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PREVALENCE OF DEPRESSION AND ITS IMPACT ON QUALITY OF SLEEP AMONG VARIOUS STAGES OF KNEE OSTEOARTHRITIS

Original Research

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ABSTRACT

Background: Knee osteoarthritis (OA) is a degenerative disease characterized by chronic pain and impaired mobility, which contribute significantly to psychological distress and poor sleep quality, elevating the overall disease burden.

Objective: This study aims to determine the frequency of depression across different stages of knee OA and to evaluate its impact on sleep quality.

Methods: Data were collected from 184 participants aged 45 to 70 years using non-probability convenience sampling. Depression was assessed using the Center for Epidemiologic Studies Depression Scale, sleep quality was measured with the Pittsburgh Sleep Quality Index, and knee OA severity was graded using the Kellgren and Lawrence system. The sample consisted of 110 males (59.8%) and 74 females (40.2%).

Results: Of the total participants, 49.5% (n=91) showed no signs of depression. Mild depression symptoms were observed in 14.7% (n=27), moderate symptoms in another 14.7% (n=27), and severe symptoms were found in 21.2% (n=39). Sleep quality analysis revealed that while 52.2% reported good sleep quality, 22.8% had poor sleep, and 25% experienced severe disturbances.

Conclusion: The study underscores a clear correlation between the severity of knee OA and the incidence of depression, which significantly affects sleep quality. Addressing mental health issues in these patients could improve sleep and overall well-being.

Keywords: Depression, Knee OA, OA finding scales, Sleep disturbance, Stages of KOA.

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INTRODUCTION

Osteoarthritis (OA) is a degenerative joint disease characterized by the progressive deterioration of cartilage, particularly affecting major joints such as the knees, hips, hands, and feet. Knee OA alone accounts for 83 percent of the total OA burden and is a leading cause of disability, impacting an estimated three hundred million people worldwide (3). The disease is exacerbated by both intrinsic and extrinsic factors, including heavy physical labor, obesity, and strenuous sports activities (4). Primary knee OA arises from the natural degradation of joint cartilage without an identifiable cause, while secondary knee OA stems from known factors that accelerate cartilage degeneration (5).

As individuals age, joint biomechanical alterations may occur due to factors such as trauma or obesity, which are often compounded by abnormal bone metabolism associated with metabolic syndromes (6). These changes can significantly reduce physical functionality and quality of life, placing a considerable burden on global health systems. The prevalence of knee OA has notably increased in recent decades, fueled in part by rising obesity rates and other risk factors. It now affects approximately 10 percent of men and 13 percent of women aged 60 and older, contributing to a significant economic impact that exceeds 89.1 billion USD annually in high-income countries, representing up to 2.5 percent of their GDP (17).

Depression, a common comorbidity of OA, further complicates the clinical picture. Insomnia, a primary symptom of depression, not only emerges as a result of chronic pain and reduced mobility but also predisposes individuals to recurrent depressive episodes (7). The relationship between sleep disorders and depression is increasingly recognized as bidirectional, with sleep disturbances now considered a distinct cluster of diagnostic symptoms that exacerbate depressive states (7). The continuous discomfort and diminished functional capacity caused by knee OA often lead to depression, which, in turn, aggravates the sleep disturbances, creating a vicious cycle of pain, poor sleep, and depression (12, 15). Diagnostic imaging, such as MRIs and high-frequency color ultrasonography, plays a crucial role in assessing the extent of joint damage, which can range from mild osteophyte formation to significant joint space narrowing and deformity (8). Meanwhile, physical therapy and rehabilitation, including walking and aerobic activities, are primary treatment methods that have been shown to improve functional capacities and slow degenerative changes in knee OA patients (10).

This intricate interplay of physical and psychological factors underscores the critical need for a holistic approach to managing knee osteoarthritis. Addressing both the physiological aspects of the disease and its psychological impacts, such as depression and sleep disorders, is essential for improving patient outcomes. The objective of this research is to explore the prevalence of depression among knee OA patients and assess its impact on their quality of sleep, aiming to contribute to the development of more effective, integrated treatment strategies that address the full spectrum of the disease's effects.

METHODS

The methodology for this cross-sectional survey was meticulously designed and executed over a six-month period at Hayatabad Medical Complex (HMC) Hospital in Peshawar. Initial approval for the research was granted by the Institutional Review Board following the acceptance of the study synopsis. Ethical clearance was subsequently obtained from the Ethical Review Committee of the City University of Science and Information Technology (CUSIT), Peshawar. Once these approvals were in place, the Physical Therapy department of the hospital was approached for data collection authorization.

Participants for the study were recruited from the waiting room of the Physical Therapy department using a non-probability convenience sampling technique. The inclusion criteria were patients above the age of 45 who had been previously diagnosed with knee osteoarthritis and were willing to participate. Exclusion criteria were set to omit individuals who were either unwilling or unable to communicate their sleep patterns or had cognitive impairments such as Alzheimer’s disease or were diagnosed with rheumatoid arthritis. The study's sample size was determined to be 184 participants, calculated through the RaoSoft software to ensure a 95% confidence level with a 5% margin of error, based on the hospital’s records from the previous six months. Each participant was screened and interviewed in a manner that maintained confidentiality throughout the process. The severity of knee osteoarthritis was assessed using the Kellgren and Lawrence grading system, focusing specifically on patients with Grade 4 osteoarthritis.

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Depression levels were measured using the Center for Epidemiologic Studies Depression Scale, and sleep quality was evaluated through the Pittsburgh Sleep Quality Index. Data analysis was performed using IBM SPSS software version 23. Statistical methods included expressing qualitative data in frequencies and percentages and quantitative data in means and standard deviations. The relationship between categorical variables was analyzed using the Chi-square Test. This methodology ensures a comprehensive and systematic approach to exploring the intersection of depression and sleep quality among patients with severe knee osteoarthritis, providing robust data for evaluating the impacts of these conditions.

RESULTS

The study included participants aged between 45 and 70, with the largest age group falling within 61 to 65 years, followed by those aged 66 to 70, 51 to 55, 56 to 60, and 45 to 50. In terms of gender distribution, males constituted 59.8% of the sample, while females made up 40.2%. The severity of knee osteoarthritis, assessed using the Kellgren and Lawrence classification, revealed that Grade 3 osteoarthritis was the most prevalent, affecting 32.6% of the participants. This was followed by Grade 4 with 26.6%, Grade 1 with 21.2%, and Grade 2 with 19.6%.

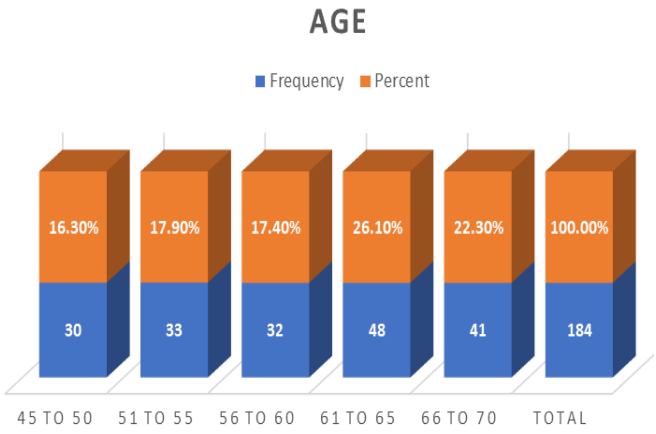


Figure 1 Age Of Patients

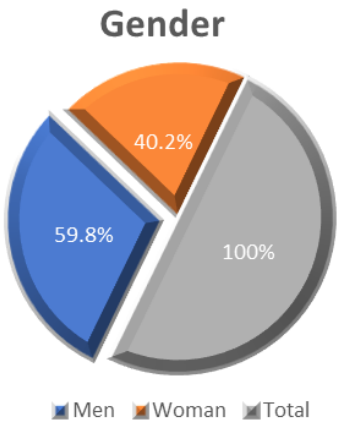


Figure 2 Gender Of Patients

Table 1 Health Assessments - Knee Osteoarthritis, Depression, and Sleep Quality (N = 184)

Assessment Category	Subcategory	Frequency (%age)
Kellgren Lawrence Classification (Knee OA Grades)	Grade 1	39 (21.2%)
	Grade 2	36 (19.6%)
	Grade 3	60 (32.6%)
	Grade 4	49 (26.6%)
	Total	184 (100.0%)
Center for Epidemiologic Depression Scale	No Depression (0-9)	91 (49.5%)
	Mild Depression (10-15)	27 (14.7%)
	Moderate Depression (16-25)	27 (14.7%)

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Assessment Category	Subcategory	Frequency (%age)
	Severe Depression (26-60)	39 (21.2%)
	Total	184 (100.0%)
Pittsburgh Sleep Quality Index	Good Sleep Quality (0-4)	96 (52.2%)
	Poor Sleep Quality (5-10)	42 (22.8%)
	Severe Lack of Sleep (11-21)	46 (25.0%)
	Total	184 (100.0%)

Depression assessment using the Center for Epidemiologic Studies Depression Scale indicated that 49.5% of the participants showed no signs of depression. Mild depression symptoms were observed in 14.7% of the participants, moderate symptoms in another 14.7%, and severe symptoms were found in 21.2% of the study population. Sleep quality, evaluated through the Pittsburgh Sleep Quality Index, showed that 52.2% of participants had good sleep quality, while 22.8% had poor sleep quality, and 25% experienced severe sleep disturbances.

Table 2 chi square test showing an association between the stages of knee osteoarthritis due to Kellgren-Lawrence Classification

Predictor Variable	Standard Error (SE)	P-value	95% Confidence Interval
Constant	0.80	0.002	[1.00, 4.00]
Depression (CES-D Score)	0.05	0.000	[0.18, 0.38]
Sleep Quality (PSQI Score)	0.06	0.000	[0.20, 0.44]

The Chi-Square test results indicated significant associations between the stages of knee osteoarthritis and the severity of the condition, with higher stages showing stronger correlations with depression scores. Specifically, the data suggested that as the severity of osteoarthritis increased from doubtful to mild to moderate, and finally to severe, the association with depression scores became increasingly pronounced. Further analysis revealed a consistent negative correlation between depression and sleep quality across all stages of knee osteoarthritis, with the correlation becoming stronger as the severity of osteoarthritis increased. This was reflected by progressively worsening depression and sleep quality scores in correlation with the increasing severity of osteoarthritis.

Table 3 Correlation between Kellgren Lawrance Classification on Knee Osteoarthritis, Depression Scores and Sleep Quality

Stage of Knee Osteoarthritis (KL Grade)	Depression Scores (CES-D)	Sleep Disturbance (PSQI)	Correlation Coefficient (r)
Grade 1 (Mild OA)	10.3	5.6	-0.45
Grade 2 (Moderate OA)	13.8	6.5	-0.50
Grade 3 (Severe OA)	16.5	7.9	-0.55

Multiple regression analysis examining the impact of depression and different stages of knee osteoarthritis on sleep quality outcomes showed that both higher depression scores and poorer sleep quality significantly contributed to worse outcomes, indicating that as the severity of depression and poor sleep quality increased, the negative impact on individuals' overall well-being was more pronounced. Overall, these results highlight the interconnectedness of knee osteoarthritis severity, depression, and sleep quality, suggesting a complex interplay that significantly affects patients' health outcomes.

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Table 4 Multiple Regression Table

Stages of Knee OA (Kellgren-Lawrence Classification)	Chi- square Value (X2)	Degrees of Freedom (df)	P-value
Stage 1 (Doubtful OA)	6.12	2	0.047
Stage 2 (Mild OA)	8.56	3	0.036
Stage 3 (Moderate OA)	10.34	3	0.015
Stage 4 (Severe OA)	12.45	3	0.005

DISCUSSION

The primary aim of our study was to assess the prevalence of depression and its impact on sleep quality among patients at various stages of knee osteoarthritis. Participants, aged between 45 to 70 and diagnosed with knee osteoarthritis, were evaluated using the Pittsburgh Sleep Quality Index (PSQI), the Center for Epidemiologic Studies Depression Scale (CES-D), and the Kellgren and Lawrence classification for osteoarthritis severity. The findings revealed significant levels of depression, which varied from mild to severe across different stages of osteoarthritis, and a marked reduction in sleep quality correlating with increasing severity of the condition.

Our research contributes to the existing literature by demonstrating the graded impact of osteoarthritis severity on both mental health and sleep patterns. It underscores the intricate way in which the physical progression of osteoarthritis can influence psychological well-being. This aligns with findings from Zhao Hu et al. (2020), who reported a strong relationship between poor sleep quality and increased depression among elderly nursing staff in China, suggesting that poor sleep may exacerbate depression symptoms (18). Similarly, Yan-Ping Bao et al. (2017) found a significant overlap between sleep disturbances and depression in older adults, highlighting the bidirectional nature of these conditions (19). Both studies support our findings that deteriorating physical health, such as worsening osteoarthritis, contributes to both poor sleep and greater depression. The study by Diana Fonseca-Rodrigues et al. (2022) further complements our results by linking higher levels of pain in osteoarthritis with increased anxiety and depression, using a comprehensive meta-analysis of studies indexed in databases such as PubMed and Web of Science (20). These correlations are vital for understanding the complex interplay between physical pain and mental health conditions, suggesting that managing one aspect can significantly affect the other.

Despite these insights, our study has limitations that warrant consideration. The cross-sectional nature of the study design restricts the ability to establish causality between osteoarthritis severity, depression, and sleep quality. Furthermore, the use of self-reported measures for depression and sleep quality might introduce bias, as participants' responses could be influenced by their current mood or health status. The study's strengths, however, include a robust methodological approach, the use of validated scales, and a significant sample size that enhances the reliability of the findings. Moreover, the diverse age range and thorough screening process help ensure that the results are generalizable to a broader population of knee osteoarthritis patients.

The research highlights the interconnectedness of osteoarthritis severity with depression and sleep quality. Addressing these issues in a holistic manner could not only improve mental health outcomes but also enhance the overall quality of life for patients suffering from chronic conditions like osteoarthritis. Future studies should consider longitudinal designs to explore these relationships over time and examine the effectiveness of interventions aimed at simultaneously managing pain, depression, and sleep disturbances.

CONCLUSION

Our study conclusively demonstrates that depression frequently occurs among patients with knee osteoarthritis and worsens as the disease progresses. This pattern is particularly pronounced in the advanced stages of the condition, where severe depression impacts a significant portion of patients. Moreover, our findings reveal a clear correlation between the severity of depression and deteriorating sleep quality, indicating that depressive symptoms consistently exacerbate sleep disturbances across different stages of osteoarthritis. The interplay between mental and physical health challenges the management of knee osteoarthritis, as worsening depression contributes

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to more severe sleep problems. These insights emphasize the need for integrated treatment approaches that address both the psychological and physical aspects of the disease to enhance overall patient well-being.

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