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Pregnancy Outcomes in Nurses and Nursing Assistants

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ABSTRACT

Objective: To assess whether work as nurses and nursing assistants during pregnancy increases the risk of adverse pregnancy outcomes.

Materials and methods: This study was prospectively carried out between June 2013 and August 2014. All nurses and nursing assistants who worked at Srinagarind Hospital during the study time frame were approached for recruitment. Data were collected by a self-administered questionnaire. Detailed information elicited from participants included baseline characteristics and underlying disease, occupational characteristics during pregnancy, and pregnancy outcomes. Logistic regression was used as a multivariate analysis to estimate an adjusted odds ratio (OR) and 95% confidence interval (CI) of factors associated with preterm delivery.

Results: This study included 572 pregnancies occurring in 361 participants. Mean age at pregnancy was 29.1 years. Approximately 19.0% of pregnancies had underlying disease. Cesarean section rate was 29.3%. Preterm delivery was reported in 121 pregnancies, accounting for the rate of 21.1%. Pregnancies those complicated with underlying diseases and had rotating shift work carried a higher rate of preterm delivery (30.6% and 22.7%, respectively).

Conclusion: The rate of self-reported preterm delivery among nurses and nursing assistants in this was approximately 20%. Preterm delivery trended to be more common among pregnancies those complicated by underlying diseases and had rotating shift work.

Keywords: Nurses, occupational exposure, pregnancy outcomes, preterm delivery, shift work

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Introduction

Several studies have reported that certain occupational factors were associated with an increased risk of poor pregnancy outcomes[1-4]. In the United States nurses' study, occupational characteristics significantly related to preterm delivery included long hours worked (< 36 hours) and a high level of occupation-related fatigue[2]. Increased risks of low birth weight, preterm delivery, small for gestational age, and perinatal death were frequently observed among women in occupations that generally involved chemical substances exposure, prolonged standing, and psychologically stress environment[3]. In the cohort study conducted among Iris working women, the

likelihood of having low birth weight (≤ 2500 g) and preterm delivery among pregnant women with long hours worked per week (≥ 40 hours) and shift work were significantly higher than women without these two working conditions[4].

Nurses are exposed to many stressful demands and pressures. Previous studies have reported that some job features of nurses including long hours worked, prolonged standing, and shift work rotating contributed to the high levels of stress and fatigue which resulted in heightened risk for an array of reproductive health adverse event[5-8]. However, to our knowledge, no study has been conducted to determine whether work as nurses and nursing assistants during pregnancy in Thailand increases risk of adverse pregnancy outcomes. Accordingly, this study was done to determine the prevalence of adverse pregnancy outcomes, preterm delivery in particular, and associated occupational factors among nurses and nursing assistants in Thailand.

Materials and Methods

After approval by the Research Ethic Committee of the Faculty of Medicine, Khon Kaen University, this study was prospectively carried out between June 2013 and August 2014. All nurses and nursing assistants, aged between 18-60 years old, who currently worked at Srinagarind Hospital during the study time frame were approached to determine the potential eligibility. They were excluded if had never been pregnant during work as nurse or nursing assistant at our hospital. All participants were advised of the study's propose and given opportunity to ask question before enrolling. Informed consent was obtained from each participant recruited in this study.

As no study has been conducted to determine the prevalence of adverse pregnancy outcomes among nurses or nursing assistants, we calculated a sample size at 50% prevalence of preterm delivery, which could represent the maximum number of pregnancy required. At a level of 5% precision and 95% of the confidence interval (CI), an estimated number of pregnancies required for this study were of at least 385[9].

Data were collected by a constructed self-administered questionnaire which was piloted prior to the beginning of the study to test its clarification and revised accordingly. The researcher was also present to help the participants if they had difficulty answering a question. The questionnaires were answered anonymously and individual envelops were provided for the participants to seal the completed forms. The results of this study were to be present only in an aggregate fashion.

Detailed information elicited from participants were as follow: (1) baseline characteristics and underlying disease; (2) occupational characteristics during pregnancy including heavy lifting (> 4 kg of at least once a week), long period of standing (> 4 hours, ≤ 4 hours of at least once a week), average hours worked per week (> 40 hours/week, ≤ 40 hours/week), and rotating shift work (unfixed day or night shifts); and (3) pregnancy outcomes including preterm delivery, route of delivery, operative vaginal delivery (forceps and vacuum extraction) carried out, birth weight, and admission of newborn to an intensive care unit (ICU).

Descriptive statistics were applied for baseline characteristics of participants. The association between the incidence of preterm delivery and participant's characteristics was analyzed via the $\chi 2$ or Fisher exact test, as appropriate. Logistic regression was used as a multivariate analysis to estimate an adjusted odds ratio and 95% CI of factors associated with preterm delivery ($P < 0.1$). An odds ratio with a 95% CI, which did not include unity were considered statistically significant.

Results

This study included 572 pregnancies occurring among 361 participants. Mean age of participants was 39.7 years. Mean age at pregnancy was 29.1 years. Median parity was 2 with a range of 1-5. Approximately 19.0% of pregnancies had underlying disease. Detailed occupational characteristics are displayed (Table 1). Rotating shift work was reported in 90.5% of pregnancies and the majority of these (82.6% of pregnancies) experienced rotating shift work with night. Preterm delivery was reported in 121 pregnancies in which

accounted for the rate of 21.1% (95% CI, 17.9% -24.7%). Of these, 91 were late preterm delivery. Birth weight ≤ 2000 gram was observed in 9 pregnancies (1.5%). The incidence of cesarean section was approximately 30% of all pregnancy (Table 2).

The results of univariate and multivariate analyses to determine independent factor predicting preterm delivery among the participants are displayed (Table 3). Only presence of underlying disease and having rotating shift work were noted to have a $P < 0.1$ and then entered into multivariate analyses to determine an independent effect of these two variables. Either presence of underlying disease or experiencing rotating shift work remained a statistically significant factors predicting preterm delivery. Nurses and nursing assistants in this study who reported as having underlying disease and those who experienced rotating shift work during pregnancy were approximately 2- and 4-fold increase in the risk of preterm delivery, respectively.

Table 1. Baseline participant and occupation characteristics (572 pregnancies)

Characteristics	Number of pregnancies (%)
Year of delivery	1998 - 2013
Mean age at study, SD (years)	39.7 ± 9.3
Mean age at pregnancy, SD (years)	29.1 ± 4.3
Median number of parity (range)	2 (1-5)
Number who have underlying disease	108 (18.8)
Hypertension	15 (2.6)
Diabetes mellitus	12 (2.1)
Hematologic diseases	11 (1.9)
Heart diseases	9 (1.5)
Thyroid disease	7 (1.2)
Asthma	6 (1.0)
Liver disease	3 (0.5)
others	32 (5.5)
> 1 diseases	13 (2.2)
History of smoking*	81 (14.2)
History of alcohol drinking	26 (4.5)
Prolonged standing	405 (70.8)
Heavily lifting	367 (64.1)
Patterns of rotating shift work	
With night	473 (82.6)
Fixed day	43 (7.6)

Abbreviation: SD, standard deviation

* including passive smoking

Table 2. Self-reported pregnancy outcomes among participants (572 pregnancies)

Outcomes	Number of pregnancies (%)
Preterm delivery (< 37 weeks)	121 (21.1)
≤ 34 weeks	30 (5.2)
> 34 weeks	91 (15.9)
Low birth weight (grams)	45 (7.8)
600-1000	2 (0.3)
1001-2000	7 (1.2)
2001-2499	36 (6.3)
Operative vaginal delivery*	54 (9.4)
Cesarean section	168 (29.3)
Admission of NICU	69 (12.0)

Abbreviation: NICU, Newborn Intensive Care Unit

*Including vacuum and forceps extraction

Table 3. The univariate and multivariate analyses for preterm delivery.

Variable	Category	N (%)	Univariate P-value	Multivariate analyses	
				OR (95%CI)	P
Underlying disease	Presence	33/108 (30.6)	0.007	1.86 (1.01-3.42)	0.046
	Absent	88/455 (19.3)			
Rotating shift work	Yes	117/516 (22.7)	0.013	3.64 (1.33-9.95)	0.012
	No	4/54 (7.4)			
Long hours work*	Yes	76/323 (23.5)	0.192	Variable removed	
	No	43/239 (18.0)			
Prolonged standing‡	Yes	88/405 (21.7)	0.862	Variable removed	
	No	32/152 (21.1)			
Heavily lifting≠	Yes	79/367 (21.5)	0.873	Variable removed	
	No	40/191 (20.9)			
History of smoking£	Presence	18/81 (22.0)	0.813	Variable removed	
	Absent	103/489 (21.0)			
Age at pregnancy	≥ 30 years	54/263 (20.5)	0.737	Variable removed	
	<30 years	67/309 (21.7)			

Abbreviation: N, number; OR, odds ratio; CI, confidence interval

*More than 40 hours per week

‡More than 4 hours of at least once a week

≠ More than 4 kg of at least once a week

£ Including passive smoking

Discussion

In this study, the authors survey the possibility of impact of occupational factors on pregnancy outcomes among nurses and nursing assistants. The rate of preterm delivery in this study was 21.1%. Participants whose pregnancies were complicated by underlying diseases carried a higher risk of preterm delivery. In addition, rotating work shift which is a typical occupation characteristic of nurses and nursing assistants also increased risk of preterm delivery.

In general population setting, several studies have consistently reported that underlying diseases can adversely affect the pregnancy outcomes, particularly increase the risk of preterm delivery[10-13]. This association was also observed in our study population. Pregnancies with underlying diseases were 1.86 times more likely to report as experiencing preterm delivery compared to those who had no underlying diseases. Because of a relatively small data set of each underlying disease type, an evaluation of significant impact of a particular underlying disease on the risk of preterm delivery was not feasible in this study.

Work as a nurse and nursing assistant typically entails several potential occupational hazards for pregnancy outcomes i.e. long period of standing, heavily lifting, long working hour, rotating work shift, and sleep deprivation due to night work. In the United States nurses' study, working in areas involving acute care, having rotating shift and long-time standing per shift, and high number of hours worked were the significant factors associated with an increased risk of preterm delivery[2]. In the Nurses' Health Study II, rate of preterm delivery was directly associated with working nights. Nurses who had night work carried a 3-fold higher risk of preterm delivery compared to those without night work (95% CI, 1.4-6.2)[7]. In our study, the majority of pregnancies (82.6%) had rotating shift work with night. Pregnancies with rotating shift work resulted in a higher rate of preterm delivery than that of pregnancies without rotating shift work (22.7% versus 7.4%, respectively) whereas physical demanding work exposures (e.g. long working hours, prolonged standing, or heavily lifting) did not predict risk. As only a small number of pregnancies in our study had only fixed day work shift, the determination of the impact of shift work patterns on pregnancy outcome was not feasible in our study.

In our study, cesarean delivery was 29.3% of all pregnancy. Although there was no data regarding the rate of cesarean delivery among general pregnant women in our hospital during the same time period of this study to be directly compared, cesarean delivery rates in our hospital for 2005 to 2008 were 33.6%, 35.6%, 43.5%, and 46.6%, respectively[14]. In the Taiwanese population-based data, rate of cesarean delivery among physicians was 31.8% which was lower than that of the average rate of above 35% in pregnant women of other settings[15]. Interestingly, in a cohort study conducted among the Finnish health professionals, the rate of cesarean delivery among nurses during 1990 to 2006 was relatively low and stable when compared to other settings. The authors proposed that the positive attitudes on vaginal delivery may be an important explanation for a relative low rate of cesarean delivery among health professionals[16].

The major limitation of this study is the way of findings reported here was elicited. Recall bias represents a major threat to the internal validity of this study because the all results either occupational characteristics or pregnancy outcomes derived from only participants' self-reported data. In addition, because of the recall period was relatively long, 10 years or longer in some participants, the internal validity of this study therefore could also be affected by a failure to accurately recall. As there has been no study evaluating the impact of work as nurse and nursing assistant on the pregnancy outcomes in Thailand, findings of this study however might be served as the preliminarily results highlighting the need of further study to verify the negative impact of some occupational-related factors on the pregnancy outcomes among nurses and nursing assistants as reported here.

In conclusion, the self-reported rate of preterm delivery among nurses and nursing assistants in this study was approximately 20%. The preterm delivery trended to be more common among pregnancies those complicated by underlying diseases and had rotating shift work. These findings however should be cautiously viewed as the internal validity of this study may be compromised by the nature self-reported data.

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ผลลัพธ์ของการตั้งครรภ์ของพยาบาลและผู้ช่วยพยาบาล

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วัตถุประสงค์: *เพื่อประเมินผลลัพธ์ของการตั้งครรภ์ของพยาบาลและผู้ช่วยพยาบาล*

วิธีการศึกษาวิจัย: *การศึกษาในพยาบาลและผู้ช่วยพยาบาลที่ปฏิบัติงานในโรงพยาบาลศรีนครินทร์ ในช่วงเดือนมิถุนายน พ.ศ. 2556 ถึง สิงหาคม พ.ศ. 2557 โดยใช้แบบสอบถามตอบเองที่คณะผู้วิจัยพัฒนาขึ้น และผ่านการทดสอบแล้วซึ่งประกอบด้วย ข้อมูลทั่วไป โรคประจำตัว ลักษณะการทำงานในขณะตั้งครรภ์ และผลของการตั้งครรภ์ทั้งวิธีการคลอด อายุครรภ์ น้ำหนักทารกแรกคลอด เป็นต้น โดยใช้การวิเคราะห์ความถดถอยแบบโลจิสติกเพื่อหาความสัมพันธ์ระหว่างการคลอดก่อนกำหนดและลักษณะการทำงานในขณะตั้งครรภ์*

ผลการศึกษาวิจัย: *ได้ศึกษาวิจัยในพยาบาลและผู้ช่วยพยาบาลจำนวน 361 คน ซึ่งมีจำนวนการตั้งครรภ์ 572 การตั้งครรภ์ โดยมีอายุเฉลี่ยขณะตั้งครรภ์ที่ 29.1 ปี เป็นการตั้งครรภ์ที่มีโรคประจำตัวร้อยละ 19 ได้รับการผ่าตัดคลอดร้อยละ 29.3 ของการตั้งครรภ์ทั้งหมด การคลอดก่อนกำหนด ร้อยละ 21.1 ของการตั้งครรภ์ทั้งหมด และพบอัตราการคลอดก่อนกำหนดมากขึ้นในกลุ่มที่มีโรคประจำตัวและลักษณะการทำงานเป็นกะระหว่างตั้งครรภ์*

สรุป: *จากแบบสอบถามในกลุ่มพยาบาลและผู้ช่วยพยาบาลในโรงพยาบาลศรีนครินทร์ พบว่ามีอัตราการคลอดก่อนกำหนดประมาณร้อยละ 20 โดยที่โรคประจำตัวและลักษณะการทำงานเป็นกะในระหว่างตั้งครรภ์มีแนวโน้มที่จะทำให้คลอดก่อนกำหนด*