

Fetal Deaths and Congenital Malformations in Progenies of Iranian Chemical Victims

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Abstract

Background: The goal of the present study was to report the results of two parallel works in which the incidence of fetal deaths and also congenital malformations among the progenies of the Iranian chemical victims were studied.

Methods: The subjects were progenies of a randomly selected population from survivors of chemical attacks during Iran-Iraq conflict. Totally 807 male cases ranged 18-85 years old (average=33.5) were included in the test. They were married and had been injured at least once with chemical warfare; all of them had been brought back to their normal voiding condition.

Results: The selected subjects were categorized into case and control groups: children were borned after and before their parents being injured chemically, respectively. The incidence of fetal deaths and congenital malformations in these two groups were significantly different ($P<0.05$).

Conclusion: Parental exposure to chemical weapons may be associated with an increased risk for some congenital malformations.

Keywords: *abnormalities, chemical warfare, congenital malformation, genetics.*

Introduction

The first reported strategic use of chemical weapons occurred about 80 years ago, early in World War I. There have been confirmed instances of the use of chemicals in military operations since 1918, but there has been general restraint in their deployment even during the Second World War. Only 4-5 cases of major conflicts have been mentioned since the First World War, in which causation due to chemical attacks have been substantiated (1). The United Nations team which investigated the possible use of chemical warfare in the conflict between Iran and Iraq has reported that mustard gas and the organophosphorous agent

tabun were responsible for many of the casualties. This is the most recent example of a military operation involving chemical warfare and it further justifies the concerns that have been expressed by many individuals and groups regarding the use of biological and chemical weapons (1). Experiments have shown that certain chemicals such as mustard gas are mutagen in animals; in man chemical mutagenesis may in fact be more important than radiation in producing genetic damage (2). Sulfur mustard effects on molecular levels cause a variety of damages to DNA (3). Increasing of fetal death rates and incidence of congenital malformations, can play a role as suitable indices for indirect study to approach to the effects of environmental factors on man. The present study has tried to detect any relations between parental exposures to

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chemical war agents and increase the risk of congenital malformations as well as fetal deaths among progenies.

Materials and Methods

The subjects were progenies of a randomly selected population from survivors of chemical attacks, during Iraq-Iran conflict. Totally 807 men from 18 to 85 years old ($X=33.5$) were selected. They were married and had been injured at least once with chemical warfare; all of them had been brought back to their normal voiding condition. The dates of injuries were 3 to 4 years before the moment of interview.

Their positions at the moment of injury were as follows: civilians, 387 (47.96%); militia, 151 (18.71%); militarists 264 (32.71%) and missing cases (no answer or unknown) 5 cases (0.62%). We were told that the gas, the victims poisoned with, was sulfur mustard, followed by nerve gas, cyanide, damper gas, mixture, disgusting agents and powerless respectively. One hundred and eleven (13.74%) people did not know the type of the chemicals. Sixty per cent of cases confined to bed after chemical injury. In the moment of the interview, 85.9% of the subjects still had distress from their injuries; the frequent manifestation was respiratory and skin disorders. The selected subjects were categorized into two case and control groups: children were borned after and before their parents being injured chemically, respectively. The incidence of fetal deaths and congenital malformations in these two groups was compared. Their wives were between 15 and 63 years old ($X=29$). Congenital malformations are defined as "gross structural defects" present at birth (4, 5). Our data were based on physical examinations by groups of medical students under heading a pediatrician. These groups noted to macroscopic structural abnormalities such as skeletal and muscle abnormalities, clinical findings of chromosomal aberrations, limb defects, anencephaly, hydrocephaly, microcephaly, cleft lip and palate, deafness,

blindness and mental retardations. The physiological and anatomical errors (if any) were ignored.

Results

The incidence of abnormalities among progenies of Iranian chemical victims is summarized in table 1. As it shows, there was a significant variation in incidence of congenital malformations among the progenies of gas victims ($P=0.00$). Table 2 shows the incidence of fetal deaths in two groups of conceptions. On the basis of the results stated in table 2, incidence of the fetal deaths among progenies of exposed parents is higher than the control group, such that the difference is significant ($P=0.00$).

Table 1: The incidence of congenital malformations among live birth progenies of chemical victims

	Case	Control
Affected live births	139	57
Total live births	538	1690
Rate estimate	0.258364	0.0337278

Rate ratio = 7.66028

Test statistic Z = 15.2998

P-Value = 0.00

Table 2: The incidence of fetal deaths in groups of conceptions

	Case	Control
Fetal deaths	26	30
Total pregnancies	547	1728
Rate estimate	0.047	0.017

Rate ratio = 2.73784

Test statistic Z = 3.91976

P-Value = 8.86734 E-5

Discussion

Nowadays it is clear that some chemicals are mutagen, also a study have showed that the chemical pollution of environment causes chromosome aberrations in rodents (6). When the cases are man and the chemicals are manmade, the study will be more difficult to do

and more complex to understand. Different studies have shown that some indices such as sex ratios of progenies (7), rate of fetal deaths (5) and incidence of congenital malformations (4) among next generation of exposed populations can result to genetic consequences of environmental hazards in victims. Although this way is not direct, but it is easier than others, and perhaps the only possible cheap method for population genetic studies in toxicogenetic area, especially when one compares the results with that of control group. The latter introduces a serious problem that usually occurs in human studies. Indeed, what is a suitable control group? It is very hard for a researcher to find a suitable control group for a population that suddenly fall in an unwanted exposure of an environmental agent, such as a high dose of ionizing radiation or mutagenic chemicals. Although it is in doubt and challenge, but in almost all investigations, researchers select the "general population" as control group. In present study, as it was explained in Materials and Methods, The children of our cases before being injured, were selected. Based on the results, frequencies of fetal deaths and congenital malformations between two groups were statistically different. Authors in a case report (8) have shown repeated fetal deaths and a son with severe physical and mental retardation among progenies of an Iranian chemical victim, 13 years after his chemical injury with sulfur mustard. They suggested that these events might be genetic consequences of sulfur mustard intoxication during war time. In present work, we could not separate abnormalities based on teratogenic or mutagenic properties of war chemical agents, we could not distinguish whether observed defects were caused only by those agents or by other environmental factors as well. Here it should be notify that we probably had two errors which had some influences on our results, first, the effect of parental aging (2) and the second, effects of environmental factors

which effected on the pregnant mothers and increased the risk of congenital malformations, such as war time stress. In fact, the large amount of differences made us sure that our conclusion is a tragic fact. It could be concluded that, besides the short term consequences of chemical war agents in victims, such as alteration of libido (9), respiratory (10,11), skin (12), and eye (13) complications, they can cause long term effects, such as increasing the rate of fetal deaths and congenital malformations.

Acknowledgments

We are grateful to Dr. H. Mahjoub and Dr. M.B. Rokni for their sincere helps. Also we have to thank from all families that let us interview.

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