

# Exploring the Relationship between Obstetrical Nurses' Work and Pregnancy Outcomes

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## Abstract

The Registered Nurses Association of Ontario Healthy Work Environments Best Practice Guideline recommends that employers promote safe, healthy workplaces. Healthy workplaces include addressing the unique needs of nurses who work while pregnant. The purpose of this descriptive study, summarizing information from 120 pregnancies reported by 95 nurses, was to determine if the workload of obstetrical nurses was associated with negative pregnancy outcomes, including preterm delivery and birth weight. Full-time obstetrical nursing work is a predictor of reduced birth weight, but not of preterm birth when compared to outcomes of obstetrical nurses working part time. One third of nurses reported pregnancy complications and most nurses experienced work-related and personal stress. Further research evaluating work modifications during pregnancy is indicated to improve birth outcomes.

## Keywords

Obstetrical Nurse, Pregnancy Outcomes, Preterm Birth, Birth Weight

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The Registered Nurses' Association of Ontario Healthy Work Environment Best Practice Guideline recommends that employers create environments that promote safe and healthy workplaces [1]. This should be done by developing a climate of staff safety through education, research and mutual accountability between staff and work place institutions [1]. This study explored the relationship between obstetrical nurses' work and pregnancy outcomes. We were interested in understanding the impact of physically

demanding work of obstetrical nurses since evidence existed suggested a relationship between heavy work during pregnancy and outcomes such as preterm deliveries and babies who were small for gestational age [2] [3].

## 1. Background

Women who work throughout pregnancy are generally considered to be healthier than non-workers due, in part, to the self-selection of healthy individuals who are able to work. However, some studies demonstrate that certain types of work can have a negative impact on pregnancy outcomes when compared to the general population of pregnant workers. Aside from environmental hazard exposure, where harm to workers is self-evident, the relationship between pregnancy outcomes and other work hazards such as shift work, heavy exercise and lifting, stress and job control is less clear.

Work that is considered physically demanding and includes shift work has been associated with spontaneous abortion, preterm birth and low birth weight [2]-[5]. The work of an obstetrical nurse typically involves shift work, including night work and requires physically demanding postures such as lifting, twisting, and standing for extended periods. The purpose of this study was to determine if the heavy workload and shift work patterns of obstetrical nurses had an association with adverse pregnancy outcomes such as low birth weight and preterm birth and if such a relationship existed, and to provide hospital administrators with healthy work place recommendations for obstetrical nurses.

## 2. Review of Literature

A PubMed search of the following terms was conducted, “pregnancy”, “nurses”, “shift work”, “occupational exposures”, “antenatal morbidity”, “fatigue”, “stress”, “exercise during pregnancy”, “preterm birth” and “birth weight” to explore factors related to work and pregnancy outcomes for the years between 1995 and 2015.

A Scandinavian systematic review conducted by Nurminen (1998) identified several studies indicating an association between shift work (that included night work) with pre-term delivery or intra-uterine growth restriction (IUGR). However, the type of occupations and shift schedules varied among the individual studies.

Three other studies demonstrated a strong association between physically demanding work, prolonged standing, shift and night work with adverse outcomes of pregnancy, specifically preterm birth and lower birth weight [3] [6] [7]. In contrast, studies conducted by Lawson *et al.* (2009) and Pompeii, Savitz, Evenson, Rogers, & McMahan (2005) [8] disputed these findings concluding that shift work and physical factors were not strong predictors of preterm birth and found no association between heavy lifting or prolonged standing with the risk of preterm birth and babies born small for gestational age. Pompeii *et al.* (2005) and Lawson *et al.* (2009) did suggest, however, that night work increased the risk of preterm birth. Lawson’s study demonstrated a 3-fold higher risk of delivering before 32 weeks, but no increased risk of preterm birth between 32 - 36 weeks related to night shift work. In addition, Lawson showed a lower

risk of preterm birth when pregnant nurses worked part-time versus full time and no dose-response relationship due to overtime hours worked. No studies were found that examined outcomes for nurses who work in obstetrics. These findings indicate that further investigation is required to better understand whether the heavy physical work or shift work demands of obstetrical nurse results in negative outcomes in pregnancy.

### 3. Methods

A survey was developed from a review of current literature as well as the experiences of several obstetrical nurses who worked during their pregnancy and left work earlier than planned in the authors' workplace. Material from these reviews formed the content of the proposed survey questions. An online survey was created that consisted of thirty-two questions including multiple choice, yes/no and open ended format. The survey gathered information about obstetrical nurses' pregnancies, physical demands and related outcomes. The study was approved by the authors' hospital research ethics board. Participants were recruited by making the survey available to nurses who were members of a provincial childbirth nurses' group with a membership of approximately 700. We invited nurses who had worked as obstetrical nurses to participate. The survey was piloted between March and September 2011 with six obstetrical nurses who worked during one or more of their pregnancies. No changes were made to the piloted survey based on the nurses' responses or feedback related to the survey design. The survey was made available online in January 2012 and two email reminders were sent to the members and responses were collected until January 2013. Participants did not receive any remuneration for completing the survey. Responses from the pilot participants were included in the survey responses.

### 4. Analysis

The association between predictor variables, birth weight and gestational age were described by work status using chi-square tests for associations for categorized variables and means (standard deviations) for continuous measures. Birth weight and gestational age did not differ between full-time, 12-hour shift workers and full-time, non-12 hour shift workers; thus, in the multivariable models, all full-time workers were compared to part-time workers. Logistic regression assessed the predictors of preterm delivery; the predictors of birth weight were assessed by linear regression. To account for multiple observations per person, all associations were examined by modeling outcome factors onto putative explanatory variables using a generalized estimating equation approach. All analyses were conducted in SAS 9.3.

### 5. Results

Ninety-five surveys were collected from approximately providing information on first, second, third and fourth pregnancies representing 120 singleton pregnancies. Only respondents identifying as working in a nursing position at the time of pregnancy were included in the analysis. Data represented 67 first pregnancies, 38 second, 12 third and

3 fourth pregnancies respectively. The nurses' age at the time of giving birth ranged from 24 to 34 years. For analysis, subsequent pregnancies were categorized as either primiparous (first pregnancy) or multiparous (2<sup>nd</sup>, 3<sup>rd</sup>, or 4<sup>th</sup> pregnancy).

Eighty per cent of the nurses (n = 84) responding to the survey identified themselves as working in labour and delivery, the remainder worked on postpartum units. Ninety of the respondents were Caucasian (94%), married (94%), non-smokers (94%). Eighty-one nurses (85%) reported they consumed no alcohol in pregnancy. Twenty-six percent (n = 25) identified that they were overweight at the time of their pregnancy.

There were no differences between groups related to parity, alcohol use or exercise activities when nurses working full time and part time were compared. While half of the respondents left work before they had intended, there was no difference between groups. Fifty-three percent of obstetrical nurses reported work stress and sixty-one percent reported other stress; these reports did not differ between part-time or full time workers. Across all groups, over one third of nurses experienced pregnancy complications ranging from antepartum hemorrhage, preterm labour, gestational diabetes and preeclampsia. The overall rate for preterm birth for all nurses participating in this study was 12.9%.

**Table 1** shows the association of birth weight and pre-term delivery, reported by work status. The mean birth weight of all babies born to survey respondents was 3433 grams (SD 599.2). Part-time nurses had significantly heavier babies than those who worked full-time 12 hour shifts and non-12 hour shift (p = 0.004). Since there were no differences in birth weight among nurses who worked full-time 12 hour shifts and those who worked full-time non-12 hour shifts, multivariable regressions compared full-time vs. part-time status to assess the factors associated with birth weight and pre-term delivery.

Infants born to mothers with pregnancy complications (excluding gestational diabetes) weighed 441 grams less than those without complications. Mothers with pregnancy complications were more likely to deliver preterm than those without complications (OR = 8.74, p = 0.009). There was a difference of 3.6 (SD 4.25) weeks between the gestational age when the nurses stopped working and the gestational age at delivery (**Table 2**).

## 6. Discussion

The results of this study demonstrate there is a significant difference between the weights of infants born to full-time and part-time obstetrical nurses. On average, babies born to full-time nurses weighed 300 grams less than infants born to nurses working part-time. Full-time nursing work is a predictor of reduced birth weight. Simcox & Jaakkola (2008) [9] reported lower birth weights among Finnish nurses compared to office workers and Quansah, Gissler, Jaakkola (2009) [10] reported lower birth weights for babies born to nurses versus teachers in Finland. A third study described lower birth weights for infants born to nurses compared to those born to women in general in

**Table 1.** Outcomes by work status.

Outcome	All respondents		Full-time, 12 hour shifts		Full-time, non-12 hour shifts		Part-time, all shifts		Test for differences (p-value)		
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	Overall (comparing all 3 groups)	Comparing FT-12 hr vs. FT non-12 hr shift	Comparing FT vs. PT
<b>Continuous Measures</b>	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)			
Birth weight	120	3432.6 (599.2)	56	3328.3 (577.7)	27	3284.6 (602.4)	33	3687.2 (516.6)	0.015	0.763	0.004
Gestational age	120	38.7 (1.94)	56	38.7 (1.83)	27	38.3 (2.33)	33	39.3 (1.53)	0.178	0.474	0.063
<b>Categorized Measures</b>	n	%	n	% of work category	n	% of work category	n	% of work category			
Birth weight									0.254	0.360	0.137
<2500	9	7.8	6	10.7	3	11.1	0	0.0			
2500 to 3000	12	10.3	7	12.5	2	7.4	3	9.1			
>3000	95	81.9	43	76.8	22	81.5	30	90.9			
Preterm delivery									0.300	0.703	0.138
Yes	15	12.9	7	12.5	6	22.2	2	6.1			
No	101	87.1	49	87.5	21	77.8	31	93.9			

**Table 2.** Differential between gestational age at birth and gestational age stopped working.

Outcome	All respondents		Full-time, 12 hour shifts		Full-time, non-12 hour shifts		Part-time, all shifts	
Continuous Measures	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Gestational age stopped working	118	35.2 (4.37)	56	35.1 (4.33)	27	34.0 (5.01)	33	(36.38)
Gestational age at delivery	120	38.7 (1.94)	56	38.7 (1.83)	27	38.3 (2.33)	33	39.3 (1.53)
Differential	118	3.6 (4.25)	56	3.7 (4.29)	27	4.3 (5.04)	33	2.9 (3.57)

the province of British Columbia [11]. However, weights of babies born to nurses working full time and participating in this study did not meet the accepted low birth weight definition of less than 2500 grams [12]. We conclude that the heavy workload of full-time obstetrical nurses can be considered as a proxy for exercise in pregnancy, a factor previously associated with the outcome of lower birth weight [13].

This study showed no difference in infant birth weight when comparing full-time obstetrical nurses working 12-hour shifts versus 8-hour shifts. It is possible that reduced birth weight may have less to do with hours worked in one shift and more to do with work that includes night work and total hours worked. This finding supports earlier research conducted by Mozurkewich *et al.* (2000). This study also demonstrated a correlation between reduced birth weight and pregnancy complications (excluding gestational diabetes).

The results of this study did not suggest that full-time nursing work was a predictor of pre-term birth which had been suggested in other research [2]. The Canadian pre-

term birth rate is 7.8% [14] and the overall rate for obstetrical nurses in this study is 12.9%. The cost of preterm birth can be great including respiratory diseases, temperature instability, hospital re-admission and neuro-cognitive problems and is the leading cause of infant mortality [15]. Although the numbers in this study are small, this finding is worthy of further investigation.

Nurses participating in this study left work three and a half weeks earlier than their delivery date. This may be because obstetrical nursing work becomes too physically demanding in late stages of pregnancy. Early departure from work may result in sick time, unpaid weeks of work, or an early start to paid maternity leave, which shortens the time a new mother has to spend at home with her baby before returning to work. Further investigation is required to determine if work modifications, for example, day shifts only or reduced hours, would enable nurses to continue working further into their pregnancy, if they so desire. There are models of workload support for medical residents such as exemption from on-call duty after 31 weeks gestation [16]. Preventive measures such as these should be considered for pregnant obstetrical nurses to decrease complications and stress.

The study's main strength is that it was the first to begin to explore pregnancy outcomes for obstetrical nurses comparing full-time with part-time work. The limitations of this study include potential recall bias as the survey asked questions about past pregnancies some of which occurred years earlier. It is recognized that nurses who responded may have been motivated to participate in based on a belief that their pregnancy was negatively affected by nursing work. Additional limitations of the study are a lack of a priori definitions of shift work or full-time versus part-time work. Nurses self-identified as full- or part-time workers. It may be possible that nurses who reported being part-time employees actually worked the equivalent of full-time hours. The study could have been strengthened if the proportion of part time nurses working night shift was known. As well, we did not ask if nurses took any preventative measures (for example, withdrawal from work, reduced hours or modification of clinical duties) to address any challenges related to working while pregnant. It was assumed that for all nurses who reported work status their status remained consistent throughout the pregnancy, but this was not confirmed. A final limitation is the small size of the study. Findings may not be generalizable to a greater population of obstetrical nurses.

The results of this study demonstrate that full-time nursing work was a predictor of reduced birth weight compared to part-time work. Birth weights of babies born to full-time obstetrical nurses were, on average, 300 grams less than infants born to those working part-time. The results of this study did not confirm that full-time nursing work was a predictor of pre-term birth as had been suggested by other research investigating similar shift-work impacts [2].

The Canadian pre-term birth rate is 7.8% [14] and the overall rate for all obstetrical nurses in this study is 12.9%. The reasons for this increased rate are not known. Although the number of participants in this study was small, nursing leaders and administrators should consider implementing preventive strategies aimed to maximize fetal

growth and optimize the gestational age at which nurses begin their maternity leave and to minimize pregnancy complications. A future study evaluating work modification interventions with a large population of nurses whose work involves heavy physical demands may be warranted before recommending widespread change.

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