



Original Article

A nationwide population analysis of antenatal and perinatal complications among nurses and nonmedical working women

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ABSTRACT

Objective: Limited information is available on health issues during pregnancy and after childbirth among nurses, especially on a nationwide level. This study thus aimed to compare antenatal and perinatal complications between nurses and nonmedical working women in Taiwan.

Materials and Methods: This nationwide population-based study was conducted using data from the Taiwan National Health Insurance Research Database. A total of 44,166 nurses and 442,107 nonmedical working women with full-time employment, aged 20–50 years, who gave birth to singletons were identified between 2007 and 2011. Logistic regression analyses (generalized estimating equation method) were used to compare risks between the two groups.

Results: Multivariable analyses showed that nurses had a significantly higher risk of anemia [adjusted odds ratio (AOR) 1.37; 95% confidence intervals (CI), 1.31–1.44], placenta previa, and abruptio placentae (AOR, 1.13; 95% CI, 1.07–1.20), and pregnancy-associated hypertensive diseases and preeclampsia (AOR, 1.10; 95% CI, 1.03–1.18) during the antenatal period than nonmedical working women. Moreover, they also experienced an increased risk of malpresentation (AOR, 1.30; 95% CI, 1.26–1.34), dystocia (AOR, 1.09; 95% CI, 1.06–1.13), preterm delivery (AOR, 1.08; 95% CI, 1.03–1.13), premature rupture of membranes (AOR, 1.09; 95% CI, 1.05–1.14), and post-term delivery (AOR, 1.11; 95% CI, 1.07–1.16) during the perinatal period.

Conclusion: Our nationwide population-based study revealed increased risks of antenatal and perinatal complications among nurses compared with those among nonmedical working women. The large-scale observation of the increased antenatal and perinatal complications draws attention to the health issues faced by nursing personnel who represent one of the most important workforces in the healthcare system.

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Introduction

Nurses are believed to be more frequently exposed to biological/infectious, chemical, physical, and mechanical/ergonomic hazards and to more stressful, complex, and challenging circumstances than nonmedical working women [1,2]. Exposure to these factors during

pregnancy has been associated with an increased risk of antenatal and perinatal complications, such as pregnancy-induced hypertension, preeclampsia [3,4], reduced intrauterine growth, preterm delivery, and post-term delivery [5–7]. In addition, physically demanding work and irregular or night shifts have also been related to spontaneous abortion and preterm delivery among nurses [2,8,9]. Studies suggested that the antenatal health issues may be associated with occupational and psychological factors among nursing staff.

Nurses comprise the largest workforce in the healthcare sector worldwide [10], and approximately 75% of female nurses are of childbearing age [11]. Prior research has reported that nurses have a

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higher risk of pregnancy-related ambulatory care visits [12]. Only a few mail survey studies have focused on antenatal and perinatal complications of pregnant nurses [5,6,8,9]. Yang and coworkers [13] described a higher risk for cesarean deliveries, tocolysis, miscarriage, and preterm labor among nurses in a sampled population, instead of the whole population. Therefore, the present study used a nationwide population-based dataset to provide a more comprehensive analysis of the antenatal and perinatal complications among pregnant nurses in Taiwan.

Materials and methods

Data sources

This retrospective cross-sectional study was conducted using the Taiwan National Health Insurance Research Database (NHIRD) between 2007 and 2011, including the inpatient expenditures by admissions, registry for contracted medical facilities, registry for medical personnel, and registry for beneficiaries. The linkage of all datasets for the relevant variables used the scrambled unique personal or hospital identification numbers. Data confidentiality assurance and privacy protections were encrypted by the National Health Insurance Administration (NHIA) before the release of the data. Diagnostic and procedure codes for each inpatient were categorized based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and the diagnosis-related group (DRG) coding. The NHIA performed expert reviews of random samples for inpatient claims quarterly to ensure the quality of care and accuracy of claim files. Additionally, the Institutional Review Board of the Chang Gung Memorial Hospital, Taoyuan, Taiwan approved our study (approval number: 102-4248B).

Study population

We included a total of 489,245 nurses and nonmedical working women who gave birth to singletons from 2007 through 2011 by using DRG codes, including 0373A (normal spontaneous vaginal delivery), 0373C (vaginal delivery after cesarean delivery), 0371A (medically indicated cesarean delivery), and 0373B (elective cesarean delivery) on the basis of the NHIA's case-based payment system. We excluded 2859 (0.6%) women younger than 20 years or older than 50 years. Additionally, 113 (0.02%) women were excluded due to incomplete information regarding physicians attending the births. Our final sample comprised 44,166 nurses and 442,107 nonmedical working women who delivered singletons.

Measures

The main outcome measure was the occurrence of the antenatal and perinatal conditions and delivery mode between nurses and nonmedical working women. We chose comprehensive items to cover antenatal and perinatal complications, according to our previous study [14] and Tang et al's [15] report, and information available in the NHIRD. Antenatal complications for pregnant women were defined as the presence of one or more of the following: placenta previa and abruptio placentae (ICD-9-CM code 641, 762.0, or 762.1), pregnancy-associated hypertensive diseases and preeclampsia (642.0, 642.1–642.5, 642.7, 642.9, or 760.0), anemia (648.2), gestational diabetes mellitus (648.0, 648.8, or 775.0), and intrauterine growth restriction (656.5). Perinatal complications for pregnant women were defined as the presence of one or more of the following: malpresentation (ICD-9-CM codes 652, 761.7, 763.0, and 763.1), dystocia (653 and 660–662, excluding 661.3), fetal distress (656.3), preterm delivery (< 37 weeks of gestation; 644), premature rupture of the membrane (PROM; 658.1

or 658.2), post-term delivery (≥ 42 weeks of gestation; 645), and postpartum hemorrhage (666). Additionally, delivery modes were categorized as vaginal (DRG 0373A or 0373C) versus medically indicated cesarean delivery (0371A) or elective cesarean delivery (0373B) according to the NHIA's DRG codes.

Information on the occupation of the pregnant women was obtained from the registry for medical personnel and the registry for beneficiary files. Nurses were identified as the study group, while other nonmedical working women were identified as the comparison group. Only women who were employed full time were included, and they were classified into two categories: nurses [registered nurse specialists and registered nurses; midwives were not included because very few cases (<0.001%) were not suitable for analysis] and nonmedical working women who were employed full time and worked for government agencies or private institutions. The latter group was chosen as the comparison group on the basis of a presumed relatively low exposure to occupational hazards.

Covariates were selected based on prior research and information available in the NHIRD, which were as follows: characteristics of singleton mothers (including age, insurable income, beneficiaries' geographic location, previous cesarean delivery, diabetes mellitus, and genitourinary comorbidities), hospitals (accreditation and patient volume), physician gender, and calendar year of delivery.

We obtained information on personal insurable wages from the NHIRD registry for beneficiaries. Mothers' socioeconomic status was defined as a woman's own insurable wage if she was the insured, or the insurable income of the insured if she was a dependent, and was divided into three categories: low [\leq New Taiwan Dollars (NTD) 20,000], medium (NTD 20,001–39,999), and high (\geq NTD 40,000). We also grouped the region of each women's NHIA unit, by enrolling the beneficiaries' geographic location into four regions (northern, central, southern, and eastern) according to the National Statistics of Regional Standard Classification. Additionally, previous cesarean delivery (ICD-9-CM codes 654.2), diabetes mellitus (250), cardiovascular diseases (404, 414, 425.4, 429.2, 440.9, 648.5, 648.6, 710 794.3, and V17.4) [14], endometriosis (615 or 616), and infection of genitourinary tract in pregnancy (646.6) [16,17] were selected as covariates.

Information on institutional characteristics was retrieved from the registry for contracted medical facilities and medical personnel. Medical centers were the hospitals with the best overall evaluation results under Taiwan's hospital accreditation system, followed by regional hospitals and district hospitals. Patient volume was determined based on the average annual number of singleton mothers admitted to each hospital, and was classified into high (≥ 500 cases per year) and low (< 500 cases per year) categories.

Statistical analysis

Distributions of demographic characteristics, institutional factors, and antenatal and perinatal complications between pregnant nurses and nonmedical working women were examined using the Chi-square test or Fisher's exact test for categorical variables, and the Student *t* test for continuous variables when appropriate. Univariable and multivariable logistic regression analyses were used to estimate the difference in each antenatal and perinatal condition between the two groups. In addition, the generalized estimating equation (GEE) method with an exchangeable correlation structure was used to adjust for the possible clustering effect among women with multiple births. Odds ratios and 95% confidence intervals (CIs) were estimated. A *p* value < 0.05 was considered statistically significant. All analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC, USA).

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