OPEN ACCESS

ORIGINAL ARTICLE

Interaction between Low Back Pain and Knee Pain – Contribution to Disability in Individuals with Knee Osteoarthritis: A Cross-Sectional Study.

Shahzaib Riaz Baloch[1], Imtiaz Ahmed Hashmi[2], Mohammad Sohail Rafi[3], Syed Ata ur Rahman[4], Sareema Eman[5], Saad Shakeel[6], Ahmer Hussain Shah[7]

[1]Fellow Spine Surgery, Dr. Ziauddin Hospital Karachi
[2-3]Orthopedic Consultant, Dr. Ziauddin Hospital Karachi
[4]Orthopedic Fellow, Dr. Ziauddin Hospital Karachi
[5-6]Medical Student, Dr. Ziauddin Hospital Karachi
[7]Resident, Dr. Ziauddin Hospital Karachi

Authorship and Contribution Declaration:
Each author of this article has encountered all 04 criterions of authorship:

1. Commencement and design of the study, attainment of data, or analysis and interpretation of information.
2. Drafting the manuscript or rewriting it censoriously for important intellectual content.
3. Providing concluding endorsement of the version for publication.
4. All authors have settled to be answerable for all aspects of their research work

Corresponding author:
Shahzaib Riaz Baloch
E-mail: sheekdurrazai@gmail.com

ABSTRACT

Objective: The study aims to find out the association between knee pain and lower back pain.
Methodology: This study focuses on a cohort of 1254 individuals who fulfilled the inclusion criteria and presented to the clinic with Knee pain from January 2022 till August 2023.
Results: Majority of our patients were females (55%). 853 patients had associated lower back pain which was 68% of the total patients that presented with knee pain. There was an association of smoking (55.2%) with lower back pain and knee osteoarthritis. Most of our patients with LBP had associated moderate to severe depression, which was 79.7% according to the GDS scale. There was a significant association in ODI scores for the patients with lower back pain when comparing patients with ones without lower back pain (p-value <0.05).
Conclusion: Our findings underscore the significant interaction between low back pain and knee osteoarthritis, impacting various aspects of patients' lives. The multifaceted nature of this association requires a holistic and interdisciplinary approach to effective management
Keywords: Chronic pain / Geriatric Depression Scale (GDS) / Kellgren And Lawrence (KL) / Knee Society Score (KSS) / Oswestry Disability Index (ODI) / Visual Analogue Score (VAS).

This article may be cited as: Baloch SR, Hashmi IA, Rafi MS, Rahman SA, Eman S, Shakeel S, Shah AH. Interaction between Low Back Pain and Knee Pain – Contribution to Disability in Individuals with Knee Osteoarthritis: A Cross-Sectional Study. J. Pak. Orthop. Assoc. 2024; Vol. 36 (3):160-168.

INTRODUCTION

A complex degenerative condition, osteoarthritis (OA) is classified by periarticular bone remodeling and articular cartilage loss or degradation[1]. Nearly four-fifths of the world's cases of osteoarthritis (OA), which deteriorates with advancing age and obesity, are caused by knee osteoarthritis (KOA), a widespread condition affecting the elderly population[2]. It is estimated that KOA affects more than 30% of people over the age of fifty[3]. KOA is the most prevalent type of OA, which is currently the twelfth greatest cause of disability, according to the Global Burden of Disease[4]. The most common kind of arthritis, OA is characterized by severe structural alterations and joint inflammation, which lead to pain and functional disability. The primary symptoms, pain and stiffness, have a major impact on day-to-day activities[5]. Patients with KOA and its coexisting symptoms can have inconsistent radiographic findings. Patients who arrive with symptoms early in the disease may not need to correlate radiographic findings, even if those with major radiographic abnormalities may not have as severe symptoms as one would expect. Nevertheless, due to their extensive availability, X-rays have been utilised to assess the prevalence of OA[2,3].

Low back pain (LBP) is reported by between 54.6% and 57.4% of individuals with knee OA, and the combination of these two illnesses may result in more severe symptoms and restrictions[6,7]. Cross-

sectional investigations on people with knee OA support this, demonstrating that the presence of concomitant LBP may aggravate the symptoms of the condition[8]. These two conditions might be related biomechanically[7]. Concurrent LBP was also linked to worsening OA symptoms, according to a recent meta-analysis[9]. The quality of life (QOL) is poorer in people with both OA and LBP[7]. Although little research has examined this relationship, a large cross-sectional investigation carried out in Japan found a high correlation between lower QOL and lower back and knee pain[10]. This study's primary focus is on the relationship between LBP and KOA and how it impacts patients' impairments.

The International Association for the Study of Pain defines central sensitization (CS) as an increased sensitivity of nociceptive neurons in the central nervous system (CNS) to afferent input at normal or subthreshold levels. A nociceptive neuron is a complete neuron, including its axon and dendrites, which can be either central or peripheral[11,12]. In order to promote adaptive reactions after tissue damage, the central nervous system actively controls nociceptive signals[13]. Peripheral sensitization, which causes primary hyperalgesia in knee OA, is the phrase used to describe how the nociceptors in the knee joint become more sensitive to painful stimuli. A chronic illness is the cause of this procedure. Owing to the facilitation of CS, central magnification of nociception, and impairment of pain control, secondary hyperalgesia, including widespread hyperalgesia at many body areas, may also occur in unaffected tissue[14].

To fully understand the relationship between KOA and LBP and how it impacts patients' levels of disability, more research is necessary. Our cross-sectional study's main objective is to evaluate the impact of the KOA and LBP interaction on patients' symptoms, disability, and quality of life. This collaboration will be extremely helpful to future medical professionals as they create protocols for effectively treating patients who have both concurrent KOA and LBP.

Background

Osteoarthritis is a degenerative condition, classified by periarticular bone remodeling and articular cartilage loss or degradation. Nearly four-fifths of the world's cases of osteoarthritis (OA), involve the knee joint (Knee osteoarthritis or KOA), and is seen to be associated with lower back pain (LBP) in up to 57.4% of the cases. The combination of these two illnesses may result in more severe symptoms and restrictions.

METHODOLOGY

Setting and Participants: During the clinic visits, older residents of the community who reported having knee pain at the time were selected and allowed to take part in the study, from January 2022 till August 2023. Since the study is observational, no upper limit on the number of recruited participants was specified. The study was authorized by ethical committee before enrolment, and each subject's written consent was sought.

Inclusion criteria:

1. Age ≥45
2. Knees with medial tibiofemoral compartment Kellgren and Lawrence [K&L] grade ≥ 1 in one or both knees evaluated on weight-bearing anteroposterior radiographs
3. Ability to walk freely on level ground without assistance from an ambulatory assistive device
4. Individuals with unilateral and bilateral knee OA were not taken into separate consideration.
5. Patients with complete medical record.

Exclusion criteria:

1. Having had knee surgery in the past
2. Rheumatoid arthritis
3. Having had a periarticular fracture in the past
4. Having neurological deficits / neurological disease
5. Spondylo-arthropathies

To maximize the result's generalizability, the age range of ≥ 45 years was chosen because knee discomfort and lower back pain are prevalent among community members in our community who are 45 years of age or older. As Knee osteoarthritis is predicted to progress from KL grade I to KL grade II within 3 to 5 years, we included patients with a KL grade ≥ 1[15,16].

Measurements

The following metrics were assessed in each patient: (1) knee society score (KSS); and (2) lower back pain (LBP). Covariates included depressed symptoms, radiographic OA severity, and demographic traits.

Low back pain (LBP)

LBP was evaluated using Oswestry Disability Index (ODI), to minimize any variations or discrepancies. And severity of pain was documented using Visual Analogue Scale (VAS).

Knee Society Score (KSS)

The Knee Society Clinical Rating System (KSS) was developed as an and objective scoring system to quantify the patient's functional capacity before and after knee arthroplasty. It was first published in Clinical Orthopaedics and Related Research in 1989. The system is separated into two categories: a functional score which evaluates the patient's ability to climb stairs and walk, and another part which scores the knee joint itself.

Covariates

The subjects self-reported their age, sex, and height. Participants' weights were recorded on a scale while they were clothed but not wearing shoes. The formula for calculating body mass index (BMI) was to divide weight in kilograms by height in squared meters.

Each participant's radiographic severity of osteoarthritis of both knees was assessed by weight-bearing anteroposterior short view, via the KL scoring system as described in previous studies. As reported by the patient, there was documentation of either unilateral or bilateral knee pain. To reduce potential bias resulting from the similarity between a patient's right and left knees, radiography examinations only included the patient's index knee. The more painful knee was designated as the index knee.

Symptoms of Depression were measured via the Geriatric Depression Scale (15-item), a uniform self-administered questionnaire with only yes/no responses. A higher number indicates more depression and a lesser number indicates vice versa. GDS is one of the most widely used depression scales in adults. It was found to be able to discriminate between mild (≥5) and moderate/severe (≥11) depression.

Statistical Analyses

Using SPSS version 20, the sample size was determined based on patients with and without LBP in order to identify a significant interaction (if any) between knee pain and low back pain leading to disability.

The study included KSS pain and stiffness (continuous) and LBP (0, no; 1, yes) as independent variables. Covariates included index knee tibiofemoral joint K&L grade, age, sex, BMI (continuous), and GDS score (continuous). Based on their correlation with disability and clinical judgment, these covariates were selected beforehand.

Data analyses was performed using SPSS version 20. P value <0.05 was taken to be statistically significant.

RESULTS

A total of 2796 patients, visited with an atraumatic knee pain from 1st January 2022 till 31st August 2023. Only 1254 patients were included in our study as they fulfilled our inclusion criteria or had complete data available. Out of these, 373 (43.7%) were males and 480 (56.3%) were females, who had associated LBP. While on the other hand, 189 (47.1%) were males and 212 (52.9%) were females who were without any LBP complaints. The mean age of participants was 56.76 years in the group with LBP, and 62.14 years in the group without LBP. The patients in this study who had LBP, on average had 2.19 co-morbidities. At the same time, patients without LBP on average had 2.20 different co-morbidities. Incidence of DM in both groups showed 100 (11.7%) people with LBP and 52 (13.0%) people without LBP were diagnosed with it respectively. A positive association with smoking was seen in patients of KOA with LBP which was 55.2% and in the group with no LBP it was only 28.2%. The mean BMI of patients with LBP was 27.3 and 25.4 for the patients without LBP. (TABLE -1)

Association of Oswestry Disability Index with lower back pain is given in TABLE - 2. The table shows the ODI index, among patients with LBP, 22(2.6%) had moderate disability, 330 (38.7%) had a severe disability, 465 (54.5%) had crippling back pain and 36 (4.2%) were in bed-bound or exaggeration of symptoms category, demonstrating a positive association between LBP and KOA as seen by the scores. While in patients without LBP, 10 (2.5%) had moderate disability, 292 (72.8%) had a severe disability, 94 (23.4%) had crippling back pain and 5 (1.2%) were bedbound or exaggeration of symptoms category (P=<0.005).

Association of Knee Society Score with lower back pain is shown in Table 3. In patients with LBP, 89 (10.4%) had a score between 86 to 100, 126 (14.8%) had a score between 76 to 85, 423 (49.6%) had a score between 65 to 75 and 210 (24.6%) had a score 64 to 34. In contrast to the group without LBP, 52 (13.0%) had a score between 86 to 100, 71 (17.7%) had a score between 76 to 85, 149 (37.2%) had a score between 65 to 75 and 125 (31.2%) had a score between 64 to 34. (P=<0.002).

In table 4, association of Kellgren and Lawrence Knee Osteoarthritis grading with lower back pain is given. In the group of patients with LBP, 90 (10.6%) patients were ranked with grade I knee osteoarthritis, 126 (14.8%) with grade II, 212 (24.9%) with grade III and 425 (49.8%) with grade

IV knee osteoarthritis score. While in the group without LBP, 112 (27.9%) had grade I, 150 (37.4%) had grade II, 128 (31.9%) had grade III, and 11 (2.7%) had a grade IV score. Our data signifies that lower back pain has an association with a worsening grade of Knee OA (p-value <0.001).

Table 1: Demographics

All Patients with Knee Osteoarthritis		With LBP (T=853)	Without LBP (T=401)
Mean Age (years)		56.76	62.14
Gender	**Male**	373 (43.7%)	189 (47.1%)
	Female	480 (56.3%)	212 (52.9%)
Height (cm)		167.72	168.67
DM		100 (11.7%)	52 (13.0%)
No. of Comorbids		2.19	2.20
Mean Weight (kg)		76.69	72.21
Smoking		471 (55.2%)	113 (28.2%)
Mean BMI (kg/m2)		27.3	25.4

Table 2: Association of ODI Scores with Lower Back Pain

Lower back pain	Oswestry Disabilty Index				Total
	21%–40%: Moderate Disability	**41%–60%: Severe Disability**	**61%–80%: Crippling back pain**	**81%–100%: bed-bound or exaggeration of symptoms**	
YES	22 (2.6%)	330 (38.7%)	465 (54.5%)	36 (4.2%)	853
NO	10 (2.5%)	292 (72.8%)	94 (23.4%)	5 (1.2%)	401
Total	32	622	559	41	1254
p-Value	p<0.005				

Table 3: Association of KSS with LBP

Lower back pain	Knee Society Score					
	86 to 100	**76 to 85**	**65 to 75**	**64 to 34**	**33**	**Total**
YES	89 (10.4%)	126 (14.8%)	423 (49.6%)	210 (24.6%)	5 (0.6%)	853
NO	52 (13.0%)	71 (17.7%)	149 (37.2%)	125 (31.2%)	4 (1.0%)	401
Total	141	197	572	335	9	1254
p-Value	p<0.002					

Table 4: Association of KL Grading with LBP

Lower Back Pain	Kellgren and Lawrence (KL) Knee Osteoarthritis Grading

	Grade - I	**Grade - II**	**Grade - III**	**Grade - IV**	Total
YES	90 (10.6%)	126 (14.8%)	212 (24.9%)	425 (49.8%)	853
NO	112 (27.9%)	150 (37.4%)	128 (31.9%)	11 (2.7%)	401
Total	202	276	340	436	1254
p-Value	P<0.001				

Table 5: Association of Geriatric Depression Scale with LBP

Lower back pain	**Geriatric Depression Scale**				
	Normal	**Mild Depression**	**Moderate Depression**	**Severe Depression**	**Total**
YES	87 (10.2%)	86 (10.1%)	588 (68.9%)	92 (10.8%)	853
NO	97 (24.2%)	98 (24.4%)	103 (25.7%)	103 (25.7%)	401
Total	184	184	691	195	1254
p-Value	p<0.005				

Table 6: Visual Analogue Scores of Knee O. A patients when Comparing with or without Lower Back Pain

Knee OA patients	**Description of VAS**	**% (n)**	**Total No. of patients**
VAS Scores of Patients with LBP	Mild pain	**0%** (0)	**853**
	Moderate pain	**0.12%** (1)	
	Severe pain	**58.38%** (498)	
	Very severe pain	**33.53%** (286)	
	Worst pain	**7.97%** (68)	
VAS Score of Patients without LBP	Mild pain	**0.25%** (1)	**401**
	Moderate pain	**1.50%** (6)	
	Severe pain	**55.11%** (221)	
	Very severe pain	**42.64%** (171)	
	Worst pain	**0.50%** (2)	
Total			**1254**

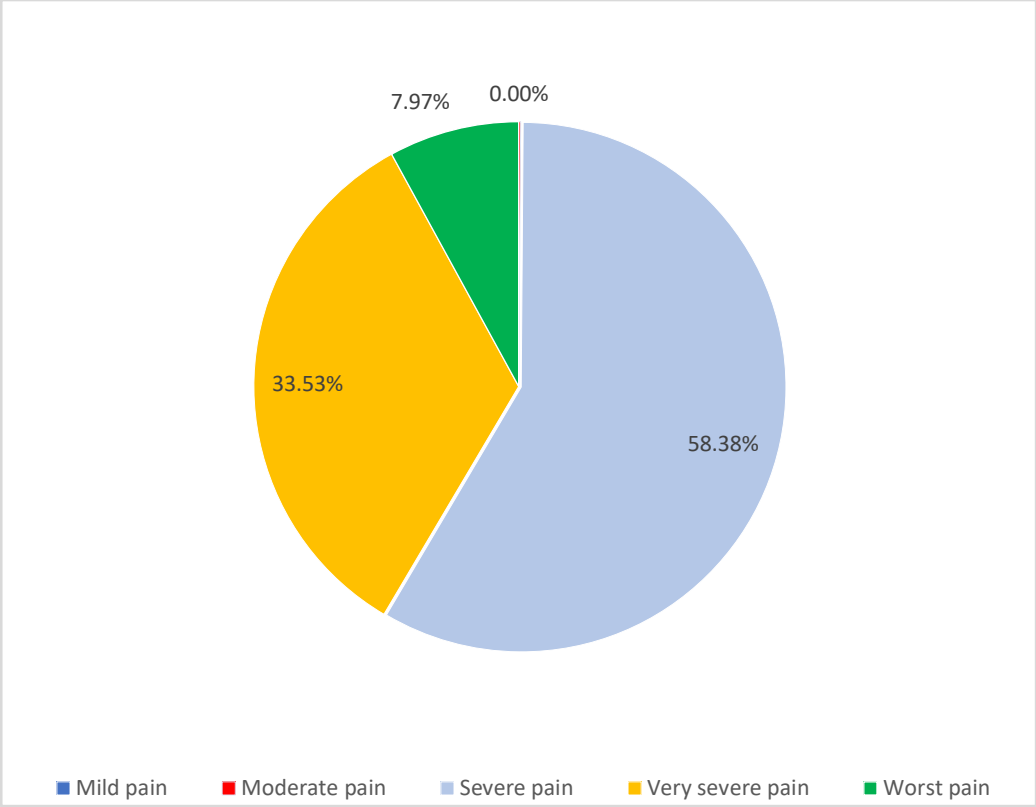

Image 1: VAS Score of patients with LBP

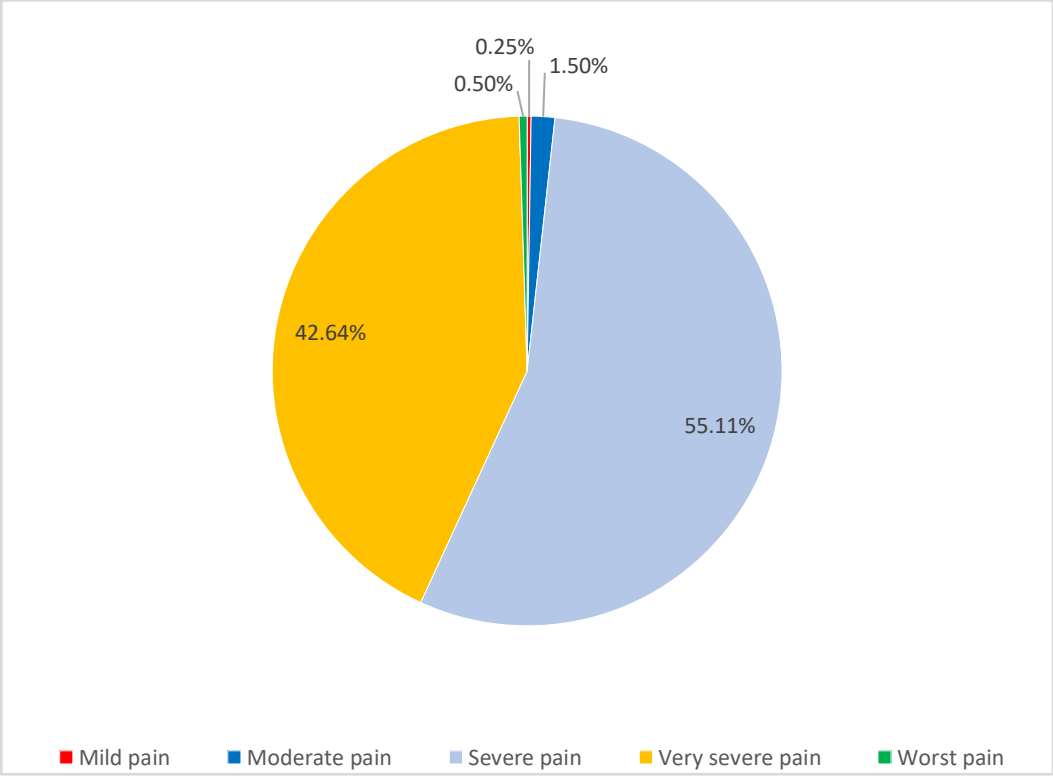

Image 2: VAS Score of patients without LBP

In Table 5, an association of the Geriatric depression scale with lower back pain is shown. In patients who suffered from LBP, 87 (10.2%) had no depression, 86 (10.1%) had mild depression, 588 (68.9%) had moderate depression and 92 (10.8%) suffered from severe depression. In the group comprising patients without LBP, 97 (24.2%) had no depression, 98 (24.4%) had mild depression, 103 (25.7%) had moderate depression and 103 (25.7%) suffered from severe depression ($p<0.005$).

The Visual Analogue Scores of patients with LBP and patients without LBP are compared in Table 6. Image-1 and Image-2. In the group with LBP, 0 (0%) had mild pain, 1 (0.12%) had moderate pain, 498 (58.4%) had severe pain, 286 (33.5%) had very severe pain and 68 (8.0%) had worst pain. In comparison with the group without LBP, 1 (0.3%) had mild pain, 6 (1.5%) had moderate pain, 221 (55.1%) had severe pain, 171 (42.7%) had very severe pain and 2 (0.5%) had worst pain.

The VAS scores were high in both sets of patients in both groups.

DISCUSSION

This cross-sectional study aimed to investigate the influence between low back pain (LBP) and knee osteoarthritis (KOA) and its combined effect on an individual's disability and its subsequent effect on the quality of life. Numerous earlier works have shown that disability is a leading consequence of lower limb OA[17]. KOA coupled with back pain is significantly associated with a loss in quality of life.[18] The findings from our study revealed a significant association between LBP and KOA, impacting various aspects of patients' lives, including symptoms, impairment, and quality of life. Through this study, we have shed light on a topic, that will have far-reaching consequences on the development of newer protocols for patient treatments and in improving their overall quality of life.

In our study which focused on patients diagnosed with knee osteoarthritis, we have found some interesting correlations. Since KOA is quite prevalent in society, the impact of its subsequent disability burden on the community is high, in terms of healthcare utilization. Thus, it is paramount to identify and understand the factors which contribute to such disability. Our results indicate that a considerable proportion of knee osteoarthritis patients also suffer from low back pain (68.0%), with a higher incidence of LBP in females compared to males is noteworthy and warrants further exploration, as it may have implications for tailored treatment approaches. The mean age of participants in the group with LBP was lower than those without LBP, suggesting that the interaction between LBP and KOA may have an earlier onset or greater impact on younger individuals. This finding emphasizes the need for early intervention strategies to address the dual burden of LBP and KOA in clinical practice.

Extensive studies have been conducted to identify several risk factors for KOA. According to a meta-analysis carried out in 2015 strong evidence for age, ethnicity, BMI, and co-morbidity count as risk factors[19]. In our study, the patients in the group with LBP had higher BMI compared to the non-LBP group, showing a correlation with increased BMI. This prevalence aligns with previous studies emphasizing the coexistence of these conditions.[20]

Though our study showed a strong correlation between smoking with LBP and KOA, showing that smokers were twice as likely to present with LBP previous studies done in this field have shown a rather causal relationship between smoking and knee OA, thus making such a relationship speculative. This calls for more = studies to further elucidate this association.[21,22]

KOA is well-known to be a significant cause of disability around the globe. A large cohort study was conducted, which primarily included Mexican Americans. The number of activities of daily living that were impaired was 1.12-1.35 times greater among those diagnosed with OA, compared to those without it[23]. A nationwide study was conducted in Korea, which found that the estimated years lived with disability was incredibly high among elderly males and females with OA.[24]

A population-based study was conducted in Sweden which showed an increased risk for sick leave or disability among job sectors, which was attributed to KOA[25]. In probing the disability in KOA patients, our study made the assessment based on the Oswestry Disability Index. It demonstrated a significant impact, as patients with LBP had more severe disability, with more percentage of patients with crippling back pain and being bedbound compared to the group without LBP.

Patients with LBP had a much more severe osteoarthritis grade when assessed with the Kellgren and Lawrence knee osteoarthritis grading. Concurrently the Knee Society Score showed patients with LBP having lesser functional ability than the latter group. Visual Analogue Score of participants with LBP showed a higher percentage of patients

with severe and worse pain compared to the non-LBP group of patients. The increased severity of symptoms, much pronounced progression of knee osteoarthritis with a much profound functional impact in patients with LBP also subsequently resulted in a higher percentage of patients with moderate and severe depression compared with the group without LBP. This association was measured using the geriatric depression scale, which highlighted the psychosocial aspect of the co morbidities. Studies have shown that besides affecting one's physical health, OA may also negatively affect their mental health. Data from the Osteoarthritis Initiative (OAI) study has shown that those with lower limb OA had greater odds of developing depressive symptoms than those without the disease.[26] It was also associated with a greater likelihood of suicidal thoughts.[27] Studies have also found a strong association between OA and perceived memory loss, which was partially mediated by mood and sleep impairments.[28] Previous surveys have also reported that combined knee and lower back pain additively strengthened the correlation with sleep problems.[29] There also appears to be increasing evidence to suggest that OA is a risk factor for cardiovascular disease development. A meta-analysis (2017) concluded that the risk of myocardial infarction was significantly increased in OA and other types of arthritis.[30] All this not only predisposes the individual to increased disability but also increased stress that negatively affects his mental and physical health.

A study conducted in Australia showed that improvement in health literacy in patients with chronic health illnesses like KOH enabled people to actively manage their health.[31] Enablement promotes the ability of an individual to control their health, which can decrease pain, depression, and disability, thereby improving quality of life.[32] It can provide individuals with better coping ability.[33] It includes strategies like education, exercise, and self-care programs, which can promote health literacy and provide enablement to effectively enhance the quality of life in patients with chronic illnesses.[34]

LIMITATIONS

Our study has several limitations, including being a single-center study and its cross-sectional design, which limits causal inferences. Longitudinal studies are warranted to establish temporal relationships between LBP and KOA progression. Additionally, considering the complex nature of these conditions, a more in-depth exploration of psychosocial factors, genetic predispositions, and lifestyle elements is crucial for a comprehensive understanding.

CONCLUSION

In conclusion, our findings underscore the significant interaction between low back pain and knee osteoarthritis, impacting various aspects of patients' lives. The multifaceted nature of this association requires a holistic and interdisciplinary approach for effective management. Future research should delve into the underlying mechanisms, considering the influence of central sensitization, to provide a more comprehensive understanding of this intricate relationship.

Conflict of Interest: None

Grants/Funding: None

Disclaimer: None

REFERENCES

1. Mahajan A, Verma S, Tandon V. Osteoarthritis. J Assoc Physicians India. 2005 Jul;53:634-41. PMID: 16190135.
2. Cui A, Li H, Wang D, Zhong J, Chen Y, Lu H. Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. EClinicalMedicine [Internet]. 2020 Dec 1 [cited 2023 Mar 28];29–30. Available from: /pmc/articles/PMC7704420/
3. Ito H, Tominari S, Tabara Y, Nakayama T, Furu M, Kawata T, et al. Low back pain precedes the development of new knee pain in the elderly population; a novel predictive score from a longitudinal cohort study. Arthritis Res Ther [Internet]. 2019 Apr 15 [cited 2023 Mar 28];21(1). Available from: /pmc/articles/PMC6466785/
4. Guérard O, Dufort S, Forget Besnard L, Gougeon A, Carlesso L. Comparing the association of widespread pain, multi-joint pain and low back pain with measures of pain sensitization and function in people with knee osteoarthritis. Clin Rheumatol [Internet]. 2020 Mar 1 [cited 2023 Mar 28];39(3):873–9. Available from: https://pubmed.ncbi.nlm.nih.gov/31713734/
5. Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, et al. The global burden of hip and knee osteoarthritis: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis [Internet]. 2014 Jul 1 [cited 2023 Mar 28];73(7):1323–30. Available from: https://ard.bmj.com/content/73/7/1323
6. Iijima H, Suzuki Y, Aoyama T, Takahashi M. Interaction between low back pain and knee pain contributes to disability level in individuals with knee osteoarthritis: a cross-sectional study. Osteoarthritis Cartilage. 2018 Oct;26(10):1319-1325. doi: 10.1016/j.joca.2018.06.012. Epub 2018 Jul 9. PMID: 30003966.
7. Amarasinghe P, Wadugodapitiya S, Weerasekara I. Biomechanical and clinical relationships between lower back pain and knee osteoarthritis: a systematic review. Syst Rev [Internet]. 2023 Mar 2 [cited 2023 Mar 28];12(1):28. Available from: http://www.ncbi.nlm.nih.gov/pubmed/36864486

8. Suri P, Morgenroth DC, Kwoh CK, Bean JF, Kalichman L, Hunter DJ. Low Back Pain and Other Musculoskeletal Pain Comorbidities in Individuals with Symptomatic Osteoarthritis of the Knee: Data from the Osteoarthritis Initiative. Arthritis Care Res (Hoboken) [Internet]. 2010 [cited 2023 Mar 28];62(12):1715. Available from: /pmc/articles/PMC2995827/
9. Calders P, Van Ginckel A. Presence of comorbidities and prognosis of clinical symptoms in knee and/or hip osteoarthritis: A systematic review and meta-analysis. Semin Arthritis Rheum. 2018 Jun 1;47(6):805–13.
10. Muraki S, Akune T, Oka H, En-Yo Y, Yoshida M, Saika A, et al. Health-related quality of life in subjects with low back pain and knee pain in a population-based cohort study of Japanese men: The research on osteoarthritis against disability study. Spine (Phila Pa 1976) [Internet]. 2011 Jul 15 [cited 2023 Mar 28];36(16):1312–9
11. Loeser JD, Treede RD. The Kyoto protocol of IASP Basic Pain Terminology. Pain [Internet]. 2008 Jul 31 [cited 2023 Mar 28];137(3):473–7.
12. Mibu A, Nishigami T, Tanaka K, Manfuku M, Yono S. Difference in the impact of central sensitization on pain-related symptoms between patients with chronic low back pain and knee osteoarthritis. J Pain Res [Internet]. 2019 [cited 2023 Mar 28];12:1757.
13. Staud R. Evidence for shared pain mechanisms in osteoarthritis, low back pain, and fibromyalgia. Curr Rheumatol Rep [Internet]. 2011 Dec [cited 2023 Mar 28];13(6):513–20. Available from: https://pubmed.ncbi.nlm.nih.gov/21833699/
14. Moore R, Clifford AM, Moloney N, Doody C, Smart KM, O'Leary H. The Relationship Between Clinical and Quantitative Measures of Pain Sensitization in Knee Osteoarthritis. Clin J Pain [Internet]. 2020 [cited 2023 Mar 28];36(5).
15. Hart DJ, Spector TD. Kellgren & Lawrence grade 1 osteophytes in the knee--doubtful or definite? Osteoarthritis Cartilage. 2003 Feb;11(2):149-50. doi: 10.1053/joca.2002.0853.
16. Cibere J, Sayre EC, Guermazi A, Nicolaou S, Kopec JA, Esdaile JM, et al. Natural history of cartilage damage and osteoarthritis progression on magnetic resonance imaging in a population-based cohort with knee pain. Osteoarthr Cartil 2011;19:683e8.
17. Yelin E, Lubeck D, Holman H, Epstein W. The impact of rheumatoid arthritis and osteoarthritis: the activities of patients with rheumatoid arthritis and osteoarthritis compared with controls. J Rheumatol 1987;14:710–7.
18. Muraki S, Akune T, Oka H, En-Yo Y, Yoshida M, Saika A, et al. Impact of knee and low back pain on health-related quality of life in Japanese women: The Research on Osteoarthritis Against Disability (ROAD). Mod Rheumatol. 2010;20(5):444–51.
19. Bastick AN, Runhaar J, Belo JN, Bierma-Zeinstra SM. Prognostic factors for progression of clinical osteoarthritis of the knee: a systematic review of observational studies. Arthritis Res Ther. 2015;17:152.
20. Vina ER, Kwoh CK. Epidemiology of osteoarthritis: literature update. Curr Opin Rheumatol. 2018 Mar;30(2):160-167. doi: 10.1097/BOR.0000000000000479. PMID: 29227353; PMCID: PMC5832048.
21. Johnsen, M.B., Pihl, K., Nissen, N. et al. The association between smoking and knee osteoarthritis in a cohort of Danish patients undergoing knee arthroscopy. BMC Musculoskelet Disord 20, 141 (2019). https://doi.org/10.1186/s12891-019-2518-z
22. Dubé CE, Liu SH, Driban JB, McAlindon TE, Eaton CB, Lapane KL. The relationship between smoking and knee osteoarthritis in the osteoarthritis initiative. Osteoarthr Cartil. 2016;24(3):465–72.
23. Haan MN, Lee A, Odden MC, et al. Gender Differences in the Combined Effects of Cardiovascular Disease and Osteoarthritis on Progression to Functional Impairment in Older Mexican Americans. J Gerontol A Biol Sci Med Sci. 2016;71:1089–1095.
24. Park JI, Jung HH. Estimation of years lived with disability due to noncommunicable diseases and injuries using a population-representative survey. PLoS One. 2017;12:e0172001.
25. Hubertsson J, Turkiewicz A, Petersson IF, et al. Understanding Occupation, Sick Leave, and Disability Pension Due to Knee and Hip Osteoarthritis From a Sex Perspective. Arthritis Care Res (Hoboken) 2017;69:226–233.
26. Veronese N, Stubbs B, Solmi M, et al. Association between lower limb osteoarthritis and incidence of depressive symptoms: data from the osteoarthritis initiative. Age Ageing. 2016
27. Kye SY, Park K. Suicidal ideation and suicidal attempts among adults with chronic diseases: A cross-sectional study. Compr Psychiatry. 2017;73:160–167.
28. Innes KE, Sambamoorthi U. The Association of Perceived Memory Loss with Osteoarthritis and Related Joint Pain in a Large Appalachian Population. Pain Med. 2017
29. Murase K, Tabara Y, Ito H, Kobayashi M, Takahashi Y, Setoh K, et al. Knee pain and low back pain additively disturb sleep in the general population: a cross-sectional analysis of the Nagahama study. PLoS One. 2015;10(10):e0140058.
30. Schieir O, Tosevski C, Glazier RH, et al. Incident myocardial infarction associated with major types of arthritis in the general population: a systematic review and meta-analysis. Ann Rheum Dis. 2017;76:1396–1404.
31. Agency for Clinical Innovation, NSW Government Consumer enablement guide — why is enablement important? https://aci.health.nsw.gov.au/projects/consumer-enablement/about/why-is-enablement-important (accessed 3 Oct 2023).
32. Pereira MG, Carvalho C, Costa EC, et al. (2021) Quality of life in chronic pain patients: illness-and wellness-focused coping as moderators. Psych J 10, 2, 283–294.
33. Geelen CC, Kindermans HP, van den Bergh JP, Verbunt JA (2017) Perceived physical activity decline as a mediator in the relationship between pain catastrophizing, disability, and quality of life in patients with painful diabetic neuropathy. Pain Pract 17, 3, 320–328.
34. Patient enablement and health-related quality of life for patients with chronic back and knee pain: a cross-sectional study in primary care. Amy Pui Pui Ng, John King Yiu Cheng, Joyce Sau Mei Lam, Carlos King Ho Wong, Will Ho Gi Cheng, Emily Tsui Yee Tse, David Vai Kiong Chao, Edmond Pui Hang Choi, Rosa Sze Man Wong, Cindy Lo Kuen Lam. British Journal of General Practice 2023; 73 (736): e867-e875. DOI: 10.3399/BJGP.2022.0546.