

Original Research Article

Study of Sperm Concentration, Motility and Morphology in Men Presenting With Infertility at A Tertiary Care Hospital

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Received on 18.02.2020

Accepted on 28.04.2020

Abstract

Introduction: Infertility is an increasingly common problem in recent times, affecting one in six couple, urging them to take treatment even in young years of age. During the past few decades, it is observed that semen volume, sperm count, percentage of motility and number of sperms with normal morphology are declining gradually. In this study, Semen Volume, Sperm Concentration, Motility and Morphology were examined in men presenting with infertility. *Materials & Methods:* This is a descriptive cross-sectional study done after getting consent from patients presenting with Infertility in a tertiary care hospital. 197 patients were included in the study over a period of one year from April 2018 to March 2019. This study included men between age group of 20-50 years. Collected Semen samples were checked for semen volume, sperm count, motility and morphology. *Results:* Out of 197 men included in the study, Hypospermia is observed in 51% ($n = 101$). Oligozoospermia seen in 44% ($n = 87$), Asthenozoospermia is seen in 49% ($n = 95$) and Teratozoospermia is seen in 49% ($n = 97$). All 3 parameters - Oligozoospermia, Asthenozoospermia and Teratozoospermia incidence were increased in smokers and alcoholics as compared to men without these habits. *Conclusion:* It was observed in this study that men who came for infertility screening are having abnormalities in various semen parameters and have to be treated, since infertility due to male factors are not given importance especially in a rural population. Further it is noticed that quality of seminal parameters are affected in association with smoking and alcoholic habits.

Keywords: Infertility; Motility; Morphology; Sperm Count.

How to cite this article:

N Thamarai Selvi, R Revathi Shree. Study of Sperm Concentration, Motility and Morphology in Men Presenting With Infertility at A Tertiary Care Hospital. Indian J Pathol Res Pract. 2020;9(1 Part II):214-220.

Introduction

Infertility is an increasingly common problem in recent times, affecting one in six couple, urging them to take treatment even in young years of age.

Infertility is defined as failure of conception after at least 12 months of unprotected Intercourse.¹ Causes of infertility are numerous such as anatomical, physiological and genetic factors. Many environmental and acquired factors also influence



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fertility. Menstrual, ovulation dysfunction followed by uterine factors were most common causes of female infertility.²

Although diagnostic problems make it difficult to establish the extent of the male partner's contribution with certainty, a number of studies suggest that male problems represent the commonest single defined cause of infertility. In recent times, the importance of occupation, environmental and particularly genetic factors in the causation of male infertility is being recognized.¹

Although many studies have been conducted on the prevalence of infertility in the world, because infertility is increasing and the life style is changing and there is no comprehensive research in rural areas where fertility centers are not available so it seems necessary to investigate the patterns of abnormalities in semen parameters thereby identifying causes of male factor infertility. During the past few decades it is observed that semen volume, number of sperms, percentage of motility and number of sperms with normal morphology are declining gradually that WHO has reduced number of all these parameters for International Criteria to classify as Normozoospermia. However these changes are not favourable and may lead to increase in the fertility problems among young couples.³ In this study, Semen Volume, Sperm Concentration, Motility and Morphology were examined in men presenting with infertility.

Materials & Methods

This is a descriptive cross sectional study done after getting consent from patients undergoing semen examination presenting with Infertility in a tertiary care hospital located at a rural area. The study was conducted after obtaining clearance from the Institutional ethics committee. 197 patients were included in the study over a period of one year

from April 2018 to March 2019. Detailed History of the patient taken and then smokers and alcoholics are graded as moderate and heavy based on the amount they take.³ Semen Samples will be collected in central laboratory, then processed and examined. This study included men between age group of 20-50 years attending OPD of the tertiary care center with complaints of Infertility. Men who are not willing for consent were excluded. Semen samples were collected after 3 to 5 days of abstinence. Collected sample will be processed and assessed within 2 hours of collection. one wet mount is used to assess motility. Neubaur chamber is used to count the number of sperms. Eosin stain is used to check for viability. Pap stain is used to study the morphology of sperms. Semen analysis was done based on the latest WHO criteria using "strict" Tygerberg method.⁴ After all the microscopic examination, reports are given to the patients and details are noted for the study. Data was entered in Microsoft Excel and analyzed in SPSS software version 17.0.

Results

In the present study, there were 197 men and belonged to the age group of 20 to 50 years and duration of their married life varied from 2 years to 10 years. Most common age group in this study was around 31-40 years. Out of 197 men, 44 were in the age group of 20-30 years and 31 men presented with primary infertility and 13 men presented with secondary infertility. Around 110 men were in the age group of 31-40 years amongst whom 58 men presented with primary and 52 men presented with secondary infertility. There were 43 men in the age group of 41-50 years of age, out of which 27 men presented with primary and 16 men with secondary infertility. Totally, 116 men presented with primary infertility and 81 men with secondary infertility (Table 1).

Table 1: Age distribution Vs primary & Secondary Infertility

S. No	Age (Years)	Primary		Secondary	
		No.	%	No.	%
1.	20-30	31	27	13	16
2.	31-40	58	50	52	64
3.	41-50	27	23	16	20
4.	Total	116	100	81	100

Most of the abnormalities in the semen examination like Sperm Count, Motility and morphology were decreased in men more than 30

years compared to the men who are lesser than 30 years of age. Out of the total 87 men who had abnormal sperm count, 32 men were less than

30 years and 55 men were more than 30 years of age. 16 men were married for less than 5 years, 48 were married for 5–10 years and 23 were married for more than 10 years. Decreased motility was observed in 95 cases out of which 34 men were less than 30 years and 61 men were over 30 years of age. Out of the same 95 cases, 15 were married for less than 5 years, 52 were married for 5–10 years and 28 were married for more than 10 years. Overall 97

patients had abnormal morphology or decreased number of sperms with normal morphology. Among them, 40 men were below 30 years and 57 men were above 30 years of age. Out of the same 97 men with abnormal morphology, 17 were married for less than 5 years, 58 were married for 5–10 years and 22 were married for more than 10 years. Overall most of the men were married for 5–10 years in this study (Table 2).

Table 2: Socio-demographic Parameters in various Semen patterns

Factor		Type of Abnormality					
		Abnormal Sperm Count		Abnormal Motility		Abnormal Morphology	
		No.	%	No.	%	No.	%
Age	<30 years	32	37	34	36	40	41
	>30 years	55	63	61	64	57	59
Total		87	100	95	100	97	100
Duration of Married Life	<5 years	16	18	15	16	17	17
	5–10 years	48	55	52	55	58	60
	>10 years	23	27	28	29	22	23
Total		87	100	95	100	97	100

Among the 197 semen samples that were assessed, Normospermia or normal volume of semen which is 2–5 ml were observed in 87 (44%)

cases, Hypospermia or volume < 2ml seen in 101 (51%) of cases and Hyperspermia or volume > 5 ml observed in 9(5%) of cases (Table 3).

Table 3 Distribution of Volume

S. No	Volume	No.	%
1.	Normospermia (2 ml–5 ml)	87	44
2.	Hypospermia (<2 ml)	101	51
3.	Hyperspermia (>5 ml)	09	05
Total		197	100

Regarding the sperm count, Normal sperm count which is > 40 millions/cumm is seen in 110 (56%) of cases and Oligozoospermia or Sperm count < 40 millios/cumm is seen in 87 (44%) of cases. Normal motility of more than 40% motile sperms were observed in 102 (51%) of cases and Asthenozoospermia or Sperm motility < 40% is

seen in 95 (49%) of cases. Normal morphology of sperms which are >4% is seen in 100 cases and Teratozoospermia where normal morphology of sperms are < 4 % is seen in 97 (49%) of cases. Pus cells were significantly present in 107 (54%) of cases and absent(not significant) in 90 (46%) of cases (Table 4)

Table 4: Seminal Parameters with Numbers and percentages

Parameter		No.	%
Volume	<2 ml (Oligo)	101	51
	2 ml – 5 ml (Normal)	87	44
	> 5 ml (Poly)	09	5
Sperm Count	>40 (Normal)	110	56
	<40 (Oligo)	87	44
Proportion of Motile Sperms	>40 (Normal)	102	51
	<40 (Asthenozoospermia)	95	49
Morphology	Normal (>4%)	100	51
	Abnormal (Terato = <4%)	97	49
Pus Cells	Present	107	54
	Absent	90	46

In this study which included 197 men, 95 were non-smokers and 102 had smoking habits. Further among them, 60 were found to be moderate smokers and 42 were heavy smokers. Regarding the sperm count among the Non-Smokers group, 58 (61%) of men had normal sperm count and 37(39%) had decreased sperm count. To the contrary, among smokers, moderate smokers had normal sperm count in 28 (47%) of cases and decreased sperm count in 32 (53%) of cases. Among heavy smokers, 12 (28%) had normal sperm count and 30 (72%) had decreased sperm count. Taking motility as the criteria among smokers and nonsmokers, in the non-smokers group, 60 (63%) of men

had normal motility and 35 (37%) of cases had decreased motility. Among moderate smokers, 22 (37%) had normal motility and 38 (63%) had decreased motility or asthenozoospermia. Among heavy smokers, 15 (36%) had normal motility and 27 (64%) had decreased motility. Regarding morphology among non-smokers, 66 (69%) of men had normal morphology and 29 (31%) had abnormal morphology or teratozoospermia. Among moderate smokers, 20 (33%) had normal morphology and 40 (67%) had abnormal morphology. Among heavy smokers, 11 (26%) had normal morphology and 31 (74%) had abnormal morphology (Table 5).

Table 5: Seminal Patterns in Smokers and Non-Smokers

Parameter	Non-Smokers		Moderate Smokers		Heavy Smokers	
	No.	%	No.	%	No.	%
Normal Sperm Count	58	61	28	47	12	28
Reduced Sperm Count	37	39	32	53	30	72
Total	95	100	60	100	42	100
Normal Motility	60	63	22	37	15	36
Reduced Motility	35	37	38	63	27	64
Total	95	100	60	100	42	100
Normal Morphology	66	69	20	33	11	26
Abnormal Morphology	29	31	40	67	31	74
Total	95	100	60	100	42	100

Out of the 197 men included in the study, 105 were non-alcoholic and 92 were alcoholic. Regarding the sperm count compared to both groups, Non-alcoholics were found to have normal sperm count in 56 (53%) of cases and reduced sperm count in 49 (47%) of cases. Among the alcoholic group, we divided them into moderate drinkers and heavy drinkers. Among the moderate drinkers, 22 (42%) had normal sperm count and 30 (58%) had reduced sperm count. Among heavy drinkers, 18 (45%) had normal sperm count and 22 (55%) had reduced sperm count. Taking into consideration of motility, non-alcoholics were found to have normal motility in 60 (57%) of cases and decreased motility in 45

(43%). Among alcoholics, Moderate drinkers were found to have normal motility in 20 (38%) of cases and decreased motility in 32 (62%) of cases. Among heavy drinkers, 16 (40%) had normal motility and 24 (60%) had decreased motility. Considering the morphology among these population, non-alcoholics were found to have normal morphology in 63 (60%) of cases and abnormal morphology or teratozoospermia in 42 (40%) of cases. Among alcoholics, in moderate drinkers, 12 (23%) had normal morphology and 40 (77%) had abnormal morphology. Among heavy drinkers, 10 (25%) had normal morphology and 30 (75%) had abnormal morphology (Table 6).

Table 6: Seminal Patterns in Alcoholics and Non-alcoholics

Parameter	Non-Alcoholics		Moderate Drinkers		Heavy Drinkers	
	No.	%	No.	%	No.	%
Normal Sperm Count	56	53	22	42	18	45
Reduced Sperm Count	49	47	30	58	22	55
Total	105	100	52	100	40	100
Normal Motility	60	57	20	38	16	40
Reduced Motility	45	43	32	62	24	60
Total	105	100	52	100	40	100
Normal Morphology	63	60	12	23	10	25
Abnormal Morphology	42	40	40	77	30	75
Total	105	100	52	100	40	100

Discussion

This study was conducted to study the patterns of semen parameters, especially the semen volume, sperm count, motility and morphology in men presenting with infertility in this rural area. Totally, 197 men were included in the study. Most common age group of men was between 31–40 years accounting for 50% of entire population. In the study conducted by Atul Jain et al, it was found that the mean age of the men was 29.24 years.⁵ Late marriages done in these days could be a reason for this increased age. In a study conducted by Haifa A. Al-Turki mean age was 33.38 years which is almost the same age group of this study.⁶

In this study, primary infertility was seen in 116 cases and secondary infertility in 81 cases. In the study conducted by Auger J et al. primary fertility ($n = 368$) and secondary infertility ($n = 89$). primary infertility is more common.⁷ It is also to be noted that most men take treatment for primary infertility and a very few take treatment for secondary infertility.

In this study, compared to men less than 30 years of age, men more than 30 years have more abnormalities in all 3 parameters like Sperm count, motility as well as morphology. This implies that as age increases, there are more probabilities of abnormal results in semen compared to younger age group.

Considering the semen volume in this study, 51% had hypospermia, 44% had Normospermia and 5% had hyperspermia. In a study conducted by Fisch H Atul Jain et al., it was observed that 28% had hypospermia, 70% had Normospermia and 2% had hyperspermia.⁸ Compared to the other study, there is increased hypospermia and decreased semen volume which may add value to male factor infertility.

In the present study with 197 men, 56% ($n = 110$) had normal sperm count and 44% ($n = 87$) had Oligozoospermia. Among the 87 men with Oligozoospermia, 55% was married for 5–10 years, 27% were married for more than 10 years and 18% were married for less than 5 years. In a study conducted by Andolz P et al. most men were married for less than 5 years.⁹ Among the 197 men, 102 cases (51%) had normal motility and 95 men (49%) had Asthenozoospermia or decreased motility. Among these 95 men, 55% ($n = 52$) were married for 5–10 years, 16% ($n = 15$) were married for less than 5 years and 29% ($n = 28$) were married for more than 10 years. Studies indicate that there is statistically significant decrease in motility as age

advances, resulting in 3% to 12% decline in motility over past 20 years.^{10,11} In this study, among the 197 cases, Pus cells were significantly present in 54% ($n = 107$) and absent in 46% ($n = 90$).

Regarding the morphology of 197 men included in the study, 51% ($n = 100$) had normal sperm morphology and 49% ($n = 97$) had abnormal sperm morphology of <4% normal sperms which are classified as teratozoospermia. Among the 97 men with teratozoospermia, 60% ($n = 58$) were married for 5–10 years, 23% ($n = 22$) were married for more than 10 years and 17% ($n = 17$) were married for less than 5 years. As we saw in motility, morphology too seems to decrease with increasing age in men. Studies signify that abnormality in sperm morphology increase from 0.2% to 0.9% each year in men, resulting in 4% to 18% reduction in normal morphology of sperms during a 20 year period.^{10,11} In a study by Anuj et al., 28% had normal morphology and 72% had abnormal morphology.⁵ In our study percentage of abnormal morphology is less compared to the above study. However it is crucial to consider the fact that sperm morphology may vary between studies taking into account the criteria being used for analysis by different researchers.

In this study, out of 197 men included in the study, 95 were non-smokers and 102 were smokers. Comparing the sperm count among smokers and non-smokers, it is observed that sperm count decreases with smoking and it further decreases with heavy smoking. Oligozoospermia is seen only in 39% ($n = 37$) among non-smokers whereas it has increased to 53% ($n = 32$) among moderate smokers and further increased to 72% ($n = 30$) among heavy smokers. In a study by Gaur DS et al., average percentage reduction in mean sperm concentration was seen in smokers compared to non-smokers.¹² Comparing the sperm motility among smokers and non-smokers, asthenozoospermia (reduced sperm motility) is observed in 37% ($n = 35$) in non-smokers and 63% ($n = 38$) among moderate smokers and 64% ($n = 27$) among heavy smokers. In a study conducted by Goverde et al., there was reduction in percentage of motile spermatozoa among smokers compared to nonsmokers.¹³

Considering the morphology of sperms among smokers and non-smokers, it was found that Teratozoospermia or abnormal morphology of sperms were found in 31% ($n = 29$) in non-smokers and it has increased to 67% ($n = 40$) among moderate smokers and further increase to 74% ($n = 31$) among heavy smokers. Study by Pajarinen et al. revealed that increase in the percentage of abnormal

spermatozoa among smokers compared to non-smokers.¹⁴ Statistically significant associations between smoking and increased abnormal sperm morphology have been reported in 7 of 15 studies and it was noted an increase in the percentage of abnormal spermatozoa, and specifically headpiece abnormalities, in association with an increase in smoke exposure measured in cigarette years.¹⁵

In the present study, out of 197 men, 105 were non-alcoholics and 92 were alcoholics. Among these 92 men, 52 were moderate drinkers and 40 were heavy drinkers. Comparing the sperm count of both the population, oligozoospermia was found in 47% ($n = 49$) among non-alcoholics and was increased to 58% ($n = 30$) in moderate drinkers and 55% ($n = 22$) in heavy drinkers. In a study conducted by Henny et al., Of the 100 alcoholics being included in that study, 88% had oligozoospermia and they concluded that alcohol consumption cause increase in oligozoospermic cases among alcoholics.¹⁶ Regarding the motility, Asthenozoospermia is seen in 43% ($n = 45$) in non-alcoholics and it has increased to 62% ($n = 32$) in moderate alcoholics and 60% ($n = 24$) in heavy alcoholics. Few studies also suggest that there was correlation with alcohol intake and Asthenozoospermia.¹²⁻¹⁶

Considering the morphology of sperms, teratozoospermia is seen in 40% ($n = 42$) among non-alcoholics and has increased to 77% ($n = 40$) in moderate drinkers and 75% ($n = 30$) among heavy drinkers. In a study by Henny et al., it was found that teratozoospermia was more prevalent among alcoholics.¹⁷

Conclusion

It was observed in this study that men are having abnormalities in various semen parameters like semen volume, sperm count, motility and morphology and have to be treated, since infertility due to male factors are not given importance especially in a rural population. Further it is noticed that quality of seminal parameters are affected in association with smoking and alcoholic habits.

References

1. D. Stewart Irvine. Epidemiology and aetiology of male infertility. *Human Reproduction* 1998 April;13(suppl_1):33-44.
2. Masoumi SZ, Parsa P, Darvish N et al. An epidemiologic survey on the causes of infertility in patients referred to infertility center in Fatemieh Hospital in Hamadan Iran *J Reprod Med* Aug 2015;13(8):513-16.
3. Roelof Menkveld. The new 5th WHO manual semen parameter reference values - do they help or hinder? *Andrology Laboratory, Department of Obstetrics and Gynaecology, Tygerberg Academic Hospital and University of Stellenbosch. Thessaloniki, Greece 01-03 October 2009.*
4. World Health Organization, Department of Reproductive Health and Research. *World Health Organization Laboratory Manual for the Examination and Processing of Human Semen.* 5th ed. Geneva, Switzerland: World Health Organization 2010.
5. Jain A, Ambrish PI, Hoogar MB, et al. Role of semen analysis in the diagnosis of infertility at a tertiary care centre in Western India: A prospective study. *Int J Reprod Contracept Obstet Gynecol* 2016 Jul;5(7):2389-91.
6. Haifa A. Al-Turki. Prevalence of primary and secondary infertility from tertiary center in eastern Saudi Arabia. *Middle East Fertility Center Journal* 2015;20:237-40.
7. Auger J, Kunstmann JM, Czyglik F, et al. Decline in semen quality among fertile men in Paris during the past 20 years. *N Engl J Med* 1995;332:281-85.
8. Fisch H, Goluboff ET, Olson JH, et al. Semen analyses in 1,283 men from the United States over a 25-year period: No decline in quality. *Fertil Steril* 1996;65:1009-14.
9. Andolz P, Bielsa MA, Vila J. Evolution of semen quality in North-eastern Spain: A study in 22,759 infertile men over a 36 year period. *Hum Reprod* 1999;14:731-35.
10. Bujan L, Mieusset R, Mondinat C, et al. Sperm morphology in fertile men and its age related variation. *Andrologia* 1988;20:121-28.
11. Vine MF. Smoking and male reproduction: A review. *International Journal of Andrology*, 1996;19:323-337.
12. Gaur DS, Talekar MS, Pathak V. Alcohol intake and cigarette smoking: Impact of two major lifestyle factors on male infertility. *Indian J Pathol Microbiol* 2010;53:35-40.
13. Goverde H J, Dekker H S, Janssen H J, et al. Semen quality and frequency of smoking and alcohol consumption: An explorative study. *Int J Fertil menopausal Stud* 1995;40:135-8.
14. Pajarinen J, Karhunen PJ, Savolainen V, et al. Moderate alcohol consumption and disorders of human spermatogenesis. *Alcohol Clin Exp Res* 1996;20:332-7.
15. Guzik DS, Overstreet JW, Factor-Litvak P, et al. Sperm morphology, motility and concentration in fertile and infertile men. *N Engl J Med* 2001;345:1388-93.
16. Henny JM Goverde, Hester S. Dekker, Herman

- J.G. Janssen, et al. Semen Quality and Frequency of Smoking and Alcohol Consumption-An Explorative Study. *Int Fétil* 1995;40(3):135-13.
17. De Burin A, Picavet HSJ, Nossikov A. eds. Health interview surveys: Towards international harmonization of methods and instruments. WHO Regional Publications, European Series; No. 58. Copenhagen. WHO Press 1996/4.

