Reproductive health of male radiographers

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ABSTRACT

Objectives: To compare certain reproductive health problems reported in 2 groups of males, one of which was exposed to x-ray radiation (radiographers) and the other group that was not exposed to x-ray radiation. The reproductive health problems were miscarriage, congenital anomalies, still births and infertility.

Methods: Two groups of men were selected (90 in each group). The first group consisted of radiographers and the other groups consisted of men not exposed to x-ray radiation. The 2 groups were matched for age and source. Relative risk, attributable risk percentage and level of significance were calculated.

Results: Incidence rate of reproductive health problems was increasing with the increase in duration of exposure to x-ray radiation ranging between 17% (for those exposed for 1-5 years) to 91% (for those exposed for more than 15 years). There were significant associations between exposure to radiation and miscarriage (relative risk = 1.67, attributable risk percentage = 40%), congenital anomalies (relative risk = 10, attributable risk percentage = 90%), still birth (relative risk = 7, attributable risk percentage = 86%), and infertility (relative risk = 4.5, attributable risk = 78%).

Conclusions: The incidence rates of reproductive health problems reported by male radiographers were significantly higher than that reported by the non exposed group and higher than the incidence rates reported in community-based studies in Jordan. The incidence rates of fetal death (miscarriage and stillbirth together) and infertility reported by our radiographers were higher than had been reported by the British radiographers. An immediate plan of action is needed to protect our radiographers. Further studies are needed in this field taking into account all extraneous variables that may affect the reproductive health of radiographers.

Keywords: Radiographers, duration of exposure, miscarriage, congenital anomalies, infertility, relative risk.

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Exposure to ionizing radiation endorses continuous fears to those exposed to such radiation accidentally or non-accidentally as it has the ability of penetrating the body tissues causing health hazards. Exposure to a sufficient dose of radiation may lead to destruction of the sex cells, gene mutation, chromosomal aberrations and abnormalities, and pathological changes of the ovaries and testicles, and subsequently may cause miscarriages, infertility, congenital anomalies, and still births.[1-6] Chronic toxicity of radiation was evident in those who were treated for certain malignancies.[7] The Chernobyl atomic accident in 1986 was a good example of the effects of radiation on the health of people. Such an accident placed fetuses and neonates at high risk of congenital malformations.[8,9] In this study an attempt was made to investigate certain reproductive problems as reported by male radiographers and to compare the occurrence of such problems between radiographers (exposed to x-ray radiation) and another group which was not exposed to x-ray radiation.

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Methods. This study was carried out with the aim of comparing reproductive health problems reported by male medical radiographers in Jordan with another group of men who were not exposed to x-ray radiation. For achieving this objective, 2 groups of men were selected. The first group was male medical radiographers (90 men) who were exposed to x-ray radiation and the comparison group (90 men) were not exposed to x-ray radiation. To decrease the effect of extraneous factors, the 2 groups were similar in age by using group (frequency) matching and were selected from the same sources as shown in Table 1. Wives of all men in the study were not workers in the X-ray Departments. The exposed group consisted of men married for at least one year and were exposed to x-ray radiation for at least one year. The non-exposed group consisted of men married for at least one year. Variables included in the study were: Age of the man (in years); duration of exposure to x-ray radiation of the exposed group (in years); certain reported reproductive problems, miscarriage of the wife, infertility of the man, congenital anomalies of the newborn, and still birth. In the exposed group, reproductive problems that took place after one year of exposure were considered in the investigation. A questionnaire was used as an instrument for the study. A trained doctor collected data. The response rate was almost complete. Relative risk, P value, and Attributable Risk Percentage (AR%) were calculated.[10] Relative risk is a measure of the degree of association between 2 variables.[10] Attributable risk percentage (AR%) reflects the percentage of the outcome that can be prevented if the exposed men become completely protected from x-ray radiation. A P value of less than 0.05 was considered significant in this study.

Results. Table 1 shows the distribution of the 2 groups according to their source. Table 2 shows that the age for the 2 groups' ranges between 20 and 60 years with a mean of approximately 36 years for the 2 groups. Approximately half of the radiographers (47%) were exposed to x-ray radiation for more than 10 years and one 4th of radiographers were exposed for more than 15 years. Table 3 shows that the incidence rate of reproductive problems (together) increases with the increase in duration of exposure ranging from 17% in those exposed for 1-5 years to 91% for those exposed for more than 15 years. Table 4 shows that newborns of radiographers were 10 times more likely to have congenital anomalies as compared to newborns of the non exposed group (RR=10), and 90% of this problem (AR%=90%) can be prevented if radiographers are properly protected. The relative risk for miscarriages was 1.7 as compared to 7 for still births and 4.5 for infertility. The AR% was 40% for miscarriages as compared to 86% for still births, and 78% for infertility.

Table 1 - Distribution of the study population according to their source.

Source	Radiographers number	Non Exposed Number
Al-Bashir Hospital	20	20
Al-Zarka Hospital	10	10
Princess Basma Hospital	8	8
Jordan University Hospital	6	6
Islamic Hospital	4	4
RMS (Amman)	20	20
Al-Nadim Hospital	4	4
Amir Faisal Hospital	4	4
Sahab Hospital	4	4
Health Centers	10	10
TOTAL	**90**	**90**
RMS - Royal Medical Services		

Table 2 - Distribution of the study population according to age and duration of exposure to x-ray radiation (radiographers).

Factor	Radiographers number	Non Exposed Number
Age (years)		
20-29	14	14
30-39	54	54
40-49	20	20
≥50	2	2
Duration (years)		
1-5	12	
6-10	36	
11-15	20	
≥16	22	

Table 3 - Distribution of reproductive problems (percentage) according to duration of exposure.

Duration of exposure (years)	Incidence rate of reproductive problems (%)	Relative Risk	P value
1-5*	17	1	-
6-10	50	3	<0.05
11-15	80	4.8	<0.05
≥16	91	5.5	<0.05
TOTAL	**62**	**-**	**-**
*Reference group and the relative risk for such a group is always one.			

Table 4 - Distribution of reproductive problems (percentage) in the two groups of men in the study.

Reproductive problems	Radiographers %	Non-exposed males %	Attributable risk %	Relative risk	P value
Miscarriage	33	20	40	1.96	<0.05
Congenital anomalies	11	1	90	10.00	<0.05
Stillbirth	8	1	86	7.00	<0.05
Infertility	10	2	78	4.50	<0.05

Discussion. The results of this study have shown that the investigated reproductive health problems as reported by male radiographers were not reassuring. The incidence rates of all reported reproductive problems in radiographers were significantly higher than in the non-exposed group and higher than had been found in a hospital-based study involving 300 newly delivered women in Jordan in 1989. This last hospital-based study showed that the incidence rates of miscarriages, still births, and congenital anomalies were 28%, 2% and 1%, as compared to 33%, 8% and 11% in our radiographers. It is worth mentioning that the incidence rates of miscarriages (28%) and still births (2%) reported in the hospital based study were higher than those reported by the non exposed group in our study (20% for miscarriages and 1% for still births). This difference could be partially explained on the basis that the 300 mothers in the hospital based study were selected from a university hospital (a referral hospital) where it is expected that many of the women included in the study were referred to the hospital due to complicated obstetric histories which may reflect badly on their reproductive health. The incidence rates of the reproductive health problems reported by the Jordanian radiographers were higher than had been reported by the British male radiographers.[3] The incidence rate of fetal death miscarriages and still births together) in the British study[3] was 19% as compared to 41% in our study. Ten percent of our male radiographers reported infertility as compared to 6% reported by the British male radiographers.[3] The scarcity of national studies in the field of reproductive health in Jordan and the scarcity of studies in the field of reproductive health of radiographers at both the regional and international level limited the comparison in this paper. However, the results of this study highlighted the need for an immediate plan of action to protect our radiographers. Proper protection will prevent the occurrence of at least three-quarters of congenital anomalies, still births, and infertility in radiographers as indicated by the AR% in this study. Further studies are needed in this field taking into account all extraneous factors that may affect reproductive health. The use of matching as indicated in the methodology section decreases the effect of such extraneous factors.[10]

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