Spontaneous Abortions and Shift Work in a Cohort of Nurses in Norway

Bente E. Moen[*1], **Siri Waage**[2], **Elena Ronda**[3], **Nils Magerøy**[4], **Ståle Pallesen**[5] **and Bjørn Bjorvatn**[6]

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may have possible adverse effects. Some studies also lack evaluation of life-style factors such as smoking, alcohol, and caffeine, all of which may be risk factors for SA [14,15]. However, as life-style factors might also be caused by the shift work situation, analyses both with and without these factors included should be performed [16]. Large groups of nurses are employed in all countries of the world, and many of them are young and of reproductive age. It is therefore important to perform more studies in this area.

The aim of this study was to examine the relationship between three different shift-work schedules and SA among nurses. In addition, we wanted to study the relationship between SA and the number of night shifts worked.

Material and Methods

A prospective cohort study was designed, where nurses working the same type of shift were examined at baseline as well as one and two years later. Nurses were chosen as this occupational group includes the largest number of female shift workers in Norway. Also, the majority of nurses in Norway are organized in one union only, the Norwegian Nurses Organisation (NNO). This organisation has a member register which made it possible to make a random sample of the population.

Sample and procedure

The data used in this study was obtained from "The SUrvey of Shift Work, Sleep and Health" (SUSSH). The baseline data collection took place among nurses in Norway during the period December 2008 to March 2009. A survey sample (n =6000) comprising a total of five strata, each containing 1200 nurses holding at least a 50% work position, was randomly selected from the member register of the NNO. The criterion for the different strata was time elapsed since graduation, in this case 0-11 months (stratum 1), 1-3 years (stratum 2), 3.1-6 years (stratum 3), 6.1-9 years (stratum 4), and 9.1-12 years (stratum 5). Each nurse in the sample received a questionnaire by post. Upon completion, the respondents could return the baseline questionnaire in pre-paid envelopes. Reminders were sent out twice. A total of 600 letters were returned due to incorrect addresses. Hence, the survey sample consisted of 5400 nurses. A total of 2058 nurses completed and returned the questionnaire, yielding a response rate of 38.0%. A second questionnaire was sent out by mail one year (2009/2010) later to these 2 058 nurses as a follow-up; 1586 of the 2058 responded (90% females), giving a response rate of 77%. A third questionnaire was sent out in 2010/2011, and 1533 responded (91% females), a response rate of 74%. Only females were included in the present study.

Questionnaire

The study was a part of a large survey of shift work, including several instruments on sleep and different health measures [17]. Only questions relevant for the present analysis on SA are described here.

Both at baseline, one and two years later we asked the respondents to provide information about living with a partner (yes/no), number of children they had given birth to, present place of work (hospital, nursing home, home care service, public health centre), hours worked per week, current daily smoking (yes/no), caffeine consumption (number of cups of coffee/tea/cola daily), and height and weight (calculated to body mass index, BMI). The following factors were assessed only at baseline: Age, gender, years worked as a nurse, and frequency of alcohol consumption during the past year (scale 1-6; never, less than once a month, once a month, 2-3 times a month, once a week, 2-4 times a week, and daily). At baseline and one year later, questions were also asked about job demands (six items) and job control (five items) in the past three months, based on the Swedish Demand–Control. Questionnaire [18]. Each item was scored on a five-point scale. The scores for each item were summarised, yielding subscale scores ranging from 5 to 20 for demands and from 6 to 24 for control. Job strain was defined as the score for job demands divided by the score for job control. In all three questionnaires we asked for the number of night shifts worked the past years. These figures were added into a sum of night shifts the past three years. In the analyses the sum of night shifts were categorized into three groups (0, 1-67 and >67), based upon the tertile distribution.

In the baseline questionnaire, women were asked if they had ever experienced any SA after confirmed pregnancy (yes, no, and unsure), which gives us their experiences of SA before the study start [19]. If the answer was yes, they were asked to provide the number of SA. We did not provide any definition of SA in the questionnaire, but for Norwegian women, this expression clearly means a miscarriage, a natural death of a fetus in the womb. The expression does not include induced abortions. In the second and third questionnaire, the nurses were asked about SA during the past year (yes, no, or unsure). In the statistical analyses, the participants with SA either the second year or the third year or both were categorized as having SA in the period 2008-2010.

Schedules and inclusion criteria

The baseline questionnaire established the type of working schedule

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performed, both unadjusted and with adjustments for age, smoking, job strain and cups of coffee/tea/coke daily.

Analyses were conducted including all nurses who reported that they had experienced SA before the study start and only for nurses below 50 years of age when analysing experienced SA 2008-2010. Fifty years was chosen, as few Norwegian women give birth after this age. The risk was calculated for one or more SA versus zero SA in the given time frame. The data were analysed using Predictive Analytics Soft Ware (PASW) Statistical Package, version 18. The significance level was set to 0.05.

Ethical considerations

This study was approved by the Regional Committee for Medical and Health Research Ethics, West Norway (REK-West; 088.08). Confidentiality was guaranteed throughout the research process, and all respondents provided written consent to participate in the study.

Results

Demographic and personal data, life-style, working hours, and psychosocial working conditions. The mean age of the 914 participating nurses was 33 years, range 21-63 at baseline. The baseline information showed that the nurses who worked permanent day shift were significantly older than the two other shift groups (Table 1). Permanent night shift workers reported fewer weekly work hours than did the other two shift groups. Nurses who worked three-shift rotation had lower caffeine consumption than the other groups. Ten per cent of the total population smoked daily, and the nurses who worked permanent day shift had the highest smoking prevalence. The nurses in three-shift rotation had fewer children than the others. There were no differences between the shift groups regarding years worked as a nurse, BMI, living with a partner, or alcohol use (Table 1). Ninety per cent of the nurses worked at a hospital at baseline, four per cent in nursing homes, four per cent in home care services, and two per cent in public health centres. Nurses with three-shift rotation reported higher job strain than the two other shift groups (Table 1). Comparing results from baseline, one and two years later for smoking, caffeine consumption and BMI did not show significant changes within each shift-schedule group. The level of strain was similar at baseline and one year later.

Spontaneous abortions before study start in 2008

Experienced SA before study start in 2008 was reported by a total of 166 nurses (18%) at baseline. This occurred more often among permanent night-shift workers than in the other shift groups (Table 2). The number of abortions ranged from one to four in all individual shift groups, and 22% had experienced two abortions or more. The permanent night-shift workers had experienced significantly more abortions than the other shift groups (Table 2) and the three-shift rotation workers had the lowest number of SA. Thirty-four nurses reported to be unsure of experiencing an abortion before study start. These nurses were evenly distributed among the three shift groups, and were handled as missing answers in the following analyses.

Outcomes	Permanent

higher number of participants, the results from our study probably would have been more robust.

Conclusion

The results suggest a slightly higher risk of spontaneous abortion among permanent night shift nurses than among day time nurses, although this association did not reach statistical significance. As no association was found between SA and the number of worked night