



## SPERM MOTILITY: A CRUX OF MALE INFERTILITY

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**ABSTRACT** **Introduction:** Infertility is a disorder of the male or female reproductive system which is defined by the failure to conceive even after 12 months or more of regular unprotected sexual intercourse. Various studies revealed that male factor contribute to 20% to 70% of infertility and around 2.5% to 12% of males are infertile. Male infertility is difficult to diagnose and about 60–75% of cases remain idiopathic. As a result, semen analysis, which has a sensitivity of 89.6% and can identify 9 out of 10 men who actually have a problem with male infertility, continues to be the most important and basic research. It is an easy test that evaluates sperm development and maturity as well as sperm interactions in the seminal fluid. It also sheds light on sperm quality (motility, morphology), in addition to sperm production (count). **Material and method:** Semen collection in a clean, dry, wide-mouthed container which is allowed to get liquefied (usually takes 30 minutes) and then viewed under microscope. **Results:** In mild oligozoospermic patients - out of 52% of motile sperm, 31% were rapid progressive, 14% were sluggish motile and 7% were non-progressive. In moderate oligospermic patients - out of 40% of the motile sperm, 28.5% were rapidly progressive, 6% were sluggish motile and 5% were non-progressive. In severe oligospermic patients - out of 36% motile sperm, 23% were rapidly progressive, 11% were sluggish motile and 7% were non-progressive. **Conclusion:** Sperms with rapidly progressive motility are more important than overall motility and hence a key factor contributing to fertility. **Summary:** Infertility is a disorder of the male or female reproductive system which is defined by the failure to conceive even after 12 months or more of regular unprotected sexual intercourse. Various studies revealed that male factor contribute to 20% to 70% of infertility and around 2.5% to 12% of males are infertile. Semen analysis was done for 37 samples. The study revealed that sperms with rapidly progressive motility are more important than overall motility and hence a key factor contributing to fertility.

**KEYWORDS :** Male infertility, sperm motility, rapidly progressive motile sperms

## INTRODUCTION

Infertility is a disorder of the male or female reproductive system which is defined by the failure to conceive even after 12 months or more of regular unprotected sexual intercourse<sup>1</sup>. Infertility is a condition with psychological, economic, medical implications that can cause millions of people in the world who are of reproductive age struggle with infertility, which also has an effect on their families and communities. Infertility is thought to affect between 48 million couples and 186 million people worldwide.<sup>2</sup> The WHO reports that the overall prevalence of primary infertility ranges from 3.9% to 16.8%.<sup>3</sup> A study on male infertility around the globe showed that males are reported to be entirely accountable for 20–30% of infertility instances, and they also account for 50% of all cases<sup>4</sup>. However, this statistics is not applicable to all regions of the world. Various studies revealed that male factor contribute to 20% to 70% of infertility and around 2.5% to 12% are males are infertile. Central and Eastern Europe and Africa had the greatest infertility rates. The rates of male infertility in North America, Australia, and Central and Eastern Europe, respectively, ranged from 4.5 to 6 percent, 9 percent, and 8 to 12 percent, according to a number of publications. Additionally, it has been demonstrated that the prevalence of primary infertility varies among Indian tribes and castes living in the same territory<sup>5</sup>.

About 50% of the couples do not achieve pregnancy within one year and seek medical treatment for infertility<sup>6</sup> and genetic abnormalities are thought to account for 15 – 30% of male factor infertility<sup>7</sup>. However, male infertility is difficult to diagnose and about 60 – 75% of cases remain idiopathic<sup>8</sup>.

Infertility is a major challenge to reproductive health and the aetiology involves both genetic and environmental risk factors. Approximately 15% of couples are infertile across the globe, and the origin of problems is shared almost equally by both the sexes<sup>9</sup>. Due to male domination and illogical male masochism the problem of male infertility remains unattended in Indian society. Some of the clinically proven causes of infertility among Indian men is low sperm count and atypical morphological forms of sperm and motility. Around 90% or more of male infertility cases reported show reduced concentration of sperm or mediocre quality of spermatozoa present in the semen<sup>10</sup>. Male

infertility refers to failure to achieve pregnancy in a fertile female. “Male factor” infertility is seen as variation in sperm concentration and/or motility and/or morphology in at least one of the two samples of semen analysis, collected 1 and 4 weeks apart<sup>11</sup>. Globally, it accounts for 40-50% of infertility<sup>12,13,14</sup> and 23% in India and affects approximately 7% of all men<sup>15</sup>. Male infertility is usually due to insufficiencies in the semen and semen quality is used as a surrogate measure of male fecundity<sup>16</sup>.

Semen parameters of males with values below the lower value mentioned in the WHO for semen examination, are considered to have male factor infertility<sup>17</sup>. Low sperm concentration (oligospermia), poor sperm motility (asthenospermia), and aberrant sperm morphology are the most significant of these (teratospermia). Semen volume and other seminal markers of epididymal, prostatic, and seminal vesicle activity are other factors less clearly linked to infertility<sup>18</sup>. Up to 90% of issues with male infertility are related to count, and aberrant semen characteristics have a favourable correlation with sperm count<sup>19</sup>. Pre-testicular, testicular, and post-testicular variables are all involved in the disordered regulation mechanism that results in problems with sperm count, motility, and morphology.

As a result, semen analysis, which has a sensitivity of 89.6% and can identify 9 out of 10 men who actually have a problem with male infertility<sup>20</sup>, continues to be the most important and basic research. It is an easy test that evaluates sperm development and maturity as well as sperm interactions in the seminal fluid. It also sheds light on sperm quality (motility, morphology), in addition to sperm production (count)<sup>21</sup>.

## MATERIALS AND METHOD:

**Sample size:** 37 cases

### Study setting

Department of Pathology, Mahatma Gandhi Mission's Medical College and Hospital, Kamothe, Navi Mumbai.

### Study design

A prospective study will be carried out on semen analysis in Central

Laboratory, in the Department of Pathology, MGM Medical College, in Kamothe, Navi Mumbai.

**Inclusion criteria**

- Males fulfilling WHO infertility criteria that is inability of a sexually active, non-contracepting couple to achieve spontaneous pregnancy in one year
- Patients with an age above 21 years, received at Obstetrics and Gynecology Department for investigation of infertility at MGM's Medical College Hospital, Kamothe, Navi Mumbai.

**Exclusion criteria**

Samples from patients with history of mechanical obstruction and surgical trauma.

**Procedure**

The study consists of detailed study of all the semen samples coming to Infertility Clinic of Gynaecology Department Laboratory of Mahatma Gandhi Mission's Medical College Hospital, Kamothe, Navi Mumbai

**Collection of semen:**

- For analysis or study purposes, the semen sample should be obtained by masturbation and ejaculated into a clean, wide-mouthed non-toxic glass or plastic container labelled with patient's details and kept at room temperature, between 20 °C and 37°C, to avoid any temperature changes affecting the ejaculated spermatozoa to allow it to liquefy.

**Semen liquefaction:**

Semen is a semi-solid mass collected in a vessel after ejaculation which liquefies at room temperature within 15-30 minutes of collection and results in formation of eventually homogeneous and fluid in nature.

**Microscopic examination:**

The wet mount slides are viewed under light microscope to access the motility of sperms. For determining the total count, improved Neubauer haemocytometer is used which

Here we would look for total sperm count, classify sperms into actively motile, sluggishly motile and non-motile. Also, presence of abnormal forms of sperms, if present (double head, no tail, etc) and presence of any pus cells, round cells or red blood cells present in semen.

**RESULTS**

**Age-wise distribution of infertile males**

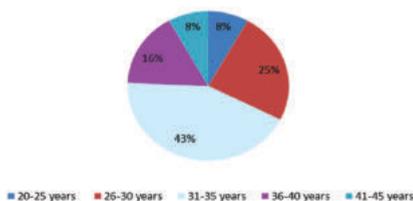
A total of 37 male partners of infertile couples were investigated during our study period.

**Table 1: Classification of patients on basis of their age group (n = 37)**

Age Groups (Years)	Number of patients N (%)
20-25	3 (8.10)
26-30	9 (24.32)
31-35	16 (43.24)
36-40	6 (16.21)
41-45	3 (8.10)
Total	37 (100)

The age of the patients ranged from 20 – 45 years, with the mean age of the patients being 32 years. The patients aged ≤30 years were 12 (32.43%) in number, whereas patients aged >30 years were 25 (67.56%). The most common age group affected was 31 – 35 years accounting to 43% followed by 26 – 30 years accounting to 25% out of total number of samples..

**Classification of Number of patients (%) according to age group**



**Graph 1. Percentage of patient in each age group (n = 37)**

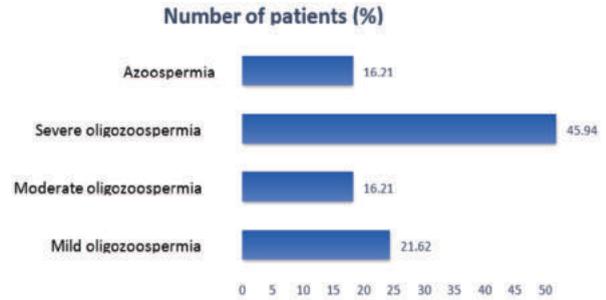
**Semen analysis**

**(I) Distribution on the basis of total sperm count**

**Table 2: Number of Patients in each category based on Sperm counts in 37 patients**

Classification	Range (Total count in millions/ml)	Number of patients
Mild oligozoospermia	10-15	8 (21.62)
Moderate oligozoospermia	5-10	6 (16.21)
Severe oligozoospermia	Less than 5	17 (45.94)
Azoospermia		6 (16.21)
Total		37(100)

Out of total 37 patients, 17 (45.94%) patients were diagnosed to have severe oligozoospermia followed by 8 (21.62%) patients diagnosed as mild oligozoospermia, 6 (21.62%) patients in each of the rest categories, which is mild oligozoospermia and azoospermia



**Graph 2: Number of Patients in each category based on Sperm counts in 37 patients**

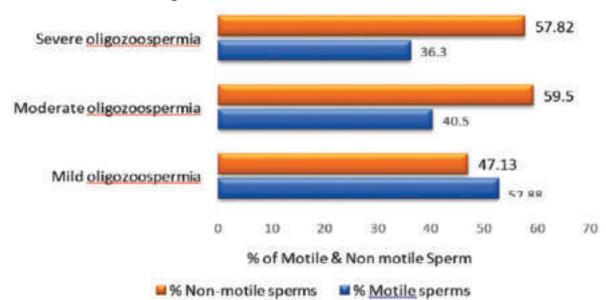
**(ii) Distribution according to motility**

**Table 3: Average of percentage of motile sperms and non-motile sperms in 37 patients**

Classification	% Motile sperms	% Non-motile sperms
Mild oligozoospermia	52.88	47.13
Moderate oligozoospermia	40.5	59.5
Severe oligozoospermia	36.3	57.82

The total motile sperm count shows a decreasing trend with decrease in the number of sperms/ml as shown in the table above.

Maximum number of motile number of sperms (52.88%) was seen in mild oligozoospermia while the highest number of non – motile sperms was seen in the moderate oligozoospermia with 59.5%. It is intriguing that non-motile % of spermatozoa also shows a rise in the trend with a fall in sperm count/ml.



**Graph 3: Average of percentage of motile sperms and non-motile sperms in 37 patients**

**(iii) Table 4: Classification of motile sperms according to their degree of motility**

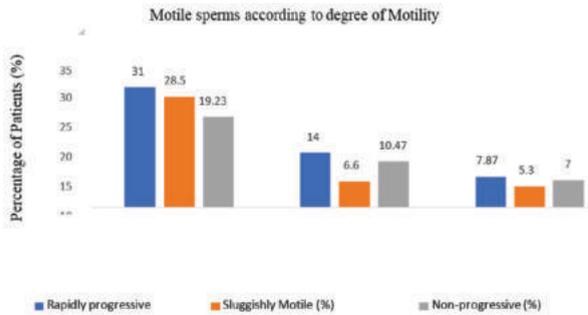
Classification	No of patients	Motility		
		Rapidly progressive (%)	Sluggishly Motile (%)	Non-progressive (%)
Mild oligozoospermia	8	31	14	7.87
Moderate oligozoospermia	6	28.5	6.6	5.3

Severe oligozoospermia	17	19.23	10.47	6.58
Azoospermia	6	-	-	-

A positive relationship is seen between a decreasing sperm count and an increasing rapidly progressive motile spermatozoon. In mild oligozoospermic patients - out of 52% of motile sperms, 31% were rapid progressive, 14% were sluggish motile and rest being non-progressive.

In moderate oligospermic patients - out of 40% of the motile sperms, 28.5% were rapidly progressive, 6% were sluggish motile and 5% were non – progressive.

In severe, oligospermic patients – out of 36% motile sperm, 19 % were rapidly progressive, 11% were sluggish motile and 7% were non progressive.



**Graph 4: Classification of motile sperms according to their degree of motility**

**DISCUSSION**

**In our study**, the age of patients ranged from 20 – 45 years, with the mean age of the patients being 32 years. The patients aged ≤30 years were 12, whereas patients aged >30 years were 25. The average age of both, moderate oligozoospermic and azoospermic patients was 33 years. 21.62 % males were diagnosed as mild oligozoospermic with mean age of 36 years whereas 16.21 % males were found to be severe oligozoospermic patients and their mean age was 30 years.

In this study the maximum number of patients (19 patients, 51.36 %) were found to be of age > 32 years while remaining 18 cases(48.64 %) belonged to class ≤32 years of age. This suggests that the average age of marriage in India is lower (18-27 years) as compared to US population (30.5 years) and thus these infertility issues are detected more around the age of 32 years (mean age of the study).

According to a study conducted at University of California at Berkeley and the Lawrence Livermore National Laboratory (LLNL), genetic defects in the sperm increase with age in men. These genetic sperm defects may cause: Decreased fertility, increased chance of miscarriage, increased risk of some birth defects. Thus based on the results of our study, we can deduce that in India, especially in regions where people of lower socio-economic strata live, not many people seek help in matters such as male infertility may be due to traditional thinking or lack of knowledge of how to go about these issues.

**Table 5: Comparison of classification of patients into different groups according to sperm count per ml**

Author	Classification of Patients (Mild/ Moderate/ Severe)
Dua A et al. (22)	Sample Size: 177, 71 Normospermic, 106 between Mild to Azoospermic.
Chitturi Ramya et al(23)	Sample Size: 159, 29 oligoasthenozoospermia 37 oligozoospermia, 12 azoospermia, 07 asthenozoospermia, 01 oligoteratoasthenozoospermia Others Normospermic
Present Study	Sample Size: 37, 8 Mild oligozoospermia, 6 Moderate oligozoospermia, 17 Severe oligozoospermia, 6 Azoospermia

In the present study, the infertile male patients were classified into 4 classes (from azoospermia to mild oligozoospermia) based on their total sperm count. Out of total 37 patients, 17 (45.94%) of the patients were diagnosed with severe oligospermia followed by 8 (21.62%) of the patients with mild oligozoospermia, 6 (16.21%) of the patients with moderate oligozoospermia and same number of patients were diagnosed to have azoospermia. Similarly, in Dua et al and Ramya et al the samples were divided into classes according to the number of sperms per ml.

**Table 6: Percentage of Motile sperms in each class of patient in present study as compared with other studies**

Author	Observations based on motility
Ramya C et al. (23)	Sample Size: 159, Oligozoospermic males – 18.7% cases show motility Normozoospermic males – 85.3% cases show motility
Dua et al. (22)	Sample Size: 177, Severe oligozoospermia – 35% motility Oligozoospermia – 40 % motility Boderline oligozoospermia – 55 % motility
Present study	Sample Size: 37, Mild oligozoospermic – 52% motility Moderate oligozoospermic – 40% motility Severe oligozoospermic – 36 % motility

**Our study** findings showed that mild oligozoospermic patients showed 52% motility & 47% non-motile sperm. Moderate oligozoospermic patients showed 40% motile & 60% non-motile sperm and severe oligozoospermic patients showed 36% motile & 57% non-motile sperm. It denoted that a maximum percentage of motility (52.88%) was seen in mild oligozoospermia on the other hand, highest percentage of non – motile sperms was seen in the severe oligozoospermia. It is deduced that sperm concentration can compensate for motility limitations, and conversely, improvement in motility can compensate for reduced sperm concentration as infertility is a multifactorial issue and it has various causes including endocrine dysfunction, anatomic abnormalities, medications, or environmental exposures. In recent times, the crucial role that modifiable lifestyle factors like aging, psychological stress, nutrition, physical activity, caffeine, high scrotal temperature, hot water, mobile telephone use play a crucial role in health of sperms.

**Dua et al.** study result indicated that as the sperm count decreases, there is decrease in the number of motile sperms and number of immotile sperms increase.

It is deduced that sperm concentration can compensate for motility limitations, and conversely, improvement in motility can compensate for reduced sperm concentration as infertility is a multifactorial issue and it has various causes including endocrine dysfunction, anatomic abnormalities, medications, or environmental exposures.

**Table 7: Comparison of percentage of type of motility in present and other studies**

		Excellent Motility	Good Motility	Sluggish Motility
Dua et al(22)	Normospermic	27.9	47	25.1
	Boderline Normospermic	30	40.6	29.4
	Oligospermic	13.5	33.7	52.8
	Severely oligospermic	14.3	23.6	62.1
		Rapidly progressive	Sluggishly progressive	Non-progressive
Present Study	Mild Oligospermic	31	14	7.87
	Moderate oligospermic	28.5	6.6	5.3
	Severe oligospermic	19.23	10.47	6.58

According to study conducted by **Dua et al.**, there was no correlation drawn on the basis of sperm count and rapidly progressive sperms while the sperms showing good motility decreased with decrease in sperm count.<sup>(60)</sup>

In the **present study**, there is a positive correlation between rapidly progressive component of motile sperms and total sperm count. As the sperm count increases, the fraction of rapidly motile sperm increases. This information can be utilized and can be emphasized that it is the fraction of rapidly progressive motility and not just the motility that is crucial for infertility.

In mild oligozoospermic patients - out of 52% of motile sperm, 31% were rapid progressive, 14% were sluggish motile and 7% were non-progressive. In moderate oligospermic patients - out of 40% of the motile sperm, 28.5% were rapidly progressive, 6% were sluggish motile and 5% were non – progressive. In severe, oligospermic patients – out of 36% motile sperm, 23% were rapidly progressive, 11% were sluggish motile and 7% were non-progressive.

## CONCLUSION

A total motility of 40% is considered adequate in order to achieve fertility. In our study, mild oligozoospermic patients showed an average 53% motility while severe oligozoospermic patients showed 36 % motility. Thus, despite having motility of > 40%, mild oligozoospermic patients showed infertility suggesting that the total motility is not the deciding factor for fertility.

Rapidly progressive motile sperms in normal semen are taken as  $\geq 32$  % (of the total motile sperms). In our study, the average of rapidly progressive motile sperms in the 37 samples was observed to be 22% (less than normal). Thus, sperms with rapidly progressive motility are more important than overall motility and hence a key factor contributing to fertility.

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