Original Article

Semenology of Infertile Men Reported at a Tertiary Level Military Hospital of Bangladesh

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Abstract

Introduction: A very simple, cheap, easily available and non-invasive approach has made routine semen analysis the most important tool for diagnosis of male fertility.

Objectives: To determine I) the percentage of abnormality in semen parameters present in the husbands of infertile couples, II) the effect of occupation on abnormal parameters and iii) the effect of increasing age on semen quality.

Methods: A cross sectional retrospective study was designed in a period of April 2019 to March 2020 on the basic semen analysis reports of the husbands of infertile couples reporting to the fertility clinic of a tertiary level military hospital of Bangladesh.

Results: Out of 851 couples only 372 were excluded from female cause. At least 44% husbands showed at least one abnormality in their semen parameters according to WHO 2010 criteria and out of them 3.8% were azospermic. Almost all abnormalities showed more severity in the patients reporting from non-military background. Significant differences were demonstrated in the mean values in semen parameters like volume, concentration and motility between different occupational groups. Mean values of sperm concentration between different age groups showed significant changes. Values of other parameters also showed gradual decrease with increase of age but differences were not significant.

Conclusion: The present study showed that even 56% normozoospermic husbands can be partners of infertile couples. Occupation and age affect male fertility.

Key words: Male infertility, Oligoasthenozoospermia, Normozoospermia, Asthenozoospermia, Azoospermia.

Introduction

No fertility specialist has any dispute or disagreement about the importance of basic semen analysis in male fertility investigation. A very simple, cheap, easily available and non-invasive approach has made this routine examination the most important tool for diagnosis of male fertility. Now a day, infertility has become a common problem affecting one couple in every six.[1] As both a clinical and public problem, it affects not only the life of a couple but also the social environment as well as health care service.[2] This widespread burning issue now affects approximately 15% of the couples having regular unprotected intercourse for more than one year. Male factor infertility contributes solely in 20% and in combination with other factors in 30% to 40% or sometimes 50% of the total infertile patients.[2,3] On an average, 25% or more of total infertility is attributed to male factors only.[4]

Worldwide infertility practitioners rely on the results of semen analysis for the diagnosis of male factor infertility in more than 90% cases. In fact, standard semen analysis has become the surrogate measure for the assessment of male factor infertility in clinical practice.[1] For diagnosis and treatment of male infertility, the semen analysis has become the cornerstone of all the work-up.[3] If a male infertility factor is present, it can usually be defined by an abnormal finding of the semen analysis.

As routine semen analysis has become the main pillar of male infertility investigations, a consistency in laboratory procedures and reporting is ensured by World Health Organization (WHO). WHO published manuals in 1980, 1987,1992,1999, 2010 and very recently in 2021. A wide range of heterogeneity is very common in human semen profile in evaluation of both macroscopic and microscopic parameters. Although it is very important, male fertility cannot be determined based solely on a single routine semen analysis.[5] Semen quality can be measured by assessing sperm concentration, total number of sperms, percentage of rapid progressive and slow progressive motile sperms as well as non-motile sperms and sperm morphology using the traditional WHO criteria (WHO, 2010).[6]

The purpose of this study was

(i) To characterize the semen of the husbands of the infertile couples

(ii) To find any correlation of age with semen quality,

(iii) To identify the effect of occupation on their fertility status

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Materials and Methods

A cross sectional retrospective study was designed over the period of April 2019 to March 2020 on the basic semen analysis reports of the husbands of infertile couples reporting to the fertility clinic of a tertiary level military hospital of Bangladesh. Routine semen analysis was done for the male partners of about 851 couples over the specific period and out of them 372 were excluded from female cause of infertility. All of them failed to conceive even after unprotected intercourse for more than 12 months. Sexual abstinence was maintained within 2 to 7 days.[6] Age range of husbands was between 25 to 50 years. Local examinations of external genitalia of all husbands were performed by clinician and patients with diabetes, infectious diseases, hydrocele, hernia and varicocele were excluded.

Semen was collected for analysis by masturbation into a clean, sterile, wide-mouthed metal-free non-toxic plastic jar in a room close to the andrology laboratory of the fertility clinic and was labeled properly. Very few cases who even after taking the help of their wives, were unable to collect semen in the fertility clinic, were allowed to collect it in supplied sterile container from their homes. These patients brought their samples within 30 to 40 minutes of collection to the laboratory.

Semen parameters like PH, odor, volume, viscosity, sperm count M/ml, percentage of motility, viability and morphology of spermatozoa were assessed. Samples were usually kept at 37ºC at a non-CO_2 incubator and analyzed within 15 to 30 mins of collection or until liquefied. Volume was measured using graduated 14ml conical test tube.[7] If a very low volume was collected, if no spillage history was there, usually indicated presence of problem with production of enough fluid by the seminal vesicle or block with the ducts or problems with prostate glands.[8]

Sperm counts were done by counting at least two drops of diluted semen sample using Neubauer's hemocytometer with required dilution according to WHO manual 2010 (1:2,1:5,1:20)[6]. For a difference of more than 10%, another aliquot was checked and all four slides were averaged and routine sperm parameters were assessed in at least 200 spermatozoa per sample.[7] Sperm motility was assessed as categories of progressive, non-progressive and immotile sperms according to WHO criteria.[6] Ultimately total motility was calculated by summation of progressive and non-progressive motility and it was measured with a Makler chamber.[9] Sperm morphology was assessed using air-dried semen smears, fixed and stained with Papanicolaou to highlight details of the spermatozoa.[6,10] As cut off value of WHO was only 4%, most of the samples were in normal range.

Semen parameter cut-off values (lower reference limits)[6] established by the WHO manual were described as: semen volume (1.5 ml), sperm concentration (15×10^6 spermatozoa/mL), motility (32% progressive motile), vitality (58% alive), morphology (4% normal forms) and HOS test score (58%).[7] In addition, Total Count (Sperm Concentration x Volume) and Total Motility (Progressive Motility PR% + Non-progressive Motility NP%) were included in the analysis in each case. The vitality and hypo osmotic tests were not done for all patients and so the results were not included in this research. Statistical analyses were performed using SPSS v23. Anova and Chi-square tests were done.

Results

During the study period about 851 infertile couples reported at this tertiary hospital. This study aimed to include the cases of absolute male infertility. Again some exclusion criteria were considered and ultimately 372 cases could be assessed. It was seen that of the infertile male about 56% husbands were normozoospermic and 3.8% had definite cause like azoospermia. Including this group, 44% of the male population had at least one abnormality of semen parameters or combination of more than one. Severity of most of the abnormalities was more in non-military population. Significant differences were demonstrated in the mean values in semen parameters like volume, concentration and motility between different occupational groups. Morphology and viscosity were also seen but there were no significant difference.

Husbands were divided into different age groups and main bulk of population was in 30-34 years of age. All parameters showed gradual decrease with the increase of age. Significant differences were demonstrated in the mean values between different age groups in semen parameters like volume, concentration and motility with Anova test. For morphology, no important information could be revealed. Chi-square test was applied to find correlation between age groups and semen parameters, but no significant correlation was found (Table-II).

Table-I: Incidence of semen status and parameters according to occupation in husbands of infertile couples (n=372)

Semen status	Frequency (%)	Occupation		Semen parameters (with significance)		
		Military	Civil	Volume (Sig= .014)	Concentration (Sig= .000)	Motility (Sig= .000)
Normozoospermia	208(55.9%)	182(48.9%)	26(7.0%)	3.32±1.51	75.72±40.64	65.74±10.33
Oligozoospermia	17(4.6%)	17(4.6%)	0	3.17±0.96	06.52±04.52	62.35±15.21
Asthenozoospermia	56(15.1%)	45(12.1%)	11(3.0%)	2.87±1.40	52.14±41.91	33.64±20.09
Oligoasthenozoospermia	69(18.5%)	55(14.8%)	14(3.8%)	3.04±1.72	6.83± 5.72	28.76±19.59
Oligoasthenoteratozoospermia	08(2.2%)	06(1.6%)	02(0.5%)	3.93±2.14	0.50± 0.71	14.63±18.29
Azoospermia	14(3.8%)	12(3.2%)	2(0.5%)	2.02±1.41	------	----

Table-II: Mean value of semen parameters according to different age groups of husbands of infertile couples (n=372)

Age Group (years)	Volume (ml)	Concentration(10^6/ml)	Total motility (%)	Morphology (%)
25-29	3.29±1.42	57.75±50.60	54.44±23.03	20.79±11.53
30-34	3.29±1.13	54.16±47.94	51.69±26.28	17.85±10.47
35-39	3.01±1.37	42.76±42.13	50.51±20.54	18.43±10.89
40-44	2.90±1.39	36.41±35.28	46.51±22.60	20.13±9.14
45-49	2.07±1.34	27.35±36.68	36.11±28.44	13.44±12.66

Table-III: Range of Semen Parameters and WHO Cut off value (n=372)

Semen Parameters	Volume (ml)	Total count (10^6 /ml)	Total Motility (%)	Morphology (%)
Range	0.5-10.00	00-900	00-85	2-42
(Mean±SD)	(3.16±1.55)	(51.76±46.23)	(50.32±24.44)	(18.6±01.80)
WHO cut off value 2010	≥ 1.5	≥ 39	≥ 40	≥ 4

Semen parameters of the husbands of infertile couples reported showed different ranges like volume from 0.5 ml to 10 ml, total count from 0 to 900 million, total motility from 0 to 85% and percentage of normal morphology from 2 to 42%. Table-III also shows cut off value of each parameter. As cut off value for normal morphology is very low (4%), about 98% of the husbands showed normal morphology.

Table-IV: Comparison of total count of sperms between different age groups of patients below and above cut off value of WHO (n=372)

Age group (years)	Total count (%)		Total	*p*-value
	Below cut off	Above cut off		
25-29	18 (4.6%)	56 (15.1%)	74 (19.9%)	
30-34	46 (12.4%)	110 (29.6%)	156 (41.9%)	
35-39	38 (10.2%)	66 (17.7%)	104 (28.0%)	0.009
40-44	2 (0.4%)	27 (7.3%)	29 (7.8%)	
45-49	5(1.6%)	4 (1.2%)	9 (2.4%)	

Table-V: Comparison of total motility of sperms between different age groups of patients below and above cut off value of WHO (n=372)

Age group (years)	Total motility (%)		Total	*p*-value
	Below cut off	Above cut off		
25-29	17 (4.6%)	57 (15.3%)	74 (19.9%)	
30-34	49 (13.2%)	107 (28.8%)	156 (41.9%)	
35-39	37 (9.9%)	67 (18.0%)	104 (28.0%)	0.056
40-44	7 (1.9%)	22 (5.9%)	29 (7.8%)	
45-49	6 (1.6%)	3 (1.2%)	9 (2.4%)	

Subjects below the cut off value of WHO among the age groups were found to be significant for total count (X^2=13.53, p=<0.01) and total motility (X^2=9.21, p=< 0.05), but not significant for volume and morphology.With occupational groups this test also didn't show any significant difference.

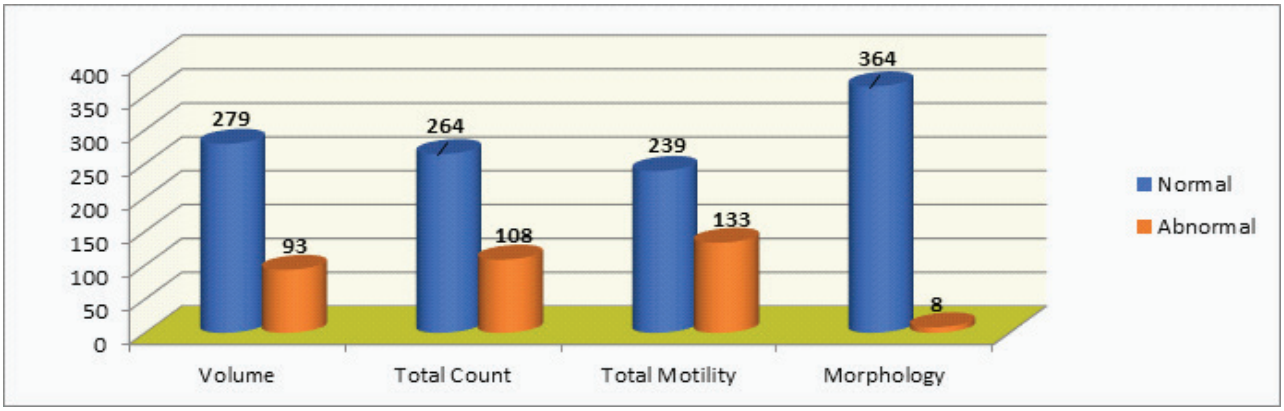

Figure-1: Distribution of male patients within and outside the range of WHO cut off value.

This figure is showing by blue column what percentage of patients within normal range of respective parameter.

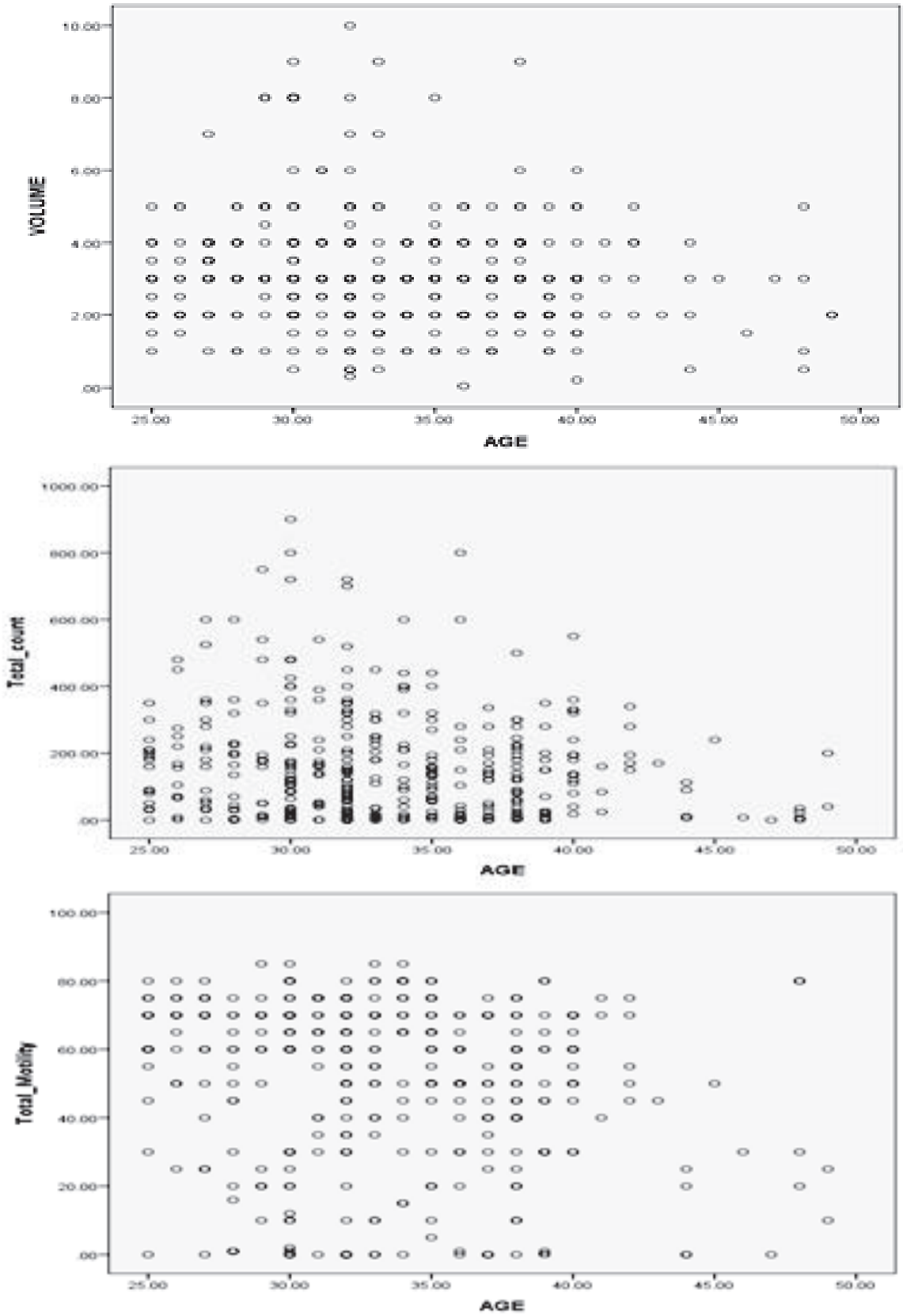

Figure-2: Pearson's Correlation test between Age group and volume, total count and total motility.

Significant negative correlation was found between age and volume (r= -.12 =<0.05), age and total count (r= -.13 p=<0.01) and age and total motility (r= -.15 p=<0.01)

Discussion

Male Infertility– a social health issue but still a taboo in low resource regions like ours. Infertility is on an upward curve now and is striking the racing horse of busy life. It is affecting public health as well as economic and psychosocial life of modern society. Globally 15% of couples are affected by this under reported public health problem. Though global data estimates males are independently responsible for 20-30% of infertility cases and contribute to 50% overall[1], still a general lack of awareness and acceptance exists to this fact and the major brunt of this menace is borne by the females. This study revealed that about 44% of the husbands had one or more abnormal features in their semen profile but several studies showed this abnormal feature around 60 to 70% or more.[8,10]

A very heterogeneous character of human sperm has made the spermiogram highly variable. Even a normal spermiogram may do not show satisfactory fertility potential in many persons.[2] This study shows normozoospermia in more than fifty percent husbands of infertile couples and it was about 75.7 x 106/ml (Table-I). Multiple authors reported similar results. Macleod and Wang[11] found a mean sperm count of 73 x 106/ml and David et al[12] reported a mean of 71 x 106/ml in their studies. In the former study 17% population had oligozoospermia. In this study, only 4.6% husbands were oligozoospermic, but about 14.8% were oligoasthenozoospermic. Sunanda et al[10] had got nearly similar (13.4%) result for oligoasthenozoospermic patients in her study.

Parental age is increasing in the developing world. Still the common concept is male can reproduce even beyond 40 years of age and onwards. But this study is showing that all semen parameters are getting worse with age. Sunanda et al[10] showed the age significantly affects the sperm quality including progressive motility, vitality and morphology. Keeping 40 years of age of male patients at cut off value Veron et al[7] showed significant decrease of semen parameters in their study on 11,706 men. This study also is reflecting same message showing that all parameters decrease along with gradual increase of age and this decrease is relatively abrupt after 39 years of age.

The researcher tried to find out the relation of different parameters of infertile male persons of Bangladesh comparing with cut off value as set by WHO. This study results revealed that volume, total count and motility affect significantly the fertility potential of this population in comparison to morphology in different age groups. Different studies emphasized on percentage of sperm morphology, as it is a very essential predictor of in vivo fecundity and in vitro fertilization capability of sperm. The reviewers of the referred study analyzed 10 articles using 5 and 14% normal sperm morphology thresholds and got positive predictive value.[13] They revealed fertilization rate per oocyte was 59.3% for those lying equal to or below 4% normal morphology threshold. Present study could not assess the fertilization rate of sperm, rather tried to exhibit any relation with increasing age. But probably very low threshold (below 4%) failed to relate the degree of severity of abnormal morphology with increasing age.

Occupation may be a causative factor for infertility, and male are undoubtedly affected. A number of harmful physical, chemical and psychological factors may affect the working environment. Now-a-days these stressors have drawn the attention of many researchers of the world about their effects on physiology of different systems of the body and especially on the reproductive system. Vaziri et al[14] tried to compare different semen parameters with occupation in their study. They didn't find any significant relation of sperm morphology with occupation, but with motility to an extent. This study was done in a tertiary level military hospital where most of the patients are uniformed personnel. They came from Army, Air force and Navy. Their work pattern, life styles etc are nearly similar. Difference mainly lies with their personal food habits, sleep habits or bad habits like smoking, tobacco chewing etc which may affect semen parameters. A number of employees also serve in Military who are not uniformed. They have no mandatory regular physical activity like the uniformed persons. Most of them are sedentary workers. A good number of them are office clerks. There are cook, mess waiter, cleaner, driver, teacher etc. All of them are grouped as civil. Comparison of the semen parameters of military and civil population has showed that more than 50% of the civil population had different types of isolated or combined abnormality in their semen parameters. At the same time, though infertile, most probably due to disciplined life style, regular physical activity, controlled food habits etc there are less abnormality shown in semen parameters in military community. Normal semen parameters were also non significantly higher in military population as was shown by Aleisa NAS.[15] He also showed that age had no effect on sperm conc., viscosity and morphology but there is an inverse effect of age on motility and volume.

Conclusion

Infertility is a curse to most of the married couples. Our society always points to the female partner, though in many instances cause lies in male partner only. Wherever may be cause, it is essential to help the couple to come out of this burden. So it is very much required to find out the causes as well as the remedies of male infertility and future studies should be continued.

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