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Research Article

The Effect of Smoking, Hookah and Tobacco Consumption on Sperms Morphological Forms - Pilot Study

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Abstract

Background: Lifestyle factors like smoking or tobacco have negative impacts on male reproduction. Tobacco chewing and smoking habits in linked to significant decrease in semen quality, particularly sperm morphology. Semen morphology is an important parameter related to pregnancy. This study was designed to evaluate the effect of smoking, hookah and tobacco consumption on sperm quality and the related parameters such as sperm concentration and motility with focusing in detailed sperm morphology.

Patients and Methods: In this pilot study, we examined 20 male patients including control (patients with normal sperms' morphology and no history of nicotine consumption), smokers, Hookah and tobacco consumers. Semen analysis was done according to WHO 2010. For sperm morphology, smears made from semen samples and processed by using H&E technique. Normal and the abnormal sperms observed under 100× oil immersion microscope. Each of the spermatozoa was examined for head, mid piece and tail defects. A total of 200 spermatozoa were observed for defects and expressed in percentage for each sample.

Results: Patients' classified according to nicotine consumption into control 3, smokers 5, tobacco 5, hookah 2 and multiple 5. Nicotine consumption (smoking, Hookah and tobacco) strongly associated with semen analysis final report (P = 0.006). Sample volume mean 2.97 ± 1.11 ml. Sperm concentration 75 ± 51.5 Millions/ml. Sperm motility 47.05 ± 34.56 Millions/ml. Sperm morphology 2.85 ± 0.99%, Head malformation 72.2 ± 13.8%, Mid piece malformation 16.2 ± 9.5%, Tail malformation 7.4 ± 6.8% and Multiple defects 0.5 ± 1.1%. However, one case of triple tail sperm has been reported. Significant differences in means have been found regarding sperm concentration (P = 0.023), motility (P = 0.002), and morphology (P = 0.045).

Conclusion: Nicotine consumption significantly decrease semen quality by lowering concentration, motility and morphology. Different forms of sperm abnormalities have been reported including one case of triple tail sperm.

Keywords: *Nicotine; Sperm Morphology; Male Fertility*

Introduction

Lifestyle factors as well smoking or tobacco have negative impacts on male reproduction, Nicotine consumption in any form has adverse effect on the semen parameters and thus affecting male fertility [1-4]. Tobacco has significant decrease in semen quality, particularly

sperm morphology, thus affect pregnancy [3]. In Sudan the prevalence of toombak use (34%) and cigarette smoking (12%) among males. The highest rates of toombak use were found among the male population ages 30 years and older (mean 46.6%) [5].

In addition to negative impacts on male fertility, smoking also negatively contribute to assisted reproduction. It may reduce the success of assisted reproduction techniques, such as *in vitro* fertilization (IVF) and intracytoplasmic sperm injection (ICSI). Paternal smoking has been suggested to contribute to decreased IVF success rates [6,7]. Paternal smoking has been suggested to contribute to IVF and ICSI failure [6]. In addition, male partner's smoking resulted in a significantly lower chance of achieving a 12-week pregnancy, suggesting that smoking and increasing male age affect fertility potential [8]. Furthermore, paternal smoking associated with significantly reduced success rates for IVF (18% vs 32% in nonsmokers) and ICSI (22% vs 38% in nonsmokers) [9]. Moreover, smoking male partner had a significantly lower live birth rate with IVF or ICSI (7.8% vs 21.1% in nonsmoking males) [10].

A retrospective study demonstrated that men who had prenatal exposure to smoking had a 20.1% lower sperm density as adults than those without such exposure [11]. Mothers smoking during pregnancy (i.e. > 10 cigarettes per day) resulted in men whom had a 48% lower sperm density than men not exposed to cigarettes in utero [12]. Although the studies in this area are limited, exposure to cigarettes in utero may have an impact on males' fertility in future [6].

Aim of the Study

The aim of this study was to evaluate the effect of smoking, hookah and tobacco consumption on semen quality with focusing on detailed sperm morphology.

Subjects and Methods

In this study, 20 male patients grouped into five groups according to nicotine consumption form of use as control, smokers, Hookah, tobacco and combination. Informed consent made for all patients.

Semen analysis was done according to WHO 2010 [13]. For sperm morphology, smears made from semen samples and processed by using H&E technique. Sperm morphological abnormalities identified according to Gardner., *et al* [14].

Statistical analysis done by using SPSS v20, descriptive statistics, Chi^2 and ANOVA tests used at 95% CI.

Results

Age of patients ranged between 22 - 54 years with mean of 36.6 ± 8.1 years. Frequencies of age distribution among groups shown in figure 1.

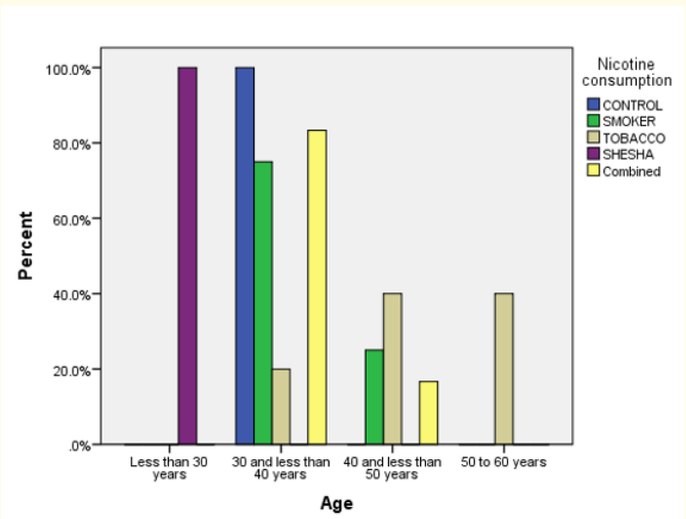

Figure 1: *Age distribution among groups. Pearson chi-square (P = 0.003).*

Sample volume mean 2.97 ± 1.1 ml. Sperm concentration mean 75 ± 51.5 Millions/ml. Sperm motility mean 47.1 ± 34.6 Millions/ml, 57.5 ± 16.7%. Descriptive statistics regarding sample volume, concentration, motility and morphology among study groups displayed in table 1. Nicotine consumption (smoking, Hookah and tobacco) strongly associated with semen analysis final remarks (P = 0.006). Distribution of final remarks among study groups shown in figure 2. Significant associations have been found regarding sperm concentration (P = 0.043), motility (P = 0.008). Moreover, Significant statistically differences found between the groups regarding: Final remarks (P = 0.032), Sperm concentration (P = 0.023), Sperm motility (P = 0.002), Sperm progressive motility (P = 0.002), Sluggish sperms (P = 0.025), Sperm morphology (P = 0.045).

Groups		Sample volume	Concentration Millions/ml	Motility %	Progressive motility %	Morphology %
Control	Minimum	1.7	122	14.29	4	57.14
	Maximum	3.5	160	25.00	4	77.87
	Mean	2.900	140.67	19.9258	4.00	70.0039
	SD	1.0392	19.009	5.37952	.000	11.22998
Smoker	Minimum	2.5	8	.00	1	25.00
	Maximum	5.0	100	21.28	3	76.60
	Mean	3.800	37.80	4.2553	2.20	49.8101
	SD	.9083	37.937	9.51518	.837	18.41748
Tobacco	Minimum	2.0	12	.00	2	33.33
	Maximum	2.5	145	14.29	4	50.00
	Mean	2.300	84.60	8.9235	2.60	44.7834
	SD	.2739	62.568	6.21142	.894	7.13891
Shesha	Minimum	3.5	21	.00	2	42.86
	Maximum	3.5	21	.00	2	42.86
	Mean	3.500	21.00	.0000	2.00	42.8571
	SD	.	.	.	.	.
Combined	Minimum	.7	45	12.50	2	64.44
	Maximum	5.0	120	22.22	4	84.21
	Mean	2.783	74.17	19.2958	3.17	73.1092
	SD	1.5171	31.846	3.72015	.983	7.64311

Table 1: *Descriptive statistics regarding sample volume, concentration, motility, progressive motility and morphology among study groups.*

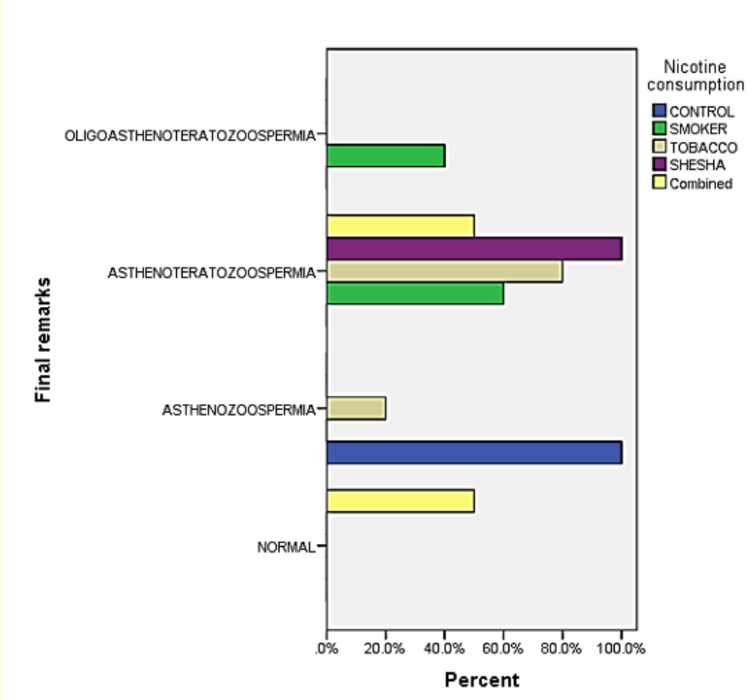

Figure 1: *Age distribution among groups. Pearson chi-square (P = 0.003).*

Sperm morphology mean 2.85 ± 0.99%. Head abnormalities 72.2 ± 13.8%. Mid piece abnormalities 16.2 ± 9.5%. Tail abnormalities 7.4 ± 6.8%. Multiple defects 0.5 ± 1.1%. One case of triple tail sperm has been reported. Distribution of sperm morphology percentages between study groups shown in figure 3 and 4.

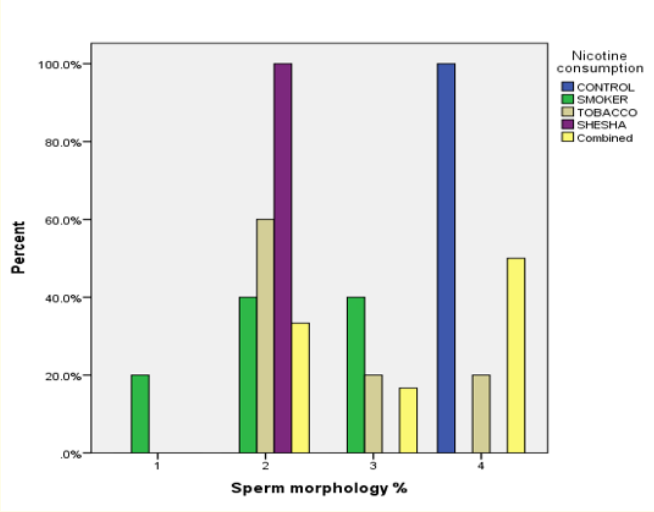

Figure 3: *Distribution of sperm morphology percentages between study groups.*

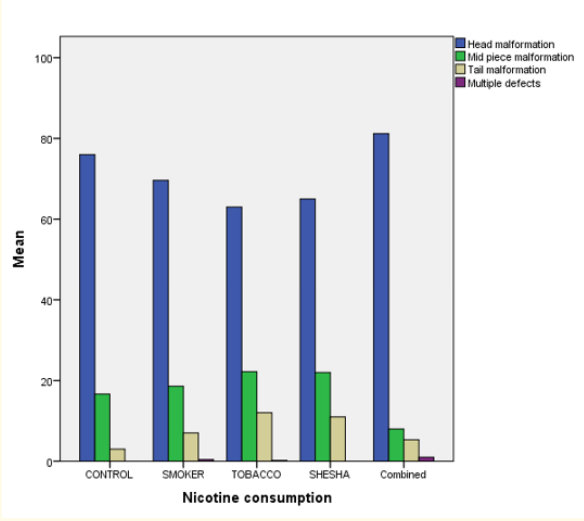

Figure 4: *Distribution of head, mid piece, tail and multiple abnormalities among study groups.*

Head abnormalities more frequent in combined group comparing to tobacco group (P = 0.031). Mid piece abnormalities more frequent in smoker and tobacco groups comparing to combined group (P = 0.048, 0.011) respectively. Tail abnormalities showed no significant differences between groups.

Germ cells and spermatids more frequent in smoker comparing to tobacco group (P = 0.027). Megalo head and proximal cytoplasmic droplet more frequent in hookah group (P = 0.001, 0.039) respectively. Vacuolated head more frequent in tobacco group (P = 0.05) (Figure 5).

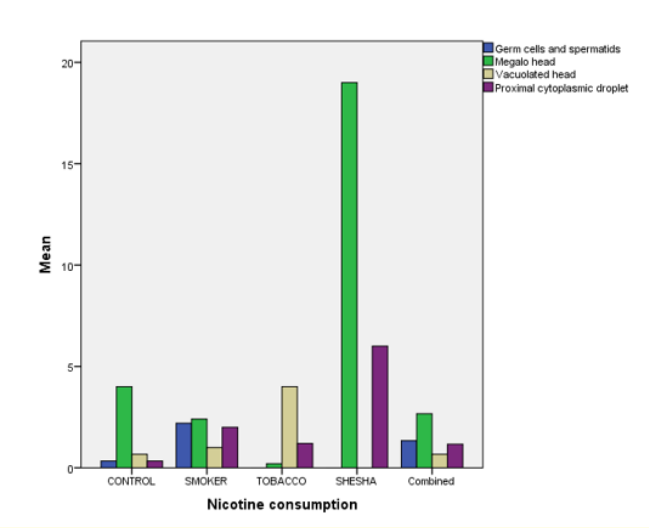

Figure 5: *Distribution of frequencies of germ cells and spermatids, megalo head, proximal cytoplasmic droplet and vacuolated head among study groups.*

Discussion

Decrease of semen quality including sperm motility, sperm viability and sperm morphological abnormalities has been reported regarding different forms of Nicotine consumption [4,15-17], table 2 showed some of published data in contrast to our study regarding concentration, motility, progressive motility and morphology.

Author, Year	Study groups	P values			
		Concentration	Motility	Progressive motility	Morphology
Present study 2020	Smokers, tobacco, hookah and combination vs control	0.023*	0.002*	0.002*	0.045*
Mostafa., *et al*. 2018 [1]	Smokers vs control	0.006*	0.001*	0.001*	0.001*
Gojiya., *et al*. 2018 [16]	Smokers, tobacco, and combination vs control	0.031*	0.0001*	0.0002*	0.0303*
Fawzy., *et al*. 2011 [4]	Smokers and shisha vs control	0.004*	0.06	-	0.001*
Makki., *et al*. 2018 [17]	Tobacco vs control	0.001*	-	0.4	0.000*
* P value significant when it < 0.05					

Table 2: *Association of nicotine consumption with sperms' parameters.*

Although data regarding effect of tobacco on sperms' morphological forms are lacking, positive correlation of head defect and cytoplasmic droplet with increasing use of the number of chewing tobacco packets (P = 0.001) reported by Sunanda., *et al* [3]. We report that head abnormalities more frequent in combined group comparing to tobacco group (P = 0.031). Megalo head and proximal cytoplasmic droplet more frequent in hookah group (P = 0.001, 0.039) respectively. Vacuolated head more frequent in tobacco group (P = 0.05).

Conclusion

Nicotine consumption significantly decrease semen quality by lowering concentration, motility and morphology. Different forms of sperm abnormalities have been reported including one case of triple tail sperm. Clinicians and fertility counselors need to be more focused to control male infertility by intimating the awareness of nicotine addiction to enhance the fertility potential. Sperm morphology shown to be an important parameter related to pregnancy, in this context sperm morphology should be examined in detailed manner accordingly.

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