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Original Article

Pattern of Semen Parameters of Sub-fertile Males Attending an Infertility Clinic at a Tertiary Level Hospital in Bangladesh

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ABSTRACT

Sub-fertility is an upsetting situation for childless couples who are experiencing a lot of physical, mental, social, and economic trauma. Many women go to an infertility clinic or gynecologist without their husbands because it is still considered a female issue, but male factors play a significant role in its etiology. Semen analysis is the most fundamental, useful and inexpensive means of assessing male factor infertility. This descriptive cross-sectional study was directed among sub-fertile males of infertile couples visiting the CARE (Centre for Assisted Reproduction) in Department of Obstetrics and Gynaecology of BIRDEM, Dhaka. The study was conducted among 126 males who were sub-fertile and aimed to evaluate the patterns of sperm parameters using semen analysis. After receiving informed consent and meeting eligibility criteria, participants were interviewed and semen analysis reports were obtained. Semen from the male partners were analyzed in the laboratory using the World Health Organization (WHO) 2021 criteria for human semen characteristics. Data were analyzed by using SPSS- 22. A total of 126 participants' semen analysis and background characteristics were evaluated by using WHO standard for semen normality criteria, 2021. The WHO standard for semen normality criteria, 2021 was used to evaluate the semen analysis and background characteristics of *126 participants. The mean age (Mean±SD) of the study subjects was 34.92±6 years with their age range 21 – 52 years; among these respondents most of them (84.10%) were in the most productive fertile age group 21-40 years. In this study primary sub-fertility was observed in 68.3% of men and maximum of them (43.7%) were demanding to conceive over 3-5 years. Study found the following normal parameters of semen analysis; those are, 4.76% of the men had <1.4 ml semen volume per ejaculation, nearly one-fourth (22.22%) of men had sperm concentration <16 million/ml, more than half (55.56%) of the men's total sperm motility was <42% and 17.46% of them were found abnormal morphology of sperm (teratospermia). The mean (Mean±SD) of semen volume was 2.59±0.99 ml, pH was 7.27±0.69, sperm concentration was 59.38±52.34 million/ml and the mean of total motility of the sperm was 36.70±24.71%; however mean of immotile sperm was 51.99±28.04% and normal morphology of sperm was 35.52±24.49%. An abnormal patterns of semen parameters were seen in majority (58.73%) of men; among them more than one-third (34.9%) of them were asthenozoospermia, 11.1% was azoospermia, Oligoasthenoteratozoospermia was 7.1%, Oligospermia 8% and Oligoasthenozoospermia 4.8%. According to age-wise distribution maximum cases of asthenospermia (20.6%) were observed between the age group of 31-40 years. Single-factor abnormalities was observed in 47.6% cases and 11.11% had combined factor abnormalities. This study found that asthenozoospermia was the main single factor abnormality or sub-fertile state, followed by azoospermia. Male partners of sub-fertile couples attending infertility clinics consistently have abnormal semen parameters, which are prevalent with primary sub-fertility. This study similarly found that asthenozoospermia and azoospermia were common abnormalities in male partners.*

Keywords: *Sub-fertility, male infertility, sperm (semen) parameters, male partners of couples.*

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INTRODUCTION

Sub-fertility is a universal health concern affecting millions of people of reproductive age worldwide. It is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. [30] Sub-fertility is still considered to be a female issue and very sensitive matter in question in country with patriarchal society like Bangladesh.[10]

The prevalence of infertility in the general population is 15% - 20%; among these, male factor is responsible for 20% - 40% [24] and female factors contribute 30% - 40% while, both factors and unexplained causes account for 20% - 40% each.[8] According to WHO data more than 180 million couples in developing countries suffer from primary or secondary sub-fertility, another study revealed that more than 186 million people are infertile worldwide.[11] The actual rate of infertility in Bangladesh is still unknown but World Infertility Survey in South Asian Country revealed that sub-fertility is 4% in Bangladesh. [27,29] Prevalence of male partner sub-fertility according to semen analysis WHO criteria 2010 was evident 62% in infertility clinic of BIRDEM in Bangladesh.[21] Sub-fertility is an underlying pathology with female factors contributing 30-40% of causes, male factors about 30-40% while both factors and unexplained infertility account for 20-40% of causes.[2] Sub-fertility affects around one in eight couples of reproductive age, with a male factor being exclusively responsible in 20% and contributory in an additional 30% of cases.[18] The total fluid volume depends on the secretory activity of accessory sex glands. The nature of spermatozoa (concentration, vitality, motility and morphology) and the composition of seminal fluid are essential for sperm function. Semen analysis is the study of semen parameters namely volume, pH, sperm count, sperm motility and sperm morphology. It is a keystone, inexpensive, noninvasive and readily available investigation in a sub-fertile couple to evaluate male infertility.[9] The semen parameters are essential determining factor to figure out the functional capability of the spermatozoa to fertilize ova. Identifiable abnormalities on semen analysis are low sperm concentration, poor sperm motility, and/or abnormal morphology. Vigilant evaluation of the semen parameters may denote the possible causes of male infertility.[25]

The accumulated data from 12 countries and five continents has established lower reference values for semen parameters for fertile men that are more comprehensive, more geographically representative, and globally applicable. (Campbell et al 2020). WHO endorsed the 95% confidence interval for the 5th centile values of semen parameters from this study and made it available in the WHO laboratory manual for human semen examination and treatment in 2021. This manual not only facilitate the interpretation of the results of semen analysis but also give a guideline for clinical decisions as the choice of treatment modalities for male factor infertility.

Routine semen analysis still remains the gold standard in the search for male factor infertility. Most studies on semen pattern had been done based on the WHO 2010 criteria for human values for semen characteristics. Bangladesh is a patriarchal society where women are obliged being treated for subfertility for a long time without assessing her male partner's fertility status on most the occasions. Unfortunately, in our country there is no sufficient literature and research, epidemiological study and statistical data regarding male factor infertility. The goal of this study was to draw the patterns of semen parameters in male partner of sub-fertile couples for holistic management of subfertility.

MATERIALS AND METHODS:

This descriptive type of cross-sectional study aimed to analyze seminal fluid of sub-fertile males for the founding of pattern of sperm parameters to address infertility. This study was carried out during July 2021 to Dec 2022 among male partners of couples attending at CARE (Centre for Assisted Reproduction) in the Department of Obstetrics and Gynaecology, BIRDEM, Dhaka. Ethical approval was obtained from Institutional Review Board (IRB) of BIRDEM and participants were enrolled in the study after taking written informed consent. Samples were selected purposively according to the availability of the respondent who fulfilled the inclusion and exclusion criteria. Total 126 sub-fertile males, age > 18 years, married for at least 12 months having regular unprotected intercourse and were able to provide semen sample were included in this study as participants.

Specimen collection:

The sub-fertile males were adequately counseled and given instructions on how to collect the semen samples. All the participants were abstained from sexual intercourse or masturbation for a period of 3 - 5 days. Semen collection was done mainly by masturbation after washing their

hands in a dedicated room in the laboratory. Spilled samples were avoided. All samples were collected into sterile screw capped plastic universal containers. The semen analysis was done by the same laboratory scientist to avoid inter-laboratory variation, within 1 hour of collection. The sample was assessed for volume, appearance, liquefaction, concentration, motility, morphology, viability and presence of pus cells. The semen volume was measured using a graduated disposable pipette and pH was checked with pH paper. After liquefaction, the semen specimen was thoroughly mixed using a pipette and a thin drop of specimen was spread on a glass slide by placing a cover slip on it. Sperm motility was assessed using an Olympus binocular microscope, magnification .100, while the sperm concentration was counted in millions per mL using the Meckler counting chamber and categorized in accordance with WHO normal and pathological ranges in 2021.

*[**Safety precaution:** Universal precaution was obtained. Semen samples might contain dangerous infectious agents (e.g. human immuno deficiency virus (HIV), hepatitis viruses or herpes simplex virus) and should therefore be handled as a biohazard. Gloves, lab coat, and safety glasses was worn when handling body fluid products. Disposable plastic, glass, paper and gloves that contact semen was placed in a biohazard bag. Non-disposable material at the end of working day was disinfected. Washing hands thoroughly was done after removal of personal protective devices used in handling specimens and kit reagents].*

Data Collection: At first participants were interviewed and semen analysis report was recorded. A semi structured questionnaire and a chick list were developed to record information from the participants and semen analysis. It was contained the socio demographic characteristics of the participants in terms of age, educational status, religion, occupation, income status, type of infertility and duration of infertility. The semen analysis report was collected and interpreted

Data presentation and analysis: Statistical analyses were carried out by using Windows based Statistical Package for Social Sciences (SPSS), Version- 22. Descriptive statistics of the study was presented in tables, figures or suitable graphs, frequency, percentage, mean±SD as per the requirement of qualitative and quantitative variables. Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as frequency, distribution, percentage and 95% confidence limit was taken.

RESULT

The hospital based descriptive cross-sectional study was carried out to evaluate the semen patterns in male partners of infertile couples attending infertility clinic, CARE, in the Department of Obstetrics and Gynecology of BIRDEM General Hospital, Dhaka. A total of 126 study subjects were selected according to selection criteria. The mean age of participants was 34.92 ±.6 years and age range was 23 to 52 years; here, 84.1% of them was in 21 to 40 years age group and rest of them were 41 to >50 years. Muslim participants were 95.24% and rest were Hindu. Among the participants 48.4% was service holder; additionally business 20.6%, migrant worker 9.5%, agriculture 1.6% and others 19.8%. According to their income status; middle income (31 - 60k) was 62.70%, lower income (1 -30k) was 30.95% and upper income (>60k) was 6.35%. According to educational status, 50% of the participants had completed tertiary level of education, moreover secondary education 34.92%, primary 10.32% and non-formal 4.76%. Results related to pattern of sperm parameters following semen analysis of sub-fertile males are presented by graphs and tables.

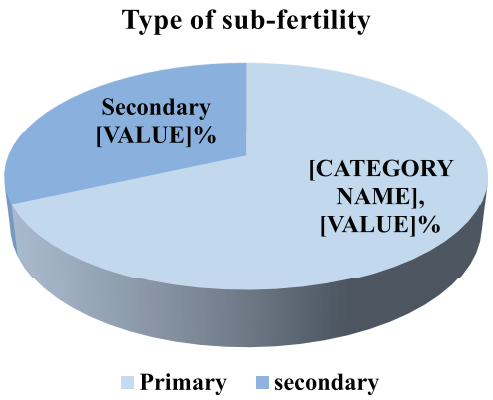

Figure-1: *Distribution of participants according to type of sub-fertility (n=126)*

Figure1 appears the distribution of participants according to type of sub-fertility; a total of 86 (68.3%) participants were investigated as a case of primary infertility while 40 (31.7%) were secondary infertility.

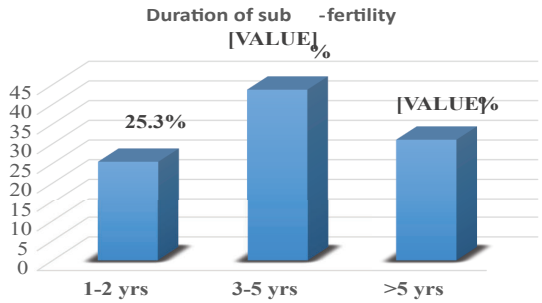

Figure- 2: *Distribution of participants according to duration of sub-fertility (n=126)*

Figure 2 illustrates the distribution of participants according to duration of sub-fertility, where we found 43.7 % of the respondents were trying to conceive for 3-5 years, 31% for >5 years and 25,3% for 1-2 years.

SEMEN PROFILE FOLLOWING SEMEN ANALYSIS

Table-I demonstrates the semen parameters of participants; study found abnormal parameter of semen volume, sperm concentration, total motility and morphology of sperms below the cut off value (teratospermia) were 4.76%, 22.22%, 55.56% and 17.46% respectively in study participants.

Table II contains the physiochemical characteristics of semen of the participants; the characteristics includes appearance, liquefaction, consistency and WBC count (<1× 10^6 /ml in all samples) of semen were normal in all study subjects. Mean of semen volume and pH was 2.59±0.99 ml and 7.27±0.69 respectively.

Table- I: Semen parameters of participants (n=126)

Characteristics	Frequency	Percentages
Semen volume		
Volume < 1.4 ml	6	4.76%
Volume > 1.4 ml	120	95.24%
Total	126	100
Sperm concentration		
<16 million /ml	28	22.22%
>16 million /ml	98	77.78%
Total	126	100
Total motility		
Motility < 42%	70	55.56%
Motility > 42%	56	44.44%
Total	126	100
Morphology		
Teratospermia (> 4% abnormal sperm)	22	17.46%
Normal morphology	104	82.54%
Total	126	100

Table- II: Physiochemical characteristics of semen of the participants (n=126)

Physiochemical properties	Mean	Std. Deviation	Minimum	Maximum	Range
Appearance		Normal			
Liquefaction		Normal			
Consistency		Normal			
Volume(ml)	2.59	0.99	1	6	5
pH	7.27	0.69	0	7.80	7.80
WBC count	<1× 10^6 /ml in all samples				
Agglutination	No agglutination in all samples				

Table III shows the features of sperm investigation; study found mean sperm concentration were 59.38±52.34 million/ml. Mean percentage of total motile and immotile sperm was 36.70±24.71% and 51.99±28.04% respectively while the proportion of normal morphology of sperm was 35.52±24.49%.

Table- III: Features of sperm investigation (n=126)

Sperm characteristics	Mean	Std. Deviation	Minimum	Maximum
Concentration	59.38	52.34	0	230
Total motility	36.70	24.71	0	75
Rapid progression	13.67	11.25	0	70
Slow progression	17.74	12.78	0	40
Non progressive	6.06	4.65	0	30
Immotile	51.99	28.04	0	100
Normal morphology	35.52	24.49	0	85

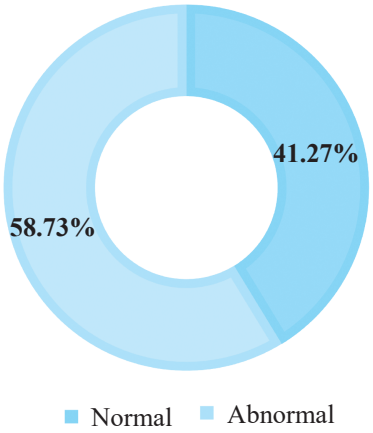

Figure- 3: *Normal and abnormal parameters among participants (n=126)*

Figure- 3 displays normal and abnormal semen parameter; here abnormal semen parameter of sub-fertile men was 58.73%.

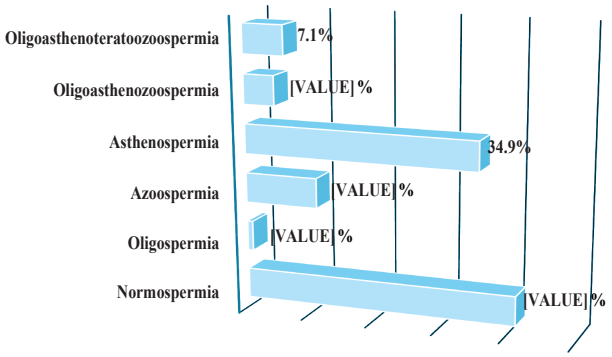

Figure- 4: *Outcome features sperm following semen analysis (n=126)*

Figure 4 exhibits the outcome features sperm following semen analysis; at this point asthenospermia 34.9%, azoospermia 11.11%, oligoasthenzoospermia (4.8%), oligo asthenoteratoozoospermia (7.1%) are main features of abnormal semen parameter.

Table- IV: Distribution of semen parameters by age groups (n=126)

Age group	Pattern of semen analysis						Total
	Normospermia	Oligospermia	Azoospermia	Asthenospermia	Oligoasthenozoospermia	Oligoasthenoteratozoospermia	
21 to 30	15	0	3	10	1	1	30
31 to 40	28	1	10	25	5	7	76
41-50	9	0	1	7	0	1	18
>50	0	0	0	2	0	0	2
Total	52	1	14	45	6	8	126

DISCUSSION

This cross sectional study was carried out to determine the pattern of semen parameters in male partner of infertile couples attending outpatient clinic of BIRDEM General Hospital. A total of 126 male partner of infertile couples attending CARE of Obstetrics and Gynaecology department of BIRDEM General Hospital who fulfill the inclusion and exclusion criteria were included in this study.

In this study majority (60.3%) of the respondents were 31-40 years of age and only 2 (1.6%) respondents were more than 50 years of age. Mean age of respondents were 34.92± 6.005 years. In this study 95.24 % of respondents were Muslim and only 4.76 % were Hindu. Majority of respondents (48.4%) in this study were service holder and 20.6% were business man. In present study majority (50%) of respondents completed their tertiary level of education and only 4.76 % were non-formally educated. In a similar study carried out by [21] in BIRDEM found that majority 63% respondents were 30-40 years age and mean age was 35.5 years, There majority of respondents were Muslim (88.5%), Over 50.3% completed their tertiary level of education and only 11.3% had primary level of education.[21] Noted that, 45.6% participants were service holder which was almost similar to my current study as both the study was carried out in the same place.

This study finds that 68.3% of the study population had primary infertility and 31.7% had secondary infertility. In a similar study carrie out by[12] in Nepal showed that primary infertility was 78.5% and secondary infertility was 21.5%. There was slight disparity of finding because my study was

on male partners of infertile couples attending the infertility clinic while the index study selected infertile male partners of couples attending both gynaecology and urology clinics. Here majority of the respondents (43.7%) were trying to conceive for 3-5 years. Similar findings were observed in study conducted by Abrari et al. and Bodal et al.

The study search for the characteristics of abnormal semen parameters among male partners, semen volume <1.5 ml was 4.76%, sperm concentration <16 million/ml was 23.8%, sperm motility <42% was 55.56% and abnormal sperm morphology >4% was found in 17.46% study participants. In a retrospective study, Patan hospital in Nepal noted semen volume < 1.5 ml was 8.6% and sperm concentration <16 million/ml was 19.3%.[7] These findings similar to my current study. There are multiple studies where shows, There is a trend of declining sperm concentration in men around the world.[15,16]

Low sperm count plays significant role in male sub-fertility.

This research showed that appearance, liquefaction and consistency of semen was normal in all subjects. Mean Semen volume was 2.59±.99 ml, PH was 7.26±.69 and semen concentration was (59.37±52.33)×106//ml. In a similar study carried out by[12] in Nepal showed that Mean volume of semen was 2.48±0.91 ml, PH was 7.26±32, Mean semen concentration was (35.45±26.68)×106/ml. In another study carried out by Sarkar A, 2015 were showed that the sperm volume was less 1.5 ml in 7.45% of cases.

This study investigated that the mean motility of sperm was 36.70% and among them 13.67% was rapid progressive, 17.73% was slow progressive, and 6.06% was non progressive. Average 51.99% sperm was immotile among study participants. Furthermore, Normospermia was 41.3%, Asthenospermia 34.9%, Azoospermia 11.1% and Oligoasthenzoospermia 4.8% and OAT 7.1%. These all were the major factors for contributing abnormal semen. In another study,[12] 2021 in Nepal reported that Asthenospermia 39.30%, Azoospermia 28.8% and oligoasthenzoospermia 17.9%, Oligozoospermia 8.7%, OAT 3.5% and teratozoospermia 1.8%. This slight dissimilarity was due to demography and ethnicity difference of study subjects. In this study, all age group had abnormal semen parameters but Asthenospermia was highly prevalent in all age group. In a similar study carried out by[3] showed that Oligozoospermia was prevalent among them. This dissimilarity was due to ethnicity different among the study subject.

The prevalence of abnormal semen parameters according to WHO guideline 2021 was 58.73% in this study. Several other studies showed the prevalence of male factors infertility which was similar to current study like[7] all three studies showed the prevalence of abnormal semen parameters were 56% , 62% and 66.2% respectively. This higher prevalence of male infertility could be mainly due to this study area being a referral center from the primary and secondary institutions for sub-fertility. Another study, demonstrates abnormal semen quality is up to 75.4% of the male partners of couples seeking medical attention for their inability to conceive in. [2,27] Enrolled patients' conditions, Social, Ethnic, Geographical, Environmental, Socioeconomic and Psychological factors among the study participants may play a role in these dissimilarities. Which need further detailed analysis and evaluation.

CONCLUSION

Abnormal semen parameters remain markedly high in male partners of sub-fertile couples and was more common with primary subfertility. Asthenozoospermia and azoospermia were frequent abnormalities in study participants. The present study only illustrates an abnormal pattern of seminal fluid analysis of malefactors. The presumptive causative factors/ risk factors account for these aberrant semen patterns, which were not discussed in this study. As a result, further research is needed to understand the causes of male factor infertility, which will eventually aid in the management of male infertility situation

Limitations of the Study

Hospital based, small sample, purposive sampling merely institute a cross-sectional study and never represent the general population.

RECOMMENDATIONS

Community based or multiple hospital (infertility centre) based systematic large sample would provide authentic parameters following semen analysis of sub-fertile males. Qualitative study would be encouraged to identify risk factors related to male sub-fertility. Need necessary awareness and a simple semen analysis test as a screening tool among sub-fertile couples at community level.

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