



## **Semen and Spermatozoa Characteristics in Alcohol Users and Non-Users**

**Tanuja Lella <sup>a</sup>, A. Ruckmani <sup>a\*</sup>, N. Pandiyan <sup>b</sup> and R. Arunkumar <sup>a†</sup>**

<sup>a</sup> Department of Pharmacology, Chettinad Hospital & Research Institute, Chettinad Academy of Research and Education, Kelambakkam, Chennai-603103, Tamil Nadu, India.

<sup>b</sup> Department of Andrology and Reproductive Medicine, Chettinad Super Speciality Hospital, Kelambakkam, Chennai – 603103, Tamil Nadu, India.

### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Introduction:** Increasing infertility rate worldwide raises research to investigate plausible reason health community. To find out the characteristics of semen and spermatozoa in alcohol users and compare these characteristics with that of non-users of alcohol.

**Methodology:** The data on alcohol use and semen analysis were obtained from case records of patients reported to the Department of Andrology & Reproductive Medicine of a tertiary care hospital for a period of one year from January 2018 to December 2018. The semen volume, sperm concentration, motility and morphology in alcohol users were compared with non-users.

**Results:** A total of 231 patients had reported to the Department of Andrology & Reproductive Medicine during the study period. Among them 81 (35.06%) were alcohol users and 150 (64.94%) alcohol non-users. Analysis of their semen reports revealed that the difference in semen volume and sperm morphology was not found to be statistically significant, but the sperm concentration and progressive motility of spermatozoa showed significant reduction in alcohol users compared to non – users ( $p < 0.05$ ).

**Conclusion:** The semen volume and sperm quality were found to be low in alcohol users. Among the spermatozoa characteristics, sperm concentration and motility were significantly reduced in alcohol users.

<sup>≡</sup>PG Student;

<sup>°</sup>Professor/ Head;

<sup>†</sup>Professor/ Vice-Principal;

<sup>\*</sup>Corresponding author: E-mail: [ruckmani.nirmal@gmail.com](mailto:ruckmani.nirmal@gmail.com);

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## 1. INTRODUCTION

### 1.1 Infertility

Infertility is defined as the “Failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse” (WHO-ICMART glossary) [1]. Up to 15% of reproductive-aged couples are affected with infertility worldwide. Infertility can be of two types, primary and secondary. Primary infertility means that the couple has never conceived. In secondary infertility the couple has experienced a pregnancy before but failed to conceive later. Globally, most infertile couples suffer from primary infertility. The WHO estimate shows that the prevalence of primary infertility in India ranges from 3.9% - 16.8% and it varies from state to state. Irrespective of the type, about one third is female infertility and another one third is male infertility. The remaining is due to problems in both the partners or the cause is unclear. Female infertility can be caused by a number of factors like fallopian tube damage, ovarian dysfunction, hormonal imbalance, uterine or cervical causes. Male infertility is due to low spermatozoa count, poor sperm motility, poor morphology or all of them. The other causes include anatomical problems, hormonal imbalances and genetic defects. The factors that could affect the fertility in both the sexes include apart from hormonal changes, environmental/occupational factors, alcohol consumption, tobacco and marijuana use, other drugs like spironolactone and cimetidine, malnutrition, extreme weight loss or gain and advanced age [2]. The association between infertility and alcohol consumption and smoking tobacco has been reported by a few authors [3,4].

### 1.2 Effects of Alcohol on Male Reproductive System

Alcohol can adversely affect the Leydig cells of testis, which produce and secrete the hormone testosterone. Alcohol also impairs the function of the testicular Sertoli cells that play an important role in spermatozoa maturation. In the pituitary gland, alcohol can decrease the production, release, and activity of Luteinizing hormone (LH) and Follicle-stimulating hormone (FSH) which have crucial reproductive functions. Finally, alcohol can interfere with hormone production in the hypothalamus [5]. which in turn leads to abnormal development and maturation of

spermatozoa, decreased rate of spermatozoa production, gonadal atrophy, impotence and infertility [6-10]. Excessive alcohol intake leads to increased acetaldehyde, a by-product of alcohol metabolism, which interacts with proteins and lipids generating ROS [11]. Excessive alcohol intake is also associated with morphologically abnormal spermatozoa, reduction in spermatogenesis, decreased seminal fluid volume, low LH, FSH, and testosterone, and increased oxidative stress [12]. Animal studies have also proven the association between alcohol and abnormal spermatozoa [13]. Hence the present study was undertaken to find out whether there are differences in the semen and spermatozoa characteristics in relation to alcohol consumption.

## 2. MATERIALS AND METHODS

The case records of men who reported to the department of Andrology & Reproductive Medicine in a selected tertiary care institute in Tamilnadu for the treatment of infertility during the period from January 2018 to December 2018 were collected and screened. Demographic details were recorded and the information regarding alcohol use and the semen analysis report were collected.

Based on alcohol use, patients were classified into two groups - alcohol users and alcohol non-users. Semen analysis report was assessed based on WHO criteria.

The following semen parameters were compared between the two groups. 1) Semen volume, 2) pH 3) Sperm concentration 4) Sperm motility and 5) Sperm morphology.

### 2.1 Statistical Analysis

The difference in semen characteristics between both the groups was estimated by using chi-square test.

## 3. RESULTS

A total of 231 patients had reported to the Department of Andrology & Reproductive Medicine during the study period and their case records were screened. Among them 81 (35.06%) were found to be alcohol users and 150 (64.94%) alcohol non-users.

The age of the patients ranged from 21 – 52 years. The usage of alcohol was high in the age group of 31-40 years. The semen analysis report was analyzed between the alcohol non-users and users.

The following table shows the sperm and semen characteristics between alcohol users and non-users.

**Table 1. WHO criteria for assessing sperm characteristics (2010)**

Parameters	Lower Reference Limit
Semen volume	1.5 ml
pH	≥ 7.2
Sperm concentration	15 million/ml
Progressive motility	32%
Total motility	40%
Normal morphological forms	4%

*Cut-off values for normal sperm characteristics (WHO criteria 2010)*

Data were analyzed using the chi-square test. The results revealed that:

- The number of persons who had reduced sperm concentration and reduced sperm motility were significantly higher among alcohol users than non-users ( $p < 0.05$ ).
- The semen volume, pH and the percentage of abnormal morphological forms were not significantly different between alcohol non-users and users.

#### 4. DISCUSSION

In this study, it was found that the sperm characteristics like sperm concentration and progressive motility were reduced in alcohol users. As it is a retrospective study the information on the type and the duration of alcohol consumption could not be obtained. However, La Vignera S et al., have reported that

irrespective of the type (beer, wine, whisky and brandy), alcohol was found to affect spermatogenesis [14]. Alcohol can affect spermatogenesis through different mechanisms. It can act centrally and reduce the level of testosterone and peripherally cause oxidative damage in the testicular tissue. Sunil Kumar et.al has reported that alcohol consumption could cause significant alteration in sperm quality. Reactive oxygen species (ROS) liberated during alcohol metabolism could be the reason for DNA damage in sperm which in turn affects sperm quality and fertility [15]. R. A. Condorelli et al., in their study conducted with 40 occasional drinkers and 36 daily drinkers observed a high percentage of morphological abnormal spermatozoa in daily drinkers in addition to reduction in seminal volume and increased mucus production. However, in our study with 81 alcohol users, the percentage of spermatozoa with abnormal morphology was not found to be significant [16]. The animal study conducted by O. O. Dosumu et al., with male Sprague–Dawley rats also confirmed similar outcome [17]. Jensen TK et al., also observed a dose related adverse change in semen quality and habitual alcohol intake was most pronounced in men who consume above 25 units in a week [18]. However, the limitation in the present study is the lack of information on the type of alcohol, quantity consumed and the duration of alcoholism. Most of these studies have been conducted in non-Indian population. The current study was on Indian population. Hence further studies using larger population is needed to derive additional information on the severity and duration of alcoholism. From our study we suggest that alcoholism may be an important cause for male infertility. Hence when couple reports with infertility, counselling should be given to male alcoholics to slowly withdraw from drinking alcohol.

**Table 2. Semen characteristics in alcohol and non- alcohol users**

Semen analysis	Alcohol non-users (Total 150)	Alcohol users (Total 81)	P value
Reduction in semen volume (less than 1.5 ml)	26.70%	29.62%	0.74
pH (less than 7.2)	0.66%	1.23%	0.76
Reduction in sperm concentration (less than 15 mill/ml)	35.64%	49.38%	0.04
Reduction in progressive motility (less than 32%)	25.08%	43.21%	0.008
Reduction in normal morphological forms (less than 4%)	34.66%	43.21%	0.26

## 5. CONCLUSION

Based on the current study and the available evidences it can be concluded that the spermatozoa quality especially sperm concentration and motility are adversely affected in alcohol users irrespective of the type of alcohol.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

Ethical Clearance for this study got approved from the Institutional Human Ethical Committee (IHEC).

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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