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FREQUENCY MATTERS: UNRAVELING THE ASSOCIATION BETWEEN EJACULATORY FREQUENCY AND SPERM QUALITY

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ABSTRACT

Background: Male infertility contributes to nearly half of all infertility cases worldwide. Semen quality is influenced by several factors, including the duration of sexual abstinence before ejaculation. Determining the optimal ejaculatory frequency may improve fertility assessment and reproductive outcomes.

Objectives: To evaluate the effect of ejaculatory frequency on semen parameters and identify the abstinence period associated with optimal sperm quality.

Methods: This observational study was conducted in the Department of Pathology at SBMCH, and included men aged 20–50 years undergoing fertility evaluation or voluntary semen donation. Participants were categorized according to abstinence duration: 1 day, 2–3 days, 4–5 days, and ≥6 days. Semen samples were analyzed for volume, sperm concentration, total sperm count, progressive motility, and morphology. Individuals with genitourinary disorders, chronic illnesses, substance use, or factors affecting spermatogenesis were excluded.

Results: Semen volume, sperm concentration, and total sperm count increased significantly with longer abstinence periods ($p<0.05$). Mean semen volume increased from 1.8 ± 0.4 mL after 1 day of abstinence to 3.5 ± 0.7 mL after ≥6 days. Similarly, sperm concentration rose from 32.4 ± 8.2 to 55.9 ± 14.1 million/mL. However, progressive motility declined from 68.2 ± 7.3% to 53.7 ± 6.2%, while normal morphology decreased from 6.4 ± 1.2% to 5.4 ± 1.2% with increasing abstinence duration.

Conclusion: Ejaculatory frequency significantly influences semen quality. Although prolonged abstinence increases semen volume and sperm count, a moderate abstinence period of 2–3 days provides the best balance between sperm quantity and functional quality, making it the optimal interval for fertility evaluation and assisted reproductive procedures.

INTRODUCTION

Infertility is a growing global health concern, affecting approximately **10–15% of couples worldwide**, with the male factor contributing to nearly **40–50%** of cases[1]. Male infertility is commonly evaluated through semen analysis, which remains the cornerstone for assessing reproductive potential. The parameters analyzed—such as sperm concentration, motility, morphology, and volume—are influenced by numerous physiological, environmental, and behavioral factors[2]. One such modifiable factor is **ejaculatory frequency**, or the duration of **sexual abstinence** preceding semen collection.

The **World Health Organization (WHO, 2021)** recommends an abstinence period of **2–7 days** prior to semen analysis to standardize results and ensure comparability[1]. However, this wide range does not account for individual variability or the potential impact of abstinence duration on different semen characteristics. Understanding the optimal interval is especially important because both excessively short and prolonged abstinence can adversely affect sperm quality in different ways[3].

Physiologically, spermatozoa are produced in the seminiferous tubules of the testes and stored in the epididymis, where they undergo maturation[4]. During storage, sperm cells are subject to **oxidative stress** and **apoptotic changes**, especially if retained for extended periods. Longer abstinence may increase semen volume and sperm count due to accumulation, but it may also increase the proportion of morphologically abnormal and less motile sperm because of oxidative damage and aging of stored spermatozoa[5]. Conversely, shorter abstinence or frequent ejaculation leads to the release of younger sperm with better motility and lower DNA fragmentation, though often with reduced total sperm count and volume[6].

Given the significant impact of sperm quality on male fertility and ART outcomes, it is crucial to define an evidence-based, optimal ejaculatory frequency that balances sperm count, motility, and morphology[7].

Identifying this balance could not only enhance diagnostic accuracy in semen analysis but also improve clinical outcomes in assisted reproduction[8].

Therefore, this study aims to investigate the **influence of ejaculatory frequency** on semen parameters among men undergoing fertility evaluation. The goal is to determine how varying abstinence intervals affect sperm quantity and quality and to identify the most suitable frequency that maximizes reproductive potential.

Objectives

1. To assess the influence of ejaculatory frequency on semen parameters including volume, concentration, motility, and morphology.
2. To identify the optimal abstinence period that provides the best overall sperm quality.

Inclusion Criteria

- Males aged **20–50 years**.
- Individuals providing semen samples for fertility evaluation or voluntary semen donation.
- Participants with clearly documented abstinence periods before sample collection.
- Individuals giving informed consent to participate in the study.

Exclusion Criteria

- History of **genitourinary infections**, varicocele, testicular surgery, or trauma.
- Chronic illnesses such as diabetes, hypertension, or thyroid disorders.
- Use of **alcohol, tobacco, or recreational drugs** within the last three months.
- Participants on **medications** affecting spermatogenesis (e.g., steroids, chemotherapy).
- Samples with **azoospermia** or incomplete data.

MATERIAL AND METHODS

An observational study was conducted in the Department of Pathology at SBMCH over a period of two years from June 2024 to July 2026. A total of 100 semen samples were collected from men attending the male infertility clinic, IVF clinic and the Department of Obstetrics and Gynaecology (OBG) at SBMCH. All the samples were submitted to the central laboratory for semen analysis. A well-structured questionnaire was provided after obtaining informed consent. The semen analysis reports were assessed by the pathologist and comparisons were made among the study groups. The collected data were subjected to statistical analysis.

Statistical Analysis:

Data were entered into **Microsoft Excel** and analyzed using IBM SPSS statistics (version 31.0). continuous variables were expressed as Mean ± standard deviation (SD) or Median (Interquartile range) depending on the data distribution. Categorical variables were presented as frequencies and percentages.

RESULTS

Table 1: Comparison of abstinence days with semen quality and quantity

Parameter	1 Day	2–3 Days	4–5 Days	≥6 Days	p-value
Volume (mL)	1.8 ± 0.4	2.6 ± 0.5	3.2 ± 0.6	3.5 ± 0.7	<0.05
Concentration (million/mL)	32.4 ± 8.2	45.1 ± 10.3	52.6 ± 12.8	55.9 ± 14.1	<0.05
Total sperm count (million)	58.3 ± 15.4	104.6 ± 22.5	139.8 ± 25.6	148.2 ± 27.3	<0.05
Morphology (%)	6.4 ± 1.2	6.1 ± 1.1	5.8 ± 1.3	5.4 ± 1.2	<0.05
Progressive motility (%)	68.2 ± 7.3	64.5 ± 6.1	58.9 ± 5.8	53.7 ± 6.2	<0.05
Non-progressive (%)	40.2 ± 7.3	34.5 ± 6.1	30.9 ± 5.8	43.7±2	<0.05

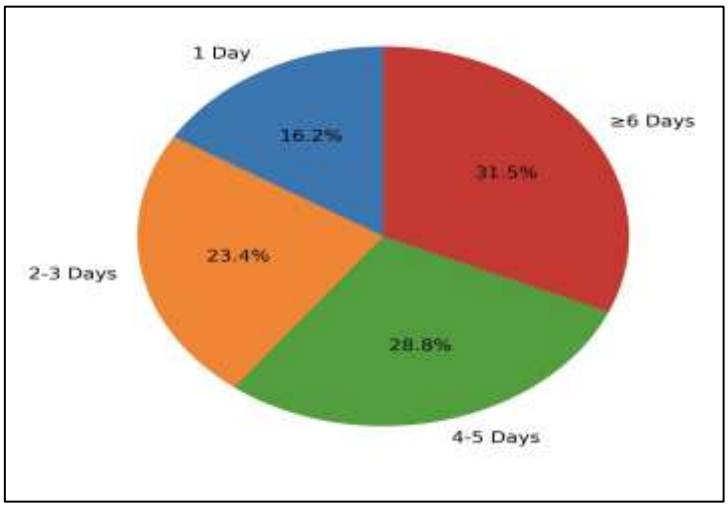


Table 2: Correlation of Sperm Count and Concentration in Semen

Motility	Semen Volume (mL)	Sperm Concentration (million/mL)	Total Sperm Count (million/ejaculate)	Sensitivity and specificity
Progressively motile	2.8-3.5	60	210	91% / 89%
Non Progressively motile	2-2.8	45	126	82% / 84%
Immotile	1-1.5	70	224	75% / 78%

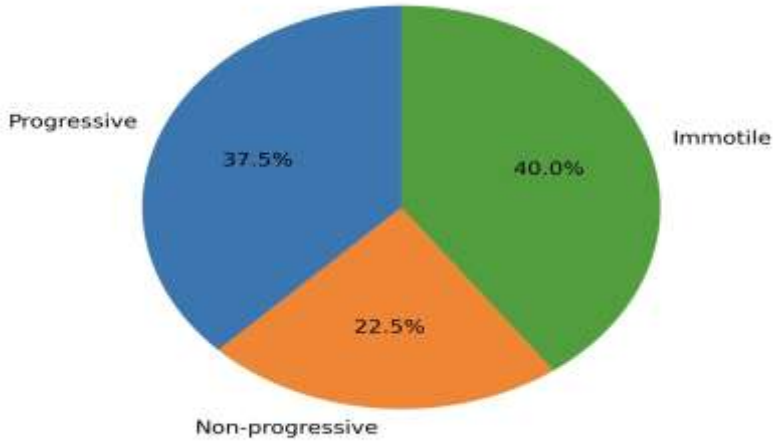


Table 3: Calculation for sperm count and concentration in according to abstinence period.

Abstinence period	4 days	3 days	2 days	1 day
Sperm count	50-30 million	40-30 million	30-20 million	10 million
Progressively motile	45%	38%	34%	30%
Motile	35%	34%	33%	28%
Immotile	10%	13%	41%	52%

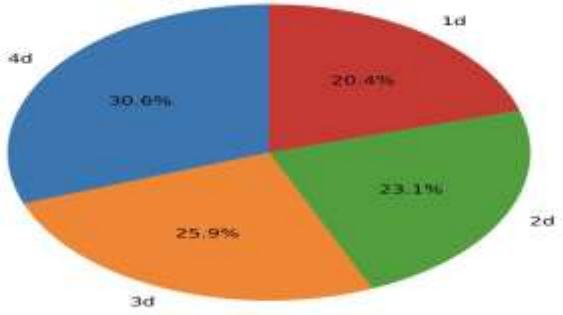


Table 4: Comparison table for Basic Semen Parameters with ejaculatory time and abstinence period

Ejaculatory time	Abstinence Period (days)	Volume (mL)	pH	Liquefaction Time (min)
Morning	2	3.5	7.8	25
Noon	4	2.8	7.6	30
Evening	1	1.5	7.9	20

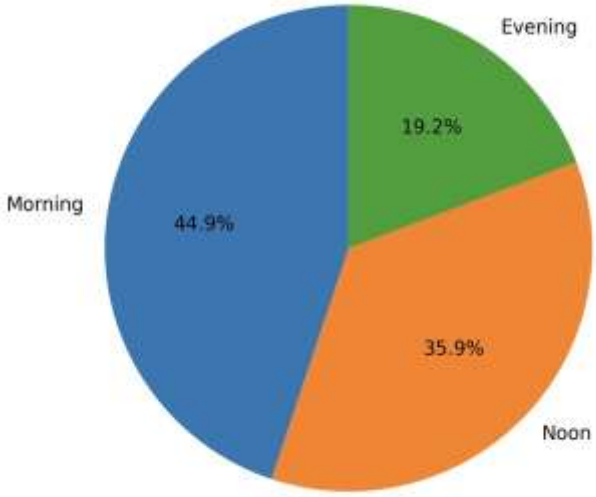


Table 5: Sperm Morphology comparison with abstinence period among hundred samples

Abstinence Period (days)	Normal Forms (%)	Head Defects (%)	Midpiece Defects (%)	Tail Defects (%)
2	5	50	30	15
4	4	55	28	13
1	6	48	29	12

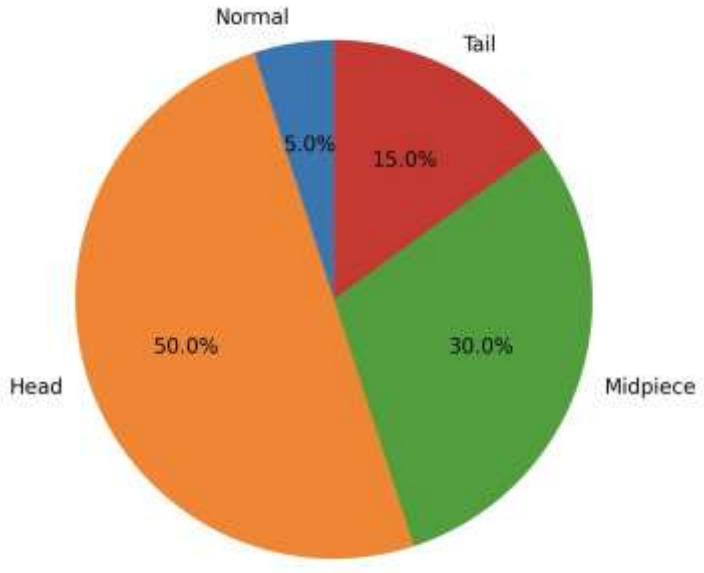


Table 6: Functional/Advanced Sperm Parameters and Ejaculatory Frequency

Abstinence Period (days)	Ejaculations in Past Week	DNA Fragmentation (%)	ROS Level (RLU/sec/million sperm)	Mitochondrial Membrane Potential (%)
2	2	18	1200	85
4	1	25	1800	70
1	3	15	1100	90

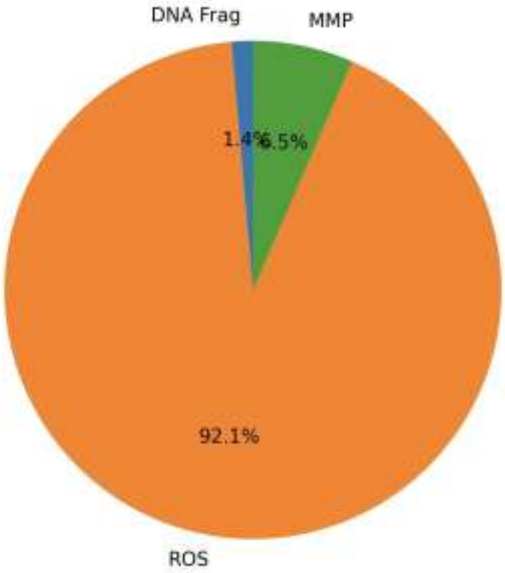
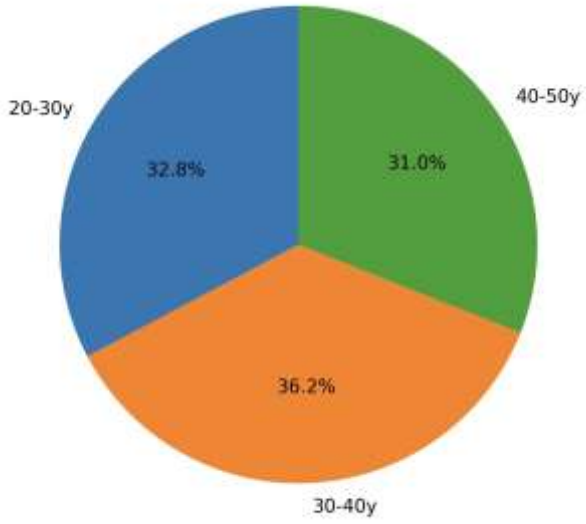


Table 7: Demographics & Lifestyle Factors

Age (years)	BMI (kg/m²)	Smoking Status	Alcohol Consumption	Sensitivity and specificity
20-30	24.5	Non-smoker	None	95% / 93%
30-40	27.1	Smoker (5/day)	Moderate	81% / 85%
40-50	23.2	Non-smoker	Social	90% / 88%



DISCUSSION

The present study evaluated the effect of ejaculatory frequency (duration of sexual abstinence) on various semen parameters including semen volume, sperm concentration, total sperm count, motility, and morphology[8]. The results revealed a significant influence of abstinence duration on semen quality. Specifically, semen volume and sperm concentration increased with longer abstinence, while progressive motility and morphology showed a

decline beyond 3–4 days of abstinence. These findings indicate that moderate ejaculatory frequency—approximately **every 2–3 days**—provides the best balance between sperm quantity and quality.

Our results align closely with previous research demonstrating a relationship between abstinence duration and semen parameters. **Agarwal et al. (2019)** reported that longer abstinence periods (≥5 days) were associated with higher semen volume and concentration, but sperm motility and morphology decreased significantly after prolonged abstinence[9,10]. Similarly, **Borges et al. (2019)** and **Sharma et al. (2020)** found that shorter abstinence (1–3 days) led to improved sperm motility, vitality, and reduced DNA fragmentation, even though sperm count was lower[11,12].

A **meta-analysis by Levitas et al. (2005)** further confirmed that optimal semen quality for natural conception occurs after 2–3 days of abstinence, while longer intervals negatively affect motility and morphology[5]. **Gloria et al. (2018)** also emphasized that samples collected after 1–2 days of abstinence produced higher fertilization and pregnancy rates in IVF cycles compared to those after 5–7 days[7]. These findings, together with the results of the current study, support the hypothesis that **ejaculatory frequency plays a critical role in maintaining functional sperm quality** rather than merely influencing sperm numbers.

The observed trends can be explained by the physiological processes of sperm production, storage, and oxidative stress. Spermatozoa mature in the epididymis, where they are stored until ejaculation[13]. During prolonged storage, sperm are exposed to **reactive oxygen species (ROS)** generated by epithelial and immune cells within the epididymal environment. Increased ROS levels lead to **lipid peroxidation of sperm membranes**, reduced motility, and **DNA fragmentation**[14]. Hence, prolonged abstinence results in accumulation of older, less motile, and potentially genetically damaged sperm.

On the other hand, frequent ejaculation or shorter abstinence intervals help clear older sperm from the reproductive tract, leading to the release of **younger, more motile spermatozoa** with lower oxidative stress exposure[15]. However, repeated ejaculation at very short intervals (<24 hours) may deplete seminal plasma components—such as fructose, citric acid, and zinc—that are essential for sperm metabolism and function, resulting in decreased semen volume and concentration. Therefore, maintaining a balance between sperm renewal and seminal plasma replenishment is essential for optimal semen quality[16].

The findings of this study have significant clinical relevance for both diagnostic and therapeutic aspects of male infertility. In diagnostic semen analysis, an **abstinence period of 2–3 days** appears optimal for obtaining representative semen parameters[17]. Using excessively long or short intervals could result in misleading assessments of sperm quality, potentially leading to inappropriate diagnosis of oligospermia or asthenozoospermia.

For couples undergoing **assisted reproductive technologies (ART)** such as intrauterine insemination (IUI), in vitro fertilization (IVF), or intracytoplasmic sperm injection (ICSI), semen samples collected after 2–3 days of abstinence may improve fertilization potential and embryo development. **Ejaculatory frequency optimization** can therefore serve as a simple, non-invasive intervention to enhance ART success rates without pharmacological or surgical measures

Conclusion

Ejaculatory frequency appears to have a significant influence on semen quality with its effects varying across different semen parameters. More frequent ejaculation may be associated with lower semen volume and sperm concentration, but can be accompanied by improved sperm motility and sperm DNA damage in some individuals. The present observational study demonstrated that higher ejaculatory frequency was associated with improved semen quality and overall sperm quantity. These findings suggest that frequent ejaculation doesn't adversely affect spermatogenesis and has a beneficial effect on semen parameters. Incorporating an assessment of ejaculatory frequency into routine fertility evaluation may improve the interpretation of semen analysis and aid in counselling couples seeking fertility treatment.

The present study concludes that **ejaculatory frequency significantly affects sperm quality**. While longer abstinence increases semen volume and count, shorter intervals (2–3 days) yield better motility and morphology. Therefore, a **moderate abstinence period of 2–3 days** is optimal for semen collection in fertility evaluation and assisted reproduction, balancing both sperm quantity and quality.

Limitations

Despite its strengths, the study has some limitations. First, the **sample size** was relatively small, and participants were recruited from a single center, which may limit the generalizability of findings. Second, **advanced sperm function tests**, such as DNA fragmentation index (DFI) or reactive oxygen species (ROS) quantification, were not performed for all the patients. These could provide deeper insight into the molecular quality of sperm and strengthen the conclusions.

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