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Original Research Article

UTILITY OF SEMEN ANALYSIS IN THE EVALUATION OF MALE INFERTILITY: A RETROSPECTIVE STUDY IN A TERTIARY CARE CENTRE OVER ONE YEAR

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ABSTRACT

Background: Male factor infertility is a well-recognized contributor to infertility in couples. Semen analysis remains an essential and non-invasive diagnostic tool in evaluating male reproductive potential. The aim and objective is to assess the prevalence and types of semen abnormalities among male partners of infertile couples.

Materials and Methods: This study was conducted in the Department of Pathology at Mediciti Institute of Medical Sciences, Ghanpur, India. A total of 146 male partners of infertile couples were evaluated over a one-year period. Semen analysis reports taken from records which were assessed for volume, viscosity, sperm concentration, motility, and morphology according to WHO guidelines were included in this study.

Results: Out of 146 cases, 77 (52.7%) had normal semen parameters, while 69 (47.3%) showed abnormalities. The majority of participants (42.5%) were between 26–30 years of age. Among those with abnormal results, oligozoospermia was the most common finding, observed in 42 cases (28.8%). Specifically, 19 had isolated oligozoospermia, 10 had oligoasthenozoospermia, and 13 had oligoasthenoteratozoospermia. Azoospermia and asthenozoospermia were the next most frequent abnormalities. Many cases exhibited defects in multiple semen parameters.

Conclusion: Male factors significantly contribute to infertility. Abnormal semen patterns-particularly oligozoospermia, azoospermia, and asthenozoospermia-are common. Continued research and routine semen analysis are essential for early diagnosis and effective management of male infertility.

Keywords: Male infertility, Semen abnormalities, Semen parameters.

INTRODUCTION

Infertility is defined as a disorder of the reproductive system, characterized by the inability to achieve a clinical pregnancy after 12 months or more of regular, unprotected sexual intercourse.[1] In developing countries such as India, infertility often carries a significant social stigma. The prevalence of infertility in the general population is estimated to be around 15%–20%, with male factors contributing to approximately 20%–40% of cases.[2-4] In India according to WHO the overall prevalence of primary infertility ranges between 3.9% and 16.8%.[5] Also the estimates of infertility vary widely among Indian states from 3.7% in Uttar Pradesh, Himachal Pradesh and Maharashtra,[6] to 5% in Andhra Pradesh,[7] and 15% in Kashmir.[8]

A key milestone in reproductive biology occurred in 1677, when Antonie van Leeuwenhoek, using a microscope, observed motile sperm cells in a sample of his own semen—providing the first evidence of the role of sperm in human reproduction.[3] Despite this discovery, male factor infertility has only gained broader clinical attention and recognition in the past fifty years.[9,10] Among Indian couples seeking fertility treatment, male factors are responsible in approximately 23% of cases.[9] More broadly, male infertility is considered the sole cause in around 20% of couples and a contributing factor in another 30%–40%.[11]

Male fertility is largely regulated by the hypothalamic-pituitary-gonadal (HPG) axis. Adequate levels of gonadotropins and testosterone are necessary for the initiation and maintenance of normal spermatogenesis. A decline in male fertility may result from various causes, including congenital or acquired urogenital abnormalities, infections of the genital tract, increased scrotal temperature (as seen in varicocele), hormonal disturbances, genetic defects, and immunological disorders. In addition to abnormalities in sperm count and structure, functional issues such as erectile and ejaculatory dysfunctions have seen a notable rise in recent years.[12] Environmental and lifestyle factors also play a significant role in male infertility. Tobacco smoking and excessive alcohol consumption have been shown to negatively impact sperm count, motility, and morphology, and are associated with increased oxidative stress and DNA damage in sperm cells.[12] These modifiable risk factors are especially relevant in populations where such habits are prevalent and may contribute to the growing incidence of male infertility.

MATERIALS AND METHODS

Study Design and Setting: This was a retrospective study conducted in the Department of Pathology at a tertiary care center. The study included semen analysis reports of male partners of couples presenting with infertility, collected over a one-year period from 1st April 2024 to 31st March 2025.

Study Population: A total of 146 male partners of infertile couples were included. All individuals presented to the infertility clinic with complaints of failure to conceive despite of at least one year of unprotected regular sexual intercourse.

Inclusion Criteria

- Male partners of couples undergoing evaluation or treatment for infertility
- Age between 22 and 45 years
- Availability of complete and properly documented semen analysis records

Exclusion Criteria

- History of vasectomy
- Current use of medications known to interfere with spermatogenesis
- Incomplete documentation or semen samples that were improperly collected or processed

Data Collection: Patient records were retrospectively reviewed using hospital electronic medical records and laboratory databases. Demographic data (age, duration of infertility, clinical history), semen analysis results, and hormonal profiles (if available) were collected and anonymized.

Semen Collection and Analysis: Semen samples were collected by masturbation after 3-5 days of abstinence in a sterile container within the hospital premises. Samples were allowed to liquefy at room temperature for 30 minutes and analyzed within 1 hour of collection in accordance with the World Health Organization (WHO) Laboratory Manual for the Examination and Processing of Human Semen, 6th Edition (2021).

The semen analysis included assessment of volume (mL), sperm concentration (million/mL), total sperm count per ejaculate, motility (progressive, non-progressive, and immotile), morphology (percentage of normal forms), vitality (percentage of live sperm), pH, and the presence of leukocytes or cellular debris. These parameters provided a comprehensive overview of semen quality and were essential for evaluating male fertility potential.

RESULTS

Among the 146 cases analyzed, the most frequently represented age group was 26–30 years, comprising 62 individuals and accounting for 42.5% of the study population.

Table 1: Distribution of age.

Age(in years)	No of Cases	Percentage(%)
Upto 25	12	8.2%
26-30	62	42.5%
31-35	54	37%
36-40	16	11%
>40	02	1.3%
Total	146	100

Table 2: Duration of married life.

Duration of married life	No. of cases	Percentage(%)
1-3 years	80	54.8
3-6 years	32	21.9
6-9 years	15	10.2
9-12 years	12	8.2
>12 years	07	4.9

Among the 146 cases studied, the largest group comprising 80 individuals (54.8%)had a married life duration of 1 to 3 years, suggesting that most couples seek infertility evaluation within the initial years of marriage.

Table 3: Microscopic examination of sperm concentration

Sperm concentration	No of cases	Percentage(%)
Normal sperm concentration	90	61.6%
Oligozoospermia	42	28.8%
Azoospermia	14	9.6%
Total	146	100

According to the WHO 6th edition (2021) guidelines, a normal sperm concentration is defined as ≥16 million/mL. Values below this threshold are classified as oligozoospermia, while the complete absence of sperms even after centrifugation is termed azoospermia.

In the present study, normal sperm concentration was observed in 90 cases (61.6%), oligozoospermia in 42 cases (28.8%), and azoospermia in 14 cases (9.6%).

Table 4: Microscopic examination of sperm motility

Motility	No of cases	Percentage(%)
Normal (PR>30%) or (PR+NP>42%)	96	72.7%
Asthenozoospermia (PR<32%) or (PR+NP<40%)	36	27.3%
Total	132	100

Table 5: Microscopic examination of sperm morphology

Morphology	No of cases	Percentage(%)
Normal sperms	119	90.2%
Teratozoospermia	13	9.8%
Total	132	100

In our study, excluding the 14 cases of azoospermia, normal motility and morphology of sperms are observed in 132 cases. Normal motility observed in 96 cases (72.7%), while reduced motility (asthenozoospermia) was noted in 36 cases (27.3%).

According to WHO guidelines, sperm morphology is considered normal if more than 4% of the sperm exhibit a normal shape. Sperm with less than 4% normal morphology are classified as teratozoospermia.

In our study, 119 cases (90.2%) had normal sperm morphology, while 13 cases (9.8%) were diagnosed with teratozoospermia.

Additionally, reduced semen volume, defined as a decrease in volume to 1.4 mL (with a range of 1.3-1.5 mL) according to the WHO 6th Edition, 2021 guidelines, was observed in 15 out of 146 cases (13.6%). Among the 69 cases with abnormal semen parameters, 15 (21.74%) had low ejaculate volume, indicating it as a common and potentially significant contributor to male infertility.

Table 6: Categorization of cases based on semen analysis abnormalities

Microscopic findings	No of cases	Percentage(%)
Normozoospermia	52	35.6%
Normozoospermia with leucocytospermia	25	17.1%
Oligozoospermia	19	13%
Oligoasthenozoospermia	10	6.9%
Azoospermia	14	9.6%
Oligoasthenoteratozoospermia	13	8.9%
Asthenozoospermia	13	8.9%
Total	146	100

Out of total 146 cases, 77 semen analysis are normal and remaining 69 are abnormal. Among the abnormal semen analysis oligozoopermia is most common and second most common is asthenzoospermia. However, most of the cases show defect in more than one parameter.

DISCUSSION

The present study assessed semen parameters in 146 male partners of infertile couples over one year at a tertiary care center. The results were compared with similar studies from various regions in India to evaluate trends and variations in male infertility.

In our study, the majority of cases (42.5%) belonged to the 26–30 years age group, with 54.8% of participants having a married life of 1–3 years. This closely mirrors findings by Vijayalakshmi et al,[14] who also reported a predominance in the 26–30 years age range and early presentation within 1–3 years of marriage among infertile couples attending a tertiary center.

Normal sperm concentration was found in 61.6% of our study population, while oligozoospermia and azoospermia were noted in 28.8% and 9.6% of cases, respectively. Kulkarni et al,[15] reported comparable rates of oligozoospermia (18.6%) and azoospermia (10.9%) in a study conducted in Maharashtra. Similarly, Bhaduri et al,[16] from West Bengal found 19.87% oligozoospermia and 12.42% azoospermia. Juneja et al,[12] working in Assam, reported slightly

lower oligozoospermia (25.53%) but a higher incidence of motility defects.

Our study recorded normal sperm motility in 72.7% of non-azoospermic cases, with asthenozoospermia in 27.3%. This aligns with Kulkarni et al,[15] where asthenozoospermia was the most frequent abnormality (19.9%), and with Juneja et al,[12] who reported 35.11% asthenozoospermia in their population. These findings support the view that sperm motility impairment is a significant contributor to male infertility across multiple regions.

Normal sperm morphology was observed in 90.2% of our subjects. This rate is higher compared to other studies such as that by Kulkarni et al,[15] who noted a greater prevalence of morphological abnormalities. Differences in laboratory standards, observer interpretation, and application of WHO criteria may contribute to this variation.

In our study, 52.7% of cases exhibited normal semen parameters, whereas 47.3% had at least one abnormal finding. The most frequent abnormalities were oligozoospermia and asthenozoospermia, often occurring in combination with other defects. These findings are consistent with those of Vijayalakshmi et al,[14] who reported similar patterns. Bhaduri et al,[16] and Juneja et al,[12] also noted high frequencies of these abnormalities, reinforcing their significance as key indicators of male infertility.

CONCLUSION

This study provides valuable insights into the semen profiles of male partners of infertile couples attending a tertiary care center over a one-year period. Normal sperm concentration was observed in 61.6% of cases, while oligozoospermia and azoospermia were identified in 28.8% and 9.6% of cases, respectively. These findings indicate that nearly 40% of the study population had abnormal sperm concentration, underscoring the significant contribution of male factors to infertility.

Oligozoospermia and asthenozoospermia emerged as the most prevalent abnormalities, consistent with trends reported in other Indian studies. The high occurrence of motility and concentration defects highlights the importance of routine semen analysis as a key diagnostic tool in infertility evaluations.

Environmental, occupational, and lifestyle factors—particularly tobacco use—appear to influence semen quality in our population. Despite its substantial role, male infertility remains under-recognized, partly due to societal stigma. There is an urgent need for greater awareness, early diagnosis, and comprehensive multicentric research to better understand regional patterns and guide effective interventions.

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