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ASSESSMENT OF SEMEN ANALYSIS PARAMETERS IN SUSPECTED INFERTILE PATIENTS IN PESHAWAR

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Abstract

Background & Objective:
Male infertility is a growing public health concern, often linked to abnormalities in semen parameters such as motility, morphology, and count. Despite normal sperm concentration, functional defects may impair fertility. This study aimed to assess semen analysis parameters among suspected infertile male patients in Peshawar to identify the prevalence of abnormal findings and possible underlying causes.

Methodology:
A descriptive cross-sectional study was conducted at Complex Medical Laboratory, Hayatabad, Peshawar, from March to July 2025. A total of 116 semen samples were collected through convenient sampling from males aged 18–50 years who had abstained from ejaculation for 2–7 days. Semen samples were examined for liquefaction, motility, morphology, sperm count, pus cells, red blood cells (RBCs), and pH according to WHO criteria. Data were analyzed using SPSS version 22 with descriptive statistics.

Results:
Among participants, 42.2% were aged 18–28 years, 38.8% aged 29–38 years, and 19% aged 39–48 years. Normal liquefaction was observed in 74.1% of samples, while 25.9% showed delayed liquefaction. Normal motility was found in 56%, and 44% had reduced motility. Morphological abnormalities were present in 71.6% of cases, and 91.4% showed elevated pus cell counts, indicating possible genital tract infections. RBCs were found in 24.1% of samples, suggesting hematospermia. Most participants (91.4%) had normal sperm counts, and semen pH was normal in 98.3% of samples.

Conclusion:
Despite normal sperm counts, a high prevalence of abnormal motility and morphology was observed, suggesting that functional sperm defects and infections contribute significantly to male infertility in Peshawar. Routine comprehensive semen analysis, including infection screening, is essential for accurate diagnosis and management.

Introduction:

Ten to fifteen percent of couples have infertility, which is defined as the inability to conceive following a year of consistent, unprotected sexual activity. About 20–30% of all cases of infertility are caused by male factors, and between 50 and 80 million people worldwide suffer from infertility, according to the most recent WHO estimates (Babakhanzadeh et al., 2020).

Semen analysis is the primary method used to diagnose male infertility. Concentration, sperm motility, and appearance are the primary characteristics of semen. Hormonal diseases, physical concerns, lifestyle issues, psychological issues, sex issues, chromosomal abnormalities, and single-gene anomalies are some of the causes of infertility in men. Approximately 70% of cases of male infertility persist despite multiple attempts by researchers to determine the underlying causes (Babakhanzadeh et al., 2020).

Globally, the main causes of male infertility are spermatozoa abnormalities resulting from insufficient quantities (azoospermia/oligospermia), poor motility, and aberrant structure/morphology. Systematic declines in sperm counts over the past few decades have increased the contribution of male factors to infertility. The World Health Organization has acknowledged this drop in sperm quality, leading to a change in the criteria for normal versus abnormal sperm counts (E Okonofua et al., 2024).

Risk factors for impaired male fertility include age, nutrition, caffeine use, weight, physical activity, stress, smoking, drug or alcohol use, medications, diabetes, exposure to synthetic chemicals, clothing, and sleep (Bisconti et al., 2021). Only a few of these factors have been studied in sperm proteome research. Key risk factors studied include exposure to bisphenol-A (BPA), obesity, diabetes, and tobacco use, which can alter sperm protein composition and affect fertility (Jafari et al., 2021; Sabine Kliesch et al., 2023).

For an infertility work-up, diagnostic testicular biopsies are not recommended. Testicular biopsies should always be performed in conjunction with therapeutic (microsurgical) sperm extraction methods, with the option to cryopreserve spermatozoa for use with ART, in men who are azoospermic or cryptozoospermic. If TIN is suspected in males with oligospermiasis or if there is a history of a contralateral testicular tumor, testicular biopsies may be recommended (Sabine Kliesch *et al.*, 2023).

Treatments for male infertility must be developed based on each patient's unique needs and etiology. In order to obtain the right diagnostic tests and the best treatment, which may include medication, surgery, and assisted reproductive technology, couples should seek out excellent counseling. Alternative and complementary medicine (CAM) includes a wide range of group of methods that include mind-body therapies, acupuncture, and natural goods; the Centers for Disease Control (CDC) defines this as a medical and healthcare system that is distinct from modern conventional medicine. found that between 29% and 91% of patients seeking reproductive treatment used a complementary and alternative medicine approach. By combining cultural fertility and health customs, CAM could boost hope throughout reproductive treatment (Feng *et al.*, 2022)

Infertility is a global health concern that affects not only individuals but also demographic trends, especially in developing countries, where low fertility rates contribute to population aging and associated social challenges. Understanding regional causes of male infertility and implementing effective diagnostic and therapeutic strategies is essential for improving reproductive health outcomes (Haung et al., 2023).

Methods:

This study employed a descriptive cross-sectional design to assess semen analysis parameters among suspected infertile male patients in Peshawar. The research was conducted at the Complex Medical Laboratory, Hayatabad, Peshawar, over a period of four months, from March 15, 2025, to July 15, 2025. Ethical approval was obtained from the Research Committee of Sarhad University of Science and Information Technology, Peshawar. Written informed consent was secured from all participants before data collection.

A non-probability convenience sampling technique was used to recruit participants who met the inclusion criteria. The study included 116 male patients aged 18–50 years who were suspected of infertility and had abstained from ejaculation for 2–7 days prior to sample collection.

Exclusion criteria included individuals with genetic abnormalities (e.g., Klinefelter syndrome), recent history of testicular trauma or surgery, systemic illness such as chemotherapy or radiation therapy, and those using medications or drugs affecting spermatogenesis (e.g., anabolic steroids).

Semen samples were collected by masturbation into sterile containers following WHO guidelines. Each sample was delivered to the laboratory within 30–60 minutes to allow proper liquefaction. Semen was analyzed for physical parameters (color, viscosity, volume, and liquefaction time) and microscopic parameters (sperm count, motility, morphology, pH, and presence of pus or red blood cells). The microscopic examination was performed using a light microscope at 10× and 40× magnification.

Data were analyzed using SPSS version 22. Descriptive statistics, including frequencies and percentages, were used to summarize variables. Results were presented in tables and figures. Ethical considerations included maintaining patient confidentiality, using coded data, and informing participants of the study's objectives and purpose.

Results:

4.1. Age-wise distribution of individuals

A total of 116 participants in the current study were divided into three age groups. The frequency between 18 to 28 years consisted of 49 participants (42.2%), 29 to 38 years included 45 participants (38.8%), and 39 to 48 years had 22 participants (19.0%) (Table 4.1).

Table .4.1. Age wise distribution of individuals

Age of Participants		
Age	Frequency	Percent
18-28 years	49	42.2%
29-38 years	45	38.8%
39-48 years	22	19.0%
Total	116	100%

4.2. Liquefaction of the semen

Semen samples from 116 participants were categorized based on liquefaction. Normal liquefaction was observed in 86 participants (74.1%), while 30 participants (25.9%) showed abnormal liquefaction (Table 4.2).

f n=30 (25.9%) 100 %.

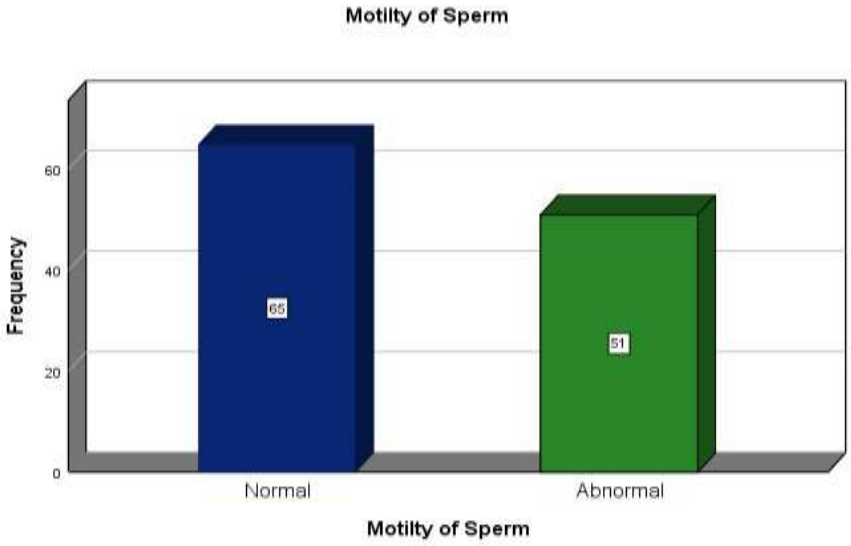
Table No 4.2 liquification of the semen

Liquification of Semen		
Liquification	Frequency	Percent
Normal	86	74.1%
Abnormal	30	25.9%
Total	116	100%

4.3. Motility of sperm

Semen analysis was conducted to assess sperm motility. Among 116 participants, 65 (56%) showed normal motility, while 51 (44%) exhibited abnormal motility. These results indicate that nearly half of the participants had motility-related issues (Fig. 4.1).

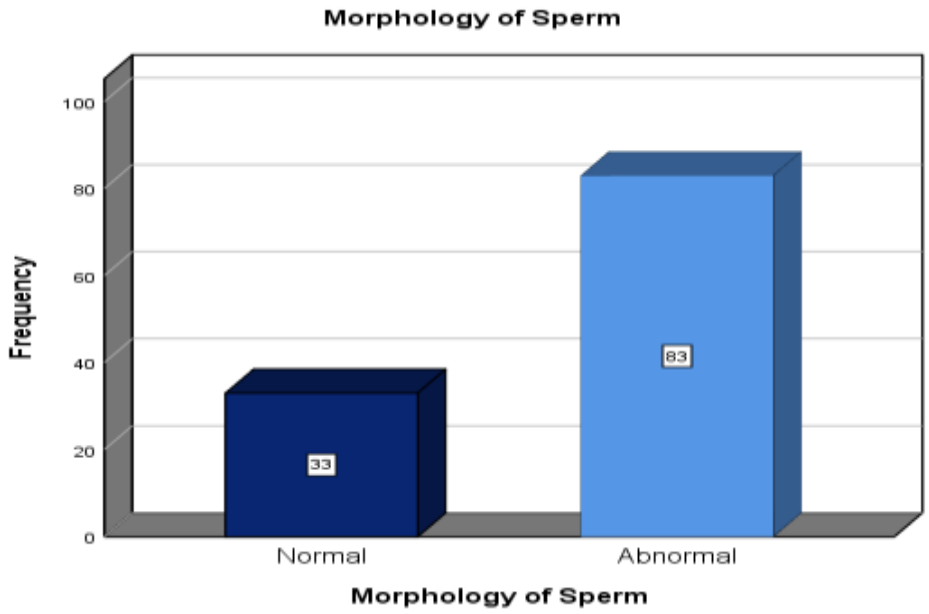
Fig.4.1. Motility of sperm



4.4. Morphology of sperm

Sperm morphology was assessed in 116 semen samples. A total of 83 samples (71.6%) displayed morphological anomalies, whereas 33 samples (28.4%) showed normal morphology. The high percentage of aberrant morphology may be influenced by various internal and external factors and can negatively impact fertilization and overall reproductive outcomes (Fig. 4.2).

Fig.4.2. Morphology of sperm



4.5. Number of pus cells in semen specimen

All 116 semen samples were examined for pus cells. A total of 106 participants (91.4%) showed increased pus cell counts, while only 10 participants (8.6%) had normal counts. The elevated presence of pus cells may indicate inflammation or genital tract infections (Table 4.3).

Table.4.3. Amount of pus cells in semen specimen

	Number of pus ce ll	
	Frequency	Percent
Normal	10	8.6
Abnormal	106	91.4
Total	116	100.0

4.6. Number of red blood cells in semen specimen

Red blood cells (RBCs) were examined in all 116 participants. RBCs were absent in 88 participants (75.9%), indicating normal levels. However, 28 participants (24.1%) showed elevated RBCs. Hematospermia can be linked to infections, inflammation, or other underlying urogenital conditions (Table 4.4).

Table.4.4. Number of RBC in semen specimen

	Nu	**mber of Red Blood Cells**	
RBCs	Frequency	Percent	Cumulative Percent
Normol	88	75.9	75.9
abnormol	28	24.1	100.0
Total	116	100.0	

4.7. Total sperm count of participants

The overall sperm count was examined in 116 semen samples. A majority of participants, 106 (91.4%), had normal sperm counts, while 10 participants (8.6%) had low sperm counts. Low sperm counts may indicate potential fertility issues and highlight the importance of regular medical monitoring (Table 4.5).

Table 4.5 sperm count of the participant

Sperm Count of Participant		
Sperm count	Frequency	Percent
Normal	10 6	91.4
Abnormal	10	8.6
Total	11 6	100.0

4.8. pH of semen

Semen pH was measured in all 116 participants. Normal pH values were observed in 114 participants (98.3%), while 2 participants (1.7%) showed abnormal pH levels. Maintaining normal pH is crucial for optimal sperm function and fertility (Table 4.6).

Table 4.6 PH of semen

PH of Semen		
PH Range	**Frequency**	**Percent**
Normal	114	98.3
Abnormal	2	1.7
Total	116	100.0

Discussion:

Most previous research on male infertility has been conducted in large clinical or multi-center settings, but limited studies have focused on regional trends in semen quality among men in Peshawar. The present study addressed this gap by evaluating semen analysis parameters in 116 suspected infertile male patients at the Complex Medical Laboratory, Hayatabad, Peshawar, revealing a high prevalence of abnormal sperm morphology and motility despite normal sperm counts in most participants.

A study conducted in Rawalpindi reported that 69.2% of infertile males exhibited abnormal sperm morphology attributed to oxidative stress, infections, and environmental exposure, which aligns with our observation of 71.6% morphological abnormalities (Rehman et al., 2020). Similarly, research from Northern Pakistan found that 40–45% of men suffered from reduced sperm motility, consistent with the 44% abnormal motility rate identified in our study (Bukhari et al., 2018). These similarities suggest that environmental factors, dietary habits, and poor lifestyle practices are major contributors to declining semen quality in this region.

However, some studies have shown differing trends. One investigation observed that sperm motility and morphology remained stable in men re-tested within short intervals, suggesting that variations might depend on duration between assessments or transient health conditions (Karavani et al., 2025). In contrast, our study found consistently high rates of morphological and motility defects, likely due to persistent environmental and infectious factors within the local population.

Overall, the findings indicate that while sperm count remains within normal limits for most men, functional sperm abnormalities such as poor motility and morphology significantly affect fertility outcomes. The high prevalence of inflammatory indicators further emphasizes the role of infections in male infertility. These results underscore the need for comprehensive semen analysis and infection management to improve reproductive health outcomes among men in Peshawar.

Conclusion:

Our study concluded that despite most participants having normal sperm counts, a large proportion exhibited abnormal sperm motility and morphology, indicating that functional sperm defects contribute significantly to male infertility. The high presence of pus and red blood cells in semen samples suggests underlying infections or inflammation that may impair reproductive health. These findings highlight the importance of comprehensive semen analysis, including infection screening and evaluation of sperm function, rather than relying solely on sperm count, for accurate diagnosis and effective management of male infertility in Peshawar.

Limitations of the Study:

This study was limited by its single-center design and relatively small sample size, which may restrict the generalizability of the findings. The use of a convenience sampling technique could introduce selection bias. Additionally, factors such as hormonal profiles, lifestyle habits, and detailed infection screening were not assessed, which may have provided deeper insight into the causes of semen abnormalities. Future studies should include larger, multi-center samples, incorporate hormonal and lifestyle analyses, and employ advanced diagnostic tools to better understand and address male infertility patterns in this region.

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