

## Letter to Editor

### Does Damaged X-chromosome Alter the Offspring Sex Ratio of Workers of Operating Rooms in Hospitals?

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Pour-Jafari and Farhud reported the fetal deaths and sex ratio among progenies of workers of operating rooms in hospitals of Hamadan (1). Offspring sex ratio in both groups (men and women workers) was lower than in the general population of Hamadan. They concluded that it seems probably, working in operating rooms of hospitals would lead to some genetic consequences. They believed that exposed chronically to waste anesthetic gases, even in low doses, would lead to induction of lethal recessive mutations on X-chromosomes (1). However, we believe that this is not the case. A characteristic that has been regarded as an important indicator of induced damage to the genetic material, is the sex ratio. If men alone are exposed to genotoxic agents, their relatively large X-chromosomes should be broken more frequently than their small Y-chromosomes. Therefore, their X-chromosomes should carry induced lethal mutant alleles which some of them are dominant, in contrast to their Y-chromosomes. Considering that, more female zygotes from these fathers should die than those from non-exposed fathers, and a higher than normal ratio of males to females would result. It should be mentioned that the data presented by Pour-Jafari and Farhud showed a decreased in offspring sex ratio of exposed men, compared with general population. If women alone are exposed, some of their X-chromosomes should be broken and some should carry induced lethal genes. This would result in greater harm to the hemizygous male zygotes than to the XX female zygotes, and the result would be a relative surplus of female births. Their data showed that the offspring sex ratio of exposed women did not decrease compared with the ratio of general population (1). Therefore, their data could not explain the damage of X-chromosome hypothesis. Several years ago Neel and Schull's findings on the sex ratio in Hiroshima and Nagasaki, which are the most extensive ones, at first gave rather strong support to the validity of the theoretical expectations; but inclusion of additional children, born after 1953, resulted in sex ratios, that did

not deviate significantly the control ratios of children from non-irradiated parents (2). On the basis of more than 140,000 births in the period of 1956-62, nearly one or both parents of 74,000 cases, had been exposed to the nuclear bombings, they concluded that "the suggestion of an effect of exposure on sex ratio in the earlier data is not borne out by the present findings" (2). While the studies in Japan fail to yield evidence for damage to the gametes of exposed individuals, there is unequivocal evidence for damage of somatic cells.

Many studies on human and animals, revealed that the sex ratio at birth is associated with several factors, including exposure to some environmental and occupational toxins (3-8). It has been reported that demographic factors, such as birth order, parental age, and race are associated with the sex ratio (9, 10). There are some evidences for changing the sex ratio over the time in several countries (11-13). Moreover, it is reported that the sex ratio is significantly associated with geographical latitude in European countries (14). Taken together, the sex ratio is influenced by several factors. At present it is difficult to explain the mechanisms of these alterations. There are several evidences indicating that mammalian sex ratio at birth, are dependent on parental sex hormone levels around the time of conception (James hypothesis) (15). The sex hormone levels of the men and women working in operating rooms, in respect of demographic data, should be assayed to test the alteration of offspring sex ratio by parental sex hormone levels.

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