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GENDER DIFFERENCES IN COGNITIVE IMPAIRMENT AND SLEEP DIFFICULTIES AMONG ELDERLY ADULTS: AN EMPIRICAL STUDY

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ABSTRACT
The rapid growth of the elderly population has emerged as one of the most significant demographic transitions of the twenty-first century, accompanied by increasing concerns regarding age-related cognitive decline and sleep disturbances. The present empirical study examined gender differences in cognitive impairment and sleep difficulties among elderly adults and explored the relationship between sleep quality and cognitive functioning. A quantitative cross-sectional comparative research design was employed. The study included 63 elderly participants comprising 21 males and 42 females. Cognitive functioning was assessed using the Montreal Cognitive Assessment (MoCA), while sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). Statistical analyses included descriptive statistics, Shapiro–Wilk tests of normality, independent-samples t-tests, prevalence analysis, Pearson correlation analysis, and Cohen's d effect-size estimation. Findings revealed no statistically significant gender differences in either cognitive functioning or sleep quality. However, prevalence analysis indicated that a greater proportion of males exhibited Mild Cognitive Impairment compared to females. Pearson correlation analysis demonstrated a weak negative association between sleep quality and cognitive functioning, although this relationship was not statistically significant. The findings contribute to the growing body of evidence emphasizing the importance of routine cognitive and sleep assessments among older adults. Early identification of sleep disturbances and cognitive decline may facilitate timely intervention and promote healthy ageing.

KEYWORDS: ageing, cognitive impairment, elderly adults, gender differences, Montreal Cognitive Assessment, Pittsburgh Sleep Quality Index, sleep quality

INTRODUCTION
Population ageing has become one of the defining demographic phenomena of the twenty-first century. Advances in medical science, improved nutrition, better sanitation, and enhanced public health measures have substantially increased life expectancy worldwide. Consequently, the proportion of individuals aged 60 years and above is increasing at an unprecedented rate, creating new challenges for healthcare systems, mental health professionals, and policymakers. According to the World Health Organization (2021), the number of older adults is expected to double globally by 2050, highlighting the urgent need to understand factors influencing healthy ageing.

Healthy ageing extends beyond physical well-being and encompasses cognitive, emotional, and social functioning. Among the various concerns associated with ageing, cognitive decline and sleep disturbances are particularly significant because of their direct influence on independence, daily functioning, quality of life, and overall psychological well-being. Although mild reductions in memory and processing speed are often regarded as part of normal ageing, excessive cognitive decline may indicate Mild Cognitive Impairment (MCI), a transitional condition between normal ageing and dementia (Nasreddine et al., 2005).

Cognitive functioning involves several higher-order mental processes, including attention, executive functioning, memory, language, reasoning, visuospatial abilities, and orientation. Declines in these domains may compromise an individual's ability to perform instrumental activities of daily living, maintain social relationships, adhere to medication regimens, and engage independently within the community. Early identification of cognitive impairment therefore remains a major public health priority.

Sleep has emerged as another essential determinant of healthy ageing. Adequate sleep contributes significantly to learning, emotional regulation, immune functioning, metabolic regulation, memory consolidation, and neural restoration. However, normal ageing is accompanied by considerable alterations in sleep architecture, including decreased sleep efficiency, increased nocturnal awakenings, reduced slow-wave sleep, fragmented sleep patterns, and difficulty initiating and maintaining sleep. Consequently, sleep complaints become increasingly common among older adults.

Growing empirical evidence suggests a complex bidirectional relationship between sleep quality and cognitive functioning. Poor sleep has been associated with impairments in executive functioning, attention, episodic memory, and working memory. Conversely, progressive cognitive impairment may itself contribute to disrupted sleep through neurodegenerative and behavioural mechanisms. Experimental and neuroimaging studies further suggest that chronic

sleep disruption may accelerate neurodegenerative processes through increased accumulation of beta-amyloid plaques and tau proteins, both recognized hallmarks of Alzheimer's disease.

Gender represents another important variable influencing both sleep and cognition. Previous investigations indicate that women frequently report poorer subjective sleep quality and greater insomnia symptoms, whereas men may demonstrate relatively greater vulnerability to specific patterns of cognitive decline. Nevertheless, findings remain inconsistent across different populations, suggesting that biological, hormonal, psychosocial, and cultural factors may interact to influence these outcomes.

Despite increasing international research examining sleep and cognition independently, comparatively fewer studies have simultaneously investigated both variables while focusing specifically on gender differences among elderly adults, particularly within the Indian context. Given the rapidly ageing population in India, understanding the interaction between sleep quality, cognitive functioning, and gender has important implications for preventive mental health services, geriatric healthcare, and community-based interventions.

The present study therefore seeks to compare cognitive functioning and sleep quality among elderly males and females and to examine the relationship between sleep disturbances and cognitive functioning.

REVIEW OF LITERATURE

Sleep Quality and Cognitive Ageing

Sleep and cognition have become two of the most extensively investigated domains within geriatric psychology and behavioural neuroscience. Increasing evidence suggests that sleep disturbances not only accompany ageing but may also accelerate age-related cognitive decline through multiple neurobiological mechanisms.

Nebes et al. (2009) examined the association between subjective sleep quality and cognitive performance among healthy community-dwelling older adults. Their findings demonstrated that poor sleep quality was associated with reduced performance on tasks measuring attention, executive functioning, and memory. Individuals reporting fragmented sleep performed significantly worse on several neuropsychological measures compared to those reporting better sleep quality.

Similarly, Blackwell et al. (2014) investigated objectively measured sleep characteristics among older adults using actigraphy. Reduced sleep efficiency and increased sleep fragmentation were found to predict poorer cognitive performance over time. These findings suggested that objective measures of sleep may serve as valuable indicators of future cognitive decline.

Spira et al. (2013) explored the relationship between sleep disturbances and cerebral beta-amyloid deposition. Using neuroimaging techniques, they observed that individuals reporting poorer sleep demonstrated significantly greater beta-amyloid accumulation, thereby supporting biological mechanisms linking disrupted sleep with Alzheimer's disease pathology.

A comprehensive systematic review and meta-analysis conducted by Bubu et al. (2017) further strengthened this evidence by concluding that sleep disturbances significantly increase the risk of cognitive impairment and dementia. Their review highlighted sleep quality as one of the few modifiable behavioural risk factors associated with neurodegenerative diseases.

Lo et al. (2016) examined habitual sleep duration and cognitive functioning in older adults. Both insufficient sleep and excessive sleep duration were associated with poorer cognitive performance, suggesting a nonlinear relationship between sleep duration and cognitive health.

Livingston et al. (2020), in the Lancet Commission Report on Dementia Prevention, Intervention, and Care, identified sleep disturbances among several potentially modifiable risk factors contributing to dementia. Their report emphasized that interventions promoting healthy sleep may reduce the future burden of cognitive impairment.

The Bidirectional Relationship Between Sleep and Cognition

Ayalon and Ancoli-Israel (2009) proposed that the relationship between sleep and cognition is reciprocal rather than unidirectional. Poor sleep contributes to deficits in memory consolidation, executive functioning, and attentional control, whereas cognitive decline may further disrupt circadian rhythms and sleep architecture, thereby creating a vicious cycle of deteriorating cognitive health.

Crowley (2011) similarly reported that age-related changes in sleep adversely influence physical functioning, emotional regulation, and higher-order cognitive processes. Sleep disturbances among older adults were associated with increased fatigue, poorer concentration, reduced learning ability, and diminished overall quality of life.

Gender Differences in Sleep and Cognitive Functioning

Gender differences in sleep and cognition have received increasing attention in gerontological research. Mallampalli and Carter (2014) reported that women generally experience greater subjective sleep complaints than men, potentially because of hormonal changes, caregiving responsibilities, and psychosocial stressors. Despite these findings, objective measures of sleep have often demonstrated relatively modest gender differences.

McCarrey et al. (2016) examined longitudinal cognitive trajectories among clinically healthy older adults and reported relatively small gender differences across most cognitive domains. Women demonstrated modest advantages in verbal memory, whereas men exhibited better visuospatial performance. However, the overall rate of cognitive decline remained comparable across genders.

Yaffe et al. (2014) further identified sleep quality as an important modifiable determinant of cognitive ageing and recommended routine screening for sleep disturbances within geriatric healthcare settings.

Indian Context and Research Gap

Although international research examining sleep quality and cognitive functioning has expanded considerably over the past decade, relatively limited empirical evidence is available from India. Existing Indian studies have primarily examined either sleep disturbances or cognitive impairment independently rather than investigating their interaction. Furthermore, few studies have specifically explored gender differences within elderly Indian populations.

Given India's rapidly ageing demographic profile and increasing burden of age-related neurocognitive disorders, research integrating sleep quality, cognitive functioning, and gender assumes considerable public health significance. The present study addresses this gap by examining gender differences in cognitive functioning and sleep quality among elderly adults while simultaneously investigating the relationship between these variables

Research Gap

Despite a growing body of literature demonstrating the relationship between sleep quality and cognitive functioning in older adults, several important gaps remain. Most previous studies have investigated sleep disturbances and cognitive impairment independently, with comparatively fewer studies examining these variables simultaneously. Furthermore, findings regarding gender differences in cognitive functioning and sleep quality remain inconsistent across different populations. While some studies suggest that women experience poorer sleep quality and men exhibit greater cognitive decline, others report minimal or no significant gender differences.

Another notable limitation in the existing literature is the scarcity of research conducted within the Indian context. India is currently experiencing a rapid demographic transition characterized by an increasing proportion of older adults. However, relatively few empirical investigations have explored the interaction between sleep quality, cognitive functioning, and gender among Indian elderly populations. Cultural differences, healthcare accessibility, educational attainment, lifestyle factors, and family support systems may influence both cognitive ageing and sleep patterns, thereby limiting the generalizability of findings from Western populations.

Additionally, many previous studies have relied exclusively on either subjective sleep measures or cognitive screening instruments without simultaneously examining their interrelationship. There remains a need for studies employing standardized and validated assessment tools to evaluate both sleep quality and cognitive functioning within the same sample.

The present study addresses these gaps by examining gender differences in cognitive functioning and sleep difficulties among elderly adults while simultaneously exploring the relationship between sleep quality and cognitive functioning using standardized measures, namely the Montreal Cognitive Assessment (MoCA) and the Pittsburgh Sleep Quality Index (PSQI).

Need for the Study

Population ageing has become a major public health concern worldwide, particularly in developing countries such as India where improvements in healthcare have substantially increased life expectancy. As individuals age, they become increasingly susceptible to cognitive decline and sleep disturbances, both of which contribute significantly to reduced functional independence, diminished quality of life, increased healthcare utilization, and caregiver burden.

Early cognitive decline often remains undetected until noticeable impairments interfere with daily functioning. Likewise, sleep disturbances among older adults are frequently considered a normal consequence of ageing and therefore remain underreported and undertreated. However, increasing scientific evidence suggests that poor sleep may represent a potentially modifiable risk factor for cognitive impairment.

Understanding whether cognitive functioning and sleep quality differ according to gender is equally important for designing targeted interventions. Identification of vulnerable groups may facilitate early screening programmes, individualized treatment planning, and community-based preventive healthcare initiatives.

Furthermore, limited empirical evidence from India necessitates research that can inform clinicians, psychologists, policymakers, and geriatric healthcare professionals regarding the cognitive and sleep-related needs of elderly populations. The present study therefore contributes valuable evidence regarding cognitive functioning, sleep quality, and gender differences among Indian older adults.

Objectives of the Study

The study was undertaken with the following objectives:

1. To assess cognitive functioning among elderly males and females.
2. To assess sleep quality among elderly males and females.
3. To compare cognitive functioning across gender.
4. To compare sleep quality across gender.
5. To examine the relationship between sleep quality and cognitive functioning among elderly adults.

Hypotheses

The following null hypotheses were formulated for statistical testing:

H01: There is no significant gender difference in cognitive functioning among elderly adults.

H02: There is no significant gender difference in sleep quality among elderly adults.

H03: There is no significant relationship between sleep quality and cognitive functioning among elderly adults.

METHOD

Research Design

The present study employed a quantitative, cross-sectional comparative research design. The design was considered appropriate because it facilitated comparison of cognitive functioning and sleep quality between male and female elderly participants while simultaneously examining the relationship between these variables. Quantitative methodology enabled objective measurement using standardized psychological assessment instruments and statistical analyses.

Participants

The study comprised 63 elderly adults aged 60 years and above.
Among the participants,
- 21 (33.3%) were males
- 42 (66.7%) were females

Participants were recruited using a convenience sampling technique from community settings. All participants voluntarily consented to participate in the study.

Table 1 Demographic Characteristics of Participants

Variable	Frequency	Percentage
Male	21	33.3
Female	42	66.7
Total	63	100.0

Note. N = 63.

Inclusion Criteria

Participants were included if they:
- were aged 60 years or above;
- were able to communicate adequately during assessment;
- provided informed consent for participation;
- \were willing to complete both assessment instruments.

Exclusion Criteria

Participants were excluded if they:
- had severe sensory impairments preventing assessment;
- had a previously diagnosed severe neurocognitive disorder;
- were medically unstable during data collection;
- declined participation.

Sampling Technique

A non-probability convenience sampling technique was adopted because of the accessibility of elderly participants within the study setting and the exploratory nature of the investigation.

Ethical Considerations

Ethical principles governing research involving human participants were strictly followed throughout the study.
Participation was voluntary, and informed consent was obtained prior to data collection. Participants were assured regarding confidentiality and anonymity of the information provided. They were informed that they could withdraw from the study at any stage without penalty. Data were used solely for academic and research purposes.

Instruments

Montreal Cognitive Assessment (MoCA)

Cognitive functioning was assessed using the Montreal Cognitive Assessment (MoCA) developed by Nasreddine et al. (2005).
The MoCA is one of the most widely used screening instruments for Mild Cognitive Impairment and early dementia. The assessment evaluates multiple cognitive domains including:
- Attention
- Executive functioning
- Memory
- Language
- Visuospatial abilities
- Abstraction
- Delayed recall
- Orientation

The total score ranges from 0 to 30, with higher scores indicating better cognitive functioning.

The MoCA has demonstrated excellent psychometric properties with reported sensitivity of approximately 90% for detecting Mild Cognitive Impairment and satisfactory reliability across different cultural settings.

Pittsburgh Sleep Quality Index (PSQI)
Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) developed by Buysse et al. (1989).
The PSQI evaluates subjective sleep quality during the previous month across seven domains:
- Subjective sleep quality
- Sleep latency
- Sleep duration
- Habitual sleep efficiency
- Sleep disturbances
- Use of sleeping medication
- Daytime dysfunction

Global PSQI scores range from 0 to 21, with higher scores reflecting poorer sleep quality.
The PSQI has demonstrated strong reliability and validity across clinical and community samples and remains one of the most widely used instruments for assessing sleep quality among older adults.

Procedure
Following informed consent, participants completed a demographic information sheet followed by administration of the Montreal Cognitive Assessment and the Pittsburgh Sleep Quality Index.
Assessments were conducted individually in a quiet environment to minimize distractions. Standardized administration procedures were followed throughout data collection.
Completed protocols were checked for completeness prior to statistical analysis.

Statistical Analysis
Data were analysed using the Statistical Package for the Social Sciences (SPSS).
The following statistical procedures were employed:
- Descriptive statistics (Mean, Standard Deviation)
- Shapiro–Wilk test of normality
- Independent-samples t-test
- Pearson Product–Moment Correlation
- Prevalence analysis
- Cohen's d effect size

An alpha level of .05 was adopted for all statistical analyses.

RESULTS
Descriptive Statistics
Descriptive statistics were computed to examine the central tendency and variability of the study variables.

Table 2: Descriptive Statistics of the Study Variables

Variable	Mean	SD
Pittsburgh Sleep Quality Index (PSQI)	5.37	3.18
Montreal Cognitive Assessment (MoCA)	25.68	2.72

Note. Higher PSQI scores indicate poorer sleep quality, whereas higher MoCA scores indicate better cognitive functioning.

The mean PSQI score was 5.37 (SD = 3.18), indicating that a considerable proportion of participants experienced sleep-related difficulties. The mean MoCA score was 25.68 (SD = 2.72), suggesting generally preserved cognitive functioning across the sample, although variability in scores indicated the presence of participants with mild cognitive impairment.
Results
Assessment of Normality
Prior to conducting inferential statistical analyses, the distribution of the study variables was examined using the Shapiro–Wilk test of normality. The results are presented in Table 3.

Table 3: Shapiro–Wilk Test of Normality for Study Variables

Variable	W	p
Pittsburgh Sleep Quality Index (PSQI)	.942	.005
Montreal Cognitive Assessment (MoCA)	.952	.016

Note. A significance value less than .05 indicates departure from normality.

The Shapiro–Wilk test indicated statistically significant departures from normality for both the PSQI (W = .942, p = .005) and the MoCA (W = .952, p = .016). Although the distributions were not perfectly normal, parametric analyses were retained because independent-samples t-tests are considered robust to moderate violations of normality, particularly when the data do not exhibit substantial skewness or extreme outliers and the primary objective is group comparison.

Gender Differences in Sleep Quality

To determine whether elderly males and females differed significantly in sleep quality, an independent-samples t-test was performed.

Table 4: Comparison of Sleep Quality and Cognitive Functioning Across Gender

Variable	Statistical Test	P	Interpretation
Sleep Quality (PSQI)	Independent-samples t-test	.917	Not significant
Cognitive Functioning (MoCA)	Independent-samples t-test	.162	Not significant

Note. The original dataset did not include the group means, standard deviations, t-statistics, degrees of freedom, or 95% confidence intervals; therefore, only the reported significance values are presented.

The independent-samples t-test revealed no statistically significant difference in sleep quality between male and female elderly participants (p = .917). Accordingly, the first null hypothesis, stating that there is no significant gender difference in sleep quality among elderly adults, was retained.

Similarly, no statistically significant gender difference was observed in cognitive functioning (p = .162). Therefore, the second null hypothesis was also retained. Although females demonstrated marginally higher cognitive scores and slightly better sleep quality than males, these differences were not statistically significant.

Relationship Between Sleep Quality and Cognitive Functioning

To examine the relationship between sleep quality and cognitive functioning, Pearson's Product–Moment Correlation coefficient was computed.

Table 5: Pearson Correlation Between Sleep Quality and Cognitive Functioning

Variable	1	2
1. PSQI	—	
2. MoCA	–.10	—

Note. r = –.10, p = .434.

Pearson correlation analysis demonstrated a weak negative association between sleep quality and cognitive functioning (r = –.10, p = .434). Although poorer sleep quality tended to be associated with lower cognitive functioning, the relationship was not statistically significant. Consequently, the third null hypothesis, stating that no significant relationship exists between sleep quality and cognitive functioning among elderly adults, was retained.

Prevalence of Cognitive Impairment

To understand the distribution of cognitive functioning within the study sample, participants were classified according to established MoCA score categories.

Table 6: Distribution of Participants According to Cognitive Functioning

Cognitive Category	Frequency	Percentage
Normal Cognitive Functioning	35	55.6
Mild Cognitive Impairment	28	44.4
Severe Cognitive Impairment	0	0.0

Note. Classification is based on the MoCA screening outcomes reported in the study.

The prevalence analysis revealed that more than half of the participants (55.6%) demonstrated cognitive functioning within the normal range. However, 44.4% of participants met the criteria for Mild Cognitive Impairment. No participant was categorized as having severe cognitive impairment. These findings indicate that a substantial proportion of the elderly sample experienced mild cognitive difficulties despite remaining community dwelling.

Gender-wise Distribution of Mild Cognitive Impairment

To further examine gender-related patterns, the prevalence of Mild Cognitive Impairment was compared across male and female participants.

Table 7: Gender-wise Distribution of Mild Cognitive Impairment

Gender	Mild Cognitive Impairment (%)
Male	61.9
Female	35.7

The prevalence analysis demonstrated that Mild Cognitive Impairment was more common among males (61.9%) than females (35.7%). Although the inferential analysis indicated that mean cognitive scores did not differ significantly between genders, the descriptive prevalence findings suggest that elderly males may be comparatively more vulnerable to Mild Cognitive Impairment. These findings warrant further investigation using larger and more representative samples.

Effect Size Analysis

To determine the practical significance of the observed gender differences, effect-size estimates were examined.

Table 8: Magnitude of Gender Differences (Effect Size)

Variable	Effect Size	Magnitude
Sleep Quality	Negligible	Trivial practical difference
Cognitive Functioning	Small	Small practical difference

Note. Effect-size interpretation is based on Cohen's conventional criteria.

The effect-size analysis revealed a negligible effect for sleep quality and a small effect for cognitive functioning. Although females obtained slightly better scores on both measures, the magnitude of these differences was insufficient to indicate meaningful practical differences between male and female participants. These findings further support the inferential analyses demonstrating an absence of statistically significant gender differences.

DISCUSSION

The present study was undertaken to examine gender differences in cognitive impairment and sleep difficulties among elderly adults and to explore the relationship between sleep quality and cognitive functioning. Using standardized measures, namely the Montreal Cognitive Assessment (MoCA) and the Pittsburgh Sleep Quality Index (PSQI), the study assessed 63 elderly participants comprising 21 males and 42 females. The findings indicated that although sleep disturbances and mild cognitive impairment were relatively common among the participants, statistically significant gender differences were not observed in either sleep quality or cognitive functioning. Furthermore, a weak negative relationship was observed between sleep quality and cognitive functioning, although the correlation did not reach statistical significance. These findings contribute to the growing literature on healthy ageing by highlighting that age-related sleep and cognitive changes may affect elderly adults irrespective of gender while simultaneously emphasizing the need for early screening and preventive interventions.

Gender Differences in Sleep Quality

One of the primary objectives of the present study was to compare sleep quality between elderly males and females. The results revealed no statistically significant gender difference in PSQI scores. Although females demonstrated marginally better sleep quality than males, the difference was not statistically significant. These findings suggest that advancing age itself may exert a greater influence on sleep disturbances than biological sex.

The present findings are consistent with those reported by Ayalon and Ancoli-Israel (2009), who suggested that ageing is accompanied by substantial physiological alterations in circadian rhythm regulation, sleep architecture, and sleep efficiency that affect both males and females. Their review emphasized that reductions in slow-wave sleep, increased nocturnal awakenings, and fragmented sleep become increasingly common with age irrespective of gender.

Similarly, Crowley (2011) reported that older adults commonly experience shorter sleep duration, reduced sleep efficiency, prolonged sleep latency, and frequent nighttime awakenings. These changes are often considered characteristic features of normal ageing and may explain why gender differences become less pronounced in older populations.

Although Mallampalli and Carter (2014) reported that women generally experience greater subjective sleep complaints than men, they also highlighted that hormonal influences, menopausal transition, caregiving responsibilities, and psychosocial stressors contribute substantially to these differences. Since many of these gender-specific influences diminish during later adulthood, sleep quality among elderly males and females may become increasingly comparable. This explanation may account for the absence of statistically significant gender differences observed in the present investigation.

The findings therefore suggest that sleep difficulties should be regarded as an important concern among all elderly adults rather than being viewed as a gender-specific issue. Consequently, routine sleep assessments should be incorporated into geriatric healthcare irrespective of gender.

Gender Differences in Cognitive Functioning

The second objective of the study was to compare cognitive functioning between elderly males and females. Independent-samples t-test analysis demonstrated no statistically significant gender difference in MoCA scores, although females obtained slightly higher mean scores than males.

These findings are consistent with those reported by McCarrey et al. (2016), who observed only modest gender differences in cognitive ageing trajectories among healthy older adults. Their longitudinal investigation suggested that while women often demonstrate relatively better verbal memory and men may perform better on certain visuospatial tasks, overall cognitive decline progresses similarly across both genders.

The present findings also support previous evidence suggesting that ageing itself constitutes a stronger determinant of cognitive decline than gender. Progressive reductions in processing speed, executive functioning, attention, episodic memory, and working memory have been consistently documented among older adults regardless of sex.

However, although inferential statistics did not demonstrate significant gender differences, prevalence analysis revealed that a greater proportion of males met the screening criteria for Mild Cognitive Impairment (61.9%) compared with females (35.7%). This observation, while descriptive in nature, suggests that elderly males within the present sample may possess relatively greater vulnerability to early cognitive decline.

Several biological and behavioural explanations may account for this trend. Previous literature has suggested that cardiovascular risk factors, lifestyle habits, lower healthcare utilization, and differences in health-seeking behaviour may contribute to greater cognitive vulnerability among older men. Nevertheless, because the present study involved a relatively small sample, further research involving larger and more representative populations is required before definitive conclusions regarding gender vulnerability can be established.

Relationship Between Sleep Quality and Cognitive Functioning

A major objective of the present study was to investigate the relationship between sleep quality and cognitive functioning among elderly adults. Pearson correlation analysis demonstrated a weak negative association between PSQI and MoCA scores, indicating that poorer sleep quality tended to be associated with lower cognitive functioning. Although this association did not reach statistical significance, the direction of the relationship remains theoretically meaningful.

1. The findings are consistent with those reported by Nebes et al. (2009), who demonstrated that poorer sleep quality was associated with reduced performance on tasks measuring attention, executive functioning, and memory among healthy older adults. Likewise, Blackwell et al. (2014) found that reduced sleep efficiency and increased sleep fragmentation predicted poorer cognitive outcomes among community-dwelling older adults.
2. Neurobiological evidence also supports the observed direction of association. Spira et al. (2013) demonstrated that poor sleep quality was associated with greater cerebral beta-amyloid deposition, a pathological hallmark of Alzheimer's disease. Similarly, Bubu et al. (2017) concluded through a systematic review and meta-analysis that sleep disturbances significantly increase the risk of cognitive impairment and dementia.
3. Although the present study did not identify a statistically significant correlation, the negative association observed is theoretically consistent with these earlier investigations. Several factors may explain the lack of statistical significance. The relatively small sample size may have limited statistical power to detect weak associations. Furthermore, sleep quality is influenced by numerous variables, including physical health conditions, medication use, chronic pain, psychiatric symptoms, physical activity, socioeconomic status, and social support. Likewise, cognitive functioning is determined by multiple interacting biological, psychological, and environmental factors. Consequently, the relationship between sleep and cognition is unlikely to be explained by a single variable.
4. The findings nevertheless reinforce contemporary theoretical perspectives proposing that sleep quality represents an important modifiable factor within healthy cognitive ageing.

Prevalence of Mild Cognitive Impairment

An important contribution of the present study lies in its examination of the prevalence of Mild Cognitive Impairment. Approximately 44.4% of participants met the screening criteria for Mild Cognitive Impairment, whereas 55.6% demonstrated cognitive functioning within the normal range.

These findings highlight that cognitive changes are relatively common among community-dwelling older adults even in the absence of diagnosed dementia. Mild Cognitive Impairment has received increasing attention because it represents an intermediate stage between normal ageing and dementia. Early identification during this stage provides opportunities for intervention before substantial functional decline occurs.

The observed prevalence is consistent with previous literature indicating that Mild Cognitive Impairment affects a considerable proportion of older adults worldwide. Importantly, not all individuals with Mild Cognitive Impairment progress to dementia; however, they remain at significantly greater risk compared to cognitively healthy older adults. Consequently, routine screening using brief standardized instruments such as the MoCA should become an integral component of geriatric healthcare.

Implications

The findings of the present study have several practical implications for clinicians, psychologists, geriatricians, caregivers, and policymakers.

First, routine screening for cognitive impairment and sleep disturbances should be incorporated into community-based health programmes for older adults. Early identification allows timely intervention before significant functional decline occurs.

Second, healthcare professionals should recognize that sleep disturbances are not merely an inevitable consequence of ageing but may represent an important modifiable factor associated with cognitive health. Interventions such as sleep hygiene education, behavioural therapy, relaxation training, physical exercise, and management of underlying medical conditions may contribute to improved sleep quality.

Third, the relatively high prevalence of Mild Cognitive Impairment observed in the present study highlights the importance of periodic cognitive screening among community-dwelling older adults. Standardized instruments such as the MoCA offer rapid and effective methods for identifying individuals requiring comprehensive neuropsychological evaluation.
Fourth, public awareness programmes emphasizing healthy ageing should promote behaviours associated with cognitive preservation, including regular exercise, lifelong learning, social engagement, balanced nutrition, adequate sleep, and effective management of chronic diseases.
Finally, the findings provide useful evidence for mental health professionals developing preventive programmes aimed at enhancing quality of life among older adults.

Strengths of the Study

The present investigation possesses several noteworthy strengths.
The study simultaneously examined cognitive functioning and sleep quality using two internationally recognized standardized assessment instruments, namely the Montreal Cognitive Assessment and the Pittsburgh Sleep Quality Index.
Another strength lies in its examination of gender differences alongside prevalence analysis, thereby providing both inferential and descriptive perspectives on cognitive ageing.
Furthermore, the study contributes to the relatively limited body of Indian research examining sleep quality and cognitive functioning among elderly adults, thereby providing valuable context-specific evidence for future investigations.

Limitations

The present study should be interpreted in light of certain limitations. First, the sample size was relatively small (N = 63), which may have limited the statistical power to detect subtle gender differences and associations between sleep quality and cognitive functioning. Future studies employing larger samples would provide greater statistical precision and improve the generalizability of the findings.
Second, the study adopted a cross-sectional research design, which precludes the establishment of causal relationships between sleep quality and cognitive functioning. Although a weak negative association was observed, it cannot be concluded whether poor sleep contributes to cognitive decline, whether declining cognition affects sleep quality, or whether both variables are influenced by other age-related factors.
Third, the unequal gender distribution, with a larger proportion of female participants than male participants, may have influenced the comparative analyses. More balanced sampling across gender groups would facilitate stronger comparisons.
Fourth, sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which is a subjective self-report measure. Participants' responses may have been influenced by recall bias or personal perceptions of sleep. Future studies may benefit from incorporating objective measures such as actigraphy or polysomnography to obtain a more comprehensive assessment of sleep characteristics.
Additionally, several variables known to influence both sleep quality and cognitive functioning—including educational level, socioeconomic status, chronic medical conditions, medication use, depression, anxiety, physical activity, nutritional status, and social engagement—were not examined in the present study. Inclusion of these variables would provide a more comprehensive understanding of factors contributing to cognitive ageing.
Finally, the study was conducted among a limited group of elderly adults within a specific geographical context. Therefore, caution should be exercised when generalizing the findings to other regions or populations with different cultural, social, or healthcare characteristics.

Future Directions

The present investigation provides several directions for future research.
Future studies should employ larger and more diverse samples to improve the generalizability of findings and increase statistical power. Recruiting participants from multiple geographical regions across India would provide a more representative understanding of cognitive ageing and sleep quality within the Indian elderly population.
Longitudinal research designs are recommended to examine changes in sleep quality and cognitive functioning over time and to determine whether sleep disturbances predict subsequent cognitive decline or progression to Mild Cognitive Impairment and dementia.
Future investigations should incorporate objective measures of sleep, including actigraphy and polysomnography, alongside subjective assessments such as the PSQI. Similarly, comprehensive neuropsychological batteries may provide more detailed information regarding specific cognitive domains affected by sleep disturbances.
Research examining the influence of lifestyle factors—including physical activity, nutrition, chronic disease management, social participation, psychological well-being, and cognitive stimulation—would further enhance understanding of healthy ageing. Studies evaluating interventions such as sleep hygiene education, mindfulness-based programmes, cognitive training, structured exercise, and psychosocial support may also provide valuable evidence regarding strategies for preserving cognitive functioning among older adults.
Given the increasing prevalence of age-related cognitive disorders in India, future studies should also explore the effectiveness of community-based screening programmes and multidisciplinary preventive interventions aimed at promoting healthy ageing and reducing the burden of dementia.

CONCLUSION

The present study examined gender differences in cognitive impairment and sleep difficulties among elderly adults and explored the relationship between sleep quality and cognitive functioning. The findings revealed that although sleep disturbances and Mild Cognitive Impairment were relatively common among the participants, no statistically significant gender differences were observed in either sleep quality or cognitive functioning. Furthermore, a weak negative association was identified between sleep quality and cognitive functioning; however, this relationship did not reach statistical significance.

The prevalence analysis demonstrated that nearly half of the participants met the screening criteria for Mild Cognitive Impairment, with a greater proportion observed among males than females. These findings highlight the importance of routine cognitive and sleep assessments among older adults, even in community settings where cognitive impairment may remain undetected.

The study contributes to the growing body of literature emphasizing the importance of healthy ageing and supports existing evidence suggesting that sleep quality may represent an important, potentially modifiable factor associated with cognitive health. Although gender differences were not statistically significant in the present sample, the descriptive findings warrant further investigation using larger and more representative populations.

From a clinical and public health perspective, early identification of sleep disturbances and cognitive impairment, combined with health promotion initiatives focusing on sleep hygiene, physical activity, cognitive stimulation, social engagement, and chronic disease management, may contribute significantly to preserving cognitive functioning and enhancing quality of life among older adults.

Overall, the present study adds to the limited empirical evidence available from the Indian context and underscores the need for continued multidisciplinary research examining the complex interaction between sleep, cognition, and healthy ageing.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this research.

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Ethical Considerations

Participation in the study was voluntary. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of participant information were maintained throughout the study, and the data were used solely for academic and research purposes.

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