RESEARCH PAPER

Association of Kinesiophobia with Pain, Disability, Fall Self-Efficacy and Quality of Life in Patients with Knee Osteoarthritis: A Correlational Study

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Abstract

Background: Knee osteoarthritis (KOA) is a chronic progressive degenerative joint disease affecting more than 250 million people worldwide. Kinesiophobia—an excessive, irrational fear of physical movement resulting from perceived vulnerability to reinjury—is increasingly recognised as a major biopsychosocial determinant of outcomes in KOA. Increased fear of movement related to pain, FSE, disability, and Quality of life may lead to poor OA prognosis. Despite growing global evidence, the relationship between kinesiophobia and multidimensional outcomes in the Indian population remains underexplored.

Objective: To determine the association of kinesiophobia with pain intensity, disability, fall self-efficacy, and quality of life in patients with knee osteoarthritis.

Methods: 152 patients with chronic knee osteoarthritis were screened for this study, with a mean age of 50.8 ± 5.62 years. The Numeric Pain Rating Scale, Tampa scale for kinesiophobia, fall-efficacy scale, WOMAC scale, and SF-36 were used to measure pain intensity, kinesiophobia, fall self-efficacy, disability, and quality of life, respectively. Data normality was assessed with the Shapiro–Wilk test; correlation analyses employed Spearman's rho (non-normal data) and Pearson's r (normal data) at $\alpha = 0.05$.

Results: The participants were 71% female and 29% male, with no gender difference. Mean TSK score was 47.8 ± 11.3 (indicative of kinesiophobia). Kinesiophobia showed a strong positive correlation with pain ($r = 0.657$, $p < 0.001$), a moderate positive correlation with disability ($r = 0.575$, $p < 0.001$) and fall self-efficacy ($r = 0.447$, $p < 0.001$), and significant negative correlations with multiple SF-36 quality-of-life domains ($r = -0.201$ to -0.354, $p < 0.05$).

Conclusion: Osteoarthritis-related psychological distress affects both genders. There is a significant correlation between kinesiophobia and associated factors. Moreover, comorbidity worsens psychological distress among people with osteoarthritis. In light of these results, routine assessment of kinesiophobia is warranted in clinical physiotherapy practice to guide holistic, biopsychosocial management of KOA.

Keywords: Knee osteoarthritis; Kinesiophobia; Tampa Scale for Kinesiophobia; Fear of movement; Pain; Disability; Quality of life; Fall self-efficacy; Correlational study; India

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Introduction

Osteoarthritis (OA) of the knee is a common degenerative complaint that can affect all structures within and around the joint.[1] OA can occur in any joint; the knee is the most common site of clinically significant involvement.[2] The most common compartment to get involved is the medial tibiofemoral compartment of the knee joint complex. It affects more than 250 million people worldwide.[3] Symptoms generally include knee pain, joint stiffness, poor proprioception, and dropped muscle strength.[4] Muscle weakness attributed to knee OA is related to physical inactivity and advanced case-reported pain.[5]

During their continuance, 40% of the males and 47% of the females are at risk of developing characteristic osteoarthritis of the knee. There's an added need for attention to this disease, as estimated that the number of people affected with OA will increase by 50% over the coming 20 years.[6] Further pain means lower physical function, lower capability to perform diurnal tasks, including walking short and long distances, climbing stairs, and sitting to standing. Stiffness is initially due to pain and muscle spasms. Lack of regular physical exertion is a current risk factor for functional decline in people with knee OA. Still, despite the known benefits, people with knee OA are inactive. Fear of pain and physical pain have both been linked as implicit barriers to regular physical activity participation in this population.[5] The KL classification was first described using AP knee radiographs. Each radiograph was assigned a grade from 0 to 4, which they identified as adding inflexibility to OA.[7] The association between the stages of knee OA and knee pain is significantly identified, suggesting that the more advanced the grade, the greater the pain.[8]

Pain-related fear is a veritably salient predictor of pain disability in a habitual pain population and is indeed more predictive than biomedical status and pain intensity.[9] It has been stated that pain-related fear is more disabling than pain itself. Pain-related fear predicts unborn disability and health status in the general population.[10]

Kinesiophobia is an inordinate, illogical, and enervating fear of physical movement and exertion performing to a feeling of vulnerability to painful injury or re-injury.[11] It's believed that the degree of movement disability isn't only related to changes in biomechanics associated with KOA, but also to the individual's perceived position of disability and their perception of pain.[12] Avoidant conduct is a state where an individual withdraws from performing conditioning similar to leisure, work, and socialising, which are associated with high levels of pain, which may aggravate the painful experience.[13] Kinesiophobia may lead to worsening of

functional capability, which in turn leads to reduced mobility and persistent pain.[14] Chronic KOA is an independent risk factor for falls.[15] A study performed in 2017 observed that nearly 50% of patients with knee OA experienced falls.[16] The high risk of falls in patients with KOA is attributable to several factors, such as knee instability, muscle weakness, and a significant decline in basic functional ability.[17] In addition, personal factors and fear of falls may predispose these individuals to falls.[18] These disabilities, mainly related to pain, are manifested by difficulty in walking, climbing stairs, performing household chores, or when sitting upright, and change is accompanied by a drop in quality of life and an important cerebral impact.[19]

In current clinical practice, fear of movement has been considered a significant factor affecting a patient's health in varied musculoskeletal conditions. The significance of the study is to find the relation between different variables and kinesiophobia in our culture, which can add value towards better treatment plans for cases with OA of the knee.

Methodology

Study design

A cross-sectional correlational study was conducted over a period of 12 months.

Study Setting and Population

The study was conducted in the outpatient department of SPB Physiotherapy College and Physiotherapy (OPDs) or orthopaedic conventions of Surat between February 2023 and March 2024. All the participants were diagnosed by consultant orthopaedic doctors. The diagnostic criteria included positive medical history and physical examination, and the presence of osteophytic changes in a plain radiograph, based on Kellgren-Lawrence's grades two to four.

Sample Size and Sampling Technique

Sample size was estimated using G*Power 3.1.9.7 ($\alpha = 0.05$, power = 0.80, effect size = 0.26 derived from a pilot study), yielding n = 87. Incorporating a 10% dropout allowance, the minimum required sample was 96. Due to patient availability, 102 participants were included via convenience sampling.

Participants and eligibility criteria

Inclusion criteria encompassed: both sexes; age 40–60 years[20]; clinical and radiographic diagnosis of KOA (KL Grade II–IV), unilateral or bilateral, lasting $\geq$ 3 months; capability to comprehend and follow instructions; literacy in Gujarati or English; and willingness to participate.

Exclusion criteria included: prior lower extremity surgery or injury; systemic inflammatory arthritis; meniscal or ligamentous knee injury; intra-articular corticosteroid injection within 6 months; co-existing neurological or musculoskeletal disorders of the lower limb; acute post-traumatic knee pain; systemic diseases (sickle cell disease, cancer, chronic kidney disease, uncontrolled diabetes[21], cardiovascular disease, CRPS); history of arthroplasty; or psychiatric disorder.

Research instruments and procedures for data collection

The following data collection tools or questionnaires were used: the Tampa scale for kinesiophobia (TSK), the Numeric Pain Rating Scale (NPRS), the Western Ontario and McMaster Universities Arthritis Index (WOMAC), the Short Form 36(SF-36) and the Fall-efficacy scale (FES).

The TSK is an instrument for measuring fear of movement; it has been verified as a pain predictor for the continuity of pain-related disability. It's a 17-point scale, scoring ranging from 1:4 (strongly disagree = 1 to strongly agree = 4). The total score of the scale ranges from 17- 68, where 17 means no kinesiophobia, 68 means severe kinesiophobia; and a score of ± 37 indicates there's kinesiophobia. The test-retest reliability of TSK ranged from r=0.64 to 0.80.[22] Concurrent validity is moderate, ranging from r(s) =0.33 to 0.59.[23]

The intensity of knee pain was assessed with NPRS using an 11-point scale. Subjects were asked to answer the following questions on a scale of 0 to 10, where 0 corresponds to no pain and 10 to the worst imaginable pain. The scale has been shown to have concurrent and predictive validity as a measure of pain intensity. Scores range from 0 to 10 points, with higher scores indicating greater pain intensity.[24] High test-retest reliability has been observed (r = 0.96).[25] For construct validity, correlations range from 0.86 to 0.95.

To assess the disability, the Western Ontario and McMaster Universities Arthritis Index (WOMAC) is extensively used in the evaluation of Hip and Knee Osteoarthritis. It is a self - administered questionnaire consisting of 24 items divided into 3 subscales (pain, stiffness, and physical function). The test questions are scored on a scale of 0-4, which corresponds to: None (0), Mild (1), Moderate (2), Severe (3), and Extreme (4). Test-retest reliability was satisfactory with ICCs of 0.86, 0.68, and 0.89, respectively.[26]

The 36-Item Short Form Survey (SF-36) is an outgrowth measure instrument that's frequently used, a well-developed, self-reported measure of health for the objective measure of the quality of life. It comprises 36 questions that cover eight disciplines of health.[27] Cronbach's alpha is greater than 0.85, reliability coefficient is greater than 0.75 for all dimensions except social functioning.[28]

Eventually, each participant's fall efficacy was assessed through the Falls Efficacy Scale (FES-I). It measures "fear of falling" or, more specifically, "concerns about falling", which are suitable for use in exploration and clinical practice. It is a 16-point questionnaire where individuals are instructed to score their concern about falling during an exertion on a 4-point Likert scale, with 1 as not concerned at all and 4 as very concerned. The point scores are added up to gain an aggregate; the higher the score, the higher the concern for falling. A total score of greater than 70 indicates that the person has a fear of falling. Test-retest reliability of the FES-I has ranged from 0.79 to 0.96 in older adult populations.[29]

All the data were collected using a pen on a separate questionnaire by the participants, entered into a word defended electronic spreadsheet, and stored in a pen drive accessible to only the authors. Ethical clearance was obtained from the Institutional Ethics Committee (IEC) of SPB Physiotherapy College, Surat. Eligible patients were screened and provided written informed consent. Demographic data were recorded on a standardised proforma. All five questionnaires were self-administered under investigator supervision during a single 20–25 minute session. Gujarati and English versions were provided per participant preference.

Statistical analysis

The data was entered using Microsoft Excel 2021, and it was analysed using Jamovi version 2.3.28. Descriptive analysis

(mean, standard deviation, frequency %, etc.) of different variables was done. The Normality of distribution was checked by the Shapiro-Wilk test. The parameters disability and domain 5 of quality of life are typically distributed. The rest of the parameters are not typically distributed. The Correlation of kinesiophobia with pain, disability, fall self-efficacy, and quality of life in patients with knee osteoarthritis was analysed by parametric Karl Pearson's correlation coefficient and non-parametric Spearman's rank correlation coefficient test, respectively, based on normality distribution of data. The level of significance was set at $\alpha = 0.05$. The confidence interval was set at 95%.

Results

Participant's demographic and gender distribution

Of 152 patients screened, 102 met eligibility criteria and were enrolled; 50 were excluded for failing to satisfy selection criteria. The mean age was 50.8 ± 5.62 years (range 41–65). The cohort comprised 30 males (29%) and 72 females (71%).

Table 1 shows the gender distribution of participants.

Table 1: **Gender Distribution of Study Participants (n = 102)**

GENDER	N	PERCENTAGE (%)
Male	30	29
Female	72	71
Total	102	100

Descriptive statistics

The mean TAMPA score was 47.8 (SD = 11.3) points, which exceeded the clinical threshold of 37, indicating the presence of kinesiophobia across the majority of participants. The mean pain intensity measured by NPRS was 4.82 (SD= 1.88) cm, reflecting moderate pain, and the mean disability measured by WOMAC was 37.6 (SD= 13.2) points, the mean of all different domains of quality of life measured by SF-36 score; and MIN and MAX of all outcomes were given (Table 2). Tests for normality of data were done by the Shapiro-Wilk test. After checking normality, parametric & non-parametric tests for normally & not normally distributed data were applied.

Table 2: Illustrates the mean, Standard Deviation, Minimum, and Maximum of the participants

VARIABLES	MEAN	STANDARD DEV.	MIN	MAX
AGE	50.8	5.62	41	65
NPRS SCORE	4.82	1.88	0.00	8.0
WOMAC SCORE	37.6	13.2	7.00	72.0
TAMPA SCORE	47.8	11.3	0.00	67.0
FES-I SCORE	36.1	10.5	21.0	62.0
SF-36 Domain 1 (physical functioning) SCORE	49.9	20.8	15.0	95.0
SF-36 Domain 2 (role limitations due to physical health) SCORE	27.5	44.8	0.00	100
SF-36 Domain 3 (role limitations due to emotional problems) SCORE	46.1	50.1	0.00	100
SF-36 Domain 4 (energy/fatigue) SCORE	50.0	20.9	10.0	95.0
SF-36 Domain 5 (emotional well-being) SCORE	56.5	21.8	4.00	96.0
SF-36 Domain 6 (social functioning) SCORE	63.0	26.4	25.0	100
SF-36 Domain 7 (pain) SCORE	52.1	13.8	22.5	77.5
SF-36 Domain 8 (general health) SCORE	55.8	22.0	10.0	95.0
SF-36 Domain 9 (health change) SCORE	45.1	26.3	0.00	75.0

A Parametric (Pearson's correlation) test for normally distributed data, i.e. WOMAC score (P= 0.385) and Domain 5 score of SF-36 (P=0.0069) was applied. Non-parametric (Spearman's rank correlation) test for not normally distributed data, i.e. NPRS score, FES-I score, and Domain 1,2,3,4,6,7,8 of SF-36 scores was applied (Table 3). The p-value of the data that was not normally distributed was 0.001.

Table 3: Illustrates Correlation Coefficient of Tampa Score-Pain, Tampa Score- Disability, Tampa Score- Fall Self-Efficacy, And Tampa Score- Quality of Life

VARIABLES	CORRELATION COEFFICIENT	P VALUE	INTERPRETATION
TAMPA Score- NPRS SCORE	0.657	< .001	Strongly positive, significant correlation

TAMPA Score-WOMAC SCORE	0.575	< .001	Moderately positive, significant correlation
TAMPA Score-FESI SCORE	0.447	< .001	Moderately positive, significant correlation
TAMPA Score-SF36 Domain 1 (physical functioning) SCORE	-0.310	0.002	Weak negative significant correlation
TAMPA Score- SF-36 Domain 2 (role limitations due to physical health) SCORE	-0.120	0.229	Very weak negative, non-significant correlation
TAMPA Score- SF-36 Domain 3 (role limitations due to emotional problems) SCORE	-0.041	0.682	Very weak negative, non-significant correlation
TAMPA Score-SF36 Domain 4 (energy/fatigue) SCORE	-0.229	0.021	Weak negative, significant correlation
TAMPA Score-SF36 Domain 5 (emotional well-being) SCORE	-0.282	0.004	Weak negative, significant correlation
TAMPA Score-SF36 Domain 6 (social functioning) SCORE	-0.201	0.043	Weak negative, significant correlation
TAMPA Score-SF36 Domain 7 (pain) SCORE	-0.072	0.473	Very weak negative, non-significant correlation
TAMPA Score-SF36 Domain 8 (general health) SCORE	-0.354	< .001	Weak negative, significant correlation
TAMPA Score-SF36 Domain 9 SCORE	-0.266	0.007	Weak negative, significant correlation

Discussion

This study explored the extent to which kinesiophobia determines the association between pain intensity, FES, disability, and QOL, and saw if kinesiophobia predicts pain intensity, FES, disability, and QOL among people with knee osteoarthritis. However, psychological factors relating to fear and fall efficacy may discourage people with OA from engaging in specified exercises and other activities of daily living.

Kinesiophobia and Pain

In this study, individuals with KOA displayed a fear of movement as measured by the Tampa Scale of Kinesiophobia. The idea that fear of pain and (re)injury may be more disabling than pain itself lowered the capability to accomplish tasks of daily living in chronic pain patients. Further, in the correlation analysis, kinesiophobia significantly predicted pain intensity levels. These findings in our study are from studies that showed a significant association between kinesiophobia and pain intensity level in different conditions with musculoskeletal pain.[30] A recent study reveals that fear of movement and disastrous studies lead an individual to painful adverse consequences and affect the neurophysiology of pain regulation. Pain-related fear and avoidance appear to be an essential point in the development of a chronic problem for at least some patients. Indeed, this line of exploration may unleash the mysterious transition from acute to chronic pain. Different authors have seen an association between fear avoidance behaviour and pain in the lower back and those with rheumatic conditions.[31] [32]However, other experimenters have set up no similar relation. These results cannot be compared to our study as the populations studied and the study methods adopted differ.[33] [34]

Kinesiophobia and Disability

Our study supports the findings that higher kinesiophobia can cause higher disability in subjects with KOA, attesting to our proposition that disability is linked to fear of movement. Muscle strength insufficiency is one of the most common clinical presentations of knee OA and may further increase the disability by leading to a reduction in force generation and increased stress on the articular shells.[35] A study mentions that the drop in quadriceps strength is around 30–50% in individuals with OA, also suggesting an imbalance of muscle strength between flexors and extensors. This imbalance of forces can bring about functional changes that accelerate common degeneration and/or cause functional disability.[36] The muscles around the knee play a vital part in producing movement and furnishing functional joint stability.[37] It concludes that impairments in strength may affect the dynamic stability at the knee during physical conditioning, which a patient might sense, leading to a lack of confidence in their knee that might spark fear beliefs over time. Muscle weakness may increase the sensation of knee joint instability that affects knee confidence, and this may be what elicits a heightened fear response to certain movements, which also drives inactivity.

Kinesiophobia and Fall Self-Efficacy

Another factor that was thought to be associated with kinesiophobia is FES. "Fall self-efficacy" refers to personal beliefs in one's capability to engage in certain activities of daily living without falling or losing balance.[38] In this study, we set up a significant, moderately positive correlation existing between kinesiophobia and fall efficacy, which suggests that the higher fear of movement (kinesiophobia), the higher fear of falls, and low fall self-efficacy in patients with KOA. It has been suggested that limitations experienced during activities of daily living are caused by low muscle strength due to kinesiophobia and, as such, cause fear of falls.[39] Ezinne Chika Ekediegwu et al., in their study, found that the patient who showed univariate analyses had moderate pain, balance limitation, and fear of movement, but low fear of falling. The bivariate analysis showed a significant positive correlation between fear of falling and imbalance, which implies that people with a higher fear of falling have greater kinesiophobia. Each additional joint affected by OA results in a decrease in physical function and an increase in psychological instability and overall disease burden.

Kinesiophobia and Quality of Life

This study hypothesised that higher kinesiophobia is related to poor quality of life. As kinesiophobia is negatively correlated with quality of life, our findings support this hypothesis and suggest that higher kinesiophobia may represent poor exertion situations in patients. As the severity of the OA increases, pain also increases, and quality of life decreases. Branstrom and Fahlstrom reported that 56% of participants with chronic musculoskeletal pain had a high degree of fear of movement, defined as a score >37 on the Swedish Version of the TSK.[40] When viewed through a fear-avoidance model lens[41], these beliefs have the eventuality to contribute towards decreased function, catastrophizing of symptoms, kinesiophobia, and a drop in one's self-efficacy for, and engagement in, physical exertion. This, in turn, may reduce an individual with KOAs' quality of life. According to this study, the association between kinesiophobia and quality of life was estimated in eight studies. The overall quality of the evidence was moderate. Our results support this statement as we identified moderate and strong evidence of associations between a greater degree of kinesiophobia and greater levels of pain, greater levels of disability, and poorer quality of life, in addition to moderate evidence that a greater degree of kinesiophobia is a predictor of the progression of disability over time.

Clinical Implications

The integration of kinesiophobia assessment using the TSK into standard KOA physiotherapy evaluation protocols is advocated. Given the significant correlations identified, treatment plans should incorporate: (i) cognitive-behavioural approaches and graded exposure therapy to reduce fear-avoidant beliefs; (ii) structured exercise programs to rebuild muscular strength, proprioception, and fall confidence; (iii) patient education to correct misconceptions about movement and joint damage; and (iv) multidisciplinary collaboration to address co-existing depression and anxiety. The traditional biomedical management of KOA should be augmented by systematic psychological screening and psychosocial intervention.

Limitations

The study participants were sampled by a non-probability (convenience) method. The sample size was limited to only 102 patients, and samples were collected from Surat City's south zone only. In the future, a larger sample size can be taken from different zones of the city. The study participants were sampled by a convenience method, affecting the generalisability of our findings. Kinesiophobia is a patient-reported outcome measure used to assess a patient's fear of movement and functional status at a specific time. However, this information is subjective and is also a limitation. Another limitation of this study was that the study included a correlation of pain, disability, fall self-efficacy, and quality of life with kinesiophobia, which are a few factors to be correlated with kinesiophobia, as it can affect more psychological factors, so correlation with other confounding variables and their impact on the outcomes can also be included in further studies. Further exploration of these relationships is warranted to identify whether interventions targeting factors such as kinesiophobia and self-efficacy improve physical activity, or whether improvements in physical activity reduce kinesiophobia and improve quality of life.

Conclusion

The present study concludes that there is a moderately positive correlation existing between kinesiophobia with pain intensity, disability, and fall self-efficacy, a moderately negative correlation exists between kinesiophobia with SF-36 Domain 1 (physical functioning) and SF-36 Domain 8 (general health), weak negative correlation exists between kinesiophobia with SF-36 Domain 4 (energy/fatigue), SF-36 Domain 5 (emotional well-being) and SF-36 Domain 9 (health change), Weak negative non-significant correlation exists between kinesiophobia with SF-36 Domain 2 (role limitations due to physical health), SF-36 Domain 3 (role limitations due to emotional problems) and SF36 Domain 7 (pain) for quality of life. In light of these results, it is recommended that clinicians supplement their assessment

with kinesiophobia in patients with knee osteoarthritis for improved decision-making during treatment.

Abbreviations

OA: Osteoarthritis; KOA: Knee Osteoarthritis; KL: Kellgren and Lawrence; QoL: Quality of life; OPD: Out Patient Department; NPRS: Numeric Pain Rating Scale; TSK: Tampa Scale for Kinesiophobia; TSK-G: Tampa Scale of Kinesiophobia Gujarati; WOMAC: Western Ontario and McMaster Universities Arthritis Index; SF-36: Short Form 36; FES: Fall-efficacy Scale; MIN: Minimum; MAX: Maximum; Df: Degree of freedom; Sig: Significance

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Competing interests

The authors declare that they have no competing interests.

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