seminars to improve interview skills and gain experience analyzing data and interview methods. An experienced qualitative researcher who taught qualitative research methodology at the graduate level and conducted several qualitative studies oversaw the study process and participated in analytic discussions with the research team. Advice was sought from qualitative researchers in the initial study design. Consensus was reached through team discussions, with the qualitative researcher sharing opinions on the coding system derived after analyzing the first participant interview data, returning to the raw data, and comparing them together. These continuous data analysis meetings contributed to the rigor of this study.

Results

The characteristics of participants who cared for their children in home quarantine are presented in Table 1. As a result of exploring the mothers’ experience, four themes, and 13 subthemes were derived (Table 2): (1) Unable to be relieved due to uncertain situations surrounding me; (2) Blame and hurt toward me, others, and one another; (3) Pulling myself together for my children in my broken daily life; and (4) Change in the meaning of life amid COVID-19.

Theme 1: Unable to be relieved due to uncertain situations surrounding me
Feeling flustered and guilt caused by unexpected circumstances
Participants expressed feeling flustered and guilty when they heard that their children were in close contact with a COVID-19 person. For working mothers, their children had to stay in school longer, which they felt resulted in close contact with COVID-19 patients. Thus, the mothers blamed themselves, as seen in the following statement:

“I got a call from the school to take my child home because the daycare class is scheduled to be closed immediately. So, I was really at a loss because I could not ask someone else to take care of my child because my child had to be home-quarantined. I panicked and eventually, I had no choice but to stay with my child I had no choice and let my child stay at school until I got off work. (Participant 5)”

Anxiety about the probability of a child being diagnosed with COVID-19
The waiting time for the children's COVID-19 results and the subsequent 2-week home quarantine period were times of anxiety for mothers considering the probability of their child being confirmed with COVID-19. This extended anxiety was expressed by the following participant:

“I was relieved when I heard that the first screening test was negative, but it was about 50-60 percent relief. I thought it would be okay while my child was in home quarantine, but I still felt anxious (throughout that time). (Participant 7)”

| Table 1. Characteristic of participant mothers (N=9) |
|----------|----------|--------|------------|-----------------|---------------------|------------------------|
| ID  | Age | Living area | Job   | Child's sex/age (year) | Quarantine period | No. of children cared for together |
| P1  | 30s | Seoul      | Part-time | Male/9         | May 2020         | 1                      |
| P2  | 40s | Seoul      | Full time  | Female/8      | June 2020        | None                   |
| P3  | 40s | Seoul      | Full time  | Male/7        | August 2020      | 1                      |
| P4  | 30s | Seoul      | Part-time  | Male/7        | May 2020         | 1                      |
| P5  | 30s | Seoul      | Full time  | Female/10     | August 2020      | 1                      |
| P6  | 40s | Busan      | Housewife | Male/10       | November 2020    | 3                      |
| P7  | 30s | Daegu      | Full time  | Male/11       | December 2020    | None                   |
| P8  | 40s | Seoul      | Full time  | Male/10       | May 2020         | 1                      |
| P9  | 40s | Incheon    | Part-time  | Female/10     | November 2020    | 1                      |
Worrying how the situation can affect the daily life around me
Participants were concerned that if their children and family were confirmed COVID-19 positive, it could affect other families, their workplace, and cause social disruption. In other words, the participants were afraid that everything around them could change, as seen in the following statement:

“What should I do if my child is also confirmed to have COVID-19 during home quarantine? How should I quarantine? If the child is positive, should I isolate, or can I be quarantined together because my child is young? What will happen to my work? These thoughts made me feel afraid and being at a loss. (Participant 5)”

Confusion of unsettled rules related to COVID-19
In May 2020, home quarantine took place in the early stages of COVID-19 in Korea. Therefore, the guidelines for home quarantine for school-aged children were not clear, and this confused participants who felt the responsibility fell on them. Uncertainty was noted in one mother’s statement:

“Depending on the officials in charge of home quarantine, there was a difference in information provided to each family. For example, someone gets information sooner and more specific guidance. (Participant 1)”

Theme 2: Blame and hurt toward me, others, and one other
Fear of being “targeted” in a situation fraught with speculation and rumors
The participants felt that the public tried to determine who the confirmed and close contacts were. Seeing the situation, participants felt fearful that their children and family might be blamed. One mother expressed the following:

“Rumors that someone’s family was positive for COVID-19 went around. (…) and I also got a call from the school my child attends. At that time, the situation was chaotic. No one knew exactly who might have had COVID-19. Other moms were searching for them as if they were looking for criminals, and it was so scary to see them. (Participant 6)”

Resentment for situations that have brought about a change
The participants’ children were classified as having close contact with COVID-19. However, the “probability of confirmation (i.e., testing positive for COVID-19)” could make the children and families the perpetrator. Thus, the participants resented those who were confirmed to be COVID-19 positive, as shown in the following statement:

“Among many mothers, everyone knew how the person was infected. Looking at this situation, if my child tested positive and this is known, people will see us as the perpetrator, even though we are the victim. It is very unfair! (Participant 2)”

Theme 3: Pulling myself together for my children in my broken daily life
Pity for my child in home quarantine
The participants felt sorry for the reality of their children wearing masks even at home to comply with the home quarantine guidelines, and expressed some bitterness at seeing their children bravely endure the home quarantine. In addition, they deeply regretted that they could not constantly be with their children at home due to their work, as seen in one participant’s statement.

“I was constantly guilty of not being able to take time off from work and leaving the child alone. Is a job this important to me? Occasionally, my child told me of being so scared of having to be alone at that time. I have a heavy burden on my heart. (Participant 5)”

Hardship for maintaining daily life when it tumbles down in enforced time
Two weeks of forced home quarantine gradually disrupted the participants’ daily lives. Since the participants had to spend repeated days performing more roles, the burden increased and they felt physically exhausted.

“Most of all, it was most difficult for me to break my parenting routine.
My child followed the school schedule, but it did not work out at home. I said to my kid, let us read some books, stop watching TV, and play with blocks. However, my child was out of control. (Participant 3)."

"Trying not to show my anxiety in front of my child"
During the child’s home quarantine, the participants had anxiety throughout the 2 weeks but had to hide these feelings fearing that it could be passed on to their child. One mother expressed that it was a mother’s role to provide emotional stability to the child.

"I think the most important thing is for a child to live with emotional stability. However, it’s influenced by the mother. When the mother was anxious, her child was anxious. I think mothers need to build up their minds. (Participant 6)"

"Standing firm with support from family and neighbors"
Quarantine time was a difficult event for the participants and their families. However, they were able to persevere because of their family and supportive neighbors, as seen in the following statement:

"The efforts of the neighbors who tried to take care of my child for 2 weeks were the best for me. I made food before going to work, but the food used to get cold by lunch-time. A neighbor who had known my child since a young age left warm food in front of the door and then sent a cell phone message to my child to eat it. In addition, neighbors brought things for my child to play with at home. (Participant 5)"

"Theme 4: Changes in the meaning of life amid COVID-19"
Understanding and concern for others
After the participants experienced home quarantine, they became worried that COVID-19 patients had to face similar or worse situations. They were also concerned about the health of the COVID-19 students and what their families might be exposed to. In this sense, they developed understanding for other children/families facing home quarantine, as seen in one mother’s words.

"How hard is it for that family with COVID-19? How does the mother feel? I was worried about these issues. Because we are close neighbors, even though they were infected. (Participant 8)"

Living together our precious daily life
Participants felt thankful to their children for overcoming the 2-week home quarantine and appreciated the importance of family and daily life. In addition, they noted that we could live in peace because there were people who faithfully quarantined when required. Thus, following infection guidelines was seen as a concrete way to create a safe world where one could live without fear, as expressed by one mother.

"I didn’t know it before, but this experience made me feel compelled to do my best (following the home quarantine guidelines). I think we can live safely because people follow the rules well for others. (Participant 8)"

"Anxiety amid the unfinished COVID-19"
Participants felt that it was necessary to adapt to this situation rather than impatiently expecting a return to their old life during the ongoing global crisis. However, mothers were still worried about the probability of facing the same circumstances again, i.e., COVID-19 and close contact situations, as noted by one mother below. They also had fears because they had to send their children back to school or tutoring institutes, which they perceived as places with a high risk of infection.

"The number of people with COVID-19 is increasing continuously. I think it has permeated our lives now. Can I avoid getting the coronavirus until the end of this situation? Will I not get infected someday, too? I have this anxiety. (Participant 8)"

Discussion
As a qualitative exploratory study, we explored the experiences of mothers caring for school-aged children who were subjected to home quarantine after close contact with COVID-19 persons. Fortunately, all of our participants’ children completed quarantine without any health problems. Since the outbreak of COVID-19, there have been many qualitative studies focusing on how medical staff [22], vulnerable groups [23], and children [24], experience the pandemic. However, this study is meaningful since it focuses on mothers who have experienced home quarantine with their children who have been in close contact with COVID-19 persons.

Interpretation
The following is a conceptual discussion of the topics identified in this study: First, the increased burden of working mothers’ difficulties in work-family compatibility and childcare due to COVID-19 do not seem to have been accounted for in home quarantine. Even before the COVID-19 pandemic outbreak, working mothers with young children in Korea were required to play multiple roles, such as work, childcare, housework, and as earners [25]. Subsequently, they experienced difficulties due to insufficient parenting alternatives and a lack of time. In addition, the COVID-19 pandemic has increased the stress of working mothers. Previous study has shown that working mothers have an increased role in preventing and protecting their families from COVID-19 [26]. Most of the participants in this study were
working mothers and some could not take 2 weeks off for fear of being fired from their job. It led to the guilt and burden of the mothers. Although, various systems in Korea were newly established to promote work-family balance, they were not utilized by the participants [14,27]. Unlike in European countries, the role of the government is essential because labor and care policies are not organically linked, making it difficult to realize policies the exist-
the government is essential because labor and care policies are not 
grown, and the role of Government is essential because labor and 
care policies are not organically linked, making it difficult to realize policies the exist-
ing system [28]. In addition, the participants were anxious about 
their child’s “probability of confirmed COVID-19” and were 
cussed by the lack of guidelines. In a previous study, perceived 
COVID-19 threats were associated with negative mental health outcomes [29] and quarantine due to infectious diseases had neg-
ative psychological effects on the quarantined person, including 
posttraumatic stress symptoms, depression, anxiety, confusion, 
and anger [7,29]. In fact, during the early stages of COVID-19 
(April 2020), 17% and 27% of the general population in Ireland 
and Greece respectively, were reported to have experienced symp-
toms of posttraumatic stress [30,31]. In our study, one mother 
expressed feeling more stressed than her father’s death and ex-
pressed difficulty in this uncertain circumstance, which was lik-
ened to war. This suggests symptoms of posttraumatic stress may 
have been experienced, although more studies are required to 
identify this further.

In Korea, based on the experience of the 2015 Middle East re-
spiratory syndrome, expert counseling, recovery programs, and 
follow-up monitoring are being conducted to provide mental and 
psychological support for citizens since the early stages of 
COVID-19 [32,33]. In addition to these efforts, it is necessary to 
prepare a rapid and accurate response system to prepare for new 
infectious diseases that may occur in the future. Specifically, allo-
cating resources for psychological support of parents who have 
to co-quarantine with young children, especially for mothers 
who balance work-family responsibilities is necessary.

Second, according to the results of a study on quarantine expe-
riences conducted in India, a person with COVID-19 positive has a dual burden not only of physical health problems but also of social stigma from the public [34]. Also, in the study of Lo-
hiniva et al. [35], a history of COVID-19 infection has led to dif-
ficulties in going out of the house or interacting with people after 
quarantine. This was also noted in our study, with some who iso-
lated themselves from outside completely, stating, “I could not 
even go to the supermarket” or “We just decided to quarantine at 
home together.” Self-stigma, which is one of the processes of so-
cial stigma, may underlie this reaction. Self-stigma is defined as 
the self- adoption of negative social beliefs and emotions associat-
ed with stigmatized group members [36]. A strong sense of so-
cial stigma was expressed by our participants, which is a cause for 
concern as it can lead to psychosocial problems. As people fear 
unknown diseases and associate their fear with ‘COVID-19 pa-
tients’ as well as “the close contact-others” the social stigma will 
continue to prevail unless COVID-19 is over [29]. To stop this 
self-stigmatization process and mitigate its harmful consequenc-
es, we must first weaken the factors that induce or promote stig-
ma. Moreover, as seen in participants’ realization such as “We are 
living so safely through the work of someone who adhered to the 
home quarantine rules,” it is important to remind the general 
population that such individual efforts are laudable in preventing 
the spread of community infection, rather than cause for stigma 
[7]. In addition, providing accurate and sufficient information 
about home quarantine to the public reduces uncertainty about 
infection and can reduce anxiety [37,38]. This will lower the so-
cial stigma against those in home quarantine, helping them com-
plete the required period and return to society without having to 
worry about repercussions.

Third, the parents were in charge of their child’s care during 
home quarantine while being co-quarantined, as mandated by the 
Korean COVID-19 Response Guidelines [14]. In addition to 
their existing roles at home and work, they also had to check and 
report on their children’s symptoms and manage their school-
work. Moreover, although it is not a government guideline, for 
those with more than one child, the sibling also had to stay at 
home due to social stigma rather than because of health guide-
lines. Therefore, the participants took care of not only the chil-
dren in home quarantine but also shouldered the role of separat-
ing and caring for other children. According to the study of 
Moon et al. [39], the mother’s parenting duties, as well as her 
day-to-day work, are greatly increased with COVID-19, which 
increases the risk of burnout. A mother’s burden can lead to psy-
chological problems in her children, which in the long term ex-
tends into adulthood and can affect various areas of life [40]. 
However, participants tried not to express their stress of burden 
and anxiety in uncertain situations in front of their child and did 
not take adequate care of themselves. Since Korean culture val-
ues family over individuals [25], most participants put the needs 
of their children and family before themselves. Despite the bur-
den, our participants endured the situation with the support of 
their families and could communicate with mothers in similar 
situations besides receiving help from neighbors. Currently, the 
government’s support is focused on confirmed patients and 
home-quarantined individuals, so support for those who pro-
vide care, such as mothers, is insufficient. Assessing and sup-
porting maternal burnout related to parenting in disaster situa-
tions can enable maintaining positive parenting and reduce 
burnout [12]. In addition, supportive measures for psychologi-

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cal health care are needed for those who provide care in co-quar-
antine.

Eventually, some participants noted a remarkable change in thinking that was restructured as positive despite the ongoing pandemic. Participants felt that the efforts of those who have so far followed the home quarantine guidelines had kept the general public safe from the risk of COVID-19. In addition, the participants thought that home quarantine was an effort by individuals and everyone to regain our daily life that was lost. This was similar to posttraumatic growth, a positive psychological change that is subjectively perceived after experiencing a traumatic event in life [41]. A previous study in Greece reported that, people had negative experiences similar to posttraumatic stress but a positive experience of posttraumatic growth was possible through an individual's inner coping ability in COVID-19 pandemic [41]. After the experience in 2-week home quarantine, which became a turning point in discovering the importance of daily life that they were unaware of, people also became to appreciate the meaning of living a healthy life for family and living with others [35,42].

Limitations
In November 2020, when the recruitment of interview participants began, the number of COVID-19 cases increased rapidly in the Seoul metropolitan area in Korea, and the level of social distancing raised. Subsequently, daily life other than essential social and economic activities was restricted. Thus, due to this unforeseen obstacle, recruitment guidance and explanation could not be conducted face-to-face. In addition, as mothers were fearful of the negative social repercussions of experiencing home quarantine, they were reluctant to participate in the study and expose themselves voluntarily. As most mothers who participated in the study preferred indirect contact, more than about half of the interviews were conducted via a web-based model or telephone. The results of this study are based on interviews conducted under restrictive circumstances due to the mothers’ reluctance to participate, and hence, may be limited in transferability to other mothers of school-aged children who have experienced home quarantine at times of different COVID-19 intensity. Future research should consider the circumstances of this situation.

In conclusion, this exploratory study on mothers’ experiences in caring for their school-aged children in home quarantine after close contact with COVID-19 persons, found that mothers had to endure 2 weeks of uncertainty as they faced unexpected events and difficulties due to social stigma and increased roles due to work-family compatibility. However, they were able to persevere with the help of those around them and it was an opportunity to reflect on living precious daily lives together, despite the probability of repeated close contact with COVID-19. Even if the ongoing coronavirus situation ends, new infectious diseases can occur at any time. Mothers may suffer from psychosocial problems, such as anxiety, stress from social stigma, and the burden of working. Thus, it is necessary to improve policies to prevent or reduce such burdens and support mothers. Further research is also needed to identify potential psychosocial problems of co-quarantine mothers.

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Conceptualization: Lee H, Choi S; Data collection: Lee H, Choi S, Kim M, Kim O; Formal analysis: all authors; Writing–original draft: Lee H, Choi S; Writing–review & editing: all authors.

Conflict of interest

Sue Kim has been editor-in-chief of the Korean Journal of Women Health Nursing since January 2020. She was not involved in the review process of this manuscript. Otherwise, there was no conflict of interest.

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Data availability

Please contact the corresponding author for data availability.

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The effects of a maternal nursing competency reinforcement program on nursing students' problem-solving ability, emotional intelligence, self-directed learning ability, and maternal nursing performance in Korea: a randomized controlled trial

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Purpose: The purpose of this study was to develop a maternal nursing competency reinforcement program for nursing students and assess the program's effectiveness in Korea.

Methods: The maternal nursing competency reinforcement program was developed following the ADDIE model. This study employed an explanatory sequential mixed methods design that applied a non-blinded, randomized controlled trial with nursing students (28 experimental, 33 control) followed by open-ended interviews with a subset (n=7). Data were analyzed by both qualitative and quantitative analysis methods.

Results: Repeated measures analysis of variance showed that significant differences according to group and time in maternal nursing performance; assessment of and intervention in postpartum uterine involution and vaginal discharge (F=24.04, p<.001), assessment of and intervention in amniotic membrane rupture (F=36.39, p<.001), assessment of and intervention in delivery process through vaginal examination (F=32.42, p<.001), and nursing care of patients undergoing induced labor (F=48.03, p<.001). Group and time improvements were also noted for problem-solving ability (F=9.73, p<.001) and emotional intelligence (F=4.32, p=.016). There were significant differences between groups in self-directed learning ability (F=13.09, p=.001), but not over time. The three main categories derived from content analysis include “learning with a colleague by simulation promotes self-reflection and learning,” “improvement in maternal nursing knowledge and performance by learning various countermeasures,” and “learning of emotionally supportive care, but being insufficient.”

Conclusion: The maternal nursing competency reinforcement program can be effectively utilized to improve maternal nursing performance, problem-solving ability, and emotional intelligence for nursing students.

Keywords: Emotional intelligence; Maternal-child nursing; Problem solving; Self-directed learning as topic; Students

Introduction

In the current clinical practice education environment, as the awareness of patient rights and the demand for nursing services increase, nursing students only observe patients in the clinical field rather than learning actual nursing skills [1]. In addition, in
Korea, there are relatively few cases of pregnancy and childbirth because of the extremely low fertility rate. Also, patients often feel uncomfortable with exposing their sensitive areas and health care providers need to protect patient privacy, so it is particularly difficult for nursing students to practice in delivery rooms [2]. Furthermore, it is difficult for nursing students in practicum to continuously observe and practice delivery-related care because delivery is a long and continuous process [3]. Thus, nursing students often lack sufficient opportunity to perform the necessary health assessments during pregnancy, childbirth, and postpartum stages, as well as interpret the results and apply nursing care needed for the situation. As a result, nursing students may have difficulty in solving nursing-related problems and performing as nurses after graduation [4].

In Korea, simulation is often reinforced in the nursing curriculum to overcome the limitations of clinical practice education and improve the problem-solving abilities of students in various nursing situations [5]. According to previous studies, simulation education had a positive relationship with nursing students’ knowledge [6], self-efficacy [6], clinical performance ability [7], problem-solving ability [5], clinical judgment ability [8], and self-directed learning ability [9]. However, since previous studies on simulation programs for maternal nursing were lacking, more studies are needed to verify simulation training programs for maternity nursing and determine their effectiveness. In particular, as Korea’s fertility rate is very low and clinical practice alone is not sufficient in maternal nursing education, simulation allows students to practice real nursing skills [2]. Moreover, in the era of the 4th Industrial Revolution, nurses are required to have problem-solving skills to solve complex problems as well as self-direction to cope with the ever-changing environment [10]. Since emotional intelligence is related to clinical performance [11] and problem-solving ability [12], nursing students need to improve their emotional intelligence.

In order to provide an education that is tailored to each student population, it is useful to reflect on the level and needs of the population concerning the educational subject at hand. If an educational program does not reflect the students’ performance level, its efficacy may be reduced for learners who have already reached high achievement levels. Conversely, it can cause frustration for low-achieving learners.

This study aimed to develop and evaluate a maternal nursing competency reinforcement program based on the core principles of maternal nursing that considers the students’ needs and levels.

Methods

Ethics statement: This study was approved by the Institutional Review Board of Daegu Catholic University (CUIRB-2018-0040). Written consent was obtained from students who indicated voluntary participation. An explanation was provided to students that refusal to participate in the study did not adversely affect grades.

Program development phase
The ADDIE (Analysis, Design, Development, Implementation,
and Evaluation) model was used to select, apply, and evaluate the elements of core nursing care related to childbirth [13] (Supplementary Fig. 1).

Analysis phase
For analysis of learning needs and job tasks for maternal nursing competency, the researchers selected 15 maternal nursing skills through a literature review and developed a structured questionnaire. The questionnaire was used to investigate the importance of maternal care skills and the amount of time required to perform those skills, both in the present and in the future. Data collection took place from September 14 to 24, 2018. Structured questionnaires were collected from experts (n = 8) and third year nursing students (n = 83), followed by focus group interviews with students (n = 19).

Design phase
Based on the analysis phase, performance goals were determined as of core nursing competency related to childbirth, self-directed learning, emotional intelligence utilization, and clinical problem solving. Teaching strategies and materials included pre-video self-study, scenario-based learning, practice clinical skills, and team learning using childbirth pelvic models, low-fidelity simulators, and standardized patients.

Development phase
Based on the analysis of learning needs and job tasks, four maternal nursing competencies were developed: Assessment of and intervention in (1) postpartum uterine involution and vaginal discharge (uterine involution), (2) amniotic membrane rupture (rupture of membrane), (3) delivery process through vaginal examination (delivery process); and (4) nursing care for patients undergoing induced labor (induced labor). The core skills according to maternal nursing competencies were assessment of and intervention in postpartum uterine involution and vaginal discharge; assessment of and intervention in amniotic membrane rupture; assessment of and intervention in delivery process through vaginal examination; and oxytocin drug injection and intervention, and electronic fetal monitoring and intervention. A protocol was developed for each core skill through the analysis of learning needs and job tasks, and the developed protocol was validated by three professors of maternal health nursing.

Implementation and evaluation phase
Plans were made for identifying needs that would occur in implementing the 2-day program (Table 1) and evaluation parameters were identified for measuring maternal nursing performance, problem solving, emotional intelligence, and self-directed learning ability.

Testing the efficacy of the maternal nursing competency reinforcement program
Study design
This study used an explanatory sequential mixed method design [14] employing a non-blinded, randomized controlled trial (RCT), followed by open-ended interviews with a subset of program participants. The explanatory sequential mixed method design was employed to sequentially collect and analyze quantitative and qualitative data, in order to understand the effect of the program more abundantly than when only quantitative research design is used [14].

1. RCT phase
This study ascribed to the CONSORT (Consolidated Standards of Reporting Trials) guidelines [15].

Participants and recruitment
The participants of this study were third year nursing students who had completed their first maternal nursing lecture class and clinical practicum in the first semester, and were taking their second maternal nursing lecture class in the second semester, and had not yet started their maternal nursing clinical practicum. Eligible students from Daegu Catholic University in Daegu, Korea, received an online explanation of the study and one more invitation by a research assistant, following classes. It was explained that refusal to participate would not adversely affect grades, and those who voluntarily expressed their intention to participate were selected as participants.

Sample size
Sample size was calculated using the G*Power 3.1.9.2 program, with an effect size of .42, based on Song and Son's study [16]. For the repeated measures analysis of variance (ANOVA), estimation by an effect size .42, power of .95, and significance level of .05, for two groups across three measurements, and the correlation coefficient between repeated measurements set at .5, at least 52 participants were necessary. In consideration of dropout (25%) based on similar studies [17], we aimed to recruit 66 students. The experimental group and control group were assigned using random numbers, with 33 students in each group. After excluding students who did not participate in the program (n = 3) and had incomplete data at the posttest (n = 2), data from 61 students (28 experimental, 33 control) were used for final analysis (Fig. 1).
<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Content</th>
<th>Teaching strategy</th>
<th>Time (min)</th>
</tr>
</thead>
</table>
| 1       | Introduction of program | · Greetings, introduction  
· Introducing the program’s goals and operating methods  
· Building rapport  
· Motivating for learning | · Guiding to learning management | 30 |
| 2       | Preview | Homework | Facilitating self-directed learning | 60 |
| 3       | Uterine involution scenario | 1) Understanding the scenario  
· Understanding the symptoms of uterine involution and postpartum lochia, assessing the condition  
· Empathize with the maternal psychological state when insufficiency of uterine involution  
· Thinking about problem-focused solutions  
· Elicit participants to know how to assess maternal uterine involution and postpartum lochia.  
· Promote participants to understand and empathize with the maternal physical and psychological state.  
· Encourage participants themselves to derive nursing problems that may arise with uterine involution and postpartum lochia.  
· Elicit participants to learn the rationale for uterine involution and postpartum lochia. | 10 |
|         |       | 2) Practice clinical skills  
· Observing the demonstration  
· 1:1 skill training  
· Demonstrate nursing performance that meets the patient’s nursing needs  
· Observe and feedback 1:1 training  
· Promote positive reinforcement | 60 |
|         |       | 3) Debriefing  
· Elicit reflection and internalization. | 50 |
| 4       | Rupture of Membrane scenario | 1) Understanding the scenario  
· Assessing amniotic membrane rupture  
· Empathize with the maternal psychological state in case of amniotic membrane rupture or premature amniotic membrane rupture  
· Thinking about problem-focused solutions  
· Elicit participants to know how to assess amniotic membrane rupture  
· Promote participants to understand and empathize with the maternal physical and psychological state.  
· Encourage participants themselves to derive nursing problems that may arise with amniotic membrane rupture.  
· Elicit participants to learn the rationale for amniotic membrane rupture, nitrazine test, and AmniSure® test | 10 |
|         |       | 2) Practice clinical skills  
· Observing the demonstration  
· 1:1 skill training  
· Demonstrate nursing performance that meets the patient’s nursing needs  
· Observe and feedback 1:1 training  
· Promote positive reinforcement  
· Elicit reflection and internalization. | 60 |
|         |       | 3) Debriefing | 50 |
| 4       | Delivery process scenario | 1) Understanding the scenario  
· Assessing delivery progress  
· Empathize with the maternal psychological state during the delivery process and vaginal examination  
· Thinking about problem-focused solutions  
· Elicit participants to know how to delivery progress  
· Promote participants to understand and empathize with the maternal physical and psychological state.  
· Encourage participants themselves to derive nursing problems that may arise with delivery progress.  
· Elicit participants to learn the rationale for delivery process and vaginal examination. | 10 |
|         |       | 2) Practice clinical skills  
· Observing the demonstration  
· 1:1 skill training  
· Demonstrate nursing performance that meets the patient’s nursing needs  
· Observe and feedback 1:1 training  
· Promote positive reinforcement  
· Elicit reflection and internalization. | 60 |
|         |       | 3) Debriefing | 50 |
| 4       | Induced labor scenario | 1) Understanding the scenario  
· Assessing the need for induced labor  
· Empathize with the maternal psychological state during the induced labor  
· Thinking about problem-focused solutions  
· Elicit participants to know how to induced labor  
· Promote participants to understand and empathize with the maternal physical and psychological state.  
· Encourage participants themselves to derive nursing problems that may arise with induced labor.  
· Elicit participants to learn the rationale for induced labor. | 10 |

(Continued to the next page)
Measurement

All structured instruments were used with permission from the developers.

Maternal nursing performance: After reviewing the literature on core maternal nursing skill protocols and general simulation competency evaluation tools for students, the authors developed a maternal nursing performance tool covering four maternal nursing competencies: uterine involution (19 items), rupture of membrane (20 items), delivery process (13 items), and induced labor (15 items). Participants self-evaluate the degree to which they can perform each task on a 5-point Likert (1, not at all to 5, extremely), with higher mean scores indicating greater maternal nursing performance capability. In this study, the Cronbach’s α value were .95 (uterine involution), .94 (rupture of membrane), .93 (delivery process), and .95 (induced labor).

Problem-solving ability: Problem-solving ability was measured using the Adult Problem-solving Process tool that asks about actions one can take when trying to solve problems related to pregnancy and childbirth [18]. This tool is composed of a total of 30 questions, and five subcategories: clarification of the problem (six items), seeking a solution (six items), making a decision (six items), applying the solution (six questions), and evaluation and reflection (six items). Each item is rated on a 5-point Likert (1, not at all to 5, extremely), with higher mean scores indicating greater problem-solving ability. Cronbach’s a was .87 [19], and .91 in this study.

Self-directed learning ability: The 45-item Self-directed Learning Ability measurement for college students developed by the Korea Educational Development Institute [21] was used in this study. There are three competency areas: learning planning ability (20 items; diagnosing learning needs, setting learning goals, and discovering learning resources), learning execution ability (15 items; basic self-management ability, selection of learning strategies, and continuity of learning execution); and learning evaluation ability (10 items; attribution of effort and self-reflection on the outcome). Using a 5-point Likert (1, very rarely to 5, very often), higher mean scores indicating higher self-directed learning skills. Cronbach’s a was .93 at development [21], and .92 in this study.

Procedures

The study was conducted from October 10 to November 16, 2018. Measurements were done before the intervention (T0), immediately afterward (T1), and three weeks later (T2).

Pretest (T0): One week before the program began; pretests were done through an online questionnaire. This included maternal nursing performance, problem-solving ability, emotional intelligence, self-directed learning ability, and demographic characteristics.

Experiment: The experimental group consisted of a total of eight teams, with three or four students on each team. Two maternal nursing professors and two delivery room nurses were assigned as professional instructors for each of the four maternal nursing competencies. The experimental group took part in the maternal nursing competency reinforcement program over the course of 2 days (580 minutes). In the program, a low-fidelity
simulator was used to advance nursing skills through genital observation and assessment, and the students practiced interpersonal interaction using standardized patients and student patients who were not research participants. Each team learned two maternal nursing competencies per day. Three days before the program began, an overall orientation was given to introduce the purpose and progress of the program (30 minutes), and individual assignments were given, which included watching videos on core skills (approximately 60 minutes). The experimental group was then asked to study four maternal nursing competencies in a team learning setting over 2 days (480 minutes). Team learning consisted of understanding the scenario understanding (10 minutes), technical demonstration and technical training (60 minutes), and debriefing (50 minutes) (Table 1). A workbook was used during the program, and each team did their activities in a separate training room. The debriefing was conducted by the instructors who led each maternal nursing competency. The control group was provided usual care, general orientation on clinical practicum. After T2 measurement, the control group was provided with the workbook and information on the four maternal nursing competencies. About $3 was offered as an incentive to all students who participated in the study, after completion of T1 and T2.

Posttest (T1 & T2): The first posttest (T1) was conducted immediately upon completion of the intervention through a self-report questionnaire given to both groups at different locations. The second posttest (T2) was conducted three weeks later, with both groups gathered in different classrooms.

**Data analysis**
Analyses were done using IBM SPSS ver. 25.0 (IBM Corp., Armonk, NY, USA). To assess the degree of homogeneity of the ex-
per experimental and control groups, the chi-square test and Fisher exact test were used for general characteristics, and an independent t-test was used for the outcome variables. Normality was confirmed by the Shapiro-Wilk test both before and after the program. Based on the homogeneity test, variables with significant differences between the two groups (age, and pretest results of delivery process) were treated as covariates, and the main effects were evaluated using repeated measures ANOVA. Mauchly’s sphericity test was used to verify the homogeneity of variance, and if the sphericity assumption was not established, the Greenhouse-Geisser value was taken.

2. Qualitative phase

Participants
A subsection of the experimental group participants were invited to individual interviews. Selection was based on pre-post differences in maternal nursing performance scores: those who showed a small difference (n = 3), those with a large difference (n = 3), and one participant with a moderate difference in scores. After analyzing the interview data of seven participants, no further interviews were conducted because no new content was derived.

The mean age of participants (six females, one male) was 22.00 years (standard deviation [SD], ± 2.01), and the mean academic achievement scores for the previous semester was 80.69 (SD, ± 6.86) in maternal nursing lecture class and 90.20 (SD, ± 8.0) in maternal nursing clinical practicum.

Procedures
Individual interviews were done by one researcher, with a subset of participants in the experimental group, one week after the second posttest via purposive sampling. The interviews ranged from 25-40 minutes and the main interview questions were: “Which maternal nursing competency do you think has improved the most, and why do you think that?”, “What is the least improved maternal nursing competency do you think could be solved if you could care directly for the patient?”.

Data analysis
The interview data were analyzed using content analysis method [22]. The sensitivity was increased by the researcher comparing the content with the manuscript and repeatedly listening to the recorded file and ensuring the accuracy of the interview content by referring to the field notes. Each main category, category, and code were defined. The researchers reviewed the derived meanings several times and reconfirmed the original data. As a final step, the final result was reviewed by two professors experienced in qualitative research and four participants, and the final agreement and revision were made through discussion among the research team.

3. Integration of quantitative and qualitative findings
Integration in this study involved connecting the results from the quantitative phase to help plan the follow-up qualitative data collection phase. This connection, questions needed for further probing were identified, as well as which participants could help best explain the quantitative results.

Results
General characteristics and test for homogeneity of the participants
The majority of participants were female (92.9% of experimental group, 93.9% control group) and there was no significant difference between the two groups. The only statistically significant difference (p = .001) between the experimental and control groups was for mean age (22.93 ± 2.28 years and 21.21 ± 1.34 years, respectively). The two groups were comparable in academic achievement levels in lecture classes (81.64 ± 7.02 in experimental, 79.85 ± 6.33 in control group) and in clinical practicum (89.46 ± 8.89 in experimental, 90.21 ± 7.48 in control group) (Table 2).

Among maternal nursing performance, uterine involution (p = .133), rupture of membrane (p = .063), and induced labor (p = .057) were not significantly different between the two groups at baseline. However, the score of delivery process was slightly higher in the control (3.75 ± 0.55) than in the experimental (3.37 ± 0.83) at T0 (p = .042). Problem-solving ability (p = .931), emotional intelligence (p = .614), and self-directed learning ability (p = .077) were not significantly different between the two groups at T0.

Effects of the maternal nursing competency reinforcement program on main variables
The program’s effect on maternal nursing performance is presented in Table 3. Uterine involution (F = 24.04, p < .001), rupture of membrane (F = 36.39, p < .001), delivery process (F = 32.42, p < .001), and induced labor (F = 48.03, p < .001) significantly differed by group × time interaction. Problem-solving ability (F = 9.73, p < .001) and emotional intelligence score (F = 4.32, p = .016) significantly differed by group × time interaction. But, self-directed learning ability significantly differed only by group (F = 13.09, p = .001) (Table 3).
Qualitative phase findings

Three main categories were identified regarding how this program helped maternal nursing competency, problem-solving ability, emotional intelligence, and self-directed learning ability.

Main category 1: Learning with a colleague by simulation promotes self-reflection and learning

This was derived from four categories (Table 4). Participants thought that self-driven video-based learning induced more interest in face-to-face learning, and that they were able to concentrate on the material in the videos and learn the content faster. Participants observed and sought out self-reflection and learning strategies while observing the activities of their peers during the program and in the debriefing sessions. Participants said that they were able to review the content after participating in the program, and that it helped them to combine knowledge and practice.

“…While doing this program, I have been self-directed and re-discovered learning content... and that. Well… Ah! That’s the effacement of the cervix and the opening of a few centimeters. I think it was an opportunity to study in a self-directed manner.” (Participant A)

However, some participants said that they felt motivated to learn after participating in the program, but they could not translate that motivation into practice.

Main category 2: Improvement in maternal nursing knowledge and performance by learning various countermeasures

This main category was derived from eight categories (Table 4).

Participants expressed that they were able to improve their nursing abilities by observing various clinical case studies and various coping methods of their peers and that they became familiar with nursing practice and gained confidence through repeated observation. They also thought that the program gave them the opportunity to connect the knowledge and practice of maternal nursing, to identify and correct uncertain knowledge, and to learn how to understand and cope with patients while practicing direct nursing.

“I think it’s good to do that. Ah! This way, even if I actually go to the hospital (for clinical practicum), I can do it. I can see!” (Participant C).

However, some participants recognized that empirical learning in nursing practice was insufficient, as they were not skilled enough to make good clinical decisions despite coming to understand the patient’s situation.

Main category 3: Learning of emotionally supportive care, but being insufficient

This was derived from two categories (Table 4). Participants better understood and sympathized with their patients after participating in the program, but they were embarrassed because they could not fully control their own emotions. They still felt that their ability to provide emotionally supportive care to their patients was inadequate.

“Actually, I’m not good at recognizing other people’s feelings. Now, I understand that the patients are naturally anxious about delivery or her own condition. When the patient rejected it at first, in fact, it was...” (Participant B)

Table 2. General characteristics of participants and test of homogeneity (N=61)

<table>
<thead>
<tr>
<th>Variable/categories</th>
<th>Exp. (n = 28)</th>
<th>Cont. (n = 33)</th>
<th>t or χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2 (7.1)</td>
<td>2 (6.1)</td>
<td>0.03†</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>Female</td>
<td>26 (92.9)</td>
<td>31 (93.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic achievement level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecture classes</td>
<td>81.64 ± 7.02</td>
<td>79.85 ± 6.33</td>
<td>1.04</td>
<td>.305</td>
</tr>
<tr>
<td>Clinical practice classes</td>
<td>89.46 ± 8.89</td>
<td>90.21 ± 7.48</td>
<td>–0.36</td>
<td>.722</td>
</tr>
<tr>
<td>Age (years)</td>
<td>22.93 ± 2.28</td>
<td>21.21 ± 1.34</td>
<td>3.65</td>
<td>.001</td>
</tr>
<tr>
<td>Problem-solving ability</td>
<td>3.25 ± 0.54</td>
<td>3.24 ± 0.62</td>
<td>0.09</td>
<td>.931</td>
</tr>
<tr>
<td>Emotional intelligence</td>
<td>5.08 ± 0.68</td>
<td>4.98 ± 0.80</td>
<td>0.51</td>
<td>.614</td>
</tr>
<tr>
<td>Self-directed learning ability</td>
<td>3.44 ± 0.43</td>
<td>3.25 ± 0.39</td>
<td>1.80</td>
<td>.077</td>
</tr>
<tr>
<td>Maternal nursing performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterine involution</td>
<td>3.15 ± 0.62</td>
<td>3.39 ± 0.63</td>
<td>–1.52</td>
<td>.133</td>
</tr>
<tr>
<td>Rupture of membrane</td>
<td>3.20 ± 0.75</td>
<td>3.52 ± 0.56</td>
<td>–1.90</td>
<td>.063</td>
</tr>
<tr>
<td>Delivery process</td>
<td>3.37 ± 0.83</td>
<td>3.75 ± 0.55</td>
<td>–2.10</td>
<td>.042</td>
</tr>
<tr>
<td>Induced labor</td>
<td>3.09 ± 0.80</td>
<td>3.46 ± 0.66</td>
<td>–1.94</td>
<td>.057</td>
</tr>
</tbody>
</table>

Exp.: Experimental group, Cont.: control group.
†Fisher exact test.
Table 3. Comparison of outcome variables between the groups (N=61)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Possible score range</th>
<th>Time</th>
<th>Exp. (n=28), mean ± SD</th>
<th>Cont. (n=33), mean ± SD</th>
<th>Between groups</th>
<th>Source</th>
<th>( F^2 )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-solving ability</td>
<td>1–5</td>
<td>T0</td>
<td>3.25 ± 0.54</td>
<td>3.24 ± 0.62</td>
<td>0.09 .931</td>
<td>Group</td>
<td>15.36</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>3.87 ± 0.41</td>
<td>3.40 ± 0.63</td>
<td>3.49 .001</td>
<td>Time</td>
<td>5.07</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>4.11 ± 0.49</td>
<td>3.43 ± 0.42</td>
<td>5.79 &lt;.001</td>
<td>G×T</td>
<td>9.73</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>0.62 ± 0.73</td>
<td>0.16 ± 0.43</td>
<td>8.66 .005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>0.86 ± 0.69</td>
<td>0.19 ± 0.50</td>
<td>16.14 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional intelligence</td>
<td>1–7</td>
<td>T0</td>
<td>5.08 ± 0.68</td>
<td>4.98 ± 0.80</td>
<td>0.51 .614</td>
<td>Group</td>
<td>6.22</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>5.47 ± 0.68</td>
<td>5.06 ± 0.98</td>
<td>1.82 .073</td>
<td>Time</td>
<td>6.31</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>5.69 ± 0.87</td>
<td>5.06 ± 0.86</td>
<td>2.82 .007</td>
<td>G×T</td>
<td>4.32</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>0.39 ± 0.53</td>
<td>0.08 ± 0.57</td>
<td>2.27 .138</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>0.61 ± 0.66</td>
<td>0.08 ± 0.68</td>
<td>6.91 .011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-directed learning ability</td>
<td>1–5</td>
<td>T0</td>
<td>3.44 ± 0.43</td>
<td>3.25 ± 0.39</td>
<td>1.80 .077</td>
<td>Group</td>
<td>13.09</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>3.56 ± 0.39</td>
<td>3.40 ± 0.41</td>
<td>1.59 .117</td>
<td>Time</td>
<td>1.64</td>
<td>.199</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>3.75 ± 0.53</td>
<td>3.34 ± 0.33</td>
<td>3.67 .001</td>
<td>G×T</td>
<td>2.51</td>
<td>.092</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>0.12 ± 0.34</td>
<td>0.15 ± 0.33</td>
<td>0.19 .664</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>0.31 ± 0.48</td>
<td>0.09 ± 0.28</td>
<td>2.20 .143</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal nursing performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterine involution</td>
<td>1–5</td>
<td>T0</td>
<td>3.15 ± 0.62</td>
<td>3.39 ± 0.63</td>
<td>–1.52 .133</td>
<td>Group</td>
<td>65.81</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>4.50 ± 0.34</td>
<td>3.52 ± 0.64</td>
<td>7.67 &lt;.001</td>
<td>Time</td>
<td>3.61</td>
<td>.030</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>4.42 ± 0.44</td>
<td>3.48 ± 0.63</td>
<td>6.61 &lt;.001</td>
<td>G×T</td>
<td>24.04</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>1.35 ± 0.71</td>
<td>0.12 ± 0.68</td>
<td>36.55 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>1.27 ± 0.64</td>
<td>0.09 ± 0.73</td>
<td>31.54 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rupture of membrane</td>
<td>1–5</td>
<td>T0</td>
<td>3.20 ± 0.75</td>
<td>3.52 ± 0.56</td>
<td>–1.90 .063</td>
<td>Group</td>
<td>58.44</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>4.56 ± 0.48</td>
<td>3.73 ± 0.56</td>
<td>6.10 &lt;.001</td>
<td>Time</td>
<td>12.71</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>4.55 ± 0.46</td>
<td>3.67 ± 0.57</td>
<td>6.35 &lt;.001</td>
<td>G×T</td>
<td>36.39</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>1.27 ± 0.64</td>
<td>0.21 ± 0.42</td>
<td>53.18 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>1.35 ± 0.81</td>
<td>0.17 ± 0.50</td>
<td>44.01 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery process</td>
<td>1–5</td>
<td>T0</td>
<td>3.37 ± 0.83</td>
<td>3.75 ± 0.55</td>
<td>–2.10 .042</td>
<td>Group</td>
<td>38.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>4.56 ± 0.41</td>
<td>3.80 ± 0.72</td>
<td>5.12 &lt;.001</td>
<td>Time</td>
<td>3.45</td>
<td>.035</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>4.56 ± 0.46</td>
<td>3.82 ± 0.55</td>
<td>5.68 &lt;.001</td>
<td>G×T</td>
<td>32.42</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>1.18 ± 0.90</td>
<td>0.05 ± 0.47</td>
<td>44.65 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>1.19 ± 0.80</td>
<td>0.06 ± 0.44</td>
<td>47.27 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induced labor</td>
<td>1–5</td>
<td>T0</td>
<td>3.09 ± 0.80</td>
<td>3.46 ± 0.66</td>
<td>–1.94 .057</td>
<td>Group</td>
<td>9.40</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>4.42 ± 0.41</td>
<td>3.57 ± 0.67</td>
<td>6.01 &lt;.001</td>
<td>Time</td>
<td>14.98</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>4.47 ± 0.42</td>
<td>3.56 ± 0.57</td>
<td>7.21 &lt;.001</td>
<td>G×T</td>
<td>48.03</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1–T0</td>
<td>1.33 ± 0.79</td>
<td>0.12 ± 0.53</td>
<td>47.95 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2–T0</td>
<td>1.38 ± 0.77</td>
<td>0.10 ± 0.44</td>
<td>61.77 &lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exp.: Experimental group, Cont.: control group, T0: pretest, T1: posttest 1, T2: posttest 2, G×T: group×time interaction.

Table 3. Comparison of outcome variables between the groups (N=61)

Embarrassing and put temporal pressure on what to do at that time. I don’t know the best thing to do in that situation…” (Participant D).

Some participants said that they felt satisfied when they expressed empathy to the patients and provided emotionally supportive care.

Integration of findings

Upon integration of findings from both phases, the maternal nursing competency reinforcement program was found to be effective for maternal nursing performance, problem-solving ability, and emotional intelligence. It was also found to be conducive for self-reflection and learning, and knowledge and performance of maternal nursing skills. Learning emotionally supportive care was also noted as a positive experience, although somewhat insufficient.

Discussion

Key results
Although the training program lasted for a short period, it had the effect of increasing maternal nursing performance, problem-solving ability, and emotional intelligence over time, which are all quite significant results. In addition, the program was composed of maternal nursing competencies that nursing students must acquire in practical learning in the second semester of the third year; it thus has a strength in that it is tailored to the needs and levels of the students.

Interpretation
Firstly, the experimental group showed better maternal nursing performance over time than the control group.

Interviewees in this study expressed confidence that their nursing abilities had improved because they repeatedly observed their peers’ performance in various cases, and practiced maternal nursing on their own through simulation training. Similarly, in previous studies, simulation-based practice was more effective at improving nursing skills than other learning strategies [23]. The interview data also supported positive experiences of maternal nursing knowledge and perception of improved skills.

The maternal nursing competency reinforcement program also improved the problem-solving ability of nursing students. The interview participants said that although they did not directly experience nursing-related problems in lecture classes or clinical practice, they were able to learn various nursing response strategies and application skills through the case study, peer observation study, and repetitive learning by participating in the program. In previous studies, simulations that applied problem-based learning for maternal nursing were effective at improving maternal nursing performance [24]. In a meta-analysis study of simulation-based learning using standardized patients, the simulation helped students improve their knowledge, communication skills, self-efficacy, and clinical performance [25]. Therefore, it is thought that repetitive direct and indirect behavioral performance learning through simulation-based learning and peer observation learning influence the students’ ability to identify problems, develop solutions, and implement those solutions in the realm of maternal nursing.

Second, improvements were also found for emotional intelligence pre and posttest and interviews showed that students came to understand the mental and physical situation faced by pregnant women. This is in line with ‘appraisal and recognition of emotion in others,’ which is an attribute of emotional intelligence. Students also learned how to deal with their patients’ emotional expression more wisely by observing their colleagues, which reflects ‘use of emotion to facilitate performance,’ another attribute of emotional intelligence. There is a worldwide need for the development of emotional intelligence in nursing education for nurses and midwives [26]. Thus, education that promotes emotional intelligence should be provided to increase the quality of professional nursing and compassionate care [26]. However, until now, there have been no experimental studies aimed at promoting the emotional intelligence of nursing students in maternity-related simulations. Therefore, this study is meaningful in that it attempted to evaluate the effects on emotional intelligence.

Emotional intelligence can be developed by performing self-assessment, reflection activities, modeling of emotional intelligence
behaviors, and development of empathy, using experiential learning strategies such as simulation training and role play and peer mentoring strategies [27]. It has been pointed out that emotional intelligence education should be integrated into the nursing curriculum and become an ongoing process rather than a short-term, temporary learning [25]. As such, because the scenario-based simulation education strategy was used in this study, emotional intelligence framed in the virtual patient scenarios may have been a safe and natural way for students to understand the patient's emotions more deeply and train their emotional intelligence. Emotional intelligence education improves the efficiency of nursing care services and professional competence [28]. However, as qualitative findings found that learning emotionally supportive care was somewhat insufficient, more programs that include emotional intelligence as a learning strategy should be developed in the future.

Third, the difference in self-directed learning ability between the experimental and control groups was significant, but the difference in self-directed learning ability over time was not. Self-directed learners should use a structured approach and develop facilitator-guided self-regulated learning skills [29]. Blended coaching, which has been used in self-directed learning programs in clinical practice for two weeks, provided direct guidance both online and offline, feedback on discussions, encouragement for the writing of reflection reports and assignments, and encouragement to review and act on daily learning goals and contents [30]. In this study, the program operation period was short (2 days) and there were few strategic self-directed learning activities. The interviewees in this study recognized that the learning process was promoted by reflecting on their own learning, establishing a learning strategy, and linking knowledge with practice while learning with their peers. However, some participants said that they felt motivated to learn but could not translate that motivation into practice. Therefore, adding coaching to promote self-reflection, assignment of tasks, and facilitate encouragement may be helpful for future educational programs and research.

Fourth, this study is significant in that it presents evidence that can be used in nursing education. In addition, this practical program was developed by investigating maternity nursing-related learning needs of nursing students, analyzing job tasks with experts, and selecting the most important topics. As a tailored maternal nursing competency reinforcement program for third-year students in the second semester, its effectiveness was verified by quantitative study and further strengthened by the narratives from results.

Limitations
As all participants were students from a single university, the results may be limited in generalizability to other nursing programs. Also, although interviews were done with full assurance of anonymity and no linkage to academic performance, students may not have fully disclosed their honest opinion about any negative aspects of the program.

In conclusion, this 2-day maternal nursing competency reinforcement program was shown to improve maternal nursing performance, problem-solving ability, and emotional intelligence in nursing students learning high-risk maternal nursing care. Interview findings also found it to be conducive for self-reflection and learning, performance of maternal nursing skills, and learning emotionally supportive care. Therefore, this program can be used to strengthen maternal nursing competency. Adding a coaching strategy may strengthen self-directed learning skills and extending the number of program hours may ensure sufficient training.

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Authors’ contributions
Conceptualization, Formal analysis: Kim SH, Lee BG; Writing–original draft: Kim SH; Writing–review & editing: Lee BG.

Conflict of interest
The authors declare no conflict of interest.

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Data availability
Please contact the author for data availability.

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None.
Supplementary materials

Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2021.09.13).

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23. Hall SW. High-fidelity simulation for senior maternity nurs-


Introduction

Studies on breast cancer have developed diagnostic methods for early diagnosis and treatment due to high screening rates [1]. Specifically, breast cancer survival rates continue to increase in Korea, reaching a 5-year relative survival rate of 93.3% [2], higher than that of other cancers. The incremental increase in the number of cancer survivors has led to a shift to adopting a chronic disease management approach to cancers [3], and as a high number of young women are diagnosed with breast cancer, their long-term quality of life should be considered [4]. The main risk factors of cancer include obesity, drinking, eating, and smoking, and many women are overweight and obese when diagnosed with breast cancer [5]. Studies have shown that healthy eating habits, maintaining normal weight, regular physical activity, and smoking abstinence can reduce breast cancer risk by 34% [6].

Breast cancer prevention is an important goal that includes physical activity and dietary management because being overweight and obese contribute to higher cancer incidence and recurrence rates [7]. Studies of cancer survivors show that those who maintained a healthy weight, regularly practiced physical activity, abstained from drinking, and ate well-balanced foods, had
lower mortality rates [8]. Moreover, breast cancer survivors (BCS) who consumed more than five vegetables and fruits a day and walked more than 30 minutes a week had a higher survival rate than those who ate red meat-based diets and were physically inactive [9-11]. However, a comparative study of the characteristics of cancer patients and survivors found that the former had a high frequency of drinking and a low rate of cancer screening, which worsened their lifestyles after treatment [11]. According to a study that evaluated obesity among BCS in Korea, 67.4% were overweight, and 48.4% were obese with low physical activity [5].

BCS reported that they have to deal with the after-effects of treatment, and a variety of physical, social, and psychological problems which need attention and support. Physical problems included pain, lymphedema, fatigue, and changes in sexual function. Psychological problems were anxiety, depression, and distress, leading to a poor overall quality of life [12]. Thus, effective management intervention strategies for BCS need to be developed [13].

Services using the internet and mobile applications are being transformed according to consumer expectations for high-level medical services [14]. These include applications related to health promoting programs and healthcare education and ongoing studies are assessing their usability [15]. Education and management using mobile applications continue to grow because of their convenience, excellent accessibility, and the advantages of unrestricted mobility [16]. Moreover, it is used not only in cancer but also in various health issues such as stroke, brain damage, and dementia because individual characteristics and customized health education can be low cost and effort. Specifically, these applications have been applied to BCS to reduce depression and improve quality of life [17]; studies show that using these to maintain a healthy lifestyle increased motor motivation and physical activity [18]. However, these two studies have not been tailored to the needs of overweight or obese BCS.

Therefore, the purpose of this study was to develop a mobile lifestyle application for overweight and obese BCS and confirm the validity of the application. The application seeks to promote the health of BCS by providing information on the importance of a healthy lifestyle (e.g., diet and exercise) and ways to attain it.

**Methods**

**Ethics statement:** This study was approved by the Institutional Review Board of the Presbyterian Medical Center (2020-05-021). Informed consent was obtained from the participants.

**Study design**

This methodological study aimed to develop a lifestyle modification (LSM) mobile application for overweight and obese BCS and to evaluate the usability of the developed application. The LSM mobile application was developed according to the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model [19] (Figure 1). Its advantages include an ongoing review of objectives in the development process, interrelationships of elements, and feedback and modifications based on real-world experience [20].

**Analysis phase**

We performed need analysis, literature review, web site and mobile application review, and group interview in this phase. For the need assessment, 20 BCS were recruited via convenience sampling from the breast cancer outpatient clinic of the Presbyterian Medical Center in Jeonju, Korea. Inclusion criteria were those who aged 19 to 65 years, 1 year after the end of treatment, and have not been diagnosed with a psychiatric disease. As the exclu-
sion criteria, those who had metastasized or recurred breast cancer to other sites and those without a spouse were excluded. The needs assessment survey was conducted from June 1 to 30, 2020, to determine the functional and needs requirements for the LSM mobile application. Surveys and interviews were conducted in the outpatient counseling room, and took about 20 minutes.

The contents of the applications were organized using literature reviews and other mobile applications. We reviewed the contents from following sites: The KISS (Korean Studies Information Service System), NDSL (National Digital Science Library), CI-NAHL (Cumulative Index to Nursing and Allied Health Literature), RISS (Research Information Sharing Service), EMbase, Pubmed, and Cochrane Library. The main content and effects in the exercise and diet of BCSs were identified and applied in the mobile application using BCSs. We searched for keywords such as “BCS and exercise,” “overweight BCS and lifestyle program,” “BCS and diet,” “BCS and immune function,” “BCS and mobile application,” “BCS and partner,” “BCS and couple,” and “BCS and marital.” As a result of the literature search within the last 10 years, a total of 1,027 papers were searched. For domestic literature search, “BCS” OR “breast cancer” AND “exercise” AND “diet” AND “lifestyle” AND “mobile application” AND “smartphone” AND “marital” AND “psychological” keywords were applied in RISS and KISS. The search expression used the MeSH (Medical

Figure 1. Process of the mobile application development.
Subject Headings) expression in Pubmed ("BCS" [Mesh] OR "C"[TW] OR "Obesity" OR "Overweight"[TW]) AND "Exercise"[Mesh] AND "Diet"[Mesh] AND "Mobile application" AND "Partner" AND "Couple" AND "Marital". The search was performed using CINAHL headings (BCS OR Breast cancer) AND (Diet OR Exercise OR Lifestyle OR Mobile application OR Couple OR Partner OR Marital OR Psychological. The English association used keywords such as "breast cancer," "exercise," "lifestyle," "diet," "overweight," "obesity," and "mobile applications," to conduct searches. The contents were analyzed after searching for "living habits" and "breast cancer" on mobile applications related to lifestyle management of BCSs in the Google Play Store of Android mobile phones. Using the combined search terms, a total of 1,027 studies were identified, including 104 studies from Korean databases (DBs) and 923 studies from foreign DBs. As a result of the keyword search results, the number of papers on "body exercise for BCSs" was 430, "the diet of BCSs" was 172, "the number of psychological searches of BCSs" was 262, "mobile program" was 39, and "the number of spouse searches" was 124. Among the searched papers, nine physical exercise programs, four psychological programs, three dietary programs, five mobile programs, and 10 spouse programs were selected for BCSs.

We searched and analyzed existing mobile lifestyle applications for BCSs to organize the configuration items of primary lifestyle applications. It was based on the purpose and content of each item. The searched application types were 'breast cancer by second doctor,' 'Bravo,' 'Pink Touch,' 'Overcoming Breast Cancer,' 'Pink Avatar,' 'Dear Mamma fights breast cancer,' 'Owise-Breast cancer support,' 'Breast cancer Healthcare,' and 'Outcomes4me Breast cancer care,' etc. Based on the literature review, open questionnaires for users and experts were developed and data were collected with specific details. The survey consisted of 25 questions to identify overall healthy LSM requirements such as educational experience and satisfaction, and the need for a correct lifestyle. The analysis of mobile usage consisted of subject experience and satisfaction, and the need for a correct lifestyle factors of overweight and obese BCSs’ mobile applications?; “What are the most important lifestyle factors of overweight and obese BCSs?; “What should researchers be aware of while developing mobile applications for overweight and obese breast cancer patients’ lifestyles?” We identified the importance of lifestyle management for overweight obese BCSs, the challenges in current exercise methods and dietary control methods, the reasons for continuous failure, and the essential aspects to include in BCS mobile applications.

For analyzing professional lifestyle requirements, we performed interviews with five experts. The first question was, “What do you think is the most important aspect of overweight and obese BCSs’ lifestyles?” The second question was, “What do you think is needed in their mobile applications?” The third question was, “What do you think should be considered carefully by researchers when developing these applications?”

For analyzing of the mobile usage status of the subjects, the mobile models, usage period, application usage experience and purpose, disease-related information search, and satisfaction with the results were identified.

**Design phase**

In this phase the application was created with the content identified in the analysis phase and structure and requirement functions were determined. The definition and flow chart of the application were derived by referring to prior studies and research reports of overweight and obese BCSs. The menu of the mobile application is diverse and configured to conveniently find submenus. There are different menus for BCSs and their spouses and the administrator. The former is divided into information on preventing recurrence of breast cancer, exercise, diet, space for communication with spouses, bulletin boards for communication with administrators, and application introductions. It consists of layouts that allow overweight and obese BCSs and spouses to increase readability. Journals are included to record every meal, and exercise, time, type, and strength on daily basis to check the daily weight management using body mass index. It was configured to enter its target index daily, and allowing it to be verified. The formula, exercise and weight log, target index, and bulletin board information entered by BCSs is stored on the company server. The input, timing, and the number of accesses can be checked through it.

The menu structure and key functions are designed with main categories: login and introduction, expression, exercise, distress, intimacy with spouse, and target index confirmation boards. A design with user experience or user interface is applied, which is easily accessible and available to BCSs. The application based on the operating system of Android-based Google open platform is man-
aged using member, exercise diary, expression, target index, and other information databases. It is designed using minimal tables to implement applications.

Development phase
We commissioned a company specializing in mobile application production with design experts and programmers. To develop the application, we used the Android system. The menus used by BCS were divided into a diet diary, exercise diary, weight diary, and goal achievement level, which were to be entered each day; as well as communication space with spouse, bulletin board, and introduction. The layout was organized to improve the readability of BCS and spouses. Food log, exercise log, weight log, target index, and bulletin board information entered by BCSs are stored on the company server, and the input contents and the access time and frequency of the subjects can be viewed through the administrator computer through the company server.

Implementation phase
Pilot implementation of the developed LSM application was done at this stage. Six experts (one breast surgeon, two nursing professors, two breast cancer nursing specialists with more than 3 years of experience, and one doctoral expert in computer science with experience in creating mobile applications for patients) were invited. Also, 20 BCS (including 10 women who had participated in the needs assessment) were recruited for usability testing. The same inclusion and exclusion criteria were applied, with the additional inclusion criteria of BCS who could install the Android-based application. Participants were between 19 and 65 years.

Participants were asked to install the ‘Health for You’ application on their cell phones and sign up for membership, and were approved by the administrator (researcher). Both groups were required to use the application for two weeks from December 14 to 28, 2020.

Evaluation phase
After 2 weeks of use, experts and users evaluated the aesthetic, informational, and lifestyle aspects of the LSM mobile application.

Measurement: The following instruments were used, after obtaining permission for use from the original authors: (1) Usability evaluation of experts: The expert usability assessment tool developed by Kim [21] was used to evaluate mobile healthcare applications. The three main factors are content, interface design, and technology with 23 items including objectivity, understanding, consistency, accuracy, vocabulary accuracy, design suitability, and security. Each item on the 4-point Likert scale is measured from 0 to 3, with 0 as the lowest and 69 as the highest; the higher the score, the better usability the application. This mobile application evaluation tool was developed with Cronbach’s α of .91 [21] and was .93 in this study. (2) Usability evaluation of users: The user version of the Mobile Application Rating Scale [22] was used for user evaluation of usability. There are six factors with 26 items in total: three on aesthetic factors, four on information, five on participation, six on perceived influence, four on functionality, and four on subjective quality assessment. Each item on the 5-point Likert scale is measured from 1 to 5, the higher the score, the better usability the application. This tool was developed as a mobile application evaluation tool with Cronbach’s α = 90 [22], and was .94 in this study.

Procedures: The survey was conducted for 15 minutes in the breast outpatient interview room. Based on the evaluation results of experts and users, the revisions were made: Thus, the mobile application, “Health for You” was finalized.

Analysis of data
The data were statistically processed using the IBM SPSS for Windows, ver. 24.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (percentages, means, and standard deviations) were done for general characteristics (age, spouse age, education level, occupation, religion, monthly income, body mass index, stage, type of treatment, exercise activity, number of exercise, and exercise time), and the usability responses of experts and users.

Results

Analysis phase findings: needs of participants and experts, content, and mobile status
The mean age of 20 BCS who participated in the survey was 51 years and the mean body mass index was 26.8 kg/m² (Table 1). Most of the patients were unaware of 85% of the education on lifestyle and wanted to receive 90% of the education on LSM. Most of the desired lifestyle education methods were mobile applications (50%), followed by 1:1 education (30%). Community activities for mobile use were higher than 90%, followed by information searches at 75%, and 90% wanted to use the applications (Table 2).

Analysis of 35 studies and 10 applications on the BCS lifestyle program consisted mainly of breast cancer definition, classification, symptoms, diet, exercise, and methods for managing after-effects. Mostly the basic diet, exercise, breast cancer symptom management, and proper healthcare methods are presented, which are also included in the importance of managing weight and obesity, exercise methods, and diet tables (Supplementary Table 1).

Expert lifestyle needs were examined through open-ended ques-
tions, the importance of lifestyle management and weight loss in most BCSs is linked to the need for education and information.

**Design phase findings**

Determination of the structure and requirement function, definition, and flowchart of the application led to designing main menus and submenus. The main menus included application introduction, diet, exercise, distress, spouse and intimacy, target index verification, bulletin board, and archives. Cool diet, diet rules for weight loss, low-calorie food selection, energy intake determination, calorific comparison, diet diary preparation, food calorie table designed by exercise method, weight loss success strategy, aerobic exercise type, muscle training guide, weight log preparation, and distress self-test are included. Submenus were created for announcements, frequently asked questions, and breast cancer-related archives.

The components of the application were established, and the details and methods of the application were designed (Figure 1). The items developed in this study consist of six categories: dietary management, exercise management, distress management, spouse participation, goal index verification, and data room.

**Table 1. General characteristics (N=20)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>n (%) or mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>&lt; 40</td>
<td>1 (5.0)</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td>9 (45.0)</td>
</tr>
<tr>
<td></td>
<td>≥ 50</td>
<td>10 (50.0)</td>
</tr>
<tr>
<td>Spouse age (years)</td>
<td>&lt; 40</td>
<td>1 (5)</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td>6 (30)</td>
</tr>
<tr>
<td></td>
<td>≥ 50</td>
<td>13 (65)</td>
</tr>
<tr>
<td>Educational level</td>
<td>&lt; High school</td>
<td>2 (10)</td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>12 (60)</td>
</tr>
<tr>
<td></td>
<td>≥ College</td>
<td>6 (30)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Yes</td>
<td>16 (80)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Religion</td>
<td>Yes</td>
<td>18 (90)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Monthly income (Korean won)†</td>
<td>&lt; 1.9 million</td>
<td>4 (20)</td>
</tr>
<tr>
<td></td>
<td>2–3.9 million</td>
<td>6 (30)</td>
</tr>
<tr>
<td></td>
<td>≥ 4 million</td>
<td>10 (50)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>26.8 ± 3.1</td>
<td></td>
</tr>
<tr>
<td>Cancer stage</td>
<td>1</td>
<td>5 (25)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8 (40)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>7 (35)</td>
</tr>
<tr>
<td>Type of treatment</td>
<td>Surgery</td>
<td>2 (10)</td>
</tr>
<tr>
<td></td>
<td>Surgery+Chemotherapy</td>
<td>3 (15)</td>
</tr>
<tr>
<td></td>
<td>Surgery+RT</td>
<td>5 (25)</td>
</tr>
<tr>
<td></td>
<td>Surgery+Chemotherapy+RT</td>
<td>10 (50)</td>
</tr>
<tr>
<td>Exercise activity</td>
<td>Yes</td>
<td>13 (65)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>8 (40)</td>
</tr>
<tr>
<td>Exercise frequency</td>
<td>Everyday</td>
<td>1 (7.6)</td>
</tr>
<tr>
<td></td>
<td>5–6 times a week</td>
<td>2 (15.3)</td>
</tr>
<tr>
<td></td>
<td>3–4 times a week</td>
<td>7 (23)</td>
</tr>
<tr>
<td></td>
<td>1–2 times a week</td>
<td>3 (15.4)</td>
</tr>
<tr>
<td></td>
<td>30 minutes a week</td>
<td>1 (7.8)</td>
</tr>
<tr>
<td>Exercise time</td>
<td>30 minutes–1 hour</td>
<td>6 (46.1)</td>
</tr>
<tr>
<td></td>
<td>1 hour–2 hour</td>
<td>6 (46.1)</td>
</tr>
</tbody>
</table>

†One million Korean won=roughly 900 US dollars.
First, dietary management conveys information about diets that would make the subject aware of the importance of lifestyle and have the correct dietary habits. Clicking on “diet” on the menu provides information on topics such as breast cancer and obesity, lifestyle definition, the importance of a healthy lifestyle, breast cancer, weight-loss method, dietary control method, and the calorimetry table by food and by cooking method. A daily dietary diary was prepared to display the results on the calendar to display the number of meals consumed every day which can help identify the importance of proper diet management.

Second, clicking on “exercise” shows videos on exercise methods, weight-loss exercises and strategies, brain yoga, aerobic exercises, stretching guides, muscle exercises, and theoretical information. Daily exercise logs include the type, time, and the number of steps, and the results are linked to the calendar.

Third, the submenu on distress management consists of the definition, self-test, and ways to overcome it. The definition provides an accurate understanding of the distress experienced by cancer survivors, and the self-test items provided an index of distress with specific distressing self-test items such as physical, real-life, family, emotional, spiritual, and religious problems. Maintaining a healthy life, actively managing physical symptoms, building positive experiences, getting help from experts if necessary, and talking to people helps in overcoming stress.

The option, “Spouse and Intimacy” in the fourth menu consists of compliment stickers, making healthy food, doing aerobic exercises together, and creating happy canvas frames. It is intended to increase the intimacy of couples by listing activities that they can

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>n</th>
<th>(% )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifestyle education experience</td>
<td>Yes</td>
<td>3</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>17</td>
<td>85.0</td>
</tr>
<tr>
<td>How to acquire lifestyle related information</td>
<td>Medical person</td>
<td>3</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Professional text book</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Internet via personal computer</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Mobile phone</td>
<td>10</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Family, friends and acquaintances</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>The necessity of lifestyle education</td>
<td>Vary needed</td>
<td>11</td>
<td>55.0</td>
</tr>
<tr>
<td></td>
<td>Need</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Usually</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>Desired lifestyle education method</td>
<td>Mobile application</td>
<td>10</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>1:1 education</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>Education book</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>Intention to use the application</td>
<td>Yes</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Mobile device</td>
<td>Android</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>Apple</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Mobile usage period (years)</td>
<td>&lt; 3</td>
<td>8</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>≥ 3</td>
<td>12</td>
<td>60.0</td>
</tr>
<tr>
<td>Mobile app experience</td>
<td>Yes</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mobile purpose</td>
<td>Phone use</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Games</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Information retrieval</td>
<td>15</td>
<td>75.0</td>
</tr>
<tr>
<td></td>
<td>Education learning</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Community activities</td>
<td>18</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Shopping</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>Disease-related information search</td>
<td>Yes</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Satisfaction with information search results</td>
<td>Yes</td>
<td>11</td>
<td>55.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9</td>
<td>45.0</td>
</tr>
</tbody>
</table>
were directly added and stored by the user. The program recommended to consistently eat three meals a day for more than 20 minutes with many vegetables or fruits, and drink sufficient amounts of water. Specifically, the goal is to “walk more than 10,000 steps a day” and “stretching more than twice a day” to the point of sweating for more than 30 minutes. The goal index is checked and recorded in the diary every day. To relieve stress, there are checkboxes with phrases “satisfied with myself today,” “happy day,” “went to bed comfortably without worrying,” and “sleeping well without waking up in the middle.” The options, “walking with my spouse,” “stretching with my spouse,” and “sending compliment texts once a day” are configured to check the relationship with the spouse and to fill out the daily target index in the diary. This space supports interaction with the spouse, and increases the time spent on exchanging messages and providing active support.

Finally, the data room comprised information on BCSs such as sex life, and lymphedema definition and prevention. It also included “Q&A,” “Notice,” and “Question Room.” In the question room on the main screen, opinions are exchanged, and questions are answered and supported by nurse.

The application has a variety of menus and is designed to be convenient for finding submenus. The two menus are for BCSs and administrators. For the former, it is divided into application introduction, diet, exercise, information space for breast cancer patients, spouse and communication space, and bulletin boards for communication with administrators. The other is for the administrator to check the information entered by the patient. The layout is configured to increase readability and easy access to subjects. Dietary journals are designed to record daily diet as well as exercise methods time, and exercise intensity. The weight log was automatically calculated and the weight goal management was verified every day. It was also configured to enter its daily target index, and allowing it to be verified. The dietary, exercise, weight, target index, and bulletin board information are individually stored on the company server, and the input and the timing and number of accesses of the target person can be viewed through the server using the administrator’s computer.

In addition, for designing the application, we used a minimum number of tables, and used a design that is linked to the patient’s ID at the time of registration. Information regarding food, exercise, and weight diaries as well as target index and “distress checks” were directly added and stored by the user.

**Development phase findings**

Based on the results of the analysis and design phases, this LSM application was created and named as “Health for You” application after repeated refinement of the production and LSM process. We used the Android Java Development Kit (JDK) 1.8.0, and Android Studio as development environments, with a minimum operating system of Android 4.3 and a maximum of Android 9.0.

**Usability testing findings**

Based on feedback from experts and users, the following revisions were made: As for the revised and revised contents, the diet and exercise log parts were moved to the screen, and exercise methods for each exercise type were added. A connection item was added so that the subject and spouse in the membership registration column match. An explanation of the lymphedema exercise method of BCSs and a video were additionally inserted.

For expert usability, the average evaluation score was 3.33 ± 0.51 out of 4; “Application icon arrangement and design uniformity” showed the lowest score in interface design sub-factor consistency with 2.67 ± 0.51; the application provided reliable healthcare information and familiar words. Among them, nine items were derived with two contents, three interfaces, and one security, with an average score of 3.33 ± 0.51 points or less, and nine suggested revisions. Moreover, the total score was 65.66 ± 6.98 and the patient LSM application was evaluated positively. Based on this, eight opinions were modified, except for duplicated opinions, and nine items received an average of 3.33 ± 0.51 points or less in the evaluation of the mobile healthcare application (Table 3).

Results of usability testing with the 20 overweight and obese BCS found that the lowest-scoring question was from the participation aspect, “Are the applications interesting to use?” In contrast the highest-scoring questions were “Was it easy to learn how to use an application?” and “How accurately and quickly do the functions and components work?” from the functional area. All 26 questions scored more than 3 points, 24 scored more than 3.5 points, and eight scored more than 3.8 points (Table 4).

The final interface of the developed LSM mobile application, “Health for You,” is shown in Figure 2.

**Discussion**

This study aimed to develop a LSM mobile application for overweight and obese BCS and test its usability with experts and BCS. According to a survey on lifestyle-related needs of overweight obese BCSs, educational experience was 85% or more, information acquisition methods were over 50% higher through mobile, and support from medical staff was 15% lower. After breast cancer treatment, many people opined it was difficult to maintain a
healthy lifestyle. The demand for healthy lifestyles was high, but there was a lack of information regarding healthy lifestyles and support from medical staff was also limited, which is consistent with the results of a previous study [18]. Therefore, it was confirmed that active intervention and support from the medical staff related to lifestyle and improvement of BCSs were required. BCSs have to manage important factors that impact their healthcare, along with proper weight maintenance after chemotherapy, hormone therapy, and radiation treatment [23]. Weight gain is attributed to hormonal changes after treatment, changes in body composition, and a decrease in health behavior. Proper physical activity and healthy dietary habits are not followed, which is an important problem that the application is aiming to address [24].

After checking the participant’s needs, application content was customized for the user. The importance of a healthy lifestyle management program for BCSs confirmed. This was also used in this study based on the results provided by prior literature that demonstrated that recording diet, exercise, and weight through self-monitoring helps maintain healthy behavior [25].

Information on the prevention and risk factors of breast cancer has been used on official websites such as the Korean Cancer Center and the Korean Breast Cancer Society [2], and it has sought to improve knowledge by providing health information. The contents and validity of the mobile application were verified by experts. With the recent development of information and communication technology, mobile applications have been developed and used in various ways without restrictions of time and place. Health promotion and management education programs using applications are actively developed and utilized in healthcare [26]. Mobile applications have been reported to be helpful to healthcare by increasing knowledge of disease and allowing better monitoring for chronic patients [27]. Since lifestyle healthcare is considered more important for cancer survivors, such as those with chronic diseases, it can be utilized appropriately to enhance their effectiveness [5]. Specifically, BCSs in their late age of 40s and early 50s usually have to return to work or do housework after acute treatment, making it difficult to attend arbitration programs at a certain time and place [18]. Currently, in an environment where collective infections are feared due to COVID-19, mobile applications, regardless of the time and place, can be expected to be more effective in helping people throughout their lives than physical interactions. Prior studies using mobile applications reported that increased motor

### Table 3. Expert usability evaluation (N=6)

<table>
<thead>
<tr>
<th>Top evaluation factor</th>
<th>Sub-factor evaluation</th>
<th>Evaluation question</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents</td>
<td>Accuracy</td>
<td>Reliability of application information</td>
<td>2.83 ± 0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clarity of application information</td>
<td>3.00 ± 0.00</td>
</tr>
<tr>
<td>Understanding</td>
<td>Understanding of health care information</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use familiar words from application terminology</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Easy level of application information</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td>Objectivity</td>
<td>Expertise in health care information</td>
<td>3.17 ± 0.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System and specificity of health care information</td>
<td>2.83 ± 0.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Authoritative authority</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information provision of medical professionals</td>
<td>3.17 ± 0.40</td>
<td></td>
</tr>
<tr>
<td>Interface design</td>
<td>Consistency</td>
<td>Consistency of color, arrangement, and expression method</td>
<td>3.17 ± 0.40</td>
</tr>
<tr>
<td></td>
<td>Application icon arrangement and design unity</td>
<td>2.67 ± 0.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group app icons</td>
<td>3.17 ± 0.40</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>Logic of content placement</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td>Suitability</td>
<td>Meaning clarity of icons</td>
<td>3.00 ± 0.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application text size and font comprehension</td>
<td>2.83 ± 0.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visual comfort</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The degree of visibility of the application structure</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Brevity of application text</td>
<td>3.00 ± 0.63</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>Accuracy of application text</td>
<td>2.83 ± 0.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grammatical accuracy of application phrases</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presentation of information on personal information protection</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggestion of security policy for personal information protection</td>
<td>2.83 ± 0.40</td>
<td></td>
</tr>
<tr>
<td>Skill</td>
<td>Security</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description of security system</td>
<td>3.00 ± 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total mean</td>
<td>3.33 ± 0.51</td>
<td></td>
</tr>
</tbody>
</table>
motivation, physical activity, and vegetable intake resulted in positive health behaviors [18]. In this study, over 50% preferred mobile applications as a desired lifestyle education method and 90%, mobile users preferred 75% information retrieval and 90% community activities, which is expected to be highly utilized.

In the expert usability assessment of the developed application, most areas received more than three out of four. This seems to reflect the results of conducting lifestyle needs and environmental analysis using systematic literature reviews and researching the needs of expert groups, as well as mobile applications for breast cancer patients. According to the experts’ usability evaluation, the information availability of medical professionals was high, which used professional materials from the Korean Breast Cancer Society [2] and reflected expert opinions. The application icon arrangement and design uniformity were the lowest, and similar results were shown in a study using the same tool [28]; design experts participated in problems caused by the limited screen size of mobile devices, but it needs to be corrected to improve design satisfaction. Moreover, security protocol suggestions for personal information are low, and additional information is expected with notifications from server. From the user’s perspective, the average score was above three out of five and “ease of use” was the highest, with a mean of 4.00 ± 0.70 points. However, in terms of entertainment and relevance, information provision and method of living, such as exercise and diet, scored the lowest compared to existing applications; the content in the application developed by this study can feel boring compared to applications such as games. Therefore, it is necessary to develop more interesting content to increase the expected effect.

In BCS, the spouse has a significant role as a primary health provider, indicating a similar level of psychological stress and quality of life, and that their adaptation and support can have a positive effect [29,30]. In view of this, a menu is inserted to gain the interest and support of the spouse. The partners participated and created a space to communicate with each other to increase the level of intimacy through a lifestyle intervention mobile appli-

<table>
<thead>
<tr>
<th>Domain</th>
<th>Item</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Entertainment</td>
<td>3.10 ± 0.88</td>
</tr>
<tr>
<td></td>
<td>Interest</td>
<td>3.33 ± 1.15</td>
</tr>
<tr>
<td></td>
<td>Personalization</td>
<td>3.19 ± 0.87</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>3.38 ± 0.80</td>
</tr>
<tr>
<td></td>
<td>Appropriateness for the subject</td>
<td>3.71 ± 0.78</td>
</tr>
<tr>
<td>Functionality</td>
<td>Performance</td>
<td>3.90 ± 0.76</td>
</tr>
<tr>
<td></td>
<td>Ease of use</td>
<td>4.00 ± 0.70</td>
</tr>
<tr>
<td></td>
<td>Screen movement</td>
<td>3.57 ± 0.67</td>
</tr>
<tr>
<td></td>
<td>Finger gesture function</td>
<td>3.86 ± 0.72</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Layout</td>
<td>3.86 ± 0.65</td>
</tr>
<tr>
<td></td>
<td>Graphic</td>
<td>3.86 ± 0.65</td>
</tr>
<tr>
<td></td>
<td>Visual effect</td>
<td>3.71 ± 0.71</td>
</tr>
<tr>
<td>Information</td>
<td>Information quality</td>
<td>3.76 ± 0.62</td>
</tr>
<tr>
<td></td>
<td>Amount of information</td>
<td>3.90 ± 0.62</td>
</tr>
<tr>
<td></td>
<td>Visual information</td>
<td>3.24 ± 0.94</td>
</tr>
<tr>
<td></td>
<td>Reliability of data sources</td>
<td>3.71 ± 0.64</td>
</tr>
<tr>
<td>Subjective quality</td>
<td>Willingness to recommend the app to others</td>
<td>3.76 ± 0.62</td>
</tr>
<tr>
<td></td>
<td>Intention to re-use for the next 12 months</td>
<td>3.24 ± 0.94</td>
</tr>
<tr>
<td></td>
<td>Intention to purchase the app</td>
<td>3.24 ± 0.94</td>
</tr>
<tr>
<td></td>
<td>If you give the app a total score</td>
<td>3.67 ± 0.79</td>
</tr>
<tr>
<td>Lifestyle aspect</td>
<td>Raising awareness of the importance of lifestyle</td>
<td>3.71 ± 0.56</td>
</tr>
<tr>
<td></td>
<td>Knowledge and understanding of lifestyle</td>
<td>3.52 ± 0.51</td>
</tr>
<tr>
<td></td>
<td>Change in my attitude toward lifestyle</td>
<td>3.67 ± 0.57</td>
</tr>
<tr>
<td></td>
<td>Improving intention/motivation for lifestyle</td>
<td>3.62 ± 0.66</td>
</tr>
<tr>
<td></td>
<td>Degree of help for lifestyle</td>
<td>3.57 ± 0.67</td>
</tr>
<tr>
<td></td>
<td>Improving my lifestyle behavior</td>
<td>3.57 ± 0.59</td>
</tr>
<tr>
<td>Total mean</td>
<td></td>
<td>3.60 ± 0.69</td>
</tr>
</tbody>
</table>
cation [4,27]. A compliment sticker and ways to exercise and make healthy food together were added. This is expected to help increase the intimacy of BCSs with their spouses. It also allows users to interact with experts through breast cancer information boards, Q&A, and announcements.

The limitations of this study are as follows: first, in this study, the requirements of breast cancer spouses were not identified and reflected, so it is thought that strategies to increase effectiveness will be needed in future studies. Also, it is necessary to think about how to encourage spouse participation after program development. Second, this study is difficult to generalize because it only focused on BCSs from one region.

In conclusion, the LSM mobile application for overweight and obese BCS, “Health for You” was found to be appropriate in terms of content, design, function, and quality according to its usability evaluation by experts and users. Subsequently, the LSM mobile application can be used with overweight and obese BCSs, and we suggest a study to verify its effectiveness and identify potential clinical significance.

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**Authors’ contributions**

Conceptualization: all authors; Formal analysis: Seo SJ, Nho JH; Writing–original draft: Seo SJ, Nho JH; Writing–review & editing: all authors.

**Conflict of interest**

Ju-Hee Nho has been associate editor of *Korean Journal of Women Health Nursing* since 2020. She was not involved in the review.
process of this article. Otherwise, there are no other conflicts of interest to declare.

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**Data availability**

Please contact the corresponding author for data availability.

**Acknowledgments**

None.

**Supplementary materials**

Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2021.09.14).

**References**


16. Pyo MY, Kim JY, Sohn JO, Lee ES, Kim HS, Kim KO, et al. The effects of an advanced cardiac life support training via smartphone’s simulation application on nurses’ knowledge


Impact of the COVID-19 pandemic on women's health nursing clinical practicums in the spring 2020 semester in Korea: a nationwide survey study

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Purpose: This study investigated the impact of coronavirus disease 2019 (COVID-19) on women’s health nursing clinical practicums in undergraduate nursing schools in Korea during the spring 2020 semester.

Methods: A cross-sectional online survey on clinical practicum teaching experiences in the spring 2020 semester was distributed to members of the Korean Society of Women Health Nursing (KSWHN) who taught undergraduate nursing. One faculty member from each of 203 institutions was requested to respond and there were no duplicate participants. Seventy-nine participants (38.9%) responded and 74 responses were analyzed. Descriptive statistics were presented for all survey items.

Results: Fifty-two faculty members (70.3%) belonged to universities and 22 (29.7%) taught at colleges. Thirty-eight (51.4%) answered that their institutions had affiliated teaching hospitals. More than half (52.7%) conducted hospital-based clinical practicums either entirely (n=20) or partially (n=19), whereas the rest of them (47.3%) conducted clinical practicums at school or home via online teaching. The typical teaching methods for offline or online education were case conferences, tests or quizzes, scenario studies, nursing skill practicums, (virtual) nursing simulations, and simulated patient education. Most of faculties (93.2%) supported the development of an educational platform to share educational materials and resources, such as case scenarios.

Conclusion: Nursing faculty members utilized various teaching methods to enhance clinical skills and mitigate limited clinical exposure during the early stage of the COVID-19 pandemic. The KSWHN should move forward to develop an education platform and modalities for members who face many challenges related to the accessibility and quality of nursing education contents.

Keywords: COVID-19; Clinical competence; Distance education; Nursing education; Republic of Korea

Introduction

The first coronavirus disease 2019 (COVID-19) patient was reported in Korea in February 2020, triggering chaos in education for the spring semester. Korea’s academic year starts in March, and most elementary, middle schools, and high schools postponed the opening of classes repeatedly, adding to confusion. Universities starting conducting untact (non-face-to-face) online
classes in mid-March, without sufficient time for preparation by either learners or instructors [1]. For the accreditation of nursing schools in Korea, nursing students are required to complete at least 1,000 hours of clinical practicum in various fields ranging from in-hospital care to community health. Nursing school faculty were faced with the urgent need to ensure that students could receive clinical practicum experience in the restrictions of a pandemic situation. Some medical schools and nursing schools mandated students’ clinical training in hospitals in the early phase of the COVID-19 pandemic. However, these mandates met protests from students and their parents [2] because of a lack of adequate protection, protective supplies (including masks), and appropriate training [3]. There was also a case of a medical student who was infected with COVID-19 after a week of clinical practicum at a university hospital [4].

The Ministry of Health and Welfare recommended guidelines for students’ clinical practicums: “Clinical schools should determine whether training for students is possible after considering student safety. If necessary, they can postpone training and adjust the academic schedule. If the clinical practicum is impossible, alternative measures such as in-school practice could be provided” [3]. The Ministry of Education also distributed guidelines on safety management for clinical training at hospitals or health centers for preventing, managing, and responding to COVID-19 [1]. At some universities, safety management for students was put in place in accordance with the official guidelines. Therefore, except for a subset of universities that conducted clinical practicums with thorough preparation for the safety of students, most universities operated clinical practicums outside of the hospital (i.e., in school or online).

In the United States, the American Association of Colleges of Nursing (AACN) provided regularly updated guidelines for nursing colleges in response to the spread of COVID-19 [5]. According to the AACN, student nurses are valuable members of the medical team who provide health care in hospitals and community health care settings. The AACN recommends the restriction of direct student care for confirmed or suspected COVID-19 patients to ensure student safety. When clinical practicum is difficult, emergency alternative plans include simulation, telemedicine education service, virtual reality nursing, online materials for educating clinical nursing, and online group chats.

The nursing clinical practicum curriculum for the spring semester of 2020 also had to rely on classroom or non-face-to-face situations in Korea. Nursing educators are thought to have developed and delivered educational content in a way they deemed would optimally enhance the educational effects of nursing clinical practicum education. Therefore, in the absence of concrete guidance, clinical practicum for the spring semester of 2020 might have been very diverse. No research has yet investigated the format, specific content, or exact status of each clinical practicum for nursing students during the first semester of 2020. The details may have also depended on faculty members’ competency and support from the school.

When traditional clinical practicums become difficult in some emergencies, nursing educators may help nursing students obtain face-to-face training with hospital patients. It is necessary to prepare a new clinical practicum method that can replace existing clinical practicum education. This preparation should start with an understanding of the status of nursing clinical practicums during the early COVID-19 pandemic in 2020. The Korean Society of Women Health Nursing is the official academic society of nurse educators and researchers in the field of women’s health nursing in Korea and its members include virtually all relevant nursing faculty. Therefore, the authors undertook this survey with

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### Summary statement

**What is already known about this topic?**
During the coronavirus disease 2019 (COVID-19) pandemic, clinical teaching and learning experiences were suspended or restricted. Integrating clinical skills and the development of required competencies have become significant curricular challenges in nursing education.

**What this paper adds**
Nursing faculty members in Korea utilized various online or offline teaching and learning methods for women’s health nursing clinical practicums, and 93.2% desired an educational platform to share materials and resources.

**Implications for practice, education, and/or policy**
Anticipating ongoing COVID-19-related educational challenges, nursing schools and the Korean Society of Women Health Nursing should develop an education platform and modalities to support women’s health nursing clinical practicums.
This study aimed to identify the status of clinical practicums for women’s health nursing for undergraduate nursing students in the early stage of the COVID-19 pandemic (spring 2020 semester) and to identify the information and resources needed by nursing educators through a survey administered to nursing faculty members teaching women’s health nursing. The specific objectives were as follows: first, to identify the characteristics of the participants, their schools, and women’s health nursing clinical practicums; second, to determine the status of women’s health nursing clinical practicums in the early stage of the COVID-19 pandemic (the spring semester of 2020); third, to identify the most challenging and positive points, and fourth, to elicit information on faculty members’ needs for women’s health nursing practice in the early stages of the COVID-19 pandemic. The findings of this study will provide essential data for seeking countermeasures and alternatives for women’s health nursing clinical practicum education in response to various disaster situations, including infectious disease pandemics.

Methods

**Ethics statement:** This study was approved by the Institutional Review Board of Chungnam National University (202008-SB-108-01). Informed consent was obtained from all participants.

**Study design**

This cross-sectional survey employed a descriptive observational study design to describe the status of women’s health nursing clinical practicums during the early stage of the COVID-19 pandemic.

**Setting**

Data collection for this study was carried out from October to December 2020. The research team sent a group e-mail to members of the Korean Society for Women’s Health Nursing. Google Forms, a free online survey tool, was used. Participants who agreed to participate in the survey accessed the online questionnaire link. As a token of appreciation for participating in the study, one mobile coupon (approximately 5,000 Korean won, equivalent to roughly 4 US dollars) was sent to the respondent if they opted to receive a reward.

**Participants**

The target population was all professors who teach women’s health nursing at all universities or colleges nationwide in Korea with an established nursing department (203 as of August 1, 2020). If there was more than one professor of women’s health nursing at the same school, only one person was requested to respond. Participants indicated that they understood the purpose and methods of this study, met the conditions, and voluntarily consented to participate. There was no specific exclusion criterion. E-mails advertising the study and inviting Society members to participate voluntarily were sent via the Society e-mail service up to four times. A total of 79 women’s health nursing professors from 79 nursing schools participated in the survey voluntarily. This corresponds to a response rate of 38.9% out of the 203 schools.

**Data sources/measurement**

The research team developed a survey tool through brainstorming to determine the questionnaire items. The team was composed of women’s health nursing professors who had experience educating nursing students during the spring semester of 2020, in the early stage of the COVID-19 pandemic. They finalized the questionnaire items (Supplementary Data 1). No reliability test was done before the survey due to the characteristics of the study.

**Variables**

The following items were measured as variables: first, characteristics of participants, educational institutions, and the clinical practicum; second, information on the women’s health nursing clinical practicum in the spring 2020 semester (e.g., credits, number of students per unit, number of professors [instructors]) and credit distribution; third, if there was a hospital practicum, the type of clinical practicum; fourth; information on in-school practicum or non-face-to-face training operations; fifth, opinion on building a content platform for women’s health nursing clinical practicum and intention to share data; and sixth, information on the affiliated educational school and information on full-time professors of women’s health nursing. Finally, the following were asked as open-ended questions: the most difficult points and solutions in clinical practicum education, the most positive points in the clinical practicum during the early stage of the COVID-19 pandemic, and expectations of the Society in relation to the women’s health nursing clinical practicum in the pandemic situation.

**Bias**

There was no sampling bias.

**Study size**

No sample size estimation was done. The respondents included
the entire target population.

Statistical methods
The collected data were analyzed using IBM SPSS ver. 24.0 for Windows (IBM Corp., Armonk, NY, USA). The characteristics of the participants and the schools with which they were affiliated were analyzed with descriptive statistics such as error, percentage, mean, and standard deviation. The characteristics related to the operation of the women’s health nursing clinical practicum were analyzed using frequency and percentage. The most difficult points, solutions, the most positive points in clinical practicums during the spring 2020 semester, and expectations of the Society were categorized. Opinions on establishing an educational platform for women’s health nursing practice and sharing their data were analyzed using frequency and percentage.

Results

Descriptive characteristics of participants and their institutions
Participants’ age and length of educational experience are presented in Table 1, as well as their institutions’ characteristics: regional location, type of nursing school (university or college, number of faculty members of women’s health nursing, presence of affiliated hospitals, clinical practicum credit and hours for women’s health nursing, and the number of students in the clinical practicum course for women’s health nursing) (Table 1). Out of the 74 institutions, 36 (48.7%) had no affiliated hospitals. At 40 institutions (54.1%), women’s health nursing had 3 credits and 3 hours.

Table 1. Characteristics of participants and their institutions (N=74)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>n (%), Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>30s</td>
<td>3 (4.0), 60</td>
</tr>
<tr>
<td>Age (years)</td>
<td>40s</td>
<td>25 (33.8), 60</td>
</tr>
<tr>
<td>Age (years)</td>
<td>50s</td>
<td>33 (44.6), 60</td>
</tr>
<tr>
<td>Age (years)</td>
<td>60s</td>
<td>13 (17.6), 20</td>
</tr>
<tr>
<td>Years of education experience</td>
<td>&lt; 3</td>
<td>5 (6.8), 10</td>
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<tr>
<td>Years of education experience</td>
<td>3–4.99</td>
<td>4 (5.4), 10</td>
</tr>
<tr>
<td>Years of education experience</td>
<td>5–9.99</td>
<td>25 (33.8), 50</td>
</tr>
<tr>
<td>Years of education experience</td>
<td>≥ 10</td>
<td>40 (54.0), 80</td>
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<td>School location</td>
<td>Seoul, Gyeonggi</td>
<td>20 (27.0), 40</td>
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<tr>
<td>School location</td>
<td>Daejeon, Chungbuk, Chungnam</td>
<td>13 (17.6), 26</td>
</tr>
<tr>
<td>School location</td>
<td>Gangwon, Jeju</td>
<td>7 (9.5), 14</td>
</tr>
<tr>
<td>School location</td>
<td>Daeju, Gyeongbuk</td>
<td>9 (12.1), 18</td>
</tr>
<tr>
<td>School location</td>
<td>Busan, Ulsan, Gyeongnam</td>
<td>11 (14.9), 22</td>
</tr>
<tr>
<td>School location</td>
<td>Gwangju, Jeonnam, Jeonbuk</td>
<td>14 (18.9), 28</td>
</tr>
<tr>
<td>School’s nursing education level</td>
<td>BSN level at university</td>
<td>52 (70.3), 104</td>
</tr>
<tr>
<td>School’s nursing education level</td>
<td>BSN level at college</td>
<td>22 (29.7), 44</td>
</tr>
<tr>
<td>Number of faculty in women’s health nursing</td>
<td>1</td>
<td>46 (62.2), 92</td>
</tr>
<tr>
<td>Number of faculty in women’s health nursing</td>
<td>≥ 2</td>
<td>28 (37.8), 56</td>
</tr>
<tr>
<td>Hospital affiliated with university</td>
<td>Yes</td>
<td>38 (51.3), 77</td>
</tr>
<tr>
<td>Hospital affiliated with university</td>
<td>No</td>
<td>36 (48.7), 72</td>
</tr>
<tr>
<td>Clinical practicum credit and hours for women’s health nursing</td>
<td>1 credit 1 hour</td>
<td>9 (12.2), 18</td>
</tr>
<tr>
<td>Clinical practicum credit and hours for women’s health nursing</td>
<td>1 credit 2 hours</td>
<td>15 (20.3), 30</td>
</tr>
<tr>
<td>Clinical practicum credit and hours for women’s health nursing</td>
<td>1 credit 3 hours</td>
<td>40 (54.0), 80</td>
</tr>
<tr>
<td>Clinical practicum credit and hours for women’s health nursing</td>
<td>Others</td>
<td>10 (13.5), 20</td>
</tr>
<tr>
<td>Number of students for clinical practicum course for women’s health nursing</td>
<td>&lt; 50</td>
<td>10 (13.5), 20</td>
</tr>
<tr>
<td>Number of students for clinical practicum course for women’s health nursing</td>
<td>50–99</td>
<td>30 (40.5), 60</td>
</tr>
<tr>
<td>Number of students for clinical practicum course for women’s health nursing</td>
<td>100–149</td>
<td>18 (24.3), 36</td>
</tr>
<tr>
<td>Number of students for clinical practicum course for women’s health nursing</td>
<td>≥ 150</td>
<td>16 (21.7), 32</td>
</tr>
<tr>
<td>Number of students per team at clinical placement</td>
<td>≤ 8</td>
<td>61 (82.4), 122</td>
</tr>
<tr>
<td>Number of students per team at clinical placement</td>
<td>≥ 9 and more</td>
<td>13 (17.6), 26</td>
</tr>
</tbody>
</table>

BSN: Bachelor of Science in Nursing.
Status of nursing clinical practicums in hospitals

Thirty-nine respondents (52.7%) replied that they conducted clinical practicums in hospitals. Of the 39 schools, 20 schools continued student training in hospitals. As the COVID-19 pandemic worsened, the hospitals began restricting practice wards and limiting the duration, time, and number of students. Therefore, in-school practice was accompanied by hospital training. In contrast, 19 schools switched to in-school training or non-face-to-face training. During the early stage of the COVID-19 pandemic, the most common educational tools were bedside clinical practicums (39), followed by case presentation at meetings, core skills training, exams or quizzes, presentation of educational materials at conferences, and simulation practice training (Table 2).

Status of in-school or non-face-to-face nursing clinical practicums

Thirty-five schools (47.3%) conducted only in-school or non-face-to-face training for clinical practicums. The other 34 schools also adopted those tools. The most frequently used practice method in in-school practice or non-face-to-face practice was case presentation at a meeting (n = 59, 14.5%), followed by tests or quizzes (n = 52, 12.8%), self-developed virtual case learning (n = 49, 12.0%), core skills training in the lab (n = 46, 11.3%), presentation of educational materials (n = 41, 10.0%), online core skills training (n = 37, 9.1%), online virtual simulation training (n = 33, 8.1%), simulation practice (n = 29, 7.1%), self-learning simulation practice (n = 28, 6.9%), journal club (n = 16, 3.9%), special lectures or videos by field nurses (n = 11, 2.7%), and the use of electronic medical records (n = 6, 1.6%) (Table 3).

Core skills education was conducted using video materials on core skills in women’s health nursing developed by the Korean Society of Women’s Health Nursing. Tests and quizzes were also classified by various respondents. Drug use, term/abbreviation quizzes, and virtual cases in the ward were presented. Online tests were conducted using Google Classroom, Zoom (Zoom Video Communications, San Hose, CA, USA), and the school learning management system. Special lectures by experts in the field of women’s health nursing or field leaders’ ward orientation and nursing situation were video-recorded, and clinical practicums (n = 11) were performed to compensate for the limitations of hospital practice.

Difficulties, positive points, and coping methods for the clinical practicums

Difficulties

The respondents reported difficulties in using teaching methods, challenges in developing practical content for in-school and online education and configuring programs due to the changed methods of practical education, challenges in communicating with students during online practicums, and an increase in instruction time relative to the number of practice credits (Table 4).

Positive points

As positive results, it was possible to improve the quality of practical education, improve the awareness of infection control, and secure student safety through the application of various teaching and learning methods such as reading articles, developing educational materials, and conducting group discussions or role-plays in various situations (Table 4).

Coping methods

Based on experiences in the spring semester, methods of cop-
ing in the fall semester included extending the practice time while operating the clinical practicum as much as possible, developing online learning content or purchasing and running a virtual simulation program, and providing various types of educational materials and programs for in-school education. Participants also mentioned development and operation through direct participation of students, and self-learning by students through self-practice time, self-directed learning, and team projects (Table 4).

**Responses on needs for and willingness to share data on an educational platform for women’s health nursing clinical practicums**

The items related to building a platform for women’s health nursing practicums are presented in Table 4. The most frequently desired materials were case scenarios (69), case-related information (order sheets, nursing records, and lab sheets) (69), and video clips for cases (68) (Table 5).

Out of 74 participants, 50 (67.6%) expressed willingness to share clinical cases, and 41 (55.4%) indicated that it would be desirable to share the relevant forms required for a case scenario and other materials (Table 5).

### Discussion

#### Key results

Thirty-nine (52.7%) nursing schools fully or partially implemented women's health nursing practice training at the hospital site. Nursing students are members of the medical team in the COVID-19 pandemic; therefore, it is necessary to secure their safety and ensure that they can continue to carry out their roles as members of the treatment team. However, 35 (47.3%) nursing schools did not have practical education in the hospital. The most common reason for this was that due to the COVID-19 pandemic, institutions suddenly requested the suspension of nursing students’ practice. In some other cases, it was difficult to secure space for a course in hospitals. Many in-school or non-face-to-face educational tools were adopted for the clinical practicum to overcome these circumstances. Participants expressed the desire for the Society to provide an adequate educational platform for women's health nursing.

#### Interpretation

**The paucity of clinical practicum in hospitals**

At the beginning of the spring 2020 semester, clinical practicums in the hospitals depended on the presence of a hospital that was...
affiliated with universities or colleges. Out of 39 institutions where clinical practicums were held, 38 had affiliated hospitals. As the COVID-19 pandemic has continued, clinical practicums in hospitals have been dependent on affiliated hospitals. Under these circumstances, it is difficult to ensure training of students without an affiliated hospital. A nursing college in Singapore formed a network with the government and representatives of medical schools to solve this problem. They established a strong communication and cooperation system to resume practice in hospitals as an essential component of nurturing future nurses [6]. A scarcity of in-hospital practice can lead to a decline in the quality of nursing education. Therefore, it is urgent to establish a solid and close network among nursing education institutions, the government, and medical schools to secure a minimum level of student training in Korea.

Non-face-to-face practice methods
During the early stage of the COVID-19 pandemic, 47.3% of nursing universities or colleges replaced clinical practicums with in-school practice or online non-face-to-face practice. If a variety of standardized clinical cases of women’s health nursing were to be developed, educational resources would be used together. For example, there were many responses that the DVD maternity edition [7] video material developed by the Korean Society of Women Health Nursing in 2017 was useful educational material in the current COVID-19 pandemics. The video materials dealt with core skills. The respondents answered that the use of these videos enhanced students’ ability to perform core skills by providing them with sufficient time for self-practice as part of in-school or online non-face-to-face practice (Table 4).

Content of practice in clinical skill labs or non-face-to-face practice
The content of in-school or online non-face-to-face practice, which may replace clinical practicums, was as follows: wearing maternity clothes and writing a testimonial, experiencing the delivery process using a delivery simulator, and practicing with a breast massage model and a newborn baby care model The professors responded that through these various learning modules, students’ understanding of nursing recipients and core skill competencies improved. Previous study [8] presented adult nursing cases in online non-face-to-face adult nursing practice, using vSIM® (Laerdal Medical, New York, NY, USA) or online core technology programs, and teaching-learning methods using Google Classroom or Zoom. This is similar to the finding that students’ learning satisfaction and academic achievement increased by improving voluntary participation, particularly as repeated practice of core nursing skills became possible. Therefore, professors should be constantly interested in new models or learning tools and should know how to apply them when necessary. In online non-face-to-face practical education, field leaders and experts developed new educational content such as online core skills and virtual scenario (vSim®) education, medical records, video educational material development, and unique lecture videos. It was difficult for students to acquire on-the-ground practical skills as an observation-oriented course progressed in a hospital [9]. The need for new changes has continued to be raised due to the protection of personal information and difficulties experienced by male students in practicing [10].

The introduction of practical content could compensate for the lack of clinical practicum education conducted in hospitals. Students feel ambivalence toward non-face-to-face practice. A prior study investigated students’ experiences of different situations using online nursing education content through non-face-to-face training. They found that nursing performance improved by integrating previously learned theories into practice, and self-efficacy and confidence improved after core skill training [8]. Nonetheless, there are limitations in observing and practicing the proficiency of medical personnel through online practice, and it is unfortunate that it is not possible to conduct practical training.

### Table 5. Necessity of an education platform and willingness to share educational materials (N=74)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Necessity of an educational platform</th>
<th>Willingness to share educational materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Case scenarios</td>
<td>69 (93.2)</td>
<td>50 (67.6)</td>
</tr>
<tr>
<td>Case-related information: order sheets, nursing records, lab sheets, etc.</td>
<td>69 (93.2)</td>
<td>41 (55.4)</td>
</tr>
<tr>
<td>Video clips for cases</td>
<td>68 (91.9)</td>
<td>33 (44.6)</td>
</tr>
<tr>
<td>URLs for YouTube contents</td>
<td>65 (87.8)</td>
<td>30 (40.5)</td>
</tr>
<tr>
<td>Video clips for nursing skills</td>
<td>62 (83.8)</td>
<td>34 (45.9)</td>
</tr>
<tr>
<td>Information for digital applications</td>
<td>60 (81.1)</td>
<td>28 (37.8)</td>
</tr>
<tr>
<td>Test or quiz sheets</td>
<td>60 (81.1)</td>
<td>41 (55.4)</td>
</tr>
<tr>
<td>Virtual simulation websites</td>
<td>59 (79.7)</td>
<td>27 (36.5)</td>
</tr>
<tr>
<td>Nursing process notes, medication information, video clips for clinical site orientation</td>
<td>19 (25.7)</td>
<td>12 (16.2)</td>
</tr>
</tbody>
</table>
in special departments such as delivery rooms. Therefore, professors need to review and develop suitable practical training methods and educational content to help students obtain the educational effects of in-hospital clinical practicums.

Expansion of non-face-to-face education and countermeasures
The COVID-19 pandemic has been a significant crisis in the world of education, as changes to which many curriculum development experts have failed to respond over the past 40 years took place at once. The importance of non-face-to-face education is expected to grow as it becomes a daily routine [6,8]. At nursing colleges in the United States, professors switched to non-face-to-face education in a situation where it was challenging to practice face-to-face education with patients in hospitals, and they conceptualized and provided alternative clinical experiences [11]. Dewart et al. [12] reported that, through online learning, students could gain insight into the impact of infectious diseases on humanity and learn the role of a licensed nurse without providing clinical practicum education to students. Non-face-to-face education can be expanded while supplementing, rather than completely replacing, existing face-to-face education. Social sympathy for non-face-to-face education, sufficient experience and preparation, and supplementation to address problems caused by non-face-to-face education are necessary [13,14].

Professor’s burden
In the recent COVID-19 pandemic, the responsibility of professors has increased due to dramatically growing demands for professors to invest time in organizing in-school practice programs to replace in-hospital training and apply various new teaching methods. Forty universities or colleges (54.1%) maintained 3 hours of clinical practicum for 1 credit, and 28 universities or colleges (37.8%) hired two or more full-time women’s health nursing professors. The respondents pointed out the lack of human resources and administrative infrastructure as problems. It will be helpful for professors to share information about other universities’ in-school practice and online non-face-to-face practice cases and personally developed content for women’s health nursing practice to overcome these difficulties.

Limitations
Despite several attempts to invite Society members to participate in the study, the response rate was 38.9% (79 out of 203 schools), and 74 responses were analyzed. Although participation was relatively even across geographical areas and was not heavily concentrated in a particular region, the results are limited to the nursing schools of the respondents.

In conclusion, this survey of nursing institutions’ experiences of women’s health nursing clinical practicums during the early COVID-19 period found that 69 participants (93.2%) supported building a shared platform for case scenarios, case-related forms, and educational videos. Fifty (67.6%) expressed their intention to share case scenarios, and 41 (55.4%) indicated interest in sharing case-related forms. The Korean Society for Women’s Health Nursing or other nursing college educational associations should consider this need and pursue building and operating such a platform to share practical educational content. Such initiatives could also contribute to nursing clinical practicum education by conducting joint research on teaching methods and sharing the results. In addition to challenging traditional educational methods of in-class learning and clinical practicum, the COVID-19 pandemic has also required us to think about continuing education for future nurses. Many changes are expected in health care in the future. The most significant change is the digitalization and smartization of Korea, which will impact the health care industry, leading to a transition to highly specialized medical services. The COVID-19 pandemic is an ongoing crisis that will continue to change the educational environment. Therefore, in the post-coronavirus or with-coronavirus era, universities and professors should be able to establish an educational infrastructure that can perform face-to-face and untact online education in nursing education.

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Authors’ contributions
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Conflict of interest
Geum Hee Jeong has been president of the Korean Society of Women Health Nursing since 2020. The remaining authors are also board members of the Society since 2020. They were not involved in the review process of this article and have no other conflicts of interest to declare. Although this study was supported and initiated by the Korean Society of Women Health Nursing, the opinions presented in this article are the authors’ alone, not offi-
cial opinions of the Society.

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**Data availability**

The dataset file is available from Harvard Dataverse at https://doi.org/10.7910/DVN/XMUOM0. Dataset 1. Survey results from 74 faculty members of women's health nursing about the impact of COVID-19 on women's health nursing clinical practicums in Korea

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None.

**Supplementary materials**

Further details on supplementary materials are presented online (available at https://doi.org/10.4069/kjwhn.2021.09.17.1).

**References**

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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 editorial” and will be published simultaneously.

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 un-published 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

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)*1</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>

*1Maximum 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.

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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.

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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

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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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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.

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☐ 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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