

ASSESSMENT OF PAIN AND FUNCTIONAL DISABILITY IN PATIENTS WITH KNEE OSTEOARTHRITIS: A CROSS-SECTIONAL STUDY.

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Abstract Background

Osteoarthritis (OA) is a degenerative joint disease that leads to pain, stiffness, and functional limitations, significantly affecting quality of life. Knee OA, the most prevalent form, impacts multiple joint structures and causes progressive disability. Understanding the relationship between pain, functional impairment, and quality of life is crucial for effective management. This study assesses the correlation among knee osteoarthritis, pain, functional impairment, and overall quality of life.

Methods

This cross-sectional study was conducted at Hi-tech Medical College and Hospital, Bhubaneswar (2020–2022) with 800 participants aged 50–65 years diagnosed with unilateral knee OA. Pain was assessed using the Visual Analogue Scale (VAS), functional disability with the WOMAC index, and quality of life using the SF-36 survey. Statistical analysis was performed using SPSS version 20, with Pearson correlation applied to assess associations between pain, functional disability, and quality of life ($p < 0.05$).

Results

Among 800 knee osteoarthritis patients (70% females, mean age 56.82 ± 4.75 years), the mean pain intensity (VAS) was 5.42 ± 1.09 , and the total WOMAC score was 56.89 ± 8.47 . Pain and functional disability showed a significant correlation ($r = 0.285$, $p = 0.01$), and higher disability was associated with lower quality of life (PCS: $r = 0.595$, MCS: $r = 0.415$, $p < 0.05$).

Conclusion

Greater pain and functional disability significantly reduce the quality of life in knee OA patients. Effective pain and disability management strategies are essential for improving patient well-being.

Recommendation

Integrated management approaches focusing on both pain relief and functional rehabilitation are recommended to enhance the quality of life in patients with knee osteoarthritis.

Keywords: Knee osteoarthritis, pain, functional disability, quality of life, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Short Form-36 Health Survey (SF-36), Visual Analogue Scale (VAS).

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Introduction

Osteoarthritis (OA) is a degenerative musculoskeletal condition that imposes a considerable burden on society. This degenerative illness arises from various contributing factors and is chiefly marked by the degradation of articular cartilage, modifications in subchondral bone architecture, and injury to adjacent soft tissues [1]. Osteoarthritis (OA) is acknowledged as a significant public health concern due to its extensive effects on mobility and functional capabilities, resulting in both health and economic repercussions. [2, 3]

Knee osteoarthritis impacts several joint components, such as the synovium, cartilage, bone, tendons, and ligaments. The disorder is linked to cartilage deterioration, bone remodeling, tendon and ligament weakness, and varied levels of synovial inflammation. Symptoms vary in intensity across individuals but typically encompass joint pain, stiffness, edema, restricted mobility, muscular weakness, crepitus, and challenges in executing daily activities such as ambulation, stair climbing, and squatting. The slow emergence of these symptoms frequently leads to increasing discomfort and

impairment [4-6]. Pain and functional impairment are primary issues for patients with knee osteoarthritis, resulting in reduced mobility and considerable difficulties in performing daily activities, ultimately impacting their overall health-related quality of life (QOL), which according to the World Health Organisation denotes the assessment of a person's status in life which includes personal aspirations, expectations, and apprehensions. It denotes an individual's recognition of their present functional condition and degree of contentment relative to their ideal of well-being, which differs among individuals. [7] The principal domains of QOL are psychological, social, physical, and cognitive functioning, in addition to overall well-being. [8,9] In individuals with knee OA, persistent pain and reduced physical function substantially influence everyday activities, impacting both physical health and mental well-being. This study assesses the correlation among knee osteoarthritis, pain, functional impairment, and overall quality of life.

Methods

Study setting and study design

This cross-sectional study was performed at Hi-tech Medical College and Hospital, Bhubaneswar, from 2020 to 2022. Hi-Tech Medical College and Hospital, Bhubaneswar, is a premier private medical institution in Odisha offering advanced healthcare services and medical education.

Study Population and Sample Size

The study involved 800 patients aged between 50 to 65 years. The sample size of 800 participants was determined based on previous literature examining the correlation between pain, functional disability, and quality of life in knee osteoarthritis. Using a confidence level of 95%, a margin of error of 5%, and an estimated moderate correlation ($r \approx 0.3$), the calculated sample size provided adequate statistical power (>80%) to detect significant associations between the variables of interest.

Participants received a diagnosis of unilateral knee osteoarthritis by the Clinical Classification Criteria for knee OA. Participants with a background of knee surgery, traumatic knee injuries, or previous steroidal injections were not included in the study.

Data Collection and Measures

Demographic Information

Baseline demographic details, including age, gender, and limb dominance, were recorded for all participants.

Pain Assessment

The measurement of pain intensity was conducted utilizing a Visual Analogue Scale (VAS) that spans from 0 to 10, with 0 denoting the lack of pain and 10 signifying the most severe pain imaginable. Participants were directed to indicate a position on the scale that most accurately represented their experience of pain.

Functional Disability Assessment

Functional limitations associated with knee OA were evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [10]. This disease-specific questionnaire assesses three domains, namely pain, stiffness, and physical function.

Responses were recorded on a five-point Likert scale, and higher cumulative scores indicated greater disability. The WOMAC index has been validated as a reliable tool for assessing OA-related impairments. [11]

Quality of Life Measurement

The 36-item Short Form Health Survey (SF-36) which comprised the physical component summary (PCS) and the mental component summary (MCS) was employed for evaluating the patient's QOL [12].

Statistical Analysis

The analysis of data was conducted utilizing SPSS version 20. Descriptive statistics, encompassing mean $\pm$ standard deviation (SD), were calculated for all assessed variables. The Pearson correlation test was employed to explore the relationships among pain, functional disability, and quality of life. A p-value of less than 0.05 was deemed to be statistically significant.

Ethical consideration

The study was conducted after obtaining approval from the institutional research review committee. Ethical requirements were meticulously adhered to, and all participants furnished written informed consent after obtaining a comprehensive explanation of the study in their preferred language.

Bias

To minimize selection bias, participants were recruited based on clearly defined inclusion and exclusion criteria, ensuring consistency in diagnosis and age range. Information bias was reduced by using validated and standardized tools for pain (VAS), functional disability (WOMAC), and quality of life (SF-36). All assessments were conducted under similar conditions, and data collection was supervised by trained personnel to enhance accuracy and uniformity.

Results

Screening of Participants

A total of 950 patients aged between 50 and 65 years presenting with knee-related complaints were initially screened at Hi-Tech Medical College and Hospital, Bhubaneswar. Of these, 870 met the preliminary eligibility criteria. After applying the exclusion criteria (prior knee surgery, traumatic injuries, or recent steroid injections), 800 patients were confirmed eligible and consented to participate. All 800 participants completed the data collection process and were included in the final analysis. The primary reasons for non-participation among the excluded individuals ($n = 70$) were incomplete

clinical data (n = 32), refusal to participate (n = 21), and recent steroidal injections (n = 17).

Sociodemographic characteristics

This study included 800 patients diagnosed with knee osteoarthritis (OA), aged between 50 and 65 years.

Among them, 241 (30.12%) were men, and 559 (69.87%) were women. The mean age of the participants was 58.82 ± 4.75 years. The average duration of OA was 3.21 ± 1.95 years, and the mean body mass index (BMI) was 28.41 ± 4.38 . Regarding employment status, 150 (18.75%) patients were retired, 267 (33.38%) were employed, and 383 (47.88%) were unemployed (Table 1).

Table 1: Characteristics of the patient cohort:

Demographic traits	Value
Age (years) (Mean $\pm$ SD)	58.82 ± 4.75
Duration of Disease (years) (Mean $\pm$ SD)	3.21 ± 1.95
Body Mass Index (BMI) (Mean $\pm$ SD)	28.41 ± 4.38
Retired (n (%))	150 (18.75%)
Employed (n (%))	267 (33.38%)
Unemployed (n (%))	383 (47.88%)
Limb dominance	
Right	710 (88.75%)
Left	90 (11.25%)

Clinical characteristics

The mean pain intensity was 5.42 ± 1.09 , indicating moderate pain levels. The total WOMAC score, representing functional disability, was 58.89 ± 9.47 , with subdomain scores of 12.38 ± 3.04 for pain, 4.42 ± 2.61 for

stiffness, and 43.09 ± 6.95 for physical function. The QOL showed a PCS score of 44.11 ± 12.42 and a MCS score of 53.76 ± 14.18 . The subcomponents of SF-36, including physical functioning, emotional well-being, and social functioning, are detailed in Table 2.

Table 2: Average Values of Pain, Functional Disability, and QOL

Variable	Mean $\pm$ SD
Pain (VAS Score)	5.42 ± 1.09
Total WOMAC Score	58.89 ± 9.47
WOMAC – Pain	12.38 ± 3.04
WOMAC – Stiffness	4.42 ± 2.61
WOMAC – Physical Function	43.09 ± 6.95
SF-36 Quality of Life Scores	
Component	Mean $\pm$ SD
Physical Component Summary (PCS)	44.11 ± 12.42
Physical Functioning	35.15 ± 7.82
Limitations Due to Physical Health	37.72 ± 11.87
Bodily Pain	51.85 ± 17.29
General Health	41.72 ± 16.53
Mental Component Summary (MCS)	53.76 ± 14.18
Limitations Due to Emotional Problems	50.92 ± 17.89
Vitality	43.01 ± 15.08
Emotional Well-Being	61.58 ± 15.54
Social Functioning	56.69 ± 17.87

A significant positive correlation was found between the VAS score and the WOMAC score (Table 3). Additionally, higher WOMAC scores were associated with poor quality of life, with PCS and MCS both showing

significant negative correlations with functional disability (Table 4). These findings suggest that greater pain and disability are associated with a reduced QOL in OA knee patients.

Table 3: Correlation of Pain with WOMAC Score (Functional Disability)

Variable	WOMAC Score (r-value)	p-value
Pain (VAS Score)	0.285	0.01*

**Significant at $p < 0.05$*

Table 4: Correlation of WOMAC Score with Quality of Life (SF-36 Score)

Variable	PCS (r-value)	MCS (r-value)	p-value
WOMAC Score	0.595	0.415	0.000*

**Significant at $p < 0.05$*

Discussion

Osteoarthritis (OA) stands as the most prevalent degenerative joint disorder, playing a substantial role in the onset of disability, emotional distress, and negative health consequences. This condition is marked by discomfort, limited movement, and difficulties in executing everyday activities. The present investigation uncovered a positive relationship between pain severity and the WOMAC score (r -value = 0.285), indicating that heightened pain intensity aggravates functional limitations in individuals suffering from knee osteoarthritis. Furthermore, a favorable correlation emerged between the WOMAC score and the PCS (r -value: 0.595) and MCS (r -value: 0.415) components of the SF-36, indicating that increased functional disability adversely affects the overall quality of life in these individuals.

The concept of QOL integrates various dimensions, such as physical health, mental well-being, autonomy in everyday tasks, social connections, and environmental influences. Constraints in both physical and mental well-being can impede participation in daily activities. The heightened challenges associated with ambulation, ascending stairs, and squatting significantly interfere with everyday life and leisure pursuits, resulting in reduced functional capacity. As a result, social participation is influenced, which in turn affects both physical and psychosocial well-being. The reduction in daily activity levels diminishes both physical and social functioning, which may result in mental distress, psychosocial difficulties, and ongoing pain.

Current studies indicate that people with OA frequently refrain from engaging in physical activity due to feelings of discomfort, apprehension regarding pain, or previous advice discouraging exercise [13,14]. The apprehension surrounding movement leads to a decline in mobility, intensifying functional limitations and subsequently impairing overall quality of life. The absence of mobility adversely affects social engagement, leading to heightened physical isolation and a sense of loneliness.

Recent research suggests a connection between balance, fear of falling, and the overall QOL in patients with knee OA. Neuromuscular impairments associated with osteoarthritis, including muscle weakness, deficits in proprioception, and changes in postural stability, lead to a deterioration in balance control [15]. The presence of these impairments results in diminished confidence and increased reliance, which ultimately fosters a

deterioration in physical function and a decline in overall QOL.

Conclusion

This study reveals the significant influence of osteoarthritis on both functional capabilities and the overall quality of life. A notable relationship was identified between the intensity of pain and the extent of functional limitations, suggesting that increased pain levels lead to heightened challenges in performing daily activities. Furthermore, diminished physical function was associated with reduced scores in both physical and mental health domains, illustrating the extensive impact of OA that extends beyond mere joint pain. The apprehension surrounding movement, coupled with diminished mobility and neuromuscular impairments, exacerbates these difficulties, resulting in social isolation and emotional turmoil. The findings underscore the importance of prompt intervention, focused rehabilitation efforts, and lifestyle adjustments to enhance mobility, reduce pain, and promote overall well-being in those affected by knee osteoarthritis.

Generalizability

The findings of this study can be generalized to middle-aged patients with unilateral knee osteoarthritis in similar hospital-based urban populations in India, but may not fully represent rural or younger populations.

Limitations

This study is limited by its cross-sectional design, which prevents establishing causality between variables. It was also conducted in a single tertiary care hospital, which may restrict the external validity of the results. Furthermore, limb dominance and physical activity levels were not accounted for, which could influence pain perception and functional outcomes.

Recommendations

Integrated and patient-centered management approaches focusing on both pain relief and functional rehabilitation are recommended to enhance the quality of life in patients with knee osteoarthritis. Longitudinal studies are needed to assess the long-term impact of these interventions.

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Hospital, Bhubaneswar, for their support during data collection and patient assessment. We are also grateful to all the patients who participated in this study.

List of Abbreviations

- OA: Osteoarthritis
- VAS: Visual Analogue Scale
- WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index
- SF-36: Short Form-36 Health Survey
- PCS: Physical Component Summary
- MCS: Mental Component Summary
- BMI: Body Mass Index

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Conflict of Interest

The authors declare no conflict of interest.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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