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Original Research Article

Adverse Effects of Excessive Consumption of Alcohol and Smoking on Semen Analytical Parameters at Tertiary Care Hospital

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Abstract:

Background: This study investigated the impact of lifestyle habits such as smoking and alcohol consumption on semen quality. Semen analysis is a crucial, cost-effective method of evaluating male infertility.

Methods: The study was conducted at Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, from January 2023 to June 2024, which included 139 male participants aged 20 years and above. Semen samples were collected and analysed for various parameters, such as semen volume, sperm concentration, sperm motility, and morphology.

Results: Significant differences were observed between smokers and non-smokers, as well between alcoholics and non-alcoholics. Non-smokers and non-alcoholics exhibited higher semen quality compared to their counterparts did. Statistical analysis revealed that sperm concentration was significantly different ($p < 0.001$) between non-alcoholics and alcoholics.

Conclusion: Lifestyle choices such as smoking and excessive alcohol consumption adversely affect semen quality. Abstinence from these habits can enhance reproductive health and semen quality.

Keywords: Semen Analysis, Infertility, Life Style Habits, Smoking, Alcohol Consumption.

Introduction

Testis produces the semen which contains the spermatozoa and it is processed in the epididymis and receiving the secretions from the male accessory organs which includes the prostate gland, seminal vesicles, bulbourethral glands and also epididymis [1] the semen can be analyzed from the various parameters like nature of the spermatozoa, total number of spermatozoa, volume, sperm concentration. The motility, shape, viability and composition of the semen are parameters usually assess the quality of the semen.

These factors can responsible for identifying the reason behind the infertility in males.[2] Semen analysis is a simple and cost-effective screening method for evaluating male infertility. According to recent studies this analysis provides a result of qualitative and quantitative analysis of testicular function. The habits like alcoholism, tobacco chewing, smoking, are sensitive markers for the reason for male infertility. These habits may alter the testicular functions. [3,4] Hence the present study is focused on the effect of factors on the testicular function like cigarette smoking, tobacco chewing, and consuming alcohol people were observed, and did qualitative and the quantitative analysis of semen to compare with the control group were non habit persons

Material and methods

The study was conducted in the pathology department at Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore from January 2023 to June 2024

A total of 139 cases analysed for semen analysis in the central lab of Sapthagiri Hospital Bangalore were included in the study. All patients aged 20 years and above from the OPD and IPD referred from the OBG, Urology, and other departments were included in the study. Individuals with cryptorchidism, testicular atrophy, history of testicular injury, tuberculosis, and diabetes mellitus were excluded from the study. The detailed history

of the patient was noted. Semen samples were collected from all the patients by masturbation. The patient had not had sexual intercourse for at least 3-5 days before the collection of samples**. [5]** The semen sample was collected in a mouthed polypropylene bottle and processed and analysed by a qualified technician.

Physical examination of Semen:

Liquefaction: At normal temperature, a typical semen sample liquefies within 60 min. Samples may occasionally refuse to liquefy, in which case other procedures such as mechanical mixing or enzyme digestion (for example, with bromelain) can be required.

Color: After liquefaction or within an hour of following ejaculation, a sample of semen is studied. Semen is typically a uniform grey-opalescent substance that may seem less opaque at low sperm concentrations. When combined with blood, reddish-brown; in those with jaundice or vitamin supplements, yellow.

Volume: The volume of the ejaculate was measured with a graduated cylinder.

Viscosity: This is determined by gently aspirating into a 5-milliliter wide-bore pipette, letting the semen fall to the bottom due to gravity, and then measuring the thread length. A typical sample emerges from the pipette as tiny, distinct droplets. A drop with anomalous viscosity created a thread longer than two centimetres. An alternative method of determining viscosity is to insert a glass rod into the sample and measure the length of thread that forms when the rod is withdrawn; this thread should not be longer than two centimetres.

PH: To evaluate the PH of the semen, one drop was equally spread over a pH paper (pH range: 6-10). After 30 seconds, the colour change was compared to a calibration strip to determine the pH.

Microscopic examination: This study was approved by the institutional human ethics committee and informed consent was obtained from all participants. And the data were kept confidential.

The WHO Health Organisation has provided normal limits of reference for semen analysis. The values mentioned in the chart below represent the accepted 5th percentile for the parameters measured [6]

- Volume = >1.5 ml
- pH = >7.2
- Total sperm number = 39 million sperm per ejaculate or more
- Morphology = >4 percent normal forms using the Tygerberg method
- Vitality = >58% live sperm
- Progressive motility = >32%
- Total (progressive motility and non-progressive motility) = >40%
- No sperm agglutination
- Viscosity = <2 cm after liquefaction
- Optional investigations
- Mixed antiglobulin reaction test with <50% motile spermatozoa with bound particles
- Immunobead test with <50% motile spermato-zoa with bound beads
- Seminal fructose =>13 mc mol/ejaculate
- Seminal zinc = >2.4 mc mol/ejaculate
- Seminal neutral glucosidase = <20 milliunits /ejaculate

Statistical analysis: The data obtained were analysed by Unpaired t-test and independent samples Mann-Whitney U test using SPSS version 29.0.2.0 software to determining the level of significance of the observed effects. Mean values and standard deviations were calculated. A 'P' value of less than *0.05 was considered statically significant and **0.001 was considered highly significant.

Observation and results

Table 1: Data related to the distribution of semen quality in non-smokers and smokers by age group are shown in **table:1**, from the data, it is found that among the total sample of 139, found normozoospermia in age group 20-24 is 8 samples in non-smokers and 7 in smokers. The age group were 25-29, 14 were non-smokers, and 10 were smokers. The age group 30-34, 20, were non-smokers, and 14 were smokers. The age group were35-39, with 18 samples in non-smokers and 16 in smokers. The age group were 40-44, with seven samples in non-smokers and one in smokers. The age group was 45-49, two were non-smokers whereas one a smokers. Similarly, oligospermia in different age groups, 20-24 is one sample in non-smokers and seven in smokers. The age group was 25-29, 0 sample in non-smokers, and one in smokers. The age group 30-34, seven samples in non-smokers whereas 4 in smokers. The age group was 35-39, with one sample of non-smokers whereas 0 of smokers. The age group 40-44, one sample was non-smokers whereas three in smokers.

Table 2: Data related to the distribution of semen quality in non-alcoholics and alcoholics by age groups is shown in table: 2, which shows that among the total sample of 139, found normozoospermia in age group 20-24 was 9 samples in non-alcoholics group and one in the alcoholics group. The age group 25-29, 19 samples in non-alcoholics and five in alcoholics.

The age group were 30-34, with 30 samples in non-alcoholics and 4 in alcoholics. The age group 35-39, 22 samples in non-alcoholics and 2 in alcoholics. The age group were 40-44, 8 non-

alcoholics 0 alcoholics. The age group 45-49, One sample in non-alcoholics and two in alcoholics. Similarly, oligospermia in different age groups, 20-24 is three sample in non-alcoholics and one in alcoholics.

The age group 25-29, 0 sample in non-alcoholics and 1 in alcoholics. The age group 30-34, three were non-smokers whereas 8 in alcoholics. The age group was 35-39, 0 sample in non-alcoholics and 7 in alcoholics. The age group 40-44, with one sample of non-alcoholics and three of alcoholics.

Table 3: Data related to distribution of parameters of semen analysis in non-smokers, smokers, and non-alcoholics, alcoholics by age groups has been depicted in table: 3.

Table 1: Distribution of semen quality in non-smokers and smokers by age group:

Semen quality	Age groups (in years) / %											
	20-24(n=15)		25-29(n=29)		30-34(n=45)		35-39(n=34)		40-44(n=13)		45-49(n=3)	
	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S
	n=8	n=7	n=16	n=13	n=27	n=18	n=18	n=16	n=8	n=5	n=2	n=1
normoz	6(40 %)	4(26. 66%)	14(48. 27%)	10(34. 48%)	20(44. 44%)	14(31. 11%)	14(41. 17%)	10(29. 41%)	7(53. 84%)	1(7.6 9%)	2(66. 66%)	1(33. 33%)
azoo	0	0	0	0	0	0	0	0	0	0	0	0
asthe	1(6.6 6%)	0	2(6.89 %)	1(3.44 %)	0	0	3(8.82 %)	6(17.6 4%)	0	0	0	0
oligo	1(6.6 6%)	3(20 %)	0	1(3.44 %)	7(15.5 5%)	4(8.88 %)	1(2.94 %)	0	1(7.6 9%)	3(23. 07%)	0	0

Note: Normoz-Normazoospermia, azoo-Azoospermia, asthe-asthenospermia, oligo-oligospermia.

Table 2: Distribution of semen quality in non-alcoholic and alcoholic by age group:

Semen quality	Age groups (in years) / %											
	20-24(n-15)		25-29(n=29)		30-34(n=45)		35-39(n=34)		40-44(n=13)		45-49(n=3)	
	Non-alcohol	Alcohol	Non-alcohol	Alcohol	Non-alcohol	Alcohol	Non-alcohol	Alcohol	Non-alcohol	Alcohol	Non-alcohol	Alcohol
	n=13	n=2	n=21	n=8	n=33	n=12	n=25	n=9	n=10	n=3	n=1	n=2
normoz	9(60 %)	1(6.6 6%)	19(65. 51%)	5(17. 24%)	30(66. 66%)	4(8.8 8%)	22(64. 70%)	2(5.8 8%)	8(61. 53%)	0	1(33. 33%)	2(66. 66%)
azoo	0	0	0	0	0	0	0	0	0	0	0	0
asthe	1(6.6 6%)	0	2(6.89 %)	1(3.4 4%)	0	0	3(8..8 2%)	0	0	0	0	0
oligo	3(20 %)	1(6.6 6%)	0	1(3.4 4%)	3(6.66 %)	8(17. 77%)	0	7(20. 58%)	1(7.6 9%)	3(23. 07%)	0	0
Mild oligo	0	0	0	0	0	0	0	0	1(7.6 9%)	0	0	0
Severe oligos	0	0	0	1(3.4 4%)	0	0	0	0	0	0	0	0

Note: Normoz- Normazoospermia, azoo-Azoospermia, asthe-asthenospermia, oligo-oligospermia.

Table 3: Comparison of characteristics between non-smokers and smokers, alcoholics and non-alcoholics

characteristics	Non-smokers		Smokers		p-value	Non-alcoholic		Alcoholic		p-value
	N=79		N=60			N=103		N=36		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Age in years	32.27	5.93	31.87	5.816	**0.797**	31.96	5.747	32.10	6.06	**0.608**
Volume in ml	2.04	0.94	2.05	0.93	**0.775**	2.05	0.92	2.06	0.94	**0.365**
Liquefaction time	37.72	20.13	38.16	20.29	**0.135**	38	20.27	38.04	20.16	**0.138**
Sperm count	30.57	21.13	30.24	21.24	**0.061**	30.38	21.26	30.30	21.10	**<0.001****

Total motility	100.07	0.85	100.07	0.85	0.383	100.07	0.85	100.07	0.84	**0.554**
Progressive motile	45.48	19.82	45.18	20.04	**0.059**	45.37	20.00	45.11	19.91	**<0.260**
Non progressive Motility	20.89	11.71	20.75	11.41	**0.964**	20.75	11.45	20.88	11.63	**0.013***
Immotility	33.69	22.89	34.13	22.97	**0.092**	33.94	22.95	34.07	22.94	**0.114**
Morphologically normal sperms	69.56	20.21	69.35	20.15	**0.406**	69.41	20.21	69.43	20.09	**0.507**
Morphologically abnormal sperms	30.43	20.21	20	20.15	**0.406**	30.58	20.21	30.56	20.09	**0.507**

Data are expressed as mean, standard deviation, and p-value. *p-value at < 0.05 is considered significantp-value at <0.001 is considered highly significant.**

Discussion

From the data it was found that there is a considerable change in the quality of the semen between smokers and non-smokers; non-smokers [n=79,56.83%] will have higher level.

However, the quality of semen was reduced in smokers [n=60,43.16%]. Reduced levels were found in all smokers compared with no Non-smokers. The number of normozoospermia was higher in non-smokers [63,45.32%] than in smokers [40(28.77%)] in all different age groups. Oligospermia is found to be increased in the smoker's age groups when compared with the non-smokers.

Semen quality in non-smoker group in comparison with the smoker group found that the difference between the groups was statistically non-significant. There is a considerable change in the quality of the semen between non-alcoholics and alcoholics, the non-alcoholics (n=103) will have higher level. In contrast semen quality was reduced in alcoholics (n=36). Reduced levels in all the alcoholics age groups were found when compared with the non-alcoholics.

The number of normozoospermia was found to be higher in non-alcoholics [89,86.40%] than in alcoholics [1413.59%] in all age groups. Thus, the semen quality in non-alcoholics group in comparison with the alcoholic group showed that the difference between the groups was statistically non-significant. There was considerable change in the different parameters.

The sperm concentration was found to be statistically highly significant when compare with the non-alcoholics and alcoholics.

The p value was < 0.001. In other parameters there were considerable differences between both the groups i.e., smokers and non-smokers and alcoholics and non-alcoholics showed statistically non-significant.

Summary and Conclusion

Semen quality is adversely affected by lifestyle choices including smoking and excessive alcohol consumption, which may cause an adverse effect on volume, concentration, motility, morphology, viability, and DNA integrity [7,8]. Those habits can negatively impact male fertility because they cause hormonal imbalance and increase oxidative stress [9,10].

On the contrary hand, individuals which don't engage in these behaviours generally have higher reproductive potential and better-quality semen. It is highly advised for people who want to enhance their reproductive health to abstain from smoking and consuming alcohol in excess.

Limitation of study: Owing to the tertiary location of the research centre, the small number of samples, and the lack of the latest techniques, we have limited findings and results.

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