The Korea Nurses' Health Study: A Prospective Cohort Study

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Abstract

Background: The Korea Nurses' Health Study (KNHS) is a prospective cohort study of female nurses, focusing on the effects of occupational, environmental, and lifestyle risk factors on the health of Korean women.

Materials and Methods: Female registered nurses aged 20–45 years and living in the Republic of Korea were invited to join the study, which began in July 2013. They were asked to complete a web-based baseline survey. The study protocols and questionnaires related to the KNHS are based on the Nurses' Health Study 3 (NHS3) in the United States, although they were modified to reflect the Korean lifestyle. Participants were asked about demographic, lifestyle factors, disease history, occupational exposure, reproductive factors, and dietary habits during their adolescence. Follow-up questionnaires were/will be completed at 6–8 month intervals after the baseline survey. If a participant became pregnant, she answered additional questionnaires containing pregnancy-related information.

Results: Among 157,569 eligible female nurses, 20,613 (13.1%) completed the web-based baseline questionnaire. The mean age of the participants was 29.4 ± 5.9 years, and more than half of them were in their 20s. Eighty-eight percent of the participants had worked night shifts as a nurse (mean, 5.3 ± 4.3 nights per month). Approximately 80% of the participants had a body mass index below 23 kg/m^2 . Gastrointestinal diseases were the most prevalent health issues (25.9%).

Conclusions: The findings from this prospective cohort study will help to identify the effects of lifestyle-related and occupational factors on reproductive health and development of chronic diseases in Korean women.

Keywords: nurses' health study, cohort, women's health, occupational exposure, Republic of Korea

Introduction

WORLD HEALTH ORGANIZATION statistics show that a woman born in 2013 is expected to live to 73 years of age (based on the global average); this is 5 years longer than the average global life expectancy for men.¹ The life ex-

pectancy of Koreans (Republic of) has increased, from 72 years in 1990 to 82 years in 2013¹; in particular, the life expectancy of Korean women has risen from 77.4 years in 2003 to 84.6 years in 2013.² By contrast, the fertility rate has decreased rapidly from 6.2 births per women in 1960 to 1.2 births per women in 2013, which is the lowest among

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Organization for Economic Cooperation and Development countries.³ Increasing life expectancy and declining fertility imply that women's health will become an important issue in terms of public health in Korea.

Further, the smoking rate among Korean women, in general, has been maintained over the past decade, whereas fewer men are smoking; however, more Korean women in their 20s now smoke. The drinking rate has not changed over the past 10 years, but heavy drinking in Korean women is on the rise.⁴ Therefore, smoking and drinking habits are threatening women's health. Stress due to poor work–family balance is also a serious risk factor for women's health. Women with a spouse suffer from more stress than single women or the general population.⁵

Given that women are usually the primary caregivers and that women's health has a direct effect on themselves and their offspring, women's healthcare issues need to be prioritized in the public health domain over a full lifetime as well as during the reproductive years. Registered nurses would be a good target population for a female cohort because of their knowledge about medical conditions, high interest in health, and the presence of a nurses' registration system. Previous cohort studies of nurses, such as the Nurses' Health Study (NHS) in the United States initiated in 1976,^{6–9} made valuable contributions to our understanding of the long-term effects of various health-related events on women (such as oral contraceptive use and cancer, cigarette smoking and cardiovascular disease [CVD], postmenopausal obesity and breast cancer, and diet and breast cancer), and its success highlighted the feasibility and advantages of recruiting nurses for long-term cohort studies of women's health. The NHS was initially designed to investigate the potential long-term consequences of oral contraceptives, and it has expanded its scope to cover the relationship between chronic illnesses and many lifestyle practices, including smoking, diet, physical activity, postmenopausal hormones, and genetic markers.^{8,9} The NHS2 is an ongoing prospective cohort study (begun in 1989) that examines oral contraceptives, diet, and lifestyle risk factors in a population younger than the original NHS cohort.^{8,9} The NHS3 is the next generation of the NHS and includes nurses from more diverse ethnic backgrounds than the NHS and NHS2. Inspired by the U.S. NHS, other nurses' cohort studies have been initiated in Denmark,¹⁰ Japan,¹¹ and Thailand.¹² Several other landmark prospective studies of women have increased our understanding of women's health. Examples are the Iowa Women's Health Study,¹³ the Shanghai Women's Health Study,¹⁴ the Swedish Mammography Cohort,¹⁵ and the Women's Health Initiative.¹⁶

Korea has seen improvements in terms of gender equality and accessibility to healthcare, but support for research into women's health is relatively limited. Moreover, only few large prospective cohort studies devoted to women's health (including reproductive health, occupational health, mental health, and other chronic diseases) have been undertaken in Korea.

Shifting trends in Korea, including the rapid transition from communicable to non-communicable diseases, dramatic changes in the fertility rate, and social changes due to rapid economic growth, support the need for a *de novo* cohort study that is aimed at identifying both risks and preventive factors related to women's health.

The Korea Nurses' Health Study (KNHS) is the first prospective cohort study to investigate the impact of occupa-

tional, environmental, and lifestyle risk factors (including work–life balance, diet, alcohol intake, smoking habits, physical activity, and reproductive factors) on the health of Korean women. The study protocols and questionnaires were based on those used by the NHS3¹⁷ in the United States and were modified to address specific research questions in Korea. Both studies are unique because, unlike other prospective studies that enrolled mainly postmenopausal women, they enrolled younger women of childbearing age.

The aim of this article is to discuss the design of the KNHS and to present the baseline characteristics (including demographic, shift work, and medical history) of the cohort.

Materials and Methods

Study population

The study population comprised female registered nurses of childbearing age, between 20 and 45 years old, living in Korea. Registered nurses on sick leave or taking leave of absence were included if they had at least 1 year of work experience. Nurses working on short contract-base or part-time were also included. Eligible registered nurses were invited to enroll and to complete a web-based questionnaire and an informed consent form. The study was approved by the Institutional Review Board of the Korea Centers for Disease Control and Prevention (KCDC) (#2013-03CON-03-P).

Sample size and statistical power

According to the Korean Nurses Association (KNA), 173,630 out of 308,620 registered male and female nurses were active, and 157,569 were women of childbearing age.

Sample sizes are generally based on confidence intervals, the tolerance for errors, variance of the estimated parameters, and the sampling method used. Because the variance of the parameters estimated from the survey was large, a large sample size was required. This also requires information regarding the variable(s) of interest. However, this was difficult in this particular case because the study was based on a survey of the overall health status of women of childbearing age. We based our sampling on population parameters and used a simple random sampling method. The sample size was calculated as 17431.67, with a significance level of 0.05 and a permissible error of 1% (95% confidence interval).¹⁸ The target sample size for this study was 20,000 female nurses; the KNHS reached this target. Recruitment was defined as completion of the baseline web-based survey.

Recruitment

Recruitment for the KNHS began in July 2013. The study opened up with questionnaire Module 1; the next modules were opened at 6–8 month intervals. Module 1 was officially closed on November 11, 2014. The recruitment was undertaken in collaboration with the KNA (17 branches and 10 affiliated organizations [nurses' associations in major cities and providences]). The KNA sent official letters requesting cooperation with the nursing department at each hospital, and the research team visited job training sessions held at mid- and small-sized hospitals to promote the study. Voluntary participation was encouraged by advertising the study via the KNA news, on the KNHS website (www.nhskorea.kr), text messages, e-mails, and social network services. The KNHS

team also published bimonthly newsletters to provide updates on the study and the recruitment process.

The surveys were conducted online via the KNHS website. Nurses were asked to log onto the online survey system by using their name and nurse registration number. On agreeing to participate in the online survey, potential participants were provided with a full explanation of the study and a web-based informed consent form. Informed consent included acknowledgment of (1) voluntary study participation; (2) the use of survey data (but not personal information) for research purposes, confidentiality, and sharing of the study results; (3) safeguarding individual information (e.g., nurse registration numbers, e-mail addresses, and contact phone numbers) used for follow-up invitation and disease ascertainment; (4) permission to undertake prospective follow-up regarding disease occurrence, death, and cause of death via links with national databases (death index, national health insurance data, and cancer registry); (5) the right to refuse or withdraw at any time; and (6) no participant would receive direct benefit from taking part in the research. In accordance with Korea's Privacy Protection Act, separate consent on the use of personal contact information was also obtained (this information was used to send an incentive for participation [a mobile gift card worth US\$4.00 (₩ 4000 won)]) and for follow-up purposes. If needed, the KNA membership register was used to identify participants or to contact them.

Study organization

The KNHS formed a steering committee and three operational teams. The recruitment team encouraged study participation by working with 17 nationwide nurses' associations and nursing department directors of hospitals across the nation. Members of the recruitment team were in charge of promoting the study through several channels, including social media and printed advertising.

The analysis team comprised academic experts in the fields of epidemiology, statistics, nutrition, nursing, and public health. This team constructed the study questionnaires, which were initially based on those used in the NHS3, and analyzed the results. The data management team managed data flow and quality control and undertook central coding of common variables.

Questionnaire construction and refinement

The design and questionnaires of KNHS were similar to those of the NHS3, an ongoing sister web-based prospective cohort study that began in 2010.¹⁷ A multidisciplinary advisory board translated and modified the NHS3 questionnaires. To ensure the study questionnaires' relevance to Korean health research needs, some of the questions were modified or eliminated and new questions were added (Table 1).

The most important modifications involved assessment of diet and occupational hazards. Specifically, the food frequency questionnaire (FFQ) used in the Korea Health and Nutrition Examination Survey (KNHANES) was used to assess current diet. The KNHANES-FFQ was developed for adults older than 19 years and has been validated among Korean adults.¹⁹ To assess dietary patterns during adolescence, the KNHANES-FFQ was modified by updating the food list to reflect foods available at the time the participants were aged between 13 and 18 years. To collect information

regarding dietary intake during adolescence by women now aged 20–45 years, all 156 women in that age bracket were asked to note all food items on the KHANES-FFQ that they consumed more than twice a month during their time spent in middle and high school. In addition, they were asked about food items frequently consumed during adolescence but that were not included in the adult-FFQ. Based on these data, nutritionists included and/or deleted food items to construct new adolescent-FFQ.

Modifications to the occupational hazards assessment section included additional questions about the types of chemotherapy agents handled, participation in safety education, symptoms after exposure, and whether medical follow-up was undertaken after exposure. Questions related to shift work were also modified because shift work patterns in Korea differ from those in the United States. For example, most Korean hospital systems do not offer 12 hour shifts or fixed-night duties. The remaining modifications included human papillomavirus vaccination status.

Baseline survey: Module 1

The questionnaires collected data regarding demographics, weight, height, health behaviors, illness, medications, family history of diseases, pregnancy, mood, employment, occupational exposure, and a subjective perception of current health. The response rate by invited nurses was 17.3%, and 13% completed Module 1. The follow-up modules are still open for ongoing responses.

Pregnancy modules

Participants were sent intermittent e-mails requesting them to notify the research team of any change in contact information and/or pregnancy. Separate consent was obtained for the pregnancy modules. Participants between gestation weeks 20 and 25 were asked to complete the early pregnancy questionnaire. At 6 weeks after the estimated date of delivery (week 46), they were also asked to complete the post-pregnancy questionnaire.

Follow-ups

On enrollment, nurses were asked to participate in subsequent modules for follow-up purposes. With IRB approval, participants were asked for their e-mail addresses and phone numbers to enable follow-up of further modules. Also, each participant's endpoint was identified through links to national databases such as the Korea Central Cancer Registry, the Korean Statistics Information Service database, and the Korean National Health Insurance Service.

Data management

Online data were automatically saved on the server at the secure internet data center designated by the KCDC. The intrusion prevention system was managed and periodically backed up. Processed data were periodically cleaned and analyzed by the KNHS analysis team. If any error in the data management occurred, the KNHS data team solved the problem and reported to the steering committee.

TABLE 1. SUMMARY OF THE VARIABLES IN EACH MODULE OF THE KOREA NURSES' HEALTH STUDY

<i>Module 1</i>	<i>Module 2</i>	<i>Module 3</i>	<i>Module 4</i>	<i>Early pregnancy</i>	<i>Post-pregnancy</i>
<i>Demographics</i> <i>Height and weight</i> <i>Drinking and smoking</i>	<i>Demographics</i> <i>Pregnancy</i> Waist and hip measurements Diet at workplace	<i>Demographics</i> <i>Illness</i> Contraception	<i>Demographics</i> <i>Illness</i> Current job	<i>Demographics</i> Trying to get pregnant <i>Pregnancy</i>	<i>Demographics</i> Diseases during pregnancy <i>Mood (parental stress)</i>
<i>Illness</i>	Diet at workplace	Hormone contraception history	Current pregnancy and child birth	Recreational activities during pregnancy	Medication during pregnancy
<i>Medication</i> Family history	Eating behaviors <i>Food frequency</i> <i>questionnaire</i>	Health Current pregnancy	Diet Residential history	<i>Mood (parental stress)</i> Morning sickness	Pregnancy outcome Baby
Female ^a	<i>Vitamins</i>	Trying to get pregnant Female	<i>Vitamins</i>	Medication during pregnancy	Delivery
Pregnancy <i>Lifetime pregnancy</i>	Supplement vitamins KNHS experience	Menstrual distress questionnaire Activity	Dairy foods Oils	Smoking <i>Work before pregnancy</i>	Nursing Sleep
Mood			Beverages	Work during pregnancy	Drinking and smoking, caffeine
<i>Employment</i>		Polycystic ovary syndrome related questions	<i>Food frequency</i> <i>questionnaire</i>	<i>Occupational exposures</i> <i>during pregnancy 1</i>	Recreational activities
Occupational exposures		Nursing work condition	Other foods	<i>Prenatal vitamins</i>	Subjective perception of health
Subjective perception of health KNHS experience		Work and family life reconciliation Work stress		<i>Prenatal multivitamin</i> <i>Regular multivitamins</i> <i>Supplement vitamins</i> Subjective perception of health <i>Food frequency questionnaire</i>	

Modified questionnaire categories (compared with NHS3) are shown in italics. Additional questionnaire categories (compared with NHS3) are shown in bold.

^aFemale: Questionnaire includes items related to menstruation, hormone pills, hysterectomy, and oophorectomy.
KNHS, Korea Nurses' Health Study.

FIG. 1. Response rates of study participants in each province (0%–5%, 6%–10%, 11%–15%, 16%–20%, 21%–25%).

Results

Of the 157,569 eligible female nurses of childbearing age, 27,335 (17.3%) responded to our invitation (including those who declined or provided incomplete information), and 20,613 (13%) completed the study questionnaire (Module 1). The response rate of the participants who enrolled in the baseline study compared with the number of female nurses aged 20–45 years working at hospitals is shown in Figure 1. More than 10% of eligible nurses joined the KNHS in most cities and provinces (except Jeju-do province). Although the target population for the KNHS comprised registered female nurses aged 20–45 years, 265 subjects aged 40–49 years also completed the baseline questionnaire. Considering the average age of menopause in Korean women (roughly 50 years), the KNHS steering committee decided to prospectively follow these additional 265 nurses, but it did not include them in the baseline analysis.

Table 2 shows the baseline socio-demographic characteristics of the study participants. The mean age of the participants was 29.4 ± 5.9 years, and more than half were in their 20s. About two-thirds were not married, and the education level was similarly distributed between 3-year (47.4%) and 4-year nursing programs (45.2%). More than half (58.2%) of the nurses were regular drinkers, although the prevalence of current smokers was very low (1%). Most women (71.9%) had never been pregnant, 9.5% experienced one pregnancy, and 17.9% had two or more pregnancies. Among women who had been pregnant, the mean age at the end of the first pregnancy was 29.6 ± 3.6 years. The mean body mass index (BMI) was $20.9 \pm 2.7 \text{ kg/m}^2$; ~80% of respondents had a BMI below 23 kg/m^2 , and 15.3% were underweight (BMI $< 18.5 \text{ kg/m}^2$).

Shift work characteristics are shown in Table 3. More than 90% of participants were full-time workers. About 88% had worked night shifts as nurses, and the mean period of time

spent working night shifts was 5.3 ± 4.3 years. Almost two-thirds (67.9%) of nurses had worked night shifts during the past year; the mean number of night shifts was $6.6 (\pm 2.3)$ per month. Approximately 60% of respondents had worked five to seven nights per month during the past year.

Table 4 shows the medical history of the study participants. Gastrointestinal problems such as gastritis, gastric ulcer, duodenal ulcer, and reflux esophagitis were the most prevalent health conditions (25.8%) followed by allergic conditions such as allergic rhinitis (19.5%) and eczema (atopic dermatitis; 11.6%). With respect to reproductive health issues, nonspecific vaginitis or candida vaginitis (8.2%), migraine headaches (6.0%), myoma uteri (4.4%), and endometriosis (2.0%) were reported.

Discussion

Nurses are a valuable group for large, prospective cohort studies due to their high level of medical knowledge and enthusiastic engagement in health-related research. Prospective cohort studies involving nurses, such as the NHS and NHS2 studies, provided significant results regarding women's health, even though those results were derived from a selected population. Thus, the risk factors and exposure identified will be useful for disease prevention, despite the particular characteristics of the NHS study group (e.g., high level of education, profession, and a specific occupational environment). However, such results are not generalizable because there are environmental, ethnic, and genetic differences among the population. The KNHS was designed not only to investigate the health problems of Korean women but also to compare ethnic and environmental differences between populations.

As this was an international collaborative project, the study questionnaires were translated and modified from the original

TABLE 2. BASELINE DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Variables	Total (n = 20,613)
Age (years)	
Mean (SD)	29.4 (5.9)
20–29	12,055 (58.5)
30–39	6842 (33.2)
40–45	1716 (8.3)
Marital status	
Never married	13,548 (65.7)
Married	6965 (33.8)
Others (cohabiting/divorced/separated/widowed)	98 (0.5)
Missing	2 (0.0)
Education	
Graduated from 3-year course	9771 (47.4)
Graduated from 4-year course	9316 (45.2)
Master's degree	1488 (7.2)
Doctorate	37 (0.2)
Missing	1 (0.0)
Regular drinking ^a	
No	8584 (41.6)
Yes	11,999 (58.2)
Missing	30 (0.1)
Number of alcoholic beverages consumed on a single occasion ^b	
1–4	7434 (62.0)
5–9	3580 (29.8)
≥10	984 (8.2)
Missing	1 (0.0)
Currently smoking	
No	20,412 (99.0)
Yes	197 (1.0)
Missing	4 (0.0)
BMI (kg/m ²)	
Mean (SD)	20.9 (2.7)
Underweight (<18.5)	3155 (15.3)
Normal (18.5–22.9)	13,490 (65.4)
Overweight (23–24.9)	2167 (10.5)
Obese (≥25)	1708 (8.3)
Missing	93 (0.5)
Self-perceived health status	
Very good	1241 (6.0)
Good	7355 (35.7)
Fair	9244 (44.8)
So-so	2586 (12.5)
Poor	184 (0.9)
Missing	3 (0.0)

Data are expressed as the mean (SD) or as number (%).

^aParticipants were considered regular drinkers if they reported consuming alcohol more than once a month.

^bAmong 11,999 regular drinkers.

BMI, body mass index; SD, standard deviation.

TABLE 3. SHIFT WORK CHARACTERISTICS OF PARTICIPANTS IN THE KOREA NURSES' HEALTH STUDY

Variables	Total (n = 20,613)
Current work status	
Full-time	18,827 (91.3)
Part-time	1784 (8.7)
Missing	2 (0.0)
Night shifts, while working as a nurse	
Never	2042 (9.9)
Ever	18,231 (88.4)
Missing	340 (1.6)
Total number of years on night shifts ^a	
Mean (SD)	5.3 (4.3)
<1	2112 (11.6)
1–4	7420 (40.7)
5–9	5510 (30.2)
10–14	2380 (13.1)
15–19	675 (3.7)
≥20	134 (0.7)
Night shifts, during the past year	
Never	6593 (32.0)
Ever	13,990 (67.9)
Missing	30 (0.1)
Mean number of night shift worked per month ^b	
Mean (SD)	6.6 (2.3)
1–4	1790 (12.8)
5–7	8404 (60.1)
≥8	3796 (27.1)

Data are expressed as the mean (SD) or as number (%).

^aAmong the 18,231 participants who had worked night shifts while working as nurses.

^bAmong the 13,990 participants who had worked night shifts during the past year.

TABLE 4. MEDICAL HISTORY OF THE STUDY PARTICIPANTS

Diseases	Total (n = 20,613)
Cardiovascular disease ^a	228 (1.1)
Cancer ^b	229 (1.1)
Diabetes mellitus	65 (0.3)
Hypertension or hypothyroidism	588 (2.9)
Gastritis or gastric ulcer or duodenal ulcer or reflux esophagitis	5317 (25.8)
Migraine headaches	1239 (6.0)
Allergic rhinitis	4010 (19.5)
Eczema (atopic dermatitis)	2393 (11.6)
Depression	261 (1.3)
Sexually transmitted infection ^c	416 (2.0)
Endometriosis	407 (2.0)
Myoma uteri	904 (4.4)
Non-specific vaginitis or candida vaginitis	1688 (8.2)

Data are expressed as number (%).

^aPresence of any of the following: hypertension, myocardial infarction, stroke, transient ischemic attack, coronary bypass, angioplasty, or stent, deep vein thrombosis or pulmonary embolism, angina pectoris.

^bPresence of any of the following: thyroid cancer, breast cancer, stomach cancer, cervical cancer, biliary tract cancer, ovarian cancer, colorectal cancer, lung cancer.

^cPresence of any of the following: syphilis, gonorrhea, chancroid, clamidia, human immunodeficiency virus, herpes genitalis, condyloma, trichomonas vaginitis.

NHS3 questionnaires. However, differences in culture, dietary patterns, and working conditions meant that some questions and response items in our survey were different from those in the original U.S. version.

This study enrolled 13% of active Korean female nurses aged 20–45 years. We compared age and regional distribution between participants and non-respondents and found that, compared with non-respondents, a slightly higher

proportion of participants were in the 40–45 years of age group and lived in a metropolitan area. These differences were statistically significant (possibly due to the large sample size) (data not shown).

The KNHS is a web-based survey. Compared with mail-based surveys, web-based surveys are cheaper, have higher response rates, and ensure wide participation by all demographic areas. They also reduce the time and money spent on data quality control because data are coded and entered automatically.^{20–22} The participants in our cohort were distributed across the whole country. However, some provinces had higher (Incheon and Daejeon) or lower (Jeju-do) participation rates than others; it is difficult to identify the reasons for these differences. Overall, the data reflect the characteristics of female nurses across the whole country.

The overall health profile of the participants revealed that the majority of nurses were non-smokers (99%) and more than half (58.2%) were regular drinkers. This is in contrast to the 2013 Korean data on current smoking status, which reported that 6.2% of adult women and 9.1% of women in their 20s are smokers.²³ In addition, the prevalence of obesity among participants in this study (8.3%) was lower than that among adult Korean women (25.1%) or women in their 20s (14.4%).²⁴ However, 15.3% of respondents were underweight, which is much higher than the proportion (6.9%) reported in the 2007–2009 data.²⁵ This high proportion of underweight women may be explained by the fact that gastrointestinal problems were the most commonly reported health issue (25.8%), which may be linked to occupational factors and diet, among other factors. Subsequent modules of the KNHS included the FFQ, eating habits at the workplace, and working conditions; therefore, future KNHS data should enable us to further understand factors related to being underweight.

Shift work, classified as work primarily outside normal daytime hours, includes night and rotational work²⁶ and is an intrinsic occupational characteristic of hospital nurses. It is considered a risk factor for chronic disease, including CVD, cancer, metabolic syndrome, and diabetes.^{26,27} Epidemiologic studies show that shift work increases CVD risk by about 40%, and that night shift work is associated with an increased risk of breast cancer and other cancers.^{27,28} A study conducted before the KNHS and aiming at examining the association between lifestyle factors and Korean women's health enrolled 10,000 female nurses; the results revealed that those who worked shifts more frequently were more likely to be overweight or obese.²⁹ Although we found that shift work was age dependent, the results suggest that special attention should be paid to nurses working shifts for long periods. There are several hypotheses about the biological mechanisms linking shift work to health problems; indeed, changes in circadian rhythm, sleep disturbance, stress, and behavioral changes are all potential mediators.²⁷

We found that 88.4% of the participants had worked night shifts, which is higher than that reported by NHS and NHS2 in the United States.^{30,31} This difference is likely due to the nature of Korean nurses' shift work, which generally includes all time shifts (day, evening, and night) on a rotating basis; by contrast, the U.S. system offers fixed shifts, for example, night-only and daytime-only options. The mean lifetime duration of night shift work was 5.3 years. The long-term effects of shift work on nurses' health should be investigated in the KNHS.

The KNHS is an ongoing investigation of women's health. The Module 1 survey was closed in October 2014 when it reached the target number of participants. Modules 2 and 3 began in March and November 2014, respectively; Module 4 began in September 2015. The pregnancy-related modules were sent to participants who became pregnant after July 2014. Nurses are currently participating in Modules 2–4 and in the pregnancy modules.

Conclusions

The KNHS is the first cohort study to focus on working Korean women of reproductive age and provides an opportunity for young nurses to participate in a long-term prospective study. As the KNHS survey items were basically matched to those of the U.S. NHS3, the findings from both data sets offer the chance to compare risk exposure in terms of ethnic and environmental differences. This cohort is expected to create a window in which we can identify important determinants of Korean women's health, and follow-up studies will continue to investigate the effects of lifestyle and environment on the health of these women, as well as the risk factors for chronic disease.

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Authors' Contributions

O.S.K. organized the survey, collected data, and discussed and revised the article. Y.A. designed the study, discussed and drafted the article. H.Y.L., H.J.J., S.K., J.E.L., H.J., and J.Y.L. collected data, discussed and revised the article. M.J.K. performed statistical analysis and contributed to the discussion. E.C., W.C.W., and J.E.C. participated in the study design and revised the article. H.Y.P. participated in the study design, discussed and revised the article, and approved the version to be published. All authors read and approved the final article.

Author Disclosure Statement

No competing financial interests exist.

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