The changing shift pattern and overtime affect work related stress and increased risk of low birth weight, pregnancy-induced hypertension and preeclampsia

Objective The aim of this study was to determine whether the frequency of changing work shift and overtime are associated with registered nurses’ menstrual characteristics.

Method Female nursing staff aged 20–45 years and working at hospitals were invited to participate in the study. Menstrual characteristics and work shifts were recorded daily for 180 days. A multivariate logistic model was performed. Important confounders such as age, educational level, occupational category, regular excise habit, and major earner of family were adjusted.

Result A total of 330 nurses and 1,437 menstrual cycles were collected and eligible for the final analysis. The adjusted odds ratio for shorter bleeding time (≤3 days) was associated with changing work shift (involved one night shift) more than 3 times between menstrual cycles was 2.2 (95% CI = 1.1–4.3). The adjusted odds ratios for longer menstrual cycle lengths (>40 days) due to changing work shift (involved one night shift) more than 3 times between menstrual cycles were 4.7 (95% CI = 3.1–7.1). The adjusted odds ratios for dysmenorrhea due to overtime more than 40 hours during 28 days before menstrual were 2.9 (95% CI = 1.6–5.2).

Conclusion The high frequency of changing work shift (esp. from day shift change to night shift or from evening shift to night shift) and overtime (>40 hours/28 days) may affect child-bearing aged female nurses’ reproductive function.

Purpose On request of the National Institute for Public Health and the Environment, the present study was set up to find studies regarding an association between work related stress and pregnancy complications, pregnancy-induced hypertension and preeclampsia and to evaluate the present level of evidence.

Methods PubMed was used to find studies published between 1990 and April 2012, using a search strategy including account pregnancy complications, pregnancy-induced hypertension, preeclampsia and work related stress or burnout. For assessment of the quality of the studies, a score was calculated adapted from Nieuwenhuijsen et al.[1].

Results 17 studies were found on preterm birth, low birth weight, spontaneous abortion, pregnancy-induced hypertension and preeclampsia. Using the studies of the highest quality, work related stress was significantly associated with a higher risk of pregnancy-induced hypertension and preeclampsia and also a significant higher risk albeit to a slightly lesser extent, on a lowering of the birth weight of about 150 gram. The association of work related stress and preterm birth or spontaneous abortion was unequivocal.

Conclusions Clear evidence was found that work related stress during pregnancy is strongly associated with pregnancy-induced hypertension and preeclampsia and to a slightly lesser extent with a lowering of the birth weight of about 150 gram. These findings underscore the need for attention and reduction of work related stress during pregnancy in order to prevent the work related effects. Therefore, it was decided to develop an information brochure on work related stress and pregnancy that will be added to the communication toolkit ‘Kinderwens, zwangerschap en werk’ which can be found on the website http://toolkits.loketgezondleven.nl/

1B E M Moen, 1Waage, 2Ronda, 3Magerøy, 1Pallesen, 1Bjorvatn.
1University of Bergen, Bergen, Norway; 2University of Alicante, Alicante, Spain; 3Haukeland University Hospital, Bergen, Norway
10.1136/oemed-2013-101717.220

Abstracts

THE CHANGING SHIFT PATERN AND OVERTIME AFFECT NURSES’ MENSTRUAL CHARACTERISTICS

W S Chin, Shiao, Guo. National Taiwan University, Taipei, Taiwan

Objective The aim of this study was to determine the frequency of changing work shift and overtime are associated with registered nurses’ menstrual characteristics.

Method Female nursing staff aged 20–45 years and working at hospitals were invited to participate in the study. Menstrual characteristics and work shifts were recorded daily for 180 days. A multivariate logistic model was performed. Important confounders such as age, educational level, occupational category, regular excursion habit, and major earner of family were adjusted.

Result A total of 330 nurses and 1,437 menstrual cycles were collected and eligible for the final analysis. The adjusted odds ratio for shorter bleeding time (≥3 days) was associated with changing work shift (involved one night shift) more than 3 times between menstrual cycles was 2.2 (95% CI = 1.1–4.3). The adjusted odds ratios for longer menstrual cycle lengths (>40 days) due to changing work shift (involved one night shift) more than 3 times between menstrual cycles were 4.7 (95% CI = 3.1–7.1). The adjusted odds ratios for dysmenorrhea due to overtime more than 40 hours during 28 days before menstrual were 2.9 (95% CI = 1.6–5.2).

Conclusion The high frequency of changing work shift (esp. from day shift change to night shift or from evening shift to night shift) and overtime (>40 hours/28 days) may affect child-bearing aged female nurses’ reproductive function.

SHIFT WORK AND SPONTANEOUS ABORTIONS

B E M Moen, 1Waage, 2Ronda, 3Magerøy, 1Pallesen, 1Bjorvatn. 1University of Bergen, Bergen, Norway; 2University of Alicante, Alicante, Spain; 3Haukeland University Hospital, Bergen, Norway

Objective Our aim was to study the relationship between spontaneous abortions among nurses working three different types of shift schedules; permanent day shift, three shift rotation, and permanent night shift.

Methods From a cohort of nurses in Norway established in 2008, we identified 1083 female workers who worked the same type of shift schedule in 2008 and one year later. Information on age, years worked as a nurse, weekly work hours, job demands, job control, smoking, consumption of alcohol, caffeine, spontaneous abortions the past year and throughout life was obtained by questionnaires. The relationship between spontaneous abortion and type of shift schedule was analysed by logistic regression analyses, adjusting for job strain and lifestyle factors. The analyses were performed in two strata, above and below 30 years of age.

Results An increased risk for experiencing spontaneous abortions the past year was found among nurses who worked only night shifts compared to those who worked only day shifts,

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219 WORK RELATED STRESS AND INCREASED RISK OF LOW BIRTH WEIGHT, PREGNANCY-INDUCED HYPERTENSION AND PREECLAMPSIA

1T Brand, 2Milder. 1AMC/Coronel Institute, Amsterdam, Nederland; 2National Institute for Public Health and the Environment, Bilthoven, Nederland

10.1136/oemed-2013-101717.219

220 SHIFT WORK AND SPONTANEOUS ABORTIONS

B E M Moen, 1Waage, 2Ronda, 3Magerøy, 1Pallesen, 1Bjorvatn. 1University of Bergen, Bergen, Norway; 2University of Alicante, Alicante, Spain; 3Haukeland University Hospital, Bergen, Norway

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restricted to nurses below 30 years of age, odds ratio (OR) 3.4 (95% confidence interval [CI] 1.0–12.4). A similar increase in risk for experiencing spontaneous abortions throughout life was found among permanent night-shift workers, OR 4.4 (95% CI 1.2–16.3), also in this case for nurses below 30 years of age. No increased risk of spontaneous abortions was found among nurses above 30 years of age.

**Conclusions** The findings suggest that night work may cause spontaneous abortion by disrupting the circadian rhythms, but other unknown mechanisms may also play a role. More studies of night-shift workers considering different age groups are needed to supplement the findings.

### Abstracts

#### Session: Parallel session 2 RICOH: Child behavior and semen quality

**222** MALE REPRODUCTIVE TOXICITY OF PHTHALATES: A CROSS-SECTIONAL STUDY OF TESTOSTERONE AND TOTAL SPERM COUNT IN EUROPEAN AND INUIT POPULATIONS

1 O S Cimler Specht, 1Toft, 1Jønsson, 1Jens Peter, 1Copenhagen N, Denmark; 2Department of Occupational Medicine, Aarhus, Denmark; 3Department of Occupational and Environmental Medicine, Lund, Sweden; 4Department of Occupational and Environmental Medicine, Copenhagen N, Denmark

10.1136/oemed-2013-101717.222

**Objectives** Phthalates are widely used man-made chemicals that in spite of a short half-life in the organism are detectable in urine among more than 95% of investigated men and women. Phthalates are with varying potency anti-androgens through interaction with some metabolic steps involved in endogenous sex-steroid metabolism. Some cross-sectional studies have shown inverse associations between phthalates and plasma levels of testosterone and some semen characteristics, but the evidence base is limited and results are conflicting. The aim of this study was to examine the hypothesis that phthalates are associated with reduced levels of plasma testosterone and total sperm counts.

**Methods** Spouses of pregnant women from Greenland (n = 196), Poland (n = 190) and Ukraine (n = 203) were enrolled into the study. We measured six metabolites of di-2-ethylhexyl phthalate (DEHP) and diisononyl phthalate (DINP) in serum and concurrent testosterone, sperm concentration, sperm volume and total sperm count. Analyses were stratified by country as well as analysed across countries.

**Results** The most abundant metabolite from DEHP namely 5-cx-MEPP (mean concentration in serum 2.22 ng/ml) was negatively associated with testosterone, sperm volume and total sperm count in the overall analysis after adjustment for country, age, sexual abstinence time and current smoking. Testosterone decreased with 1.08% pr ng/ml 5-cx-MEPP (p = 0.032), volume with 1.59% (p = 0.043) and total sperm count with 3.47% (p = 0.030). When analysed by country the association was strongest in Ukraine and Poland, but the inverse relationship between 5-cx-MEPP and outcomes was observed in all three countries. No significant association between phthalate metabolites and sperm concentration was observed.

**Conclusions** These results are compatible with a weak anti-androgenic action of the DEHP metabolite 5-cx-MEPP on testosterone and total sperm count. Whether this cross-sectional association reflects causal mechanisms remains to be established.

#### Session: Parallel session 2 RICOH: Child behavior and semen quality

**223** MOTOR DEVELOPMENT FOLLOWING PRENATAL EXPOSURE TO P,P-DDE AND CB-153: A FOLLOW-UP STUDY OF INUIT AND EUROPEAN CHILDREN AGED 5–9 YEARS

1Copenhagen N, Denmark; 2Department of Occupational Medicine, Aarhus, Denmark; 3Centre for Arctic Environmental Medicine, Nuuk, Greenland; 4Department of Occupational and Environmental Medicine, Bispebjerg Hospital, Copenhagen NV, Denmark

10.1136/oemed-2013-101717.223

**Objectives** Both PCB and DDE are lipophilic compounds which bio-accumulate in adipose tissue and cross the placental barrier. Prior studies of the association between prenatal exposure to...