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Effect of Lifestyle Factors on Semen Quality

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ABSTRACT- Background: Declining trend in semen quality is receiving attention worldwide. The aim of the study to investigate the role of lifestyle factors with respect to semen quality.
Methods: Semen samples were collected from 351 male partners attending OPD of Obstetrics and Gynecology at civil hospital and IKD hospital, Ahmedabad, India. They were subjected to assess the quality of semen according to WHO criteria and semen quality were analyzed with respect to self reported history of tobacco smoking and/or chewing and alcohol consumption as lifestyle factors.
Results: The result revealed that sperm count was lower in subjects with habit of tobacco smoking, chewing and alcohol consumption as compared to subjects without such habits and decline was found statistically significant among smokers. Total progressive motility and normal morphology percentage was significantly decreased in tobacco chewers compared to non-chewers. Further analysis of data with respect to alcohol consumption indicated non-significantly lower total progressive motility and normal sperm morphology percentage as compared to subjects with no such habit.
Conclusion: The data obtained suggested, the role of lifestyle factors especially tobacco smoking and chewing in declining semen quality.

Key-words- Semen quality, Tobacco, Alcohol, Lifestyle, Sperm motility, Smoking

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INTRODUCTION

One of the most painful problems of marital life is infertility. There are various causes of infertility such as endometriosis, ovulatory disorder, chromosomal abnormalities, semen quality and idiopathic infertility. The current approaches in the treatment of infertility, the problem could be resolved to some extent by adopting modern treatment and procedures as well as healthy lifestyle. A recent study shows that in infertile couples, 40% male partners are responsible for fertility problems while 60% are because of female partners [1]. In last few years remarkable changes have been observed in our environment, diet and lifestyle. The effect of lifestyle factors on human reproductive potential might be vary because of circumstances or individual susceptibility.

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Various lifestyle factors such as alcohol, tobacco smoking and chewing found to have an adverse effect on general health status of human. It is widely recognized fact that tobacco is health hazard and consider as major cause of life threatening disorders. Approximately one third of world population specifically older than 15 years consuming tobacco [2-3]. Tobacco smoking or chewing is one of the most potentially hazardous habits around the world but tobacco chewing mostly prevalent in South East Asia. In recent years there are increasing evidences of possible effect of lifestyle factors on reproductive health status of humans. A few studies reported significant decrement in the rate of conception due to smoking in women [4-5]. These factors might affect male reproductive system by interfering in process of spermatogenesis, sperm DNA and chromatin integrity and hormonal regulation.

Apart from the tobacco consumption, alcohol also reported to have a negative effect on the male reproductive system. Earlier studies found that alcohol consumption damage male reproductive system by directly affected testicular function [6]. There is a report which indicated that among the total infertile men population, 42% of infertile men consume alcohol [7]. This report suggests that alcohol as a major precursor of male infertility. However, a number of reports are available in which semen quality parameters had been examined in alcohol consuming subjects but results

were inconsistent [8-11]. Keeping in a view of this present study was carried out to explore the relationship if any between lifestyle factors and semen quality.

MATERIALS AND METHODS

This research paper is a part of major study on male infertility carried out between April, 2011 to December 2014 at Reproductive and Cytotoxicology department of National Institute of occupational Health, for which the ethical clearance was obtained from the Ethics Committee of National Institute of Occupational Health, Ahmedabad, India. The study was carried out among the 351 male subjects who attended for infertility problems. Reproductive age group of 20 - 45 years male attendees from the Out Patient Department (OPD) were enrolled. Subjects diagnosed with any urogenital problems, sexually transmitted diseases, or any other critical disorders which may impact on male reproduction were excluded. From each subject, a written consent was obtained. The personal information such as name, weight, age, height, history of tobacco smoking and chewing, consumption of alcohol etc. was recorded on pre-designed and pretested proforma. Semen samples were obtained by masturbation within 3-6 days of sexual abstinence in a wide-mouth sterile container. Before sample collection, each subject was informed about the hygiene aspects and to avoid any spillage.

Motile sperms were evaluated as per WHO criteria [12]. Liquefy semen sample was taken on a clean micro glass slide and covered with a cover slip. The preparation was allowed to settle for few seconds and the slide was observed using 400x magnifications under the light microscope (Zeneval, Carl Zeiss, Germany). At least 200 sperm cells were observed. During the evaluation of sperm motility, fast progressive sperms were counted first, followed by slow progressive sperms. After counting the motile sperms, non-motile sperms than immotile sperms were counted in the same microscopic field. For each category sperm percentage was calculated.

The concentration of spermatozoa was determined as per WHO guidelines [13]. Dilution of the semen sample was carried out using semen diluent (5% of $NaHCO_3$, 35% v/v neutral formalin). The sperm count was carried out with the help of Neubauer's chamber. Two isolated aliquots of diluted semen were loaded in the Neubauer's chamber. Two separate readings were taken and the mean of the two was considered.

Sperm morphology was checked in semen samples using papanicolaou staining method [13]. The analysis of sperm morphology was carried out using light microscope (Zeneval, Carl Zeiss, Germany) at 1000x under oil immersion lens. A total of two hundred sperms were counted and categorized as below:

(I) Morphologically normal sperm: Sperm with an oval head followed by distinct midpiece region, normal tail and clear well defined acrosomal area (~40-70% of the head area).

(II) Morphologically defective sperms: Head shape abnormality, midpiece defect, tail and multiple defects.

Statistical analysis of the data was performed using SPSS 16.0 for windows. Descriptive statistics are reported as Mean ± SE. A significant P value of less than 0.05 will be considered statistically significant.

RESULTS

The general characteristics of the study population such as area of residence, educational status and dietary habits have been shown in Table-1. The area wise distribution of subjects indicated that 64 (18.24%) subjects were from the rural area while 287 (81.76%) subjects belonged to the urban area. Distribution of the subjects on the basis of their literacy showed that about 7.70% of the subjects had received no formal education, while about 51.56% and 17.38% of the subjects were educated up to primary and secondary level respectively. Moreover, about 23.36% of the subjects had received education up to graduate and higher level. Dietary habits of the study subjects revealed that about 40.17% of the subjects were having habit of consuming mixed food (non-vegetarian and vegetarian food) and 59.83% subjects were vegetarian.

Table 1: Characteristics of the study subjects

Characteristics	Variables	Number of Subjects (%)
Area	Rural	64 (18.24)
	Urban	287 (81.76)
Education Status	Illiterate	27 (7.70)
	Primary	181 (51.56)
	Secondary	61 (17.38)
	Graduate or Higher	82 (23.36)
Dietary Habits	Vegetarian	210 (59.83)
	Non-Vegetarian	141 (40.17)

Distribution of the study subjects on the basis of their lifestyle has been shown in Table 2. The subjects with habit of tobacco smoking or chewing and/or alcohol consumption were considered as lifestyle exposed. About 40.46% of the subjects were not exposed to any lifestyle factors whereas 59.54% subjects with habit of either tobacco smoking/ chewing and or alcohol consumption alone or in combination. Further analysis of the data revealed that 3.34%, 5.74% and 53.12% subjects were only alcoholic, smokers and chewers respectively whereas 7.18% study population having all the three habits and 30.62% subject's with combination of any of the two habits.

Table 2: Distribution of the study subjects based on their lifestyle habits like tobacco smoking/ chewing and/or alcohol

Lifestyle habits	Number of subjects (%)
No Habit	142 (40.46)
Any Habits	209 (59.54)
Only Alcoholics	7 (3.34)
Only Smokers	12 (5.74)
Only Chewers	111 (53.12)
Any of two habits (Smokers + Chewers/ Chewers + Alcoholics/ Alcoholics + Smokers)	64 (30.62)
All three habits (Smokers + Chewers + Alcoholics)	15 (7.18)

Distribution of study subjects on the basis of sperm count, motility and morphology depicted in Table 3. Results revealed that 20 (5.7%) subjects were azoospermic, 88 (25.1%) were oligozoospermic while 243 (69.2%) had sperm count greater than equal to the WHO recommended limit of 20 millions/ml. Analysis of sperm motility data revealed that 128 (38.7%) subjects were asthenozoospermic, while 203 (61.3%) had total progressive motile sperm greater than or equal to 50. Further, sperm morphology data showed that 114 (34.4%) subjects were teratozoospermic while 217 (65.6%) subjects were having normal morphology.

Table 3: Classification of subjects based on semen parameters

Parameters	Category	WHO criteria	Number of subjects (%)
Sperm count	Azoospermic	No sperms	20 (5.7)
	Oligozoospermic	< 20 million/ml	88 (25.1)
	Normal	≥ 20 million/ml	243 (69.2)
Sperm motility*	Asthenozoospermic	Grade I & II motility < 50	128 (38.7)
	Normal	Grade I & II motility ≥ 50	203 (61.3)
Sperm morphology*	Teratozoospermic	Morphologically normal <14	114 (34.4)
	Normal	Morphologically normal ≥ 14	217 (65.6)

Azoospermic excluded

The effects of lifestyle factors such as smoking, chewing and alcohol on semen quality are shown in Table 4. Sperm count was significantly ($p<0.001$) lower in smokers as compared to non-smokers while chewers and alcohol user also have lower sperm count (statistically non-significant) with respect to subjects with normal lifestyle. Total progressive motility and normal morphology percent was significantly ($p<0.05$) lower in chewers as compared to non-chewers. Subjects with habit of alcohol consumption having non-significantly lower total progressive motility and percent normal sperm morphology with respect to non-alcoholic subjects.

Table 4: Comparison of semen parameters with respect to their lifestyle habits

Parameter	Sperm Count (millions/ml) (n=331)	Total Progressive Motility (%) (n=331)	Normal Morphology (%) (n=331)
Smokers (n=60)	38.70 ± 1.56#	49.25 ± 0.78	16.65 ± 0.42
Non-smokers (n=271)	52.96 ± 4.37	52.04 ± 1.86	17.23 ± 0.84
Chewers (n=168)	39.60 ± 1.88	48.32 ± 1.03*	15.65 ± 0.51*
Non-chewers (n=163)	42.84 ± 2.40	51.22 ± 1.00	17.89 ± 0.54
Alcoholic (n=54)	40.23 ± 1.61	49.40 ± 1.86	16.61 ± 0.40
Non-alcoholic (277)	46.46 ± 4.44	49.82 ± 0.78	17.47 ± 1.02

Values are in Mean ± S.E; #p<0.001, *p<0.05

DISCUSSION

Regardless of any form the tobacco is consumed, it negatively affects human health. Smokeless tobacco is highly addictive substance and more prevalent in south Asian countries and its use is expanding because tobacco smoking is banned in public places in most of the countries. The data obtained indicated detrimental effect of tobacco chewing and/or smoking on semen variables. Analysis of data found that a significant decrement in sperm count was observed in smokers as compared to non-smokers. Similar results were also found by Reina [14]. They found altered sperm count in smoker group as compared to non-smoker group. In the present study sperm motility and normal sperm morphology percentage was also non-significantly declined among smokers with respect to non-smokers. Tobacco chewers were also found to have significantly low sperm motility and morphology. Earlier report [15] found that tobacco chewing group of Indian men who under goes for fertility evaluation were having significantly decline in semen quality parameters.

Lower sperm count, motility and normal sperm morphology was found among alcohol consumers. However these declines were statistically non-significant with respect to non-alcohol consumers. Whereas Martini [16] found significant reduction in number of spermatozoa, number of motile sperm in alcohol consumers with respect to non-alcohol consumers. Earlier study [17] also found a significant decline in sperm concentration of men with alcohol dependence syndrome. Experimental study also found significant decrement in sperm count and sperm motility in animal treated with 30% ethanol (v/v) with respect to control animal group [18]. Whereas no correlation was found between sperm concentration, progressively motile sperm and normal morphology in healthy male volunteers with habituation of alcohol by Stutz [19]. However most of the reports found that alcohol intake is associated with deterioration of semen quality parameters.

Interruption in hypothalamo–pituitary–gonadal system or hypoxia caused by the disruption of testicular microcirculation might be one of the possible explanations for the negative effect of tobacco on semen quality. Various chemical components' which are present in tobacco smoke found to have toxic effect on germinative epithelium of testis [20]. Chemical constituents of tobacco smoke or even tobacco chewing might affect the testicular structure and function which might be associated with deteriorating of sperm quality.

CONCLUSIONS

The present data suggest that lifestyle factors such as tobacco smoking or chewing and/or alcohol consumption have some role in deteriorating male reproduction. Therefore, awareness programmers should be conducted towards specific group who has having such habits. In addition, the person who has habit of tobacco chewing or smoking and/or alcohol consumption undergoing for infertility treatment should be advised about the adverse effect of such habits on male reproductive function.

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