

## Semen Quality of Infertile Couples--Comparison Between Smokers and Non-Smokers

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### ABSTRACT:

#### BACKGROUND:

The effect of cigarette smoking on spermatogenesis is unclear. Previous studies suggest a deleterious effect of cigarette smoking on semen on semen quality ,but their results have not been consistent.

#### OBJECTIVE:

To compare the various semen parameters of infertile cigarette smokers with infertile non-smokers, to study the effect of cigarette smoking on semen quality.

#### METHODS:

Semen samples of 66 cigarette smokers and 70 non-smokers infertile patients were included in the study. As far as possible; other factors which might influence semen quality were eliminated. Seminal parameters, when taken together, indicated the presence or absence of the three main semen variables: asthenospermia (A), oligospermia (O), and normospermia (N). Smokers were categorized as light, moderate and heavy smokers. Semen samples were examined for Asthenospermia and oligospermia, according to World Health Organization guidelines.

#### RESULTS:

In our study, 25 non-smokers had normospermia (N) with their semen parameters falling within the normal ranges. In contrast, samples from 16 smokers qualified as N. This finding underscores the fact that smoking certainly has an adverse influence on the semen quality, as concluded in several other studies. Asthenospermia (A) was the most dominant semen variable contributing to the semen quality of smokers (n = 34) as well as non-smokers (n = 31). Statistical analysis using Pearson chi-squared and t-test found no statistically significant effect of cigarette smoking on sperm density; motility or morphologic features of sperm were detected.

#### CONCLUSION:

Our study shows a limited effect of smoking on conventional sperm parameters.

**KEY WORDS:** infertility, cigarette smoking, asthenospermia.

### INTRODUCTION:

Infertility is a common problem affecting one in ten couples. As a large number of men smokes worldwide and the fact that cigarette smoke contains known mutagens and carcinogens, there has been much concern that smoking may have unfavorable effects on male reproduction.<sup>(1, 2)</sup>

The clinical studies on the relationship between smoking and male reproduction, the literature results have been non-conclusive. Several studies from different parts of the world have observed that cigarette smoking has an effect on the semen quality, especially in those who are heavy smokers or who

have been smoking for many years<sup>(3, 4, 5, 6)</sup>.

The pathophysiologic mechanisms are not yet clearly understood, but one of the most likely hypotheses is Oxidants in cigarette smoke are thought to damage sperm DNA, and smokers have more oxidative DNA damage in their sperm than do non-smokers<sup>(7, 8, 9)</sup>.

Measures of semen quality are used as surrogate measures of male fertility in clinical andrology.<sup>(10, 11)</sup> Over the years, undue importance has been given to sperm count, though it is meaningless without the required motility or normal sperm morphology.

The aim of our study was to compare the various semen parameters of infertile men who were cigarette smokers with non-smoking infertile men, in order to ascertain the effect of cigarette smoking on the quality of seminal fluid.

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## PATIENTS AND METHOD:

In this study, the semen quality of 136 selected idiopathic infertile patients was considered. Semen samples were collected by masturbation after 3-4 days of abstinence.<sup>[2]</sup> Only one sample per patient was included in the study. All samples were kept at  $37 \pm 2^\circ\text{C}$  and processed immediately after complete liquefaction. Semen examination (semen volume and sperm density, motility, and morphology) was performed as soon as the samples were liquefied according to the routine method described by the World Health Organization (WHO)<sup>(2, 11)</sup>.

Work-up for infertility included a medical history, physical examination assessing testicular volume and spermatic cord, Medical history and particularly any history of previous genital disease including the number of cigarettes per day.

Only patients with primary infertility, who were either smokers or non-smokers, were selected. Patients labeled as having primary infertility were married at least for one year and none of them were using any contraceptive measures for the past one year or longer.

**The following were excluded from the study group:**

1. Patients with occupational exposure to chemicals or excessive heat, e.g. chemical factories, and bakeries.
2. Patients with history of injury to the testes, varicocele, hydrocoele, and undescended testis or its corrective surgery.
3. Patients with history of any chronic illness, such as diabetes mellitus, hypertension.
4. Azoospermic individuals.

Seminal parameters, when taken together, indicated the presence or absence of the three main semen variables: asthenospermia (A), oligospermia (O), and normospermia (N) which acted as pointers to specific need for further specific evaluation.

Samples showing A were those which had less than 50 % spermatozoa showing forward progression; samples of O had less than 20 million spermatozoa/ml of ejaculate.<sup>[11]</sup> These two variables were present either individually or in combination asthenospermia and oligospermia (A+O). Samples with normospermia (N) were those which had all the parameters within the recommended ranges and were thus categorized separately.<sup>[10, 12]</sup> Semen samples were microscopically examined for sperm density, sperm motility and morphology.

## RESULTS:

In this study, the semen quality of 136 selected idiopathic infertile patients was considered. Patients were divided into smokers (n° 66) and non-smokers (n°70). Mean age of infertile patients were  $31.73 \pm 6.59$  yr. Mean duration of infertility were  $2.6 \pm 2.7$  yr. regarding the age and duration of infertile individuals in both groups were nearly comparable. Thus, the selected study group of 66 smokers and 70 strict non-smokers had

only one known factor which differentiated them, i.e. cigarette smoking.

Based on their detailed smoking history, the smokers (n = 66) were divided into categories according to the number of cigarettes smoked daily. Those who smoked 20 or less cigarettes per day were designated light smokers (n = 3); those who smoked 21–40 cigarettes per day were moderate smokers (n = 25); and those who smoked 41 or more cigarettes per day were heavy smokers (n = 38) (Table I).

**Table I: Smoking status of cases included in the study**

Smoking status	Number of cigarettes/day	Number of cases (n)
Non-smokers		70
Smokers		66
Light	less than 20	3
Moderate	more than 20	25
Heavy	40 and more	38

Table II: Semen variables between smokers and non smokers

Semen variables	Smokers Light & moderate (n=28) %	Heavy (n=38) %	Total N=66	Non smokers N=70	P. value
Asthenospermia A	13 (46)	٢١(55.2)	٣٤	31	0.921
Oligospermia & asthenospermia A+O	3 (10.7)	٦ (15.7)	٩	7	
Oligospermia O	٤ (14.2)	3 (7.8)	٧	7	
Normospermia N	8 28.5	١٧ (21)	٢٥	25	

Among smokers, the most dominant semen variable was Asthenospermia (n = 34). Among non-smokers, isolated A also is dominant variable (n=31).

We can see the result of normal N seminal fluid variable were found in higher number in non smoker than smoker group (25 versus 16), but statistically non significant. But, no difference seen between the smokers whether moderate or heavy regarding seminal variables. In sperm morphology there was no significant difference between smokers and non-smokers.

#### DISCUSSION:

Smoking is a lifestyle hazard for both active and passive smokers. Although much is known now about the carcinogens in tobacco cigarette smoke and their resultant effects on organs like lungs and urinary bladder, their effects on fertility status have been less documented. In our study, 25 non-smokers had N with their semen parameters falling within the normal ranges. In contrast, samples from only sixteen smokers qualified as N. This finding underscores the fact that smoking certainly has an adverse influence on the semen quality, as concluded in several other studies<sup>(3, 4, 5)</sup>.

Asthenospermia (A) was the most dominant semen variable contributing to the semen quality of smokers (n = 34) as well as non-smokers (n = 31), individually as well as in combination with other variable like oligospermia, (A+O) (Table II). A appears to be a premier factor contributing to the infertile status of a male<sup>(13)</sup>.

Regarding sperm count we found no difference between the smokers and non smokers.

The effect of cigarette smoking on spermatogenesis is unclear. A meta-analysis of 21 studies on the effect of cigarette smoking on semen quality revealed that smoking lowered sperm density by 13% to 17%, although 14 of the studies did not document an effect<sup>(14,15,16)</sup>. However, smoking may serve as a cofactor for patients with other causes of male infertility, and can impair human semen quality<sup>(17)</sup>.

Researchers have variously concluded that toxins in cigarette smoke reach the male reproductive system, and their effects, though still under research,<sup>(18)</sup> are mainly due to their direct interaction with seminal fluid components and the accessory glands, which contribute their secretions to the seminal fluid, leading to its increased viscosity, reduced seminal volume and delayed liquefaction time, thus reducing forward linear progression of spermatozoa, manifesting as A<sup>(2,7)</sup>. In studies conducted on fertile men, it was observed that those who were smokers showed a reduction in semen volume in comparison to non-smokers; and this reduction in semen volume was in proportion to the number of cigarettes smoked per day<sup>(19)</sup>.

While Hassa et al didn't find the number of packages/year (cumulative dose of cigarettes) correlate with any of the sperm parameters<sup>(20)</sup>.

Unfortunately, we didn't include the duration of smoking in data of patients in our study.

#### CONCLUSION:

The study shows a limited effect of smoking on conventional sperm parameters. More standardized laboratory assays and increased sample size studies involving subjects with various level of exposure to smoking are needed to better establish the role of smoking in male infertility.

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