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Original Research Article

Interplay between psychological resilience and emotional burden in knee osteoarthritis: a cross-sectional analysis of pain perception and functional disability

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ABSTRACT

Background: Knee osteoarthritis (OA) is a common cause of chronic pain and functional disability, frequently associated with psychological distress. Emotional burden, including depression and anxiety, may exacerbate symptoms, while psychological resilience may act as a protective factor.
Methods: A cross-sectional study was conducted among 108 patients aged 45–70 years with clinically diagnosed knee OA, according to EULAR diagnostic criteria. The mean age of patients was 55.92±0.8 years, and the mean BMI was 27.24±0.4 kg/m^2. Emotional burden was assessed using the PHQ-9 and GAD-7, and resilience using the brief resilience scale. Functional disability and pain were evaluated using the WOMAC index. Pearson correlation analysis was performed.
Results: Mean scores for depression, anxiety, and resilience were 8.97±5.93, 9.35±5.97, and 20.33±7.11, respectively. Depression showed no significant correlation with functional disability (r=0.04, p=0.69). Anxiety (r=-0.18, p=0.07) and resilience (r=-0.17, p=0.09) demonstrated weak inverse correlations with WOMAC scores.
Conclusions: Although not statistically significant, consistent inverse trends suggest a potential role of psychological factors in functional outcomes, supporting a multidimensional approach to knee OA management, including psychological assessment and intervention.

Keywords: Knee osteoarthritis, Psychological resilience, Depression, Anxiety, WOMAC, Functional disability

INTRODUCTION

Knee osteoarthritis (OA) is a leading cause of chronic pain and disability worldwide, particularly among middle-aged and elderly populations. It is characterized by progressive cartilage degeneration and functional limitation, significantly impacting quality of life. The global burden of OA continues to rise due to aging populations and increasing prevalence of risk factors such as obesity and sedentary lifestyle.[1]

Traditionally, OA has been considered a degenerative joint disorder; however, recent evidence supports a broader biopsychosocial model, where psychological factors significantly influence disease outcomes.[2] Emotional burden, including depression and anxiety, has been shown to exacerbate pain perception and functional disability, independent of structural joint changes.

Depression, commonly assessed using the PHQ-9, is associated with increased pain perception and reduced functional capacity in OA patients.[3] Similarly, anxiety, measured using the GAD-7, influences pain-related fear and avoidance behavior, thereby contributing to increased disability.[4]

In contrast, psychological resilience, defined as the ability to adapt positively to stress and adversity, has emerged as a protective factor in chronic musculoskeletal conditions. The brief resilience scale is a validated tool used to assess resilience, and higher resilience has been associated with improved coping and reduced functional impairment.[5,6]

Despite increasing recognition of these factors, limited studies have explored the interplay between emotional burden and resilience in influencing pain perception and functional disability in knee OA. Therefore, the present study aims to evaluate this relationship in a clinical population.

Objective

The objective of the study was to evaluate the interplay between psychological resilience and emotional burden in relation to pain perception and functional disability in individuals with knee OA.

METHODS

Study design

This cross-sectional, time-bound study was conducted between January 2023 and September 2024 in the OPD of the Department of Orthopedics, AIIMS, Rishikesh.

Patient selection

A total of 108 patients, both men and women aged 45 to 70 years, with unilateral or bilateral knee OA of grade 2 or 3 according to the Kellgren–Lawrence (KL) scale, were included in the study. After obtaining informed consent, the patients were enrolled in the study. A standardized questionnaire was used to collect demographic data, including age, height, weight, gender, education, occupation, and comorbidities. Knee OA classification was based on radiographic findings using the KL criteria: grade 0 (normal), grade 1 (possible osteophytes), grade 2 (definite osteophytes with possible joint space narrowing), grade 3 (moderate and/or multiple osteophytes with definite joint space narrowing and possible bony attrition), and grade 4 (large osteophytes, subchondral sclerosis, and definite bony attrition). Patients with a WOMAC pain score of 1, 2, or 3 and a Karnofsky performance status score of 80–90% were included in the study. Exclusion criteria included patients who required any assistive device for ambulation, those who used prescribed footwear modifications, or those who had received intra-articular injections within the last 3 months. Patients with a history of lower extremity joint replacement were also excluded. Additionally, individuals with abnormal foot alignment, defined as an altered bilateral lateral long axis of the foot formed by joining the centers of the lateral axes, were excluded from the study. All patients were asked to complete validated questionnaires, including the PHQ-9, GAD-7, and brief resilience scale.

Statistical analysis

Categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were expressed as mean±standard deviation (SD) for normally distributed data and as median (interquartile range) where applicable. Categorical data were presented as frequencies and percentages. The normality of the data distribution was assessed before analysis. For normally distributed continuous variables, including scores from the PHQ-9, GAD-7, and the brief resilience scale, comparisons between groups were performed using the independent student's t-test**.** Pearson's correlation analysis was used to assess the strength and direction of the relationship between psychological scores and clinical variables, including age, body mass index (BMI), and WOMAC scores. All statistical analyses were performed using statistical package for the social sciences (SPSS) version 17.0. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 108 patients with clinically diagnosed knee osteoarthritis were included in the study. The mean age of the participants was 50.50±0.68 years, with the majority belonging to the 45–59 years age group (66.7%), followed by those aged 59–70 years (33.3%). The mean body mass index (BMI) was 27.24±0.44 kg/m², indicating that the study population was predominantly overweight. Females constituted a higher proportion of the study population (69.4%) compared to males (30.6%). Regarding educational distribution, female participants accounted for 40.7%, while males accounted for 21.3%. Radiographic assessment based on the Kellgren–Lawrence (KL) scale showed that the majority of patients had grade III osteoarthritis (63.0%), followed by grade II (37.0%).

Table 1: Demographic characteristics, including Kl grade of the patients.

Variables	Value	Percentage (%)
BMI category (kg/m²)		
Age (years)	50.50±0.68	-
45–59	72	66.7
59–70	36	33.3
BMI (kg/m²)	27.24±0.44	-
Gender		
Female	75	69.4
Male	33	30.6
Education		
Female	44	40.7
Male	23	21.3
Grade		
KL grade II	40	37.0
KL grade III	68	63.0

The psychological profile revealed a mean depression score of 8.97±5.93 using the PHQ-9, and a mean anxiety

score of 9.35±5.97 using the GAD-7. The mean resilience score, assessed using the brief resilience scale, was 20.33±7.11, indicating moderate resilience. Correlation analysis demonstrated that depression had a negligible positive association with functional disability (r=0.04, p=0.69). Anxiety showed a weak inverse correlation (r=-0.18, p=0.07), and resilience also demonstrated a weak negative correlation (r=-0.17, p=0.09). However, none of these associations reached statistical significance (p>0.05).

Table 2: Correlation of psychological variables with functional disability.

Parame-ter	Mean±SD	Correlation with WOMAC (r)	P value
PHQ-9	8.97±5.93	0.4	0.69
GAD-7	9.35±5.97	-0.18	0.07
BRS	20.33±7.11	-0.17	0.09

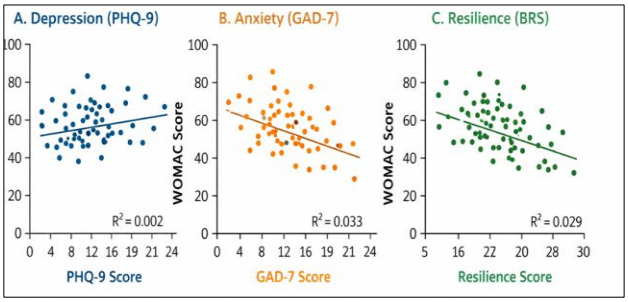

Figure 1 (A-C): Multidimensional association between psychological factors and functional disability in knee osteoarthritis.

DISCUSSION

The present study evaluated the interplay between psychological resilience and emotional burden in relation to functional disability among patients with knee osteoarthritis. The findings demonstrated that depression showed a negligible association with functional disability. At the same time, anxiety and resilience exhibited weak inverse correlations with WOMAC scores, although none of these relationships reached statistical significance.

The absence of a significant association between depression and functional disability contrasts with some previous studies that have reported a strong link between depressive symptoms and increased pain perception and disability in osteoarthritis.[7-9] However, the relatively mild-to-moderate depression levels observed in this cohort may explain the lack of a meaningful correlation. It is also possible that cultural, social, or coping-related factors influenced the perception and reporting of depressive symptoms.[10,11,13]

Interestingly, anxiety demonstrated a weak inverse relationship with functional disability. While this finding is not statistically significant, it may reflect behavioral adaptations, such as increased caution or activity modification in individuals with higher anxiety levels, potentially leading to reduced joint stress. Similar inverse trends, though uncommon, have been reported in certain chronic pain populations where anxiety may promote protective movement strategies.

Psychological resilience also showed a weak negative correlation with functional disability, supporting its potential role as a protective factor. Individuals with greater resilience may have stronger coping mechanisms, enabling them to manage pain more effectively and maintain functional independence. This observation aligns with the existing literature, which suggests that resilience contributes to improved outcomes in chronic musculoskeletal conditions.[14,15]

Despite the lack of statistical significance, the consistent directional trends observed for anxiety and resilience highlight the importance of considering psychological dimensions in the management of knee osteoarthritis. These findings support the growing emphasis on a biopsychosocial model of care, where psychological assessment and intervention are integrated alongside physical rehabilitation.

Limitations

The findings of this study should be interpreted in light of certain limitations. Although the total sample size included 108 participants, it may still have limited the statistical power to detect significant associations in correlation analysis. The cross-sectional study design restricts the ability to establish causal relationships between psychological factors and functional disability. Additionally, the reliance on self-reported measures, including the PHQ-9, GAD-7, and brief resilience scale, may introduce response and reporting bias.

Furthermore, potential confounding variables, such as disease duration, physical activity levels, and socioeconomic status, were not controlled for, potentially influencing the observed outcomes. Finally, as this was a single-center study, the generalizability of the findings to wider populations may be limited.

CONCLUSION

The present study highlights the complex interplay between psychological resilience and emotional burden in patients with knee osteoarthritis. Although no statistically significant associations were observed, consistent inverse trends between anxiety, resilience, and functional disability suggest a clinically relevant influence of psychological factors on disease outcomes. These findings reinforce the importance of adopting a biopsychosocial model for the management of knee OA, integrating psychological assessment with conventional physical and rehabilitative strategies. Early identification of emotional distress and targeted interventions to enhance resilience

may improve functional outcomes and overall quality of life in this population. Future longitudinal and large-scale studies are warranted to elucidate these relationships further and establish causal pathways.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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