

Fetal Deaths and Sex Ratio Among Progenies of Workers of Operating Rooms in Hospitals of Hamadan

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ABSTRACT

Workers of operating rooms in hospitals are chronically in exposure to rather higher dose of chemicals, e.g. halothane and nitrous oxide, than general population. Concern that exposure to waste anesthetic gases may cause mutagenic, carcinogenic, or teratogenic changes has provided the impetus for many recent studies. The goal of present work was to determine incidence of the fetal deaths and sex ratio among progenies of workers in operating rooms in hospitals. Results of pregnancies of spouses of all male workers and also pregnancies of female workers of operating rooms in hospitals in Hamadan, Iran, were studied. Total of pregnancies were 200 cases. In a cross-sectional descriptive investigation, the results of all pregnancies of two subject groups were studied for frequencies of fetal deaths (abortions + stillbirths) and sex ratios of progenies and then statistically compared with each other and with general population. The basic primary data were collected by face-to-face interviews and by employing suitable questionnaires. Total of pregnancies of our subject groups were 200 cases (101 cases belong to wives of male workers, and 99 cases belong to the female workers). Frequencies of the fetal deaths in those two groups were 4.96% and 13.13% respectively. Sex ratios of live births were 88.46% and 97.83%. Frequency of fetal deaths in spouse of the male workers were about the same value in general population in Hamadan, but frequency of the fetal deaths in female workers were statistically different from the same value in the general population of Hamadan. Sex ratio of the progenies in both groups (men and women workers) were lower than the same value in the general population in Hamadan. The results of present study showed that it seems probably, work in operating rooms of hospitals would lead to some genetic consequences.

INTRODUCTION

The mutagenic role of ionizing radiation (8) and some, but not all, chemicals (9) are clear, and almost all, as potentially hazardous compound, are under study. In 1977, the U.S. National Institute of Occupational Safety and Health (NIOSH) suggested a proposed standard for average operating room concentrations of halothane at 0.5 ppm and of nitrous oxide at 25 ppm. Exactly what "average" concentration means, where they should be measured, and when, is unclear (7).

Unfortunately, despite of such protocols, in a lot of high risk places, the workers are dramatically at a low dose, but chronically, of potentially mutagenic waste materials. At least one can assume that they are exposed more than general population.

Mutagenicity can be studied in a number of ways, but a common method involves a bacterial screening analysis, using a specialized strain of *Salmonella* (the Amestest). Unfortunately, in some cases, man made compounds, that their genotoxicity are very probable, short term experiences, have shown that they are not hazardous (14). In several cases there is no way to examine some potentially harmful compounds directly on man. In another word, in man there is no precise way to estimate the amount of genetic damage caused by chemicals. Attempts to demonstrate the potential effects of chemicals or ionizing radiation by looking at offspring of parents exposed to such potentially hazardous elements. A number of autosomal recessive mutants may have been produced but they will not be manifest for several generations. However, recessive mutations produced on X chromosome would be immediately manifested in hemizygous male offspring of mothers who had been exposed.

If these mutants were lethal then the number of male births would be diminished; the sex ratio (number of male births divided by the number of female births) would be reduced.

Fetal deaths, congenital malformations and sex ratio of progenies among war chemical victims were studied (10, 11, 12). The incidence of fetal and neonatal deaths in workers of radiology divisions with pathology divisions in hospitals were compared (5). The incidence of spontaneous abortions among women exposed to waste anesthetic gases have been reported (1). Also, the results of an epidemiologic surveys about the consequences of exposure to trace amounts of nitrous oxide in the workplace on the workers has been reported (2). Present investigation tried to study fetal deaths and sex ratio among progenies of workers of operating rooms in hospitals.

MATERIALS AND METHODS

In a cross-sectional descriptive investigation, the results of all pregnancies of two subject groups (spouse of male workers and women workers) in operating rooms of hospitals were studied for frequencies of fetal deaths (abortions + stillbirths) and sex ratios of progenies and then the results were statistically compared with each other and with general population. To avoid bias, the workers were studied that: a) their spouse had no high risk occupations, b) at least one year before having pregnancy (in women workers and in the spouses of male workers) had started to work in an operating room. The basic primary data were collected by a blind face-to-face interview and by employing suitable questionnaires. Frequency of fetal deaths in this study was total number of fetal deaths (abortions + stillbirths), divided by total number of pregnancies in each group. Our subject groups were 1) spouses of male workers and 2) female workers.

Finally the results of those two groups, were compared with general population in Hamadan by employing χ^2 test or Yate's corrected χ^2 test. Necessary data for Hamadanian general population were obtained from results of another work of the author in Hamadan (3).

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RESULTS

Table 1 shows frequencies of fetal deaths in two subject groups and also in general population of Hamadan. As it shows, frequency of fetal deaths in wives of men workers of operating rooms is about the same value in general population, but in female workers is higher than general population, and the difference is statistically meaningful ($P < 0.05$).

Table 2 shows the sex ratios of live births (secondary sex ratios) in both subject groups. They are lower than the same value of Hamadanian general population. In another word, male delivery was lower in both subject groups in comparison with general population. The differences are not statistically meaningful.

DISCUSSION

One of the ways to detect genetic damage resulting from environmental pollutions on human populations is comparing the incidence of fetal deaths in the progeny of the exposed population with the general population. On the basis of the results stated in Table 1, fetal deaths (abortions + stillbirths) among progeny of women workers was more frequent than the spouses of male workers and also than the general population. It means that work in operating rooms for women is probably, accompany more risk for their fetuses. The results were adopted with the results of other studies (10,11). It must be noted that almost all of the women interviewed stated that they continued working in the operating rooms during the first months of their pregnancies.

Results of another study (3) agree with our results. It showed that 60% of pregnancies of female anesthesiologists finished to abortions, and yet another survey (4) has showed that spontaneous abortion rate in nurses who work in operation rooms was 38%, while in other nurses it was 10%. Some researchers have reported that they did not find any evidence to protect mutagenicity or teratogenicity of exposure to low dose of chemicals used in operating rooms. So we have to accept the results of present work with caution.

As Table 2 shows, the sex ratios in two subject groups are 88.46 and 97.83, respectively. The sex ratio of the progenies in general population of Hamadan was 113.12. Diminishing the sex ratio of progeny can be considered as producing the X linked recessive mutations, which were lethal in hemizygous male fetuses. Of course, it should be noted that the sex ratios in the subject groups are not statistically different with general population. Several reports showed that some environmental factors such as some chemicals changed the sex ratios of progenies of exposed population (3,5).

It can be concluded that probably to be exposed chronically to waste anesthetic gases, even in low dose, will lead to genetic consequences such as increasing the risk of fetal deaths and decreasing the sex ratio of offspring. However, these effects to other environmental factors present in the operating rooms.

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Table 1. Frequencies of fetal deaths in operating room workers and in Hamadanian general population

Subject Groups	Total number of Pregnancies	Fetal Deaths	
		No.	%
Wives of men workers	101	5	4.95
Women workers	99	13	13.13
General population	5995	359	5.99

Table 2. Secondary sex ratios of progenies in operating room workers and in Hamadanian general population

Subject Groups	Total number of live births	Male births	Female births	Sex ratio (%)
Wives of men workers	98	46	52	88.46
Women workers	91	45	46	97.83
General	5635	2991	2644	113.12

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