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Hospital work and fecundability

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Hospitals employ many female workers of reproductive age. At the same time, hospital work environments can be characterized by occupational reproductive hazards due to a combination of chemical and biological agents, shift work, high physical work load, and psychological stress. All of these potentially have adverse effects on reproductive outcomes. With respect to fecundability (the probability for a couple of reproductive age to conceive during each cycle), the literature on specific risks for hospital staff is scarce. In his 1993 review, Baranski (1) concluded that the increased spontaneous abortion rates found for operating room staff (anesthetic gases), chemical sterilizers (ethylene oxide), and nurses handling antineoplastic drugs may indeed be indicative of reduced fecundability among hospital workers.

Only 2 studies have specifically reported on reduced fecundability among operating room staff (2). As early as 1972, Knill Jones et al (3) reported that female anesthetists had a higher risk of infertility, defined as 2 years of unsuccessful intercourse. In a case-referent study among infertile patients who failed to conceive within 1 year, Rachootin & Olson (4) showed an increased risk for women exposed to anesthetic agents. Both studies lack exposure data. A causal effect of high-level exposures in the 1970s cannot be ruled out, but with current reduced levels of exposures, the effect will be less or absent. (See the next section.)

A recent case-referent study among nurses and pharmacy assistants reported an increased risk for infertility (2 years of unsuccessful intercourse) among women handling antineoplastic drugs (5). For other chemical exposures in hospitals, no human studies have been published in which fecundability was evaluated. Circumstantial evidence comes from studies among dental assistants in the United States (6) and midwives in Sweden (2). Both groups were exposed to nitrous oxide and showed reduced fecundability with increasing exposure. A Danish study among female pharmacy assistants found an increased risk for pregnancy delay of at least 1 year (7).

With respect to nonchemical exposures like shift work and physical work load only indirect evidence (ie, among other occupational groups and female athletes) suggests a potentially adverse effect on fecundability among female hospital workers. This finding was confirmed by our observations. [See the section on study 2 (reference 8).] For men, there are some indications that exposure to anesthetic gases, ethylene oxide, and organic solvents might reduce sperm quality and couple fertility (1).

It must be concluded that most of the exposures in hospital environments have not been studied with respect to adverse effects on reproduction in general and fecundability in particular. In The Netherlands, we recently conducted 2 studies on specific exposure categories in hospitals.

Study 1

In an unpublished study by Peelen et al adverse reproductive effects of exposure to either anesthetic gases or antineoplastic drugs were investigated in a retrospective cohort study among 5400 female nurses. These women were 22—37 years of age and worked in operating rooms or oncology wards or in surgical, orthopedic and obstetrical wards (reference group) in 83 of 121 Dutch hospitals between 1990 and 1997. All the women received a

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self-administered questionnaire by mail; it contained a full reproductive history including time to pregnancy and specific questions on occupational exposures and potential confounders. The response rate was 79%. In addition, an occupational hygiene survey was conducted in 10 Dutch hospitals (university hospitals, regional hospitals andspecific cancer centers) to estimate current exposure levels of anesthetic gases and antineoplastic drugs and to study indicators for these exposures.

Exposure to anesthetic gases was assessed by measuring nitrous oxide, sevoflurane, halothane, and isoflurane during different surgical operations, including ear, nose, and throat problems of children, as well as in recovery rooms.

Exposure to antineoplastic drugs was assessed by measuring cyclophosphamide and iphosphamide in 24-hour urine samples provided by nurses from oncology wards and in outpatient oncology clinics. These nurses kept job diaries to be used to study indicators for exposure.

The preliminary analyses do not indicate reduced fecundability among these groups of nurses with relatively low exposure levels. More detailed results of these occupational hygiene and epidemiologic studies will be presented elsewhere.

Study 2

In another study (8) assessing the relationship between the level of occupational physical activity and adverse effects on reproduction in female hospital support staff, we conducted a prospective epidemiologic study among 260 women aged 18—39 years who were trying to get pregnant. These women (clerical, kitchen, and cleaning staff) were recruited from 39 Dutch hospitals out of a total of 7000 women who were approached for this study. As it is estimated that approximately 5% of women of reproductive age have active pregnancy plans, the response rate (260 out of 350) was considered satisfactory.

Data on occupational exposures, work conditions, occupational physical activity, reproductive history, and potential confounders were collected in a personal interview at the time of enrollment. Follow-up information was collected for at least 1 year using a menstrual cycle calendar and contact forms sent every 3 months. In addition, special arrangements were made for early pregnancy testing.

This study demonstrated that a high level of occupational physical activity, defined by the mean energy expenditure of more than 3 times the basal metabolic rate per day had a negative influence on fecundability (table 1). The effect was more pronounced when the work had to be done during unfavorable hours. This study indicates that, besides high energy, requirements as such having insufficient time to recover may delay conception. Lifestyle factors, such as cigarette smoking and caffeine intake, did not influence fecundability in this study population.

Table 1. Fecundability odds ratios (OR) and 95% confidence intervals (95% CI) for participants with different levels of energy expenditure during usual work days, with 2 dimensions distinguished: mean energy expenditure per day (= fatigue) and mean energy expenditure per hour (= intensity).

	N	Intensity		Fatigue			
		High versus low[a]		Moderate versus low[b]		High versus low[b]	
		OR	95% CI	OR	95% CI	OR	95% CI
Overall	259	1.0	0.7—1.5	1.1	0.7—1.6	0.6	0.4—1.0
Work hours before 0800 or after 1800	94	0.8	0.4—1.5	0.5	0.2—1.1	0.4	0.2—0.8

[a] Intensity more or less than 3.5 times basal metabolic rate.
[b] Fatigue <2, 2—3 and >3 times basal metabolic rate.

Concluding remarks

These studies indicate that more epidemiologic research is needed on reduced fecundability and other adverse reproductive effects of exposures and work conditions in health care professions. Special emphasis should be placed on estimating actual levels of exposure to chemical substances and physical work load in order to update current safety limits.

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