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ORIGINAL ARTICLE

Male fertility and its association with occupational and mobile phone towers hazards: An analytic study

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KEYWORDS

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Abstract *Objective:* The aim of the study is to determine the association of male fertility with the occupational and mobile phone towers hazards. *Background:* Male reproductive ability is likely to have multiple genetic and environmental determinants. A seminal fluid analysis is clinical marker of male reproductive potential. *Aim:* To find out whether environmental hazard such as mobile phone tower has an effect on male reproductive ability. *Methods:* Two hundred couples were enrolled, one hundred subfertile couples as a study group ($n = 100$), and one hundred fertile couples as a control group ($n = 100$). Environmental exposure to electromagnetic radiation from mobile phone towers and occupational state was assessed by standard questionnaire. Semen analysis was done for the subfertile males, because the fertile males (control group) refused to give semen samples. *Results:* The occupational hazard expressed significant difference between the subfertile and the control groups (38% versus 12%) ($p < 0.05$), with odds ratio (OR) = 4.5 and 95% Confidence Interval (CI): 2.175–9.288, and also the environmental factor (mobile tower within fifty meters from their house) showed significant difference (29% versus 12%) ($p < 0.05$), with OR = 3; 95% CI: 1.426–6.290. SFA of the subfertile males was 40% abnormal versus 60% normal semen analysis. These abnormalities were classified into 35% oligozoospermia, 55% asthenospermia, and 10% teratozoospermia. Oligozoospermia was associated with more occupational hazard (OR = 1.8, 95% CI: 0.569–5.527). Teratozoospermia was associated with more occupational hazard (OR = 5.23, 95% CI: 0.524–52.204), and with exposure to environmental hazard (OR = 2.6, 95% CI: 0.342–19.070), and associated with smoking hazard (OR = 1.7, 95% CI: 0.225–12.353). *Conclusions:* Male fertility represented by quality of semen might be affected by occupational and environmental exposures, so it seems that prevention of occupational and environmental risk factors, may lead to improvement of semen quality in subfertile men.

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1. Introduction

Subfertility is a failure to achieve pregnancy after one year of unprotected intercourse. It can be primary or secondary (1). The period in definition may be extended to two years in young female partner and shortened to six months in older one (2).

Based on statistics released by the World Health Organization (WHO), the prevalence of infertility is 10–15%. Male factors (as main cause or with female factor) are involving in 35% of all causes of infertility (3). Sperm analysis is an essential important diagnostic study in male subfertility diagnostic approach and usually is abnormal in subfertile men. Because medical history cannot explain all male infertility cases, these observations may be linked to a growing impact of potential occupational and environmental factors (4).

Environmental factors such as heat, smoking, radiation and others can effect on spermatogenesis. Based on some theories heat generator environmental sources such as jobs which need long time sitting (like driving) can cause subfertility (5).

The increasing use of devices for wireless communication has given rise to fears that the radiofrequency electromagnetic fields (RFEMFs) emitted by such devices (e.g., mobile and wireless phones) and by their respective base stations cause various adverse health effects (6). The discussion about possible health effects by exposure to RF-EMF recently has shifted toward subfertility, mainly focusing on males (7). Electromagnetic radiation (EMR) emitted by mobile cellular phones (8), and more recently, wi-fi network signals (9) can affect semen analysis characteristics (10–12).

2. Aim of the study

1. To analyze SFA in a group of subfertile couples.
2. Those with abnormal parameters were studied for possible exposure to environmental hazard as a cause for their subfertility by comparing them with a control group who were fertile.

3. Subjects and methods

This study was designed as a case-control study. Two hundred couples were enrolled, one hundred subfertile couples as a study group ($n = 100$), and one hundred fertile couples as a control group ($n = 100$). Among 220 subfertile couples attended the infertility clinic of Babylon Teaching Hospital for Maternity and Pediatric in Al-Hilla city in Iraq, from September 2014–March 2015, one hundred convenience couples were selected (random selection, odd no method). Demographic data of subfertile group are shown in Table 1.

A standard questionnaire was used for collecting demographic characteristics, education, type and duration of subfertility, occupational state, and if they live near to mobile phone base station (within fifty meters) and with power intensity of 71.226 mW/m^2 (these numbers are gained from the local environmental office) and the duration of exposure to the electromagnetic radiation which were obtained.

All the subfertile couples were surveyed for their etiology of subfertility by medical and surgical examination by surgeon and Doppler examination for possibility of varicocele; semen analysis was done for the males.

Table 1 Demographic data regarding the subfertile and the control males.

The parameter	Subfertile group	Fertile group
Age (years)	34.61 ± 10.65	37.48 ± 7.24
Education		
Unenlightened (no)	(18) 18%	–
School (no)	(62) 62%	(50) 50%
Higher degree (no)	(20) 20%	(50) 50%
Work		
Work hazard (no)	(38) 38%	(12) 12%
Non hazard (no)	(62) 62%	(88) 88%
Environmental factor		
Mobile towers (no)	(29) 29%	(12) 12%
Non hazard (no)	(71) 71%	(88) 88%
Smoking		
Smokers (no)	(38) 38%	(32) 32%
Nonsmokers (no)	(62) 62%	(68) 68%
Seminal fluid analysis (SFA)		
Normal (no)	(60) 60%	–
Abnormal (no)	(40) 40%	

Values are mean ± standard deviation or percentages ($n = 100$).

The control group was volunteers either relatives or staff of the Babylon Teaching Hospital for Maternity and Pediatric in Al-Hilla city in Iraq. Demographic data of fertile group are shown in Table 1. They had a child within the last year, and depending on their fertility, the control seminal fluid analysis was considered normal and we neglected the effects of environmental hazards on these control groups as we are focusing on their fertility per se.

3.1. Semen analysis

Seminal fluid analysis (SFA) was done for all the subfertile males ($n = 100$). Semen samples were collected by masturbation (after 3–5 days of sexual abstinence) in a clearly labeled standard container (which is a clean plastic plate with wide and dry mouth without any detergent compounds or other toxic substances). The samples were allowed to liquefy for at least 30 min at 37 °C incubator (Binder–Germany).

The sample specimen was mixed thoroughly; notes were recorded regarding the volume, color, PH and whether the sample runs freely on pipetting. Viscous samples are difficult to pipette, leaving sticky strands. High viscosity will interfere with accurate assessment of density and motility, and repeated aspiration by a needle or pipette can reduce the viscosity.

One drop of semen sample is laid on the slide and covered by a cover slide and examined by the microscope (Olympus S*31 Tokyo, Japan); sperm count is made in 4–5 fields in high power field (HPF), as well as motility %, sperm morphology, whether aggregation and white blood cells are found or not. The semen samples were evaluated according to WHO (13).

3.2. Statistical analysis

Statistical analysis of the data was performed with Statistical Package for Social Science (SPSS, Inc., Chicago, IL) SPSS version 20 for Windows. Continuous variables were expressed as

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