

Occupational exposure to anesthetic gases and risk of spontaneous abortion

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Abstract: Objective: Nowadays, some studies indicate the adverse effects of exposure to chemicals such therapeutic agents. We investigated self-reported occupational exposure to anesthetic gases and the risk of spontaneous abortion in women hospital staff in Qom. **Methods:** This study is a case control study which has carried out in 2013 in three hospitals of Qom University of Medical Sciences. During the study, married women who were working in the operating room as technicians and nurses (exposure group) compared with married women who were working in CCU, ICU and emergency as nurses (non exposure group). Rate of spontaneous exposure were assessed in both groups. Collected data were analyzed by SPSS software. **Results:** in this study pregnancy outcome and occupational exposures were collected retrospectively 143 participants of women hospital staff. In this study the rate of abortion in exposure group was 15.6% (n=11) and in non exposure group was 13.52% (n=10). Thus significant relationship between exposure to anesthetic gases and spontaneous abortion wasn't seen. **Conclusion:** these data suggest that focus on review of the status of occupational exposure of workers can be helpful in improving the reproductive of female workers. Though our study supports the idea that the use of engineering controls such Scavenging can reduce the concentration of anesthetic gases to prevent their possible effects on pregnancy and risk of spontaneous abortion.

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1. Introduction

In today's operating rooms, almost 30% of anesthesiologists, 36% of anesthesiology residents, and 51% of certified registered nurse anesthetists are women (1, 2). Many of these women are of childbearing age, and experience at least 1 pregnancy during their career. It is important for them, their colleagues, and their employers to be aware of possible occupational hazards that exist for pregnant anesthesia providers.

The adverse pregnancy outcomes that are considered are spontaneous abortions, premature births, and birth defects. Spontaneous abortion, or miscarriage, is defined as the loss of a nonviable fetus, and most of these events occur in the first trimester. In the general population, 10% to 20% of Women who know they are pregnant miscarry before 20 weeks of gestation (3). For women more than 40 years old, the miscarriage rate increases to 35% to 50%, and for

those using assisted reproductive technologies the number is even higher.

Hospital employed women are potentially exposed to several suspected reproductive hazards, including anesthetic gases, antineoplastic (chemotherapy) drugs, antiviral drugs, sterilizing agents (disinfectants), and X-rays (ionizing radiation) (2,3). Concern about occupational exposure to inhalational anesthetics has existed for many years. This concern is based on basic science, animal research, and human epidemiologic studies (1). Whether it is intraoperative fluoroscopy for orthopedic or intravascular procedures, or radiation from providing anesthesia in off-site locations such as the computed tomography (CT) scanner or interventional radiology suites, radiation exposure has become more and more common for anesthesiologists (4). 50 % of employees in the Ministry of Health and Medical Education are women (5) that significant

portion of them are working in hospitals and operating rooms (6).

By regard to insufficient quantitative studies on the association between occupational exposure to anesthetic gases and spontaneous abortion in Iran we investigated risk of spontaneous abortion in occupational exposure in three hospitals of Qom University of Medical Sciences.

2. Material and Methods

This study is a case control study which has carried out in 2013 in three hospitals of Qom University of Medical Sciences.

During the study, married women who working in operating (exposure group) were compared with married women who were working in the emergency, ICU (Intensive Care Unit) and CCU (Coronary Care Unit) units (non exposure group).

The reason of this election for non exposure group was similarity in stress and workload with exposure group.

We have been evaluated two mentioned group's spontaneous abortion in their working duration. We used questionnaire that consist of demographic information- working state- environment work quality- inclusion and exclusion criteria- history of pregnancy and possible miscarriage.

For gathering data in this study 69 participants as exposure group (anesthetic technician, operating room nurse and operating room technician) were compared with 74 participants as non exposure group (emergency, ICU and CCU nurse).

The inclusion criteria for exposure group were at least one year history work pre of pregnancy and at least once pregnancy in during working.

The inclusion criteria for non exposure group were at least one year history work pre of pregnancy and at least once pregnancy in during working too.

The exclusion criteria for two groups that were effective factors in miscarriage consist miscarriage age (<20 or 35<), history of pervious miscarriage, smoking more than 10 for a year, uterine disease such leiomyoma or early dilation of the cervix.

Endocrine disease such progesterone deficiency, polycystic ovary, hypothyroidism, defects and genetic disorders in the family, uterine infection, mellitus diabetic, unawareness and unwelcome use of OCP and IUD in pregnancy, trauma, chronic systemic disease such hypertension, diabetes, immunologic and blood disease.

The one exclusion criteria just for non exposure group was only working in operating room. Also we asked them about the type of anesthetic gases that they were exposure. The data analyzed by SPSS.

3. Results

Table 1 provides The information about frequency of exposure and non exposure groups, table 2 the rate of exposure to anesthetic gases in exposure and non exposure groups and table 3 Pregnancy outcome in the first, second, third and fourth pregnancies in exposure and non exposure groups.

Table 1. Frequency of exposure and non exposure group

exposure group	frequency	Percent (%)
Anesthetic technician operating room nurse operating room technician	34	49.3
	20	29
	15	21.7
non exposure group	frequency	Percent (%)
Emergency nurse ICU nurse CCU nurse	40	54
	18	24.3
	16	21.7

Table 2. The rate exposure to anesthetic gases in exposure and non exposure groups

exposure group	frequency	Percent (%)
Less than 1 hr.*	74	51.7
1-4 hr.	25	17.5
4-8 hr.	27	18.9
More than 9 hr.	17	11.9

4. Discussions

Rate of spontaneous abortion is 10-20% of the health care staff (7) but the rate in the general population is 10- 15 % (7, 8). In this study the rate of abortion in exposure group was 15.6% (n=11) and in

non exposure group was 13.52% (n=10), P= 0.514, the odds ratio= 1.192 and Confidence=0.95.

Thus significant relationship between exposure to anesthetic gases and spontaneous abortion wasn't seen. Based on the Fisher test, between first, second,

third and fourth pregnancies and exposure to anesthesia, there was no significant difference ($P>0.05$).

Several studies about the relations of exposure to anesthetic gases and spontaneous abortion are

performed. In study of Huraff in 1999 that compared anesthesiologists with other professionals there was no significant difference between the two groups (8, 9).

Table 3. Pregnancy outcome in the first, second, third and fourth pregnancies in exposure and non exposure groups

Pregnancy outcome	frequency	Percent (%)
First Pregnancy outcome	124	86.7
Live birth	19	13.3
Abortion	0	0
Missing		
second Pregnancy outcome	70	49
live birth	9	6.3
Abortion	64	44.7
Missing		
Third Pregnancy outcome	12	8.4
Live birth	3	2.1
Abortion	128	89.5
Missing		
Fourth Pregnancy outcome	3	2.1
Live birth	3	2.1
Abortion	137	95.8
Missing		

This effect can be achieved at high concentration (anesthetic dose) about halothane, isoflurane and enflurane (11). In conclusion of Lawson study et al. they found increased risks for spontaneous abortion with reported exposures to antineoplastic drugs, sterilizing agents, and X-rays (12). Based on In other Lawson study et al on only 11 exposed preterm cases, self-reported exposure to sterilizing agents was associated with an increased risk of preterm birth in nurses (13). Although antineoplastic drugs and X-rays are known reproductive hazards. Anesthetic gases have long been of concern to nurses, dental workers, and veterinarians, though their study did not show an association with spontaneous abortion. Many met analysis of studies that were conducted in the absence of scavenging systems reported increased risks for spontaneous abortion (14) Studies of dental and veterinary offices have found increased risks of spontaneous abortion in practices where anesthetic gases were not scavenged (15,16). More recent studies show inconsistent results, possibly because of sample size limitations (15-17) or because of the heterogeneity of exposure. Although appropriate engineering controls are commonplace in many hospital operating rooms, smaller medical facilities (such as dental, veterinary, or pediatric offices) may be less vigilant in controlling exposures. In addition, reduced ability of pediatric patients and veterinary animals to voluntarily cooperate during gas administration procedures could hamper the

effectiveness of scavenging. Therefore, though our study supports the idea that the use of engineering controls has reduced the risk of spontaneous abortion, it does not rule out possible effects on pregnancy in smaller facilities.

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