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EFFECTS OF COMMONLY PRESCRIBED SSRIS ON SPERM MOTILITY

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ABSTRACT **Introduction:** Selective serotonin reuptake inhibitors (SSRIs) are extensively prescribed antidepressants known for their effectiveness and favourable safety profile. However, growing evidence indicates potential adverse effects on male reproductive health, particularly sperm quality, raising concerns for men of reproductive age. **Objectives:** This study aimed to evaluate the effects of commonly prescribed SSRIs—specifically escitalopram, fluoxetine, sertraline, and paroxetine—on sperm motility, in patients at a tertiary care centre in Western Uttar Pradesh. **Methods:** A prospective comparative study was conducted , involving 120 male patients aged 22–45 years, diagnosed with depression, anxiety spectrum disorders, or premature ejaculation as per ICD-11 criteria. Participants received single-drug therapy with escitalopram, fluoxetine, sertraline, or paroxetine. Semen samples were analysed at baseline, 1 month, and 3 months following WHO guidelines. Data were statistically evaluated using repeated measures ANOVA. **Results:** The study revealed significant reductions ($p<0.001$) in sperm motility across all SSRI groups after 1 and 3 months compared to baseline values. Paroxetine exhibited the most pronounced negative effects, particularly in sperm motility. Conversely, escitalopram demonstrated comparatively mild impacts. **Conclusion:** This study confirmed that SSRIs significantly compromise semen quality, potentially affecting male fertility. Paroxetine showed the strongest adverse effects, suggesting clinicians exercise caution when prescribing SSRIs to patients considering conception. Further large-scale, controlled studies are needed to establish robust clinical guidelines. Patients should be counselled on these reproductive risks, and fertility-preserving strategies should be considered when initiating SSRI therapy.

KEYWORDS :

INTRODUCTION

The SSRIs commonly in use include citalopram, escitalopram, fluvoxamine, paroxetine, fluoxetine and sertraline. These drugs hinder serotonin reuptake in presynaptic neurons, increasing serotonin availability in the synaptic cleft and enhancing serotonergic neurotransmission. This mechanism is central to their therapeutic effects and aligns with the monoamine hypothesis of depression, which suggests that serotonin deficiency contributes to depressive states. SSRIs are not limited to depression management but are also used for conditions like anxiety disorders, obsessive-compulsive disorder, post-traumatic stress disorder, chronic pain, premenstrual dysphoric disorder, fibromyalgia, and premature ejaculation due to their reversible effects on sexual function.

Their high safety profile and selective action on serotonin pathways distinguish them from older antidepressants, such as tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs), which affect multiple neurotransmitter systems and are associated with more adverse effects.

Infertility: A Global Concern

Infertility is defined as failure to conceive after 12 months of regular and unprotected sexual intercourse. It is estimated to affect 8–12% of couples of reproductive age worldwide, of which male causes account for approximately 50% of infertility cases . Currently, the analysis of male infertility depends mainly on the assessment of semen quality indicators, such as sperm concentration, morphology, motility, and the DNA fragmentation index (DFI) . It has been reported that low DNA integrity in semen can reduce fecundability. In addition, the problem of semen quality decline is also serious globally. In a meta-analysis including 185 articles and 42,000 people, semen quality was shown to have decreased since 40 years . Thus, we should be more observant to the changes in semen quality and evaluating what truly affects sperm.

Globally, infertility affects approximately 15% of couples of childbearing age, with some regions reporting rates as high as 30% according to Ombelet et al. Regional variations are evident, as seen in Saudi Arabia, where the prevalence is approximately 18.93%. These differences highlight the challenges of defining infertility consistently, as the absence of a universally accepted definition, coupled with heterogeneous population sampling and varying calculation methods, leads to discrepancies in prevalence estimates. Unexplained infertility, accounting for 30–40% of infertile couples, is a diagnosis often assigned when standard investigations—such as ovulation tests, tubal patency assessments, and semen analysis—yield normal results. This condition underscores the complexity of infertility and the limitations of conventional diagnostic tools in identifying specific causes. Male infertility, commonly characterized by abnormal semen parameters, is central to the infertility diagnosis process. Semen analysis is considered the cornerstone investigation for evaluating infertile males, with a sensitivity of 89.6%, accurately identifying 9 out of 10 men with genuine reproductive issues.

Mechanism of Action

The therapeutic efficiency of selective serotonin reuptake inhibitors (SSRIs) is rooted in the monoamine hypothesis, which suggests that a deficiency in serotonin contributes to the development of depression. SSRIs work by enhancing serotonin activity, directly addressing this hypothesized deficit. As their name implies, SSRIs exert their primary effect by hindering the reuptake of serotonin into presynaptic neurons. This action increases the availability of serotonin within the synaptic cleft, allowing it to stimulate postsynaptic serotonin receptors for merely longer. The central target of SSRIs is the serotonin transporter (SERT), located at the presynaptic axon terminal. By inhibiting SERT, SSRIs prevent serotonin (5-hydroxytryptamine or 5HT) from being reabsorbed, thus enhancing serotonergic neurotransmission. Unlike other classes of antidepressants, SSRIs exhibit minimal effects on other neurotransmitters such as dopamine and norepinephrine. This high specificity contributes to their targeted action and reduces off-target effects. SSRIs are considered safer and better tolerated compared to older antidepressant classes, such as tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs). This is because SSRIs have negligible effects on adrenergic, cholinergic, and histaminergic receptors, which are often implicated in the side effects associated with TCAs and MAOIs. The ability of SSRIs to selectively enhance serotonin activity while sparing other systems has positioned them as a frontline treatment for depression and various other psychiatric conditions, with a comparatively favorable side effect profile.

Need For The Study

Selective serotonin reuptake inhibitors (SSRIs) are widely prescribed antidepressants due to their efficacy and relatively favorable side effect profile. However, emerging evidence suggests that SSRIs may have unintended effects on male reproductive health, particularly on semen quality. Semen parameters such as sperm count, motility, morphology, and DNA integrity are critical markers of male fertility, and any adverse effects from SSRIs could have significant implications for individuals of reproductive age. Despite the widespread use of SSRIs, there is limited research evaluating their specific impact on semen

quality, especially in the Indian context. In regions like western Uttar Pradesh, where cultural and socioeconomic factors may influence health-seeking behavior and reproductive outcomes, understanding the potential impact of SSRIs on male fertility is crucial. This is particularly relevant in tertiary care settings where patients often present with complex health conditions and are more likely to receive SSRIs as part of their treatment regimen.

Additionally, male infertility is a growing concern globally, and its contribution to unexplained infertility cases is substantial. Investigating the role of commonly prescribed medications such as SSRIs could provide critical insights into preventable or manageable causes of male infertility. This research aims to bridge a significant knowledge gap and guide clinicians in optimizing the management of patients requiring antidepressant therapy, while addressing concerns related to reproductive health.

Research Problem Statement

Male infertility is a significant global health issue, contributing to approximately 50% of infertility cases among couples. In regions like western Uttar Pradesh, where infertility rates are rising, the potential impact of SSRIs on semen quality remains understudied. This lack of evidence creates challenges in managing patients of reproductive age who require antidepressant therapy while preserving their fertility. Despite the increasing prescription rates of SSRIs, there is limited research addressing their effects on sperm motility in the Indian population, particularly in tertiary care settings. Without robust data, clinicians face difficulties in providing comprehensive guidance to patients regarding the potential reproductive consequences of SSRIs. This study aims to address this gap in patients attending a tertiary care center in western Uttar Pradesh. The findings aims to evaluate critical insights into the relationship between SSRI usage and male fertility, ultimately aiding in better clinical decision-making and patient care.

Rationale Of Study

There is limited research investigating their potential effects on semen parameters such as sperm motility, particularly in the Indian population. Western Uttar Pradesh represents a region with unique socio-cultural and environmental factors that may influence the distribution of infertility and the SSRIs toxicity. In this context, understanding the relationship between SSRIs and semen quality is crucial for addressing fertility challenges in male patients of reproductive age. This study is particularly important because it will provide region-specific data, contributing to the global understanding of SSRIs' effects on male fertility. The findings could help healthcare providers in tertiary care settings balance the mental health benefits of SSRIs with their potential reproductive consequences, ensuring comprehensive and informed patient care. Furthermore, the study could serve as a foundation for future research and guide evidence-based clinical recommendations for managing depression in men concerned about their fertility.

MATERIALS AND METHOD:

Study Population:

Patients presenting in the outpatient clinic of Saraswathi Institute of Medical Sciences (SIMS), which is a tertiary care teaching hospital.

Study Design:

This was a Prospective Comparative study conducted to evaluate the effects of SSRIs on semen motility in patients undergoing treatment at a tertiary care center in Western Uttar Pradesh. The study aimed to assess semen motility in patients receiving SSRIs for depression, anxiety spectrum disorder and pre mature ejaculation.

Sample:

A sample of 120 patients with depressive episodes, anxiety spectrum disorder, and premature ejaculation fulfilling the inclusion and exclusion criteria were considered for the study.

Sampling Technique:

The first two patients registered in the walk-in clinic on the respective OPD day, with a diagnosis of depressive episode, anxiety spectrum disorder, and premature ejaculation, who satisfied the inclusion and exclusion criteria, were considered for the study.

Source of Data:

Patients diagnosed with depressive episodes, anxiety spectrum disorder, and premature ejaculation attends the outpatient clinic in a tertiary care hospital.

Inclusion Criteria:

- Subjects with a diagnosis of depressive episode, anxiety spectrum disorder, and premature ejaculation as per ICD-11 criteria attended the psychiatry outpatient clinic.
- Patients on single-drug therapy (sertraline, fluoxetine, escitalopram or paroxetine).
- Patients in the age group of 22–45 years are willing and capable of providing written informed consent.

Exclusion Criteria:

- Patients having serious physical or neurological illnesses that could interfere with the patient's assessment.
- Patients with severe depression (HAMD score > 23) with psychotic symptoms or those having suicidal ideation/risks.
- Patients on multiple drug therapy.

Data Collection Tools:

Semi-structured pro forma for history taking, general physical examination, and mental state examination.

Semi-structured pro forma for socio-demographic variables, as used in various Indian studies.

ICD-11 criteria for clinical diagnosis of depressive episode, anxiety spectrum disorder, and premature ejaculation.
The Mini-International Neuropsychiatric Interview (M.I.N.I).
The Hamilton Rating Scale for Depression (HAMD).
The Hamilton Rating Scale for Anxiety (HAMA).
Premature ejaculation diagnostic tool.

Semen Analysis:

Semen samples were collected after 2–3 days of sexual abstinence. Semen analysis was performed according to the World Health Organization (WHO) guidelines (WHO 2010). Semen motility was assessed.

Semen samples were analyzed in the laboratory within one hour of collection.

Outcomes Measured:

Primary Outcome: Changes in semen motility from baseline to post-treatment.

Statistical Analysis:

Data were entered in Microsoft Excel and analyzed using IBM SPSS (v 29.0). The collected data was analyzed by appropriate statistical tests and techniques such as mean ± SD, graphical representation of data, frequency distribution and repeated measure ANOVA. A p-value < 0.05 was considered statistically significant.

Ethical Issues:

Informed written consent was obtained from all participants.

Participation or non-participation did not affect the services offered to patients.

Information gathered during the study was kept confidential.

Patients with nicotine dependence were treated accordingly at the special de-addiction clinic at SIMS Hospital, Hapur.-NIL

Conflict Of Interest

-There is no conflict of interest

RESULT

Correlation Between SSRIs and Sperm Motility

Table: Correlation Between SSRIs and Sperm Motility

Group	Escitalopram (n=30)		Fluoxetine (n=30)		Sertraline (n=30)		Paroxetine (n=30)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sperm Motility (%) 0 month	56.1	13.6	55.9	14.3	57.6	13.7	59.6	15
Sperm Motility (%) 1 month	52.2	13.1	47.3	12.2	51.5	12.6	47.8	12.3
Sperm Motility (%) 3 months	48	12.3	42	11.3	45.9	10.7	41.8	10.2
p-value	<0.001		<0.001		<0.001		<0.001	

The table presents data on the correlation between selective serotonin reuptake inhibitors (SSRIs) and sperm motility over different time points. This information is important for understanding how the use of SSRIs may influence male fertility, particularly in terms of sperm motility, which is a crucial factor in male reproductive health. The data shows the mean sperm motility percentages and standard deviations (SD) for various SSRIs—Escitalopram, Fluoxetine, Paroxetine, and Sertraline—across three time intervals: baseline, one month, and three months.

At baseline, sperm motility is relatively similar across the SSRIs, with Paroxetine showing the highest mean sperm motility at 59.6% (SD = 15.0%), followed closely by Sertraline at 57.6% (SD = 13.7%), Escitalopram at 56.1% (SD = 13.6%), and Fluoxetine at 55.9% (SD = 14.3%). These values suggest that, at the onset, there are no significant differences in sperm motility between the SSRIs studied, indicating that SSRIs may not have an immediate significant impact on sperm motility.

However, at one month, a noticeable decline in sperm motility is observed across all SSRIs. Escitalopram, which had the highest baseline sperm motility, shows a decrease to 52.2% (SD = 13.1%). Fluoxetine drops to 47.3% (SD = 12.2%), Paroxetine to 47.8% (SD = 12.3%), and Sertraline to 51.5% (SD = 12.6%). This reduction in sperm motility after one month of SSRI usage highlights a potential time-dependent effect of SSRIs on male fertility, suggesting that the impact of these medications may not be immediately noticeable but becomes more evident over time.

At three months, sperm motility continues to decline for all SSRIs. Escitalopram shows 48.0% (SD = 12.3%), Fluoxetine 42.0% (SD = 11.3%), Paroxetine 41.8% (SD = 10.2%), and Sertraline 45.9% (SD = 10.7%). The continued decrease suggests a cumulative effect of SSRIs on sperm motility with prolonged use. Among the SSRIs, Paroxetine and Fluoxetine show the greatest reduction in sperm motility over the three-month period.

In conclusion, the data indicates a trend of reduced sperm motility with prolonged use of SSRIs, with significant declines observed from baseline to three months. The p-value, <0.001 , shows observed changes in sperm motility are statistically significant across the different SSRIs and over time.

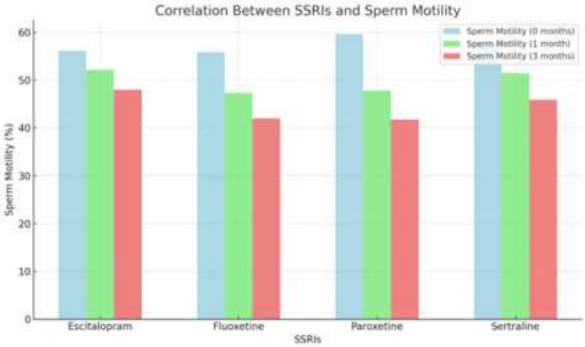

Figure: Correlation between SSRIs and Sperm motility

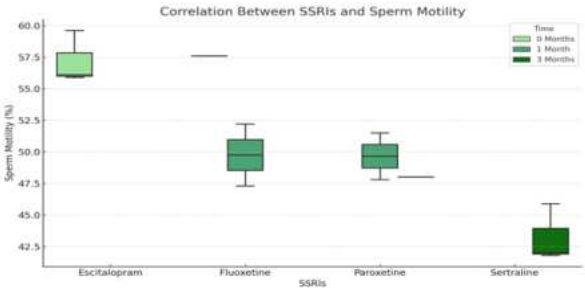

Figure: Correlation between SSRIs and Sperm motility

DISCUSSION

The correlation between SSRIs and sperm motility revealed a progressive decline across all SSRIs at one month and three months of treatment, with fluoxetine and paroxetine showing the most significant reductions in sperm motility at three months (42.0% and 41.8%, respectively). These findings are in agreement with Xu J et al. (2022)48, who conducted a meta-analysis on SSRI effects on semen quality, reporting that fluoxetine and paroxetine had the greatest impact on reducing sperm motility and increasing DNA fragmentation index (DFI). Norr L et al. (2016)38 similarly found a negative effect of SSRIs on sperm motility, attributing this to serotonergic-mediated alterations in testicular microenvironments and mitochondrial dysfunction. Milosavljevic J Z et al. (2022)47 further supported this decline, particularly emphasizing fluoxetine-related reductions in sperm count and motility due to oxidative stress and altered epididymal function. However, Pham M N et al. (2022)49, in their large retrospective cohort, found no significant differences in sperm motility between SSRI users and non-users, which contrasts with the present study's findings. Their analysis, however, was limited by the variability in SSRI exposure durations and potential confounding factors, such as underlying psychiatric conditions, that were not systematically controlled. Among individual SSRIs, escitalopram showed the least reduction in sperm motility (from 56.1% to 48.0% over three months), whereas fluoxetine and paroxetine showed the highest declines. This aligns with Aghajani R et al. (2022)50, who reported that paroxetine had a more pronounced negative effect on sperm quality compared to other SSRIs, likely due to its strong serotonin reuptake inhibition and secondary effects on hormonal regulation. Korshunov M N et al. (2016)35, in a controlled study of fluoxetine users, also reported that fluoxetine significantly reduced sperm motility and morphology, findings that are consistent with this study. However, Alsabhan J F et al. (2024)52 conducted a retrospective analysis and did not observe any significant differences in motility, viscosity, or sperm count between SSRI users and non-users. This discrepancy may be attributed to differences in study methodologies, particularly in the duration of SSRI use and semen analysis protocols. Despite these variations, the present study adds to the growing body of evidence suggesting a negative impact of SSRIs, particularly fluoxetine and paroxetine, on sperm motility over time.

CONCLUSION

The findings demonstrated a progressive decline in semen quality over time, particularly among individuals using fluoxetine and paroxetine, with notable reductions evident after three months of therapy. Given the increasing global prevalence of SSRI use, particularly among young adults and reproductive-age men, these findings emphasize the need for greater clinical awareness regarding the reproductive side effects of antidepressant medications.

The study's results also highlight a significant correlation between SSRI exposure and sperm dysfunction, reinforcing prior research that suggests serotonin-mediated alterations in testicular microenvironments. This study provides clinically relevant insights into the reproductive risks associated with long-term SSRI therapy, reinforcing the necessity for individualized treatment approaches, pre-treatment counseling, and routine semen analysis for at-risk individuals.

The relatively small sample size limits the generalizability of findings to a broader population. A short duration of follow-up may not adequately capture the long-term or delayed effects of SSRIs on semen parameters.

Data collected from a single tertiary care centre in Western Uttar Pradesh might limit the applicability of findings across different regions or demographic groups in India.

Variability in drug dosages, individual compliance, and inter-individual differences in drug metabolism were not systematically assessed, potentially influencing results.

Summary

Significant reductions were observed in sperm motility among patients treated with SSRIs (escitalopram, fluoxetine, sertraline, paroxetine) after 1 and 3 months compared to baseline values ($p<0.001$). Paroxetine demonstrated the most severe negative effects. Escitalopram showed comparatively milder adverse effects. Adverse effects on semen motility became evident early, within the first month, and intensified over the three-month duration. A balanced demographic distribution was found regarding age, socioeconomic status, occupation, and marital status, indicating the generalizability of results across diverse populations. The majority of participants were married, highlighting the relevance of fertility issues in this population. SSRIs demonstrated a clear negative impact on semen motility, aligning with international research and underscoring

potential fertility risks associated with antidepressant therapy in men. Paroxetine exhibited the strongest negative impact, indicating that clinicians should exercise particular caution when prescribing this medication to men wishing to conceive. Findings align with prior international studies demonstrating that SSRI usage, particularly paroxetine, negatively affects sperm motility. The study emphasizes the importance of clinician-patient communication regarding reproductive risks when initiating SSRI therapy. It suggests integrating fertility counseling and fertility preservation measures into clinical protocols when prescribing SSRIs to reproductive-aged men. Calls for larger, multicentric, and controlled studies to further substantiate findings and establish comprehensive clinical guidelines for prescribing SSRIs.

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