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The impact of cigarette smoking on sperm parameters: A cross-sectional study

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Abstract. Background: The large number of men worldwide smoke and it is the fact that cigarette smoke contains known complication such as mutagens and carcinogens. The aim of this study was to evaluate consequences of cigarette smoking on sperm parameters. **Material & Methods:** In this Cross-sectional study, From 1 April 2010 to 1 January 2011 a total of 280 male partners of infertile couples who presented to a St. Mary infertility center, sari, Iran for infertility evaluation, were included in this study. After exclusion of patients with excluded criteria 180 men entered in this study. Sperm parameters were measured according to the WHO criteria and were compared in non-smokers and smokers men. Data was recorded in the special forms according to our variables and analyzed by SPSS (independent sample t-test and Chi-Square test). Statistical significance was defined as $P < 0.05$. **Results:** 180 patients were entered in this study. There were 40(21.7%) smokers and 144(78.3%) non smokers. There is no significant difference in sperm parameters in smoker and non smoker groups. **Conclusions:** Our study does not corroborate reports of detrimental effects of cigarette smoking alone on sperm parameters.

Key words: Cigarette smoking, Sperm parameters, Male infertility

1. Introduction

Cigarette contains several compounds are known as chemical carcinogens and mutagenic in humans (Dube et al 1982 ; International Agency for Research on Cancer Tobacco smoking 1986) . Studies have revealed the presence of upwards of 4000 chemicals in cigarettes; many are toxic and around 40 cause cancer(Kumosani et al 2008).

Over the past two decades, there has been an increasing body of evidence that several environmental toxicants may impair semen quality and thus male fertility in animals as well as in the human (Sepaniak et al 2006; Rubes et al 2005; Evenson et al 2006). Several studies have reported a negative impact of smoking on human sperm parameters, correlated with cigarettes smoking duration. Most articles have demonstrated that smokers have lower semen volume, sperm count, sperm motility and viability compared with non-smokers. In addition, smokers showed increased seminal leukocytes, oval sperm percentage, head-piece spermatozoa defects percentage and spermatozoa with cytoplasmic droplets (Reina Bouvet et al 2007; Gaur et al 2007; Ramlau Hansen et al 2007; Hosseinzadeh Colagar et al 2007; Hassan et al 2009; Mostafa 2010) .

The exact pathophysiology underlying cigarette smoking and sperm deteriorating is unclear. Possible mechanisms include the effect of cigarette smoke on function of **sertoli and Leydig** cell and testicular microcirculation (Collin et al 1995).

Although male smoking seems to be associated with congenital abnormalities and childhood cancer, sperm mutagenicity of smoking is still debated (Marinelli et al 2004).

Available data do not conclusively report that smoking deteriorate male fertility. However, with much debate for its impact on various semen parameters, it is regarded as an infertility risk factor [Mostafa 2010]. Therefore, this study was done to evaluate consequences of cigarette smoking on sperm parameters.

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2. Material and Methods:

From 1 April 2010 to 1 January 2011 all of 280 male partners of infertile couples who presented to Saint Mary infertility center, Sari, Iran for infertility evaluation after obtaining their written agreement to entering the study and exclusion of patients with excluded criteria were interred in this study. Semen samples were obtained by masturbation after 3 to 5 days of sexual limitation. Criteria parameters for a normal semen analysis result as described by WHO guideline, are semen volume ≥ 2 ml; sperm concentration ≥ 20×10^6 per ml; motility > 50% with forward progression; total sperm count > 40×10^6 sperm and morphology > 15% normal (WHO 1999).

Excluded criteria of the samples was included these cases: Alcohol use, addict person, suffering from known physical and mental diseases including all heart, renal and immune diseases, all kinds of cancers, hepatitis and diabetes mellitus and men who had previously experienced surgery in the genital and pelvic area, including vasectomy, orchidopexy , hernia surgery, azospermia and self-reported male sexual dysfunction. Smoking status was obtained from questionnaire form completed by the male couples on the day of sperm collection.

Smoking was known as cigarette smoking within 6 months prior to data collection. The dose of smoking was recorded as the number of cigarettes smoked per day.

ceased smoking >6 months prior to data collection were known non-smokers.

Smokers were divided three groups: mild (from 1 to 9 cigarettes per day), moderate (from 10 to 19 cigarettes per day) and heavy (up to 20 cigarettes per day).

Data was collected in the questionnaire forms and analyzed by SPSS. Independent sample t-test and Chi-Square test were used in this study. For all analyses, $P<0.05$ was defined statistically significant. This study was done after getting the license from ethical committee of Islamic Azad University, Sari Branch, Iran.

3. Results:

180 patients were entered in this study. There were 40(21.7%) smokers and 144(78.3%) non smokers. Because of the small number of men in each subgroup (mild, moderate and heavy smoker), the analysis of the results was limited to the two main groups: smokers and non-smokers. (Table 1)

The age (P= o.398) and body mass index (P= 0.123) of patients were not significantly different in both groups. (Table 2)

There is no significant difference in sperm parameters in smoker and non smoker groups.(Table 3)

There is no significant difference in normal semen analysis result (as described by WHO guideline) in smoker and nonsmoker men in infertile couples. (table4)

Table 1: Smoking status among smoker men in infertile couples

Smoking status	patients number	percentage
Mild smoker	2	5
Moderate smoker	37	92.5
Heavy smoker	1	2.5

Table 2: Patients characteristic

Variables	smoker (n=40)	nonsmoker (n=144)	P-value
Age	36.30±7.76	35.23±6.81	P= o.398
BMI	25.49± 5.01	26.82±3.46	P= 0.123

Table3: comparing of semen analyses in smoker and nonsmoker men in infertile couples

Sperm parameters	smoker	nonsmoker	P-value
Sperm density	47.15±32.32	50.34±28.44	P= 0.543
Motility	44.50 ±20.24	45.47 ±16.93	P= 0.338
Semen volume	3.20 ±4.48	2.58±0.840	P= o.117
Normal morphology	18.60±9.15	18.52±10.26	P= 0.965

Table4: comparing of normal semen analysis result (as described by WHO guideline in smoker and nonsmoker men in infertile couples

Sperm parameters	smoker	nonsmoker	P-value
Sperm concentration $\geq 20 \times 10^6$ per ml	31(77.5%)	120(83.3%)	P= 0.263
Motility > 50% with forward progression	20(50.0%)	61(42.4%)	P= 0.247
Semen volume ≥ 2 ml	37(92.5%)	139(96.5%)	P= o.239
Morphology > 15% normal	32(80%)	120(83.3%)	P= 0.389

4. Discussion:

The results of our study showed that cigarette smoking does not appear to adversely affect sperm parameters. Although different researches have demonstrated that cigarette smoking is associated with abnormal semen parameters (Chia et al 1994; Merino et al 1998), others found no relationship (Vogt et al 1986; Osser et al 1992). (Merino et al 1998) reported that smokers had lower sperm density, lower percentage of normal sperm morphology and a lower percentage of motile sperms than smokers. Other study showed that smokers men have poor sperm density, viability, forward progression than non smokers (Zhang et al 2000). The data presented in our study is not consistent with that of Zhang et al and Merino et al .

(Osser et al 1992) reported that no statistically significant effect of cigarette smoking on sperm density, motility or morphologic features of sperm was detected. Nor was any significant difference in sperm quality, except for semen volume and total sperm count, disclosed between men in the different smoking categories or between heavy smokers and nonsmoking men.

In one study, the effect of cigarette smoking on conventional semen parameters was studied in voluntary men of reproductive age. They demonstrated that the only clear difference between men with smoking habits and non smoker men was in sperm motility and motility decreased more rapidly (p 0.007) in heavy smokers than nonsmokers (Saaranen et al 1987)

(Mostafa 2010) showed that although some smokers may not experience reduced fertility, men with marginal semen quality can benefit from quitting smoking.

Despite results of some studies, in this study population sperm parameters were not affected by smoking.

While quitting smoking is clearly beneficial in terms of enhancing general health, more research is necessary to evaluate its role in male fertility.

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