

Neurological conditions affect sleep quality and sexual functioning in men: A comparative analysis

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This study explores the impact of neurological conditions on sexual functioning and sleep quality in men, specifically focusing on the interplay between migraines, sleep disturbances, and sexual health. Utilising a sample of 102 male participants, the research employed standardised measures to assess acute sleep problems and sexual functioning, with a particular emphasis on the differences between individuals with and without migraines. Findings indicate a significant inverse relationship between sleep quality and sexual functioning, where acute sleep disruptions are strongly correlated with diminished sexual health. Notably, the study revealed that men suffering from migraines reported worse outcomes in both sexual functioning and sleep quality compared to those without migraines. The data highlight that migraines exacerbate the negative impacts on these aspects, suggesting a compounded burden on affected individuals. The research contributes to a relatively underexplored field, shedding light on the substantial influence of neurological disorders on fundamental biological functions such as sleep and sexual activities. These insights underscore the need for a comprehensive approach in treating neurological conditions, where both symptom management and lifestyle adjustments are considered to improve the quality of life for sufferers. This study's implications suggest potential avenues for therapeutic interventions aimed at enhancing sleep quality and sexual health in men, particularly those affected by migraines. By addressing these interlinked aspects, healthcare providers can offer more targeted and effective treatments, ultimately leading to better patient outcomes. Overall, the correlation between neurological conditions and essential life functions calls for more detailed exploration to fully understand the scope and mechanisms of these interactions.

Keywords: male; quality of sleep; sexual functioning; neurological conditions

Sex and sleep, though widely regarded as universal biological activities, have been insufficiently explored concerning their interrelated dynamics, particularly among males. Research primarily targets the interconnections of sleep disorders and sexual health in females, notably side-lining male-specific studies. Among sleep disorders, Obstructive Sleep Apnea (OSA) remains the most extensively studied in terms of its implications for both sleep and sexual functioning in men. OSA, characterised by periodic interruptions in breathing due to upper airway blockage, has been highlighted in studies such as those by Arruda-Olson et al. (2003), demonstrating significant impacts on overall quality of life due to disrupted sleep and consequent sexual dysfunction.

Neurological disorders further complicate the interaction between sleep and sexual health. Common conditions such as headaches and, more disruptively, migraines, severely affect one's quality of life. Migraines are particularly known for their debilitating effects which can extend beyond pain to significantly impair both sleep quality and sexual health (Bautista et al., 2018). Furthermore, conditions like narcolepsy, which lead to excessive daytime sleepiness, REM sleep abnormalities, and parasomnia, showcase direct implications for sexual health due to altered sleep patterns. According to the Penn State Hershey Medical Center (2013), narcolepsy's impact on bodily functions that prioritise sleep can severely limit sexual drive and performance. However, it is critical to consider that sexual functioning in narcolepsy might still be active to some extent given that nocturnal penile tumescence, a phenomenon occurring during REM sleep, suggests potential periods of sexual responsiveness even when typical sleep architecture is disturbed.

The underrepresentation of male-focused research in this area indicates a significant gap in the literature. It is crucial to understand how sleep disorders affect different aspects of life, including sexual functioning, by considering physiological, psychological, and neurological perspectives. Sleep disorders often lead to hormonal imbalances, psychological stress, and reduced physical health, which in turn can lead to sexual dysfunction (Calvo-Schimmel et al., 2024; Petrosino et al., 2024; Relojo, 2018). Men suffering from chronic sleep issues might experience lower testosterone levels, which is closely linked to libido and sexual performance. Psychological effects such as anxiety and depression associated with poor sleep can also play a substantial role in sexual dysfunction. Moreover, there is emerging evidence suggesting that the quality of sleep has a direct correlation with the quality of sexual life. Poor sleep can lead to reduced interest in sexual activity and decreased satisfaction, which can strain personal relationships and overall well-being (Dey & Relojo-Howell, 2021; Rodríguez-Almagro et al., 2024; Sonnentag et al., 2023). Considering these factors, it becomes evident that the intersections of sleep and sexual health are not merely coincidental but are driven by complex, interlinked biological processes.

Its demonstrated association with a key biological indicator of male sexual function, which is erectile dysfunction (ED), which is also a boon to research on obstructive sleep apnoea (OSA) in males. According to Awad et al. (2011), erection is a phenomenon that is influenced by a variety of biological mechanisms, including neurological processes in the regions of the brain which is linked to arousal of sexual responses, activation of ANS in the central nervous system, the release of neurotransmitters, and widening of blood vessels. Perimenis et al. (2004) found that over the course of 12 weeks, men taking sildenafil, which is sold under the brand name Viagra, experienced fewer erectile dysfunction symptoms than males using a CPAP machine every night. This finding suggested that erectile dysfunction may be more effectively managed by using erectile dysfunction-specific medications like sildenafil rather than treating the underlying condition itself. Despite the fact that sildenafil appears to alleviate erectile dysfunction symptoms in addition to CPAP due to its quick action, which involves affecting the target enzyme rather than rising the oxygenated blood through uninterrupted breathing, and the nocturnal hypoxia episodes that may be the origin of the enzymatic dysregulation on which sildenafil acts are not attempted to be treated by this medication.

For adults, the ideal amount of sleep is between seven to nine hours every night, with the circadian cycle of sleep normally being about 24 hours long. However, according to Kooij and Bijlenga (2013), these exogenous environmental cues, or "Zeitgebers", keep this cycle going or have an impact on it. Climate conditions, artificial light, natural light, physical activity, dietary restrictions, and medication are a few examples of Zeitgebers. Any Zeitgeber changes impact the circadian rhythm of the organism and can assimilate new rhythms depending on these environmental cues. While the suprachiasmatic nucleus, a tiny part of the hypothalamus, regulates the circadian cycle, and sleep is neurologically developed and sustained (Moore et al., 2002). The optic nerves are located nearby this area, which perceive cues from surrounding light and transmit data regarding everyday exposure to

light to the pineal gland. The hormone melatonin is then released by the pineal gland in a directed manner, with nighttime secretion levels being higher. Melatonin encourages sleep as we get closer to night-time. As a Zeitgeber, light appears to be essential for maintaining the sleep cycle.

The process of sexual functioning includes both biological and psychological reactions towards sexual stimulation and a smooth transition through stages of arousal and relaxation as well as a sense of pleasure and satisfaction. In males, the physiologic process of sexual arousal is the erection of the penis, this means it increases blood flow, which engorges the three spongy zones that span the length of the penis and causes vasodilation. The testicles are pressed up against the body, the scrotum's skin becomes tauter, and the penis becomes larger and firmer. As the American Psychiatric Association (2013), stated in the DSM-5's criteria for the classification of Male Hypoactive Sexual Desire Disorder include malfunctions in these various physiological functions. Which exhibits signs of both diminished psychological and biological responses towards sexual arousal including a low desire for sex, erotic thoughts and sexual fantasies. Sexual functioning is a continuous sequence-based concept, due to the intricacy of sources which are biological and psychological of arousal with either total inability to become aroused or at least just sufficiently aroused. This contrasts with the past literature and the diagnostic model that assumed that males either had sexual dysfunction or didn't.

Sexual activity and sleep are both physiologically natural and sustained activities. Hence, whether physiological or psychological factors contributed to sleep or sexual function, it continues to imply that there is physiologic imbalance. The presence of migraines and other chronic pain disorders, and pharmacotherapies are additional variables that have an impact on both the quality of sleep and sexual function.

Sleep and sexual function are only two of the many elements of life quality that are negatively impacted by chronic pain. According to Smitherman et al. (2013), One of the most common chronic pain conditions is headache, and migraine headaches are particularly common. 12% of Americans suffer from headaches each year and the prevalence of migraines is more in women than men. Global quality of life is frequently impacted by migraines due to their intensity and length. Insomnia is a typical complication of chronic pain when the pain is so intense or uncomfortable that appropriate sleep is impossible. Also, people with chronic pain frequently avoid exercising out of concern of experiencing more pain, which exacerbates sleep problems and pain levels. This is important since better sleep hygiene and more exercise are two of the primary behavioural therapies for chronic pain. Hence, a cyclical model of pain maintenance is produced by factors like insufficient exercise, pain state escalation and less sleep. Sexual functioning may also be impacted depending on the severity of a main medical condition with secondary pain or a serious health issue with primary pain alone. Neuropathic pain sufferers may have increased sensitivity to touch, making neutral or erotic contact uncomfortable or unpleasant, or their sensitivity may have diminished in erogenous areas. Similarly, the onset and maintenance of sexual arousal depend on reflexive nervous system reaction and feedback, pain conditions brought on by arousal input-output loop disruption resulting from nerve dysfunction, causes in reductions of physiological or subjective levels of arousal.

The first line of treatment for complaints of sexual problems and poor sleep quality is frequently pharmacotherapy. Erectile Dysfunction in men is typically quickly treated with drugs like Tadalafil, Sildenafil, or Levitra. Although these drugs don't address the root reasons of sexual problems, they can temporarily reduce symptoms. In order to treat a number of sleep-related symptoms and illnesses, such as inability to sleep and excessive daytime drowsiness, doctors frequently prescribe drugs that either encourage or disrupt sleep. Although benzodiazepine drugs like diazepam, clonazepam, and alprazolam are frequently used as hypnotics to induce sleep, there is an increased danger of dependence with prolonged administrations of these drugs. Therefore, these drugs are designed to disrupt the pattern of insomnia temporarily while the individual adopt healthier habits to alleviate their symptoms and gradually discontinues the medication. According to Lajiness (2008), although non-benzodiazepine sleep aids such as zolpidem and eszopiclone are prescribed to promote sleep in a manner comparable to benzodiazepines, they still carry a risk of misuse if taken in higher doses than recommended. Modafinil, a wakefulness-promoting drug that functions in opposition to the hypnotics mentioned above, is frequently administered to those with circadian rhythm abnormalities or excessive daytime drowsiness. As drugs like modafinil are not habit-forming by nature, they provide long-term relief from disruptive sleep. SSRIs, an antidepressant drug commonly given for the treatment of chronic pain, are known for having adverse effects on the sexual system. Montejo et al. (2001), reported the prevalence of sexual dysfunction in outpatients with normally functioning sexual functioning who have been taking any of 10 antidepressants and discovered that

59.1% of these outpatients reported having a sexual dysfunction. This suggests that the mode of action of these drugs negatively affects sexual function physiologically.

This study, therefore, is guided by two primary hypotheses derived from the observed impacts of neurological conditions, specifically migraines, on fundamental aspects of well-being. Hypothesis 1 posits that males suffering from migraines will experience significantly poorer sleep quality than their counterparts without such conditions. Hypothesis 2 asserts that the sexual functioning of males with migraines will be adversely affected compared to those without migraines. These hypotheses aim to elucidate the extent to which migraines can disrupt everyday health and wellness in affected individuals.

REVIEW OF CLINICAL LITERATURE

In India, Nemichandra et al. (2020) found that individuals suffering from migraines experience significant impacts on their social and familial activities. The study also linked severe, incapacitating migraines with erectile dysfunction, suggesting a causal relationship. Similarly, research by Aksoy et al. (2013) on male sexual dysfunction concluded that migraines adversely affect sexual function, indicating that factors beyond chronic pain contribute to sexual dysfunction in individuals with migraines.

Engstrøm et al. (2013) explored the interactions between sleep and migraines by examining patients with both sleep-related and non-sleep-related migraine episodes, using polysomnographic and pain-threshold measurements. They found that individuals with non-sleep-related migraines experienced more slow-wave sleep than those with sleep-related migraines, highlighting complex interactions between migraines and sleep. Additionally, a 2018 study by Fernández-de-Las-Peñas et al. revealed that half of the migraine sufferers also struggled with significant sleep issues. Their research demonstrates a correlation between the frequency and intensity of migraine episodes and poor sleep quality, underscoring the link between sleep problems and the overall burden of migraines.

Migraines, as described by Olesen et al. (2000), are recurring headaches with no apparent cause and are characterized by a pulsing sensation, moderate to severe pain, and symptoms like nausea and sensitivity to light or sound. These headaches can last from four to seventy-two hours and occur in forms with or without an aura. According to Silberstein and Merriam (1991), about 16% of the population suffers from migraines, with a higher incidence in women, likely due to hormonal factors.

Genetic factors also play a role in the onset of migraine headaches, as highlighted by Ducros et al. (1997). While anyone can experience a migraine, those with a genetic predisposition are more frequently affected. This is particularly evident in familial hemiplegic migraine (FHM), a subtype caused by mutations affecting voltage-dependent calcium channels on chromosome 19. Further genetic variations associated with migraines may also exist on chromosomes 1, X, and others, as noted by Russel et al. (1995), who described migraine as a complex genetic disorder influenced by hereditary factors.

Finally, Okeson and Bell (1995) detailed the interconnection between neuronal and vascular components in migraine pathophysiology, involving structures such as the grey matter and Medulla Oblongata. While the exact roles of these structures in migraine aetiology are debated, historical theories like the "vascular hypothesis" and "spreading depression" have attempted to explain the mechanisms behind migraine pain. Recent studies, however, suggest that vascular changes related to migraines are more likely consequences rather than causes of pain. Sanchez and Moskowitz (2000) characterized migraines as a specific type of neurovascular pain disorder, initiated by a trigeminovascular reflex that may be triggered by increased sensory information at critical neural junctions, leading to neurogenic inflammation and the onset of migraine pain.

METHOD

This study adopted a quantitative methodology, employing a correlational, cross-sectional design suitable for examining relationships between variables without the need for in-depth data collection.

This methodological approach allowed for the use of standardised testing and immediate data analysis.

The research included 102 male participants, ranging in age from 18 to 28 years, with a mean age of 22.93 (SD = 2.46). The sample was strategically selected using purposive sampling, aligning with the study's objectives, and supplemented by convenience sampling to include readily available individuals who met the inclusion criteria.

The data collection process adhered to ethical standards, beginning with obtaining informed consent from all participants. Participants were fully informed about the purpose of the study and the confidentiality of their responses. Each participant was administered three standardised instruments: the Brief Sexual Function Inventory (BSFI), the Sleep Quality Scale (SQS), and the Migraine Disability Assessment Test (MIDAS). These tools were chosen for their reliability and validity in assessing the constructs of interest. Specifically, the MIDAS was used to classify participants into groups based on migraine severity – those with significant symptoms (MIDAS Grade III and IV) and those with minimal or no symptoms (MIDAS Grade I and II).

Data analysis was conducted using IBM SPSS Statistics 25. Analytical techniques included calculating means and standard deviations to describe the data and employing independent samples t-tests and Pearson's correlation coefficients (r) to explore relationships between sleep quality, sexual functioning, and migraine severity. These statistical approaches helped identify and quantify patterns and strengths of associations between the study variables, facilitating a robust analysis in line with the research hypotheses.

RESULTS

The primary objective of this study was to explore how migraines, a neurological condition, affect the quality of sleep and sexual functioning in males. Statistical analyses were conducted to assess the differences in these variables among men with and without migraines, as well as the interrelationships between these variables. Inferential statistics, including t-tests, were applied to identify significant differences. The data were then meticulously analysed and interpreted in alignment with the specific objectives and hypotheses established for each aspect of the study.

Table 1.
 Summary of Sample Characteristics and Test Outcomes

Description	With Migraine (N = 51)	Without Migraine (N = 51)
Mean Age	22.93	22.93
Mean BSFI Score	10.80	35.61
Mean SQS Score	63.25	33.04
t-Statistic for Sexual Functioning	-15.180	N/A
t-Statistic for Quality of Sleep	15.284	N/A
Degrees of Freedom (df)	100	100
p-Value for Sexual Functioning	.009	N/A
p-Value for Quality of Sleep	.889	N/A

Table 2.

T-Statistics for Differences in Sexual Functioning and Quality of Sleep between Males With and Without Migraine

	Migraine Status	N	M	SD	t	df	p
BSFI	With migraine	51	10.80	9.722	-15.180	100	.009
	Without migraine	51	35.61	6.453			
SQS	With migraine	51	63.25	10.666	15.284	100	.889
	Without migraine	51	33.04	9.250			

DISCUSSION

Analysis of data found a significant negative correlation between sexual functioning and acute sleep problems ($r = -.836, p < 0.01$), indicating that higher cumulative weighted acute sleep problems were significantly related to higher levels of sexual dysfunction. Research has provided explanations regarding the influence of sleep disorders on male sexual function, suggesting that sleep disorders can be a contributing factor to sexual dysfunction. (Cho & Duffy, 2018). Studies focusing on females have demonstrated that shorter sleep durations and higher insomnia scores are linked to decreased sexual function. These associations persist even after accounting for other factors that may influence the results, suggesting that having adequate and good-quality sleep is crucial for maintaining optimal sexual function in women (Kling et al., 2017), hinting that it is also possible for males to have decreased sexual function with the existence of shorter sleep durations and high insomnia.

The correlation coefficient between BSFI and SQS is strongly negative at $-.836$, indicating a significant inverse relationship between the two variables. This suggests that as values on the BSFI increase, those on the SQS tend to decrease, or vice versa. Similarly, the analysis there is a significant difference between males with migraine and males without migraine in the experience of sexual functioning $t(100) = -15.180, p = .009$ and quality of sleep $t(100) = 15.284, p = .889$. That is, the average sexual functioning and quality of sleep scores of males with migraine were significantly different from that of males without migraine. This finding can be attributed to various factors, including a notable negative correlation between sexual function and the duration of acute headache episodes. Additionally, an increasing frequency of migraine attacks per month has also been found to be associated with decreased sexual function. These factors suggest that the presence and severity of headaches, particularly migraines, can impact sexual function negatively (Pradeep et al., 2019). And there are also studies that provide evidence that migraine is associated with sleep disorders, especially insomnia which could make males without migraine different from males with migraine (Kim et al., 2018). The results of the study provide support for the concept of a "sex phenotype" in migraine, suggesting that the brains of females and males are affected differently by migraine (Maleki et al., 2012). This implies that there are distinct characteristics and manifestations of migraine that are specific to each sex. So, it can also be seen that there is a significant difference in just the two different male groups.

An additional aspect to consider in the current study is how the BSFI (Brief Sexual Functioning Inventory) could potentially label a participant's lack of sexual activity in the past month as abnormal. In such cases, the BSFI may assign a score of 0 to relevant items related to sexual activity, significantly reducing the participant's overall score and suggesting a lower level of sexual functioning. Consequently, the global scores obtained from the BSFI may not accurately represent the individual's actual sexual functioning. For instance, a man who has not engaged in sexual activity in the past month may still have satisfactory sexual functioning, but this would not be reflected in his BSFI global score. This response pattern of very low BSFI scores could also significantly impact data analysis and group averages.

CONCLUSION

The findings of this study support both research hypotheses, demonstrating that migraines significantly affect both sexual functioning and sleep quality. The results indicate an inverse relationship between these variables; as one decreases, the other tends to increase to some extent. Notably, a distinct difference was observed between males with migraines and those without. This suggests that males with migraines may be more prone to acute sleep problems, while those without migraines generally exhibit healthier sexual functioning. Given the significant and meaningful trends

observed, it may be beneficial to consider intervention strategies aimed at improving sleep quality or sexual functioning among males.

Although this research contributes to the broader body of work examining sexual functioning, sleep quality, and migraines, it does have limitations. The study does not account for all potential factors that may influence sleep quality and sexual functioning. Moreover, the ability to generalize the results to all males is limited due to the use of a convenience sample, which may not accurately represent males from other regions or different age groups.

The results of this study also provide a foundation for future investigations into developing effective intervention programmes for males. For instance, the identified negative relationship between sexual functioning and acute sleep problems could be further explored to develop targeted interventions that mitigate acute sleep issues and enhance sexual functioning. Such research holds practical implications for enhancing the overall well-being of this population.

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