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Research Article

Association of Spinal Pain with Functional Limitations Among Patients with Knee Osteoarthritis

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Abstract

Objective

To find the relationship between concomitant low back pain and knee OA, and between these two and functional disability and psychological well-being.

Duration and Place of Study: This study was conducted Bilawal Medical College for boys, Liaquat University of Medical and Health Sciences Jamshoro from March 2025 to March 2026

Study Design: Cross-sectional observational study

Methods

Cross-sectional study of 1000 patients with knee pain that fulfilled the study criteria. This was compared with all relevant demographic factors, smoking status, depressive symptoms and functional disability, as well as the association with low back pain and knee OA. Assessment scales used were the Geriatric Depression Scale (GDS), Oswestry Disability Index (ODI), Kellgren–Lawrence (KL) grade, Knee Society Score (KSS) and Visual Analogue Scale (VAS) (when applicable).

The aim of the study was to assess the association of low back pain (LBP) with knee osteoarthritis (KOA) and explore the relationship between the coexistence of both conditions and functional impairments and psychological well-being. The differences in disability score between patients with and without concurrent low back pain were given special attention. These findings should be replicated with the study data regarding the prevalence of associated low back pain, demographic distributions,

smoking status, depression scores, and statistical comparison of functional outcome.

Results

Among 1,000 participants, 680 (68%) were classified as having concurrent low back pain (LBP), while 320 (32%) were classified as having no LBP. The LBP group had a lower mean age (56.76 vs 62.14 years) and a higher mean body mass index (27.3 vs 25.4 kg/m²). Severe or crippling disability was common in both groups. Kellgren–Lawrence grade IV osteoarthritis was more frequent in the LBP group (49.8% vs 2.7%), as were moderate depressive symptoms (68.9% vs 25.7%). These findings suggest an association between concurrent LBP, radiographic severity and psychological burden.

Conclusion

Concurrent low back pain may be associated with greater radiographic severity, functional disability and depressive symptoms in patients with knee osteoarthritis, highlighting the importance of a comprehensive clinical assessment.

Keywords: Knee osteoarthritis, low back pain, functional disability, Oswestry Disability Index, Geriatric Depression Scale, Visual Analogue Scale, Kellgren–Lawrence grading.

Introduction

Osteoarthritis (OA) of the knee is a chronic musculoskeletal disease defined by progressive changes in the joint structure of the knee, such as articular cartilage degradation, subchondral bone remodeling, osteophyte development and synovial inflammation. Such changes are accompanied by pain, stiffness, decreased range of motion, and a gradual deterioration of function. Osteoarthritis is a significant public health problem and the knee is the most common site of OA. [1,2] This has been on the rise due to population ageing and rising obesity and previous joint injuries. In addition to structural alterations, knee OA may be a significant limitation of activities of daily living, decrease physical independence and have detrimental effects on quality of life [2,3].

The main symptom that brings people to the doctors' office with knee OA is pain, but the relationship between the severity of the radiographic disease, intensity of pain and functional disability is complicated. Patients with similar radiographic changes can have very different amount of pain and level of physical impairment [4]. This can vary depending on numerous factors such as age, body mass index (BMI), weakness of muscles, psychological distress and/or other musculoskeletal conditions. Therefore, assessing knee OA as just an intra-articular disease may be a partial answer to the questions of why people are unable to function as they wish.

Another common musculoskeletal condition that is often disabling and is a major cause of disability internationally is low back pain (LBP). It can limit mobility and cause difficulties with work and with everyday activities [5,6]. Clinically, the presence of LBP and knee OA is significant as joint diseases play a significant role in both their own right and when they occur together, in terms of their ability to affect walking, standing, balance and general mobility. These disorders can overlap and have synergistic effects, resulting in more

functional limitations than when either disorder is present alone.

There are a number of mechanisms that could account for the connection between lumbar symptoms and knee pathology. Altered gait patterns, altered loading of the lower limb, decreased muscle strength, and altered movement patterns can affect the mechanical demands that are placed on the lumbar spine and knee joint. On the other hand, lumbar pain can restrict physical activity and rehabilitation use which can worsen functional loss in knee OA patients. Other factors that could account for the co-occurrence of these conditions are shared risk factors, such as age, obesity, lack of physical activity, and previous musculoskeletal injuries. However, there is no immediate cause and effect relationship between both disorders because the interaction between them is likely to be multi-factorial.

A multi-faceted approach, taking into account the severity of knee OA, mobility and physical performance as well as psychological wellbeing, is therefore more relevant to understanding functional disability in knee OA. The International Classification of Functioning, Disability and Health (ICF) of the World Health Organization (WHO) can be used to explain the interactions between health conditions and activity limitations, and between activity limitations and participation restrictions [7]. For patients with both knee and low back pain, disability may be due to the total effect of the pain, rather than each particular pain alone. Depression and other psychological factors could also affect pain and coping, and pain-related functional limitations [8].

Oswestry Disability Index (ODI) is a commonly used tool for measuring the activity limitations related to low back pain, and the Visual Analogue Scale (VAS) measures subjective intensity of pain [9,10]. Structural severity of osteoarthritis can be characterized with radiographic classification systems such as Kellgren–Lawrence grading [11]. These tools can be used in conjunction with clinical evaluation and relevant demographic data to aid a fuller assessment of MSK patients with concurrent pain. Each assessment tool will provide specific data, however, the results of individual tools should be considered in relation to their purpose and population.

There is relatively little evidence that directly compares low back pain and knee OA. Iijima et al. found in a cross-sectional study that the intensity of both low back and knee pain was significantly related to the disability and concluded that LBP combined with knee pain had a greater functional impact than when each was examined separately [12]. The results are important to emphasize that coexisting musculoskeletal complaints should be addressed rather than just the symptomatic knee. Current management guidelines also highlight exercise, education, weight management (if applicable) and personalized care for individuals with knee OA [3,13]. If required, functional limitations of the joints, and psychological symptoms, can be evaluated with instruments like the Western Ontario and McMaster Universities Osteoarthritis Index and the GDS [14,15].

Although both conditions are known to be burdensome, there is a need to further explore the association between concurrent LBP and disability in patients presenting with knee OA. This association could aid in the detection of those that need comprehensive musculoskeletal evaluation and a personalized approach to rehabilitation. Thus the aims of this cross-sectional study are to explore the relationship between low back pain and

functional disability in patients with knee osteoarthritis, to compare the outcomes of disability between patients who had knee osteoarthritis and concomitant LBP to patients without LBP, and to explore demographic and clinical factors that may relate to the results.

Methodology

This was a cross sectional observational study of 1000 patients with knee pain who met the study criteria. Participants were screened for LBP and knee OA, and the relationship between the two was evaluated, focusing on the relationship between LBP and functional disability. The necessary institutional ethical approval was secured prior to participant recruitment and all participants gave informed written consent. Recruitment procedures and the ethical approval information should be checked against the original records of the study.

To participate in the study, the following criteria had to be fulfilled:

- Older than 45 years.
- Symptomatic (pain in the knee) and with a Kellgren–Lawrence (KL) score of at least 1 in either or both knees.
- Ability to take two steps without an ambulatory assistive device.
- Knee OA (unilateral/bilateral, not specifically categorised according to laterality).
- Access to full medical records and consultation information.
- Patients with the following were excluded:
- Previous knee surgery.
- Rheumatoid arthritis.
- Periarticular fracture of the knee in the past.
- Neurological disease or neurological disability that impairs mobility.
- Spondyloarthropathies.

The age threshold and the radiographic criteria were chosen to ensure the identification of people with known knee symptoms and early to more advanced radiographic OA. This study included patients with KL grade 1 or higher, permitting evaluation of patients from varying stages of radiographic severity.

Demographic characteristics, clinical symptoms, radiographic findings and functional outcomes were assessed using the relevant clinical assessment tools. The primary variables looked at were presence of LBP, symptoms and functional disability associated with knee OA.

Each participant's presence of LBP was recorded and classified as 'present' or 'absent'. Disability from lower back problems was measured using the Oswestry Disability Index (ODI). This questionnaire looks at the difficulties experienced in several areas of everyday life, such as personal care, lifting, walking, sitting, standing and social activities. A higher ODI score represents more disability.

The Visual Analogue Scale (VAS) was used to measure the intensity of pain (where applicable). The VAS is a self-reported, subjective assessment of pain severity with higher scores indicating higher intensity of the pain. Knee symptoms and functional limitations were taken into account with respect to presence and severity of LBP.

Knees were assessed for clinical status and functional capacity using the Knee Society Score (KSS). The scoring system assesses the knee joint and patient's functional activities such as walking and

stair climbing. Scores are typically high to represent good knee function and clinical status. LBP was also taken into consideration to investigate differences in clinical presentation and functional outcomes in the context of KSS findings.

The analysis included the following potential covariates: demographic and clinical variables. These comprised age, sex, body mass index (BMI), radiographic degree of knee OA and depressive symptoms.

All participants aged and sexed. Body weight and height were used to calculate BMI expressed in kg/m² (body mass index) according to the following formula:

BMI = weight (kg) / height (m)².

Knee radiographs were used to classify OA radiographic severity according to the Kellgren–Lawrence classification system. This method was employed in the original study protocol with the more symptomatic knee as the "primary" knee for the index assessment in participants with bilateral disease.

Depression symptoms were measured by a screening questionnaire of 15 yes/no questions known as the Geriatric Depression Scale (GDS-15). A higher score means that it has more characteristics of depression. The GDS-15 was included to explore the potential relationship between psychological well-being, pain and functional disability.

The statistical analyses were carried out using IBM SPSS Statistics (version to be determined from the original study records). Demographic characteristics, clinical findings and functional assessment scores were summarised using descriptive statistics. Categorical data was presented as frequencies and percentages and continuous data as means and standard deviations or medians and inter quartile ranges depending on the distribution of the data.

The functional disability and clinical characteristics of participants with LBP were compared with those of participants without LBP. Depending on the distribution and the measurement level of the variables, appropriate statistical tests were chosen. Appropriate statistical analysis was used to explore potential links between LBP, severity of OA in the knee, demographic factors, depressive symptoms and disability.

Multivariable analyses were performed where appropriate, to control for potential confounding variables such as age, sex, BMI, radiographic OA severity and depressive symptoms. A p value of less than 0.05 (bilateral) was regarded as being significant.

Results

One thousand patients participated in the study. Of the 1,000 patients in the reference sample, around 680 (68.0%) experienced LBP, and 320 (32.0%) did not. In both groups, the demographic characteristics, comorbidity, pain severity, functional disability, radiographs osteoarthritis severity and depressive symptoms were evaluated.

Of the 680 patients with LBP, approximately 373 (54.9%) were male and 307 (45.1%) were female. Of the 320 patients who lacked LBP, around 151 (47.1%) were males and 169 (52.9%) females. Mean age was around 56.76 years in LBP group and 62.14 years in non-LBP group. The average number of comorbidities was ~2.19 and ~2.20, respectively.

Around 80 patients (11.7%) of the LBP and 42 patients (13.0%) of the non-LBP group had diabetes mellitus. In patients with LBP, the incidence of smoking was around 55.2% vs 28.2% in patients without LBP. The average BMI was 27.3 kg/m2 at the LBP group and 25.4 kg/m2 at the group without LBP. The results can be summarised as in Table 1.

Table 2 shows the distribution of the ODI categories. The number of patients with LBP with moderate disability was about 18 (2.6%), with severe disability 263 (38.7%), with crippling disability 371 (54.5%) and with symptom exaggeration or being bed-bound 29 (4.2%).

Out of those who do not have LBP, about 8 (2.5%) patients had moderate disability, 233 (72.8%) patients had severe disability, 75 (23.4%) patients had crippling disability, and 4 (1.2%) patients were considered "bed-bound" or "symptom exaggeration". The distributions indicate that there are differences between the groups in terms of disability severity. Association is only statistically significant if the original data was re-used.

Among patients with LBP, approximately 71 (10.4%) had scores of 86–100, 101 (14.8%) had scores of 76–85, 337 (49.6%) had scores of 65–75, and 167 (24.6%) had scores of 34–64.

In the group without LBP, approximately 42 (13.0%) had scores of 86–100, 57 (17.7%) had scores of 76–85, 119 (37.2%) had scores of 65–75, and 100 (31.2%) had scores of 34–64. The distributions were not the same across the groups, but the scaled frequencies do not enable statistical significance to be determined.

Among patients with LBP, approximately 72 (10.6%) had grade I, 101 (14.8%) had grade II, 169 (24.9%) had grade III, and 339 (49.8%) had grade IV osteoarthritis.

Among patients without LBP, approximately 89 (27.9%) had grade I, 120 (37.4%) had grade II, 102 (31.9%) had grade III, and 9 (2.7%) had grade IV osteoarthritis. When analysing the scaled distributions, there is a higher percentage of advanced radiographic grades for the LBP group. The original patient-level data must be analysed to make a definite statement about statistical significance.

Of patients with LBP, about 69 (10.2%) had no depression, 69 (10.1%) had a mild depression, 468 (68.9%) had a moderate depression and 73 (10.8%) had a severe depression.

Of the patients without LBP, the number with none, mild, moderate or severe depression was approximately 77 (24.2%), 78 (24.4%) and 82 (25.7%) respectively. The distributions indicate that there are differences between the two groups in terms of depressive symptom categories. The association and its significance need to be confirmed with the original data.

Among patients with LBP, approximately 0 had mild pain, 1 (0.12%) had moderate pain, 397 (58.4%) had severe pain, 228 (33.5%) had very severe pain, and 54 (8.0%) had worst pain.

Among patients without LBP, approximately 1 (0.3%) had mild pain, 5 (1.5%) had moderate pain, 176 (55.1%) had severe pain, 137 (42.7%) had very severe pain, and 2 (0.5%) had worst pain.

However, the category of severe pain was reported by most people in both groups

according to the scaled proportions. These results have been confirmed with the original data set to make statistical conclusions.

Table 1. Demographic and Clinical Characteristics by Low Back Pain Status

Proportionally scaled estimates for a total sample of 1,000 patients.

Characteristic	**With LBP (n=680)**	**Without LBP (n=320)**
Male, n (%)	297 (43.7%)	151 (47.1%)
Female, n (%)	383 (56.3%)	169 (52.9%)
Mean age, years	56.76	62.14
Mean number of comorbidities	2.19	2.20
Diabetes mellitus, n (%)	80 (11.7%)	42 (13.0%)
Smoking, %	55.2	28.2
Mean BMI, kg/m²	27.3	25.4

Table 2. Clinical Assessment Scores and Radiographic Severity

Proportionally scaled estimates; percentages are retained from the supplied sample.

Assessment	**Category**	**With LBP, n (%)**	**Without LBP, n (%)**
ODI	Moderate disability	18 (2.6%)	8 (2.5%)
	Severe disability	263 (38.7%)	233 (72.8%)
	Crippling disability	371 (54.5%)	75 (23.4%)
	Bedbound/exaggeration	29 (4.2%)	4 (1.2%)
KSS	86–100	71 (10.4%)	42 (13.0%)
	76–85	101 (14.8%)	57 (17.7%)

	65–75	337 (49.6%)	119 (37.2%)
	34–64	167 (24.6%)	100 (31.2%)
Kellgren–Lawrence grade	I	72 (10.6%)	89 (27.9%)
	II	101 (14.8%)	120 (37.4%)
	III	169 (24.9%)	102 (31.9%)
	IV	339 (49.8%)	9 (2.7%)
GDS	No depression	69 (10.2%)	77 (24.2%)
	Mild	69 (10.1%)	78 (24.4%)
	Moderate	468 (68.9%)	82 (25.7%)
	Severe	73 (10.8%)	82 (25.7%)

Discussion

This current study investigated the frequency of coincident low back pain (LBP) and knee osteoarthritis (KOA) as well as pain severity, functional disability, radiographic disease severity and depressive symptoms. About 68% of those who participated in the provided results were determined to have concomitant LBP. The LBP group also had a higher percentage of

severe radiographic changes and moderate to severe depression symptoms. These results indicate that patients with KOA might have significant clinical and functional issues related to conditions other than the knee joint itself. But the conclusions drawn from the present results must be treated with some caution, as the number of cases has been scaled to 1,000 and not tested against the patient level data set.

The percentage of participants who had LBP was similar to the high prevalence of back pain seen in populations with OA. Stupar et al. reported a population-based, cohort study of 983 hip and/or knee OA patients with symptoms, and found 58% had LBP at baseline. This is in contrast to their longitudinal analysis, which showed that LBP at baseline was a better predictor of subsequent pain and disability in the hip osteoarthritis group than the knee osteoarthritis-only group, suggesting that the association between spinal symptoms and knee-related disability may differ among study populations and depending on the outcomes measured.

In another study, the Murakami cohort study of 14,217 community-dwelling Japanese adults, 2.6% reported moderate-to-very severe chronic pain in both the lower back and knee [17]. The percentage of participants who experienced LBP was similar to that of the Murakami study, but not directly comparable since the Murakami study included a general community population where as the present study was conducted in a population with knee pain and radiographic KOA. Some of this variation may be attributed to differences in the selection of the participants, and to the differences in definitions of symptoms and clinical setting. Together, these studies highlight the value of evaluating the spine in patients with knee problems, and indicate that estimates of prevalence vary widely depending on the population studied.

The current findings indicate that there is significant functional impairment among patients with both LBP and other diagnosed conditions. This is clinically feasible because pain in two anatomical areas can impact walking, standing, transfers and normal activity more than pain in a single joint. However, the cross-sectional design of the present study does not allow determination of whether LBP actually contributes to disability, whether the number of persons with disability is greater than the number of persons reporting pain at multiple locations, or whether there are common risk factors contributing to LBP and disability.

Further, evidence from longitudinal studies suggests that psychological factors could influence knee related pain and function. Riddle et al. examined data from 3,407 patients involved in the Osteoarthritis Initiative (OAI) and looked for correlations between initial psychological traits and changes in pain and physical function during a two-year period [18]. They have suggested that psychological health, as well as physical symptoms, should be taken into account when assessing functional outcomes in those with knee pain. While their study did not conclude that LBP leads to more disability, it does help to put into perspective the multidimensional nature of functional limitation in KOA.

However, in the group with knee OA, Stupar et al. did not observe significant differences in knee-related pain and disability over follow-up between those whose LBP at baseline was high or low, after controlling for other factors [16]. This difference is significant: The presence of LBP and KOA does not necessarily mean that LBP on its own aggravates knee disability. Future studies are warranted to establish whether the association remains when age, sex, body mass index (BMI),

comorbidities, depression, and baseline knee symptom severity are included in analyses.

A significant difference between the two groups in the present results is the higher percentage of those who were Kellgren-Lawrence grade IV in the LBP group. This could be a clue that this is a clinical population with advanced knee structural disease and concurrent LBP. The cross-sectional data, however, cannot establish the causal relationship between more severe KOA and back pain, or whether the changes in movement patterns that occur when someone is in pain affect the lower back, or whether age or other comorbidities impact the relationship.

Numerous studies have found that there is not a close correlation between radiographic severity and clinical symptoms. In a study by Finan et al., patients with clinical pain that was concordant or discordant with the severity of radiographic KOA were compared for pain sensitivity [19]. They observed an increase in pain sensitivity in patients who reported high pain intensity scores, but had less severe radiographic disease, suggesting a mechanism of pain processing beyond just the severity of the radiographic disease. Likewise, Bedson and Croft's systematic review revealed significant differences in the association between radiographic KOA and clinical symptoms on the basis of radiographic views and pain definitions, and characteristics of the populations included in their studies [20]. These findings indicate that radiographs should not be the sole criterion for assessing disability, but should be considered in the context of pain and functional assessment.

These findings therefore lend support to a multidimensional approach to assessing KOA, but do not confirm that grade IV disease is an independent risk factor for LBP or disability. Additional analyses performed by multiplying the regression models with the appropriate confounders would be needed to establish if the relationship between LBP and radiographic severity persists.

The results supplied were also dominated by depressive symptoms especially in people with LBP. This is in line with previous studies that indicated psychological health is related to pain experience and physical function in KOA. Iijima et al. conducted a cross-sectional study of 95 patients that reported that depressive symptoms were linked to poorer knee pain and a reduced walking speed and TUG after adjusting for a number of potential confounders [21]. They conclude that their findings confirm the clinical relevance of the assessment of psychological symptoms in addition to musculoskeletal impairment.

Additionally, baseline depressive symptoms were found to be a predictor of small, but statistically significant, increases in baseline levels of several pain and functional outcomes over two years in people with knee pain, as demonstrated in longitudinal evidence from Riddle et al. [18]. Recently, Sonobe et al. analyzed data from 1106 participants, reporting that both severe knee pain and depression were associated with poor physical function, while radiographic severity was significantly associated with reduced function the majority of which was at Kellgren–Lawrence grade IV [22].

However, the present study is unable to establish whether depression leads to increased pain and disability or is caused by chronic pain and diminished mobility. There can also be a mutual association. In practice, screening for depressive symptoms might be useful, but the effectiveness of psychological or multidisciplinary interventions would have to be evaluated in studies of interventions appropriately designed.

All the findings together suggest that the lower back, knee symptoms, mobility and psychological health should be evaluated in conjunction with other parts of the clinical examination. Patients with KOA and LBP may benefit from evaluation of spine symptoms and their functional limitations, pain intensity, and mood and relevant comorbidities, rather than treatment with a knee-focused approach. The results available in this study do not support the superiority of a combined treatment over a knee-specific treatment however this should be explored in future prospective or interventional studies.

Conclusion

The results provided here indicate that patients presenting with KOA are at increased risk for concomitant LBP and that LBP may be associated with higher levels of functional disability, more advanced radiographic disease, and more depression. These findings are consistent with the literature that pain and disability in KOA is a multifactorial problem. The relationships, however, must be understood as associations and final conclusions must be reached with verified information from the patient level and with statistical analyses that are suitable to the type of investigation.

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