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Kinesiophobia as a Predictor of Pain and Disability in Postmenopausal Women with Chronic Low Back Pain

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Abstract

Background: Research indicates that postmenopausal women experiencing more severe menopausal symptoms are at a greater risk of developing chronic back pain. Research has indicated that fluctuations in female sex hormones significantly influence the development and progression of various degenerative musculoskeletal conditions. Additionally, kinesiophobia, the fear of experiencing pain or reinjuring oneself during physical activity, is a critical component in understanding and addressing disability. To ensure effective treatment outcomes, it is essential to thoroughly investigate the relationship between hormonal changes and movement-related fear.

Objectives: This study aimed to investigate whether kinesiophobia can predict pain and disability levels in postmenopausal women with chronic low back pain (CLBP). Additionally, this study aimed to examine the relationships between kinesiophobia and pain as well as between kinesiophobia and disability within this specific population.

Study design: Observational study

Methodology: This study included 110 postmenopausal women with CLBP aged up to 65 years. The pain intensity range was measured using a Numerical Pain Rating Scale. Kinesiophobia was measured using the Tampa Scale of Kinesiophobia-Gujarati. Disability was measured using the Oswestry Disability Index-Gujarati. The data were analyzed using Pearson's correlation coefficient and a linear regression model.

Results: The results demonstrated a statistically significant moderate positive correlation between kinesiophobia and pain intensity ($r = 0.447$, $p < 0.05$) and between kinesiophobia and disability ($r = 0.565$, $p < 0.05$). Linear regression analysis revealed that kinesiophobia was a significant predictor of both pain and disability, explaining 19.9% of the variance in pain ($R^2 = 0.199$) and 31.9% of the variance in disability ($R^2 = 0.319$) in the study population.

Conclusion: Kinesiophobia demonstrated moderate positive correlations with pain and disability, serving as a significant predictor in postmenopausal women with chronic low back pain. These findings suggest that assessing and addressing kinesiophobia is an integral component of CLBP management in this population.

Keywords: Chronic Low Back pain, kinesiophobia, Postmenopausal women, disability

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INTRODUCTION

Low Back Pain (LBP) is one of the most common musculoskeletal disorders affecting over 70% of individuals at least once in their lifetime. Its prevalence is a significant medical, social, and economic challenge worldwide.[1]

Spinal structures, including intervertebral discs, facet joints, vertebral bodies, ligaments, and muscles are the primary anatomical sources of low back pain (LBP). However, the etiology of LBP is multifactorial and often involves musculoskeletal dysfunction and psychological factors. Psychological elements, such as fear, anxiety, depression, and perceived helplessness, can significantly contribute to the development and persistence of chronic pain and associated functional limitations.[2]

CLBP is a common musculoskeletal disorder characterized by pain and discomfort for more than 12 weeks.[3] The primary aspects of physical deterioration include discomfort in the lumbar spine, reduced muscle endurance, and neuromuscular inhibition.[4] The complexity of CLBP is further compounded by modifiable and non-modifiable risk factors. High body mass index (BMI), sex, age, and lifestyle choices, such as smoking, interact with physiological and psychological variables to influence CLBP susceptibility and severity. Of particular significance is menopausal transition in women, which is marked by hormonal fluctuations and physiological changes that can exacerbate conditions such as CLBP.[5, 6]

It has been suggested that CLBP persists for more than 7–12 weeks beyond the anticipated healing time and may lack identifiable pathological causes. Physical factors are not the only risk factors for CLBP; psychosocial factors such as anxiety, depression, stress, and monotony are also potential risk factors for CLBP.[7]

Menopause signifies the cessation of a woman's menstrual cycle and is typically diagnosed after 12 consecutive months without a period. Although it usually occurs in patients in their 40s or 50s, the average age is approximately 51. Symptoms may manifest approximately four years before the last period and persist for roughly four years afterward. However, some women may experience symptoms up to a decade before menopause, with one in ten enduring them for 12 years post-menopause. Various factors, including genetics and ovarian health, influence menopause onset.[8, 9]

Perimenopause precedes menopause and is characterized by hormonal shifts and irregular menstrual cycles, typically starting in the mid-40s. This transitional phase may span several months to years or may be bypassed together in some women. Menopause occurs when the body ceases hormone production, signified by 12 months without menstruation, marking the onset of post-menopause, a phase lasting throughout a woman's life.[10]

Postmenopausal women face increased risks of health issues such as osteoporosis and heart disease. Menopause symptoms, including hot flashes, night sweats, and changes in menstruation, are often experienced during perimenopause and menopause. Other common symptoms include insomnia, vaginal dryness, weight fluctuations, mood changes, cognitive difficulties, and alterations in the skin and hair. These symptoms collectively shape menopausal experiences, affecting women's physical and emotional well-being.[11]

Menopause increases the risk of lower back pain via multiple mechanisms. Middle age often results in weight gain that exacerbates lower back pressure and is correlated with heightened pain severity. Additionally, menopausal stress and anxiety elevate overall muscle tension, including that in the lower back. Decreased estrogen levels are associated with lumbar disc degeneration, contributing to back pain, whereas elevated cortisol levels, resulting from decreased estrogen levels, intensify muscle tension and weakness.[11, 12]

Furthermore, reduced testosterone production in menopausal women impedes maintenance of muscle strength and exacerbates lower back pain. The prevalence of musculoskeletal disorders, including CLBP, increases as women spend a significant portion of their lives in menopause,[13] the prevalence of musculoskeletal disorders, including CLBP, increases.[14] Studies highlight the vulnerability of women with a high burden of menopausal symptoms to CLBP.[15] Female sex hormones significantly influence the development and progression of degenerative musculoskeletal diseases, such as the accelerated disc degeneration observed in postmenopausal women due to estrogen deficiency.[16] Additionally, postmenopausal women exhibit narrower intervertebral disc spaces, increased spondylolisthesis, and a higher prevalence of facet joint arthritis compared to age-matched men.[17]

Kori *et al.*[18] defined Kinesiophobia in 1990 as an "irrational and unreasonable fear of pain and re-injury associated with physical movement."It

is an excessive and debilitating fear of movement stemming from vulnerability to injury or re-injury, prevalent in 50% to 70% of persistent pain cases. Kinesiophobia can develop through direct aversive experiences or social learning. It affects motor behavior, prompts adjustments to avoid pain, and influences pain perception and processing, correlating with higher pain levels.

Kinesiophobia is a significant predictor of pain disability in populations with chronic pain and is linked to chronic LBP.[19] The Tampa Scale of Kinesiophobia (TSK), comprising 17 components, subjectively assesses kinesiophobia.[20] In CLBP, where 73.3% of patients experience depression, psychosocial factors such as anxiety and stress exacerbate the condition. Fear, particularly kinesiophobia, is a notable psychological factor associated with disability in chronic pain, intensifying pain persistence, and severity.[1]

Psychological factors, such as fear, depression, anxiety, and helplessness, commonly contribute to chronic low back pain and associated disability. Fear induces avoidance of pain-inducing activities, worsens performance, and impedes recovery. This fear, integral to disability, necessitates a thorough analysis of the successful outcomes. The fear avoidance model (FAM) elucidates pain experiences and behaviors, linking pain evaluation to acquired fear and subsequent movement avoidance.[3] Excessive fear of movement or injury (kinesiophobia) and negative pain orientation (pain catastrophizing) are crucial in chronic low back pain etiology rooted in maladaptive bodily sensation interpretations. [1, 20]

This maladaptive cycle involves misinterpretation of innocuous sensations, leading to fear of pain and subsequent avoidance behaviors, including withdrawal from rewarding activities. Moreover, fear heightens body awareness and pain hypervigilance, exacerbating pain. Treatments based on this cognitive-behavioral perspective show promise, particularly in primary care settings.[1] Understanding the relevance of kinesiophobia in chronic pain across the general population remains unclear but vital for developing effective prevention strategies, particularly targeting kinesiophobia in low back pain prevention initiatives.[21]

While the existing literature recognizes the role of kinesiophobia in CLBP, little attention has been paid to its implications in postmenopausal women with CLBP. This study aimed to address this gap by examining Kinesiophobia as a predictor of pain and disability in this specific population.

METHODS AND MATERIAL

This study used an observational study design, with participants selected through convenience sampling. The sample size was calculated using G-Power 3.3.9.2 software with the following parameters: alpha (α) = 0.05, power = 0.80, and effect size = 0.4 (medium) for both variables. This resulted in a required sample size of 92 (46 for each group), which was increased to 110 to account for potential error.

Outpatients with postmenopausal chronic lower back pain (CLBP) were recruited from various physiotherapy clinics and hospitals in Surat. The inclusion criteria were as follows: (a) age between 45 and 65 years, (b) postmenopausal status for more than two years, (c) lower back pain lasting more than three months, and (d) functional independence. Exclusion criteria were as follows: (a) recent trauma, (b) structural spinal deformities, (c) neurological disorders, and (d) mental or psychiatric conditions.

This study used the following outcome measures:

(a) Pain intensity was assessed using an 11-point Numerical Pain Rating Scale (NPRS) ranging from 0 to 10.

(b) Kinesiophobia was evaluated using the Tampa Scale of Kinesiophobia (TSK), a 17-item instrument originally designed to gauge the fear of movement associated with chronic lower back pain. The TSK comprises items scored from 1 to 4 for items 1, 2, 3-7, 9-11, 13-15, and 17, with responses ranging from (1) “Strongly disagree” to (4) “Strongly agree.” Reverse scoring was applied to Items 4, 8, 12, and 16. The total score ranges from 17 to 68, where 17 indicates no kinesiophobia, 68 indicates severe kinesiophobia, and scores around ± 37 suggest kinesiophobia. A cutoff score of 37 or higher signifies high kinesiophobia, while scores below indicate low kinesiophobia. Although a total score is recommended for interpretation, medical professionals may opt to analyze results using two subscales: “activity avoidance,” reflecting the belief that activity may lead to (re)injury or increased pain, and “somatic focus,” reflecting the belief in underlying and serious medical conditions.

Bid *et al.* explored the reliability, validity, and factor analysis of the Gujarati version of the Tampa Scale for Kinesiophobia. Their findings indicated internal consistency with a Cronbach’s α of 0.639 and moderate test-retest reliability, as reflected by an intraclass correlation coefficient (ICC) of 0.696.[22]

(c) Oswestry Disability Index-Gujarati (ODI-G): The ODI-G is the prevailing questionnaire for evaluating low back pain outcomes. This self-administered tool comprises ten sections, each targeting different facets of daily activities. Responses were rated on a 0-5 scale, with 5 denoting maximal disability. The index score is computed by summing the individual section scores, dividing by the total possible score, multiplying by 100, and expressing the result as a percentage. Consequently, the unanswered questions reduced the denominator by 5. In cases of multiple responses within a question, only the highest-scoring statement was considered indicative of a disability. Completion typically requires 3.5–5 min, with scoring taking approximately 1 min. Reliability and validity assessments of the Gujarati version of the ODI were conducted by Shah *et al.*, which revealed high internal consistency (Cronbach's $\alpha = 0.96$) and excellent test-retest reliability, with an intraclass correlation coefficient (ICC) of 0.92.[23]

Ethical approval was obtained from the Institutional Ethics and Scientific Committee, and data collection involved distributing questionnaires to eligible patients, obtaining informed consent, and analyzing the data using SPSS version 20.0. Data collection took place over 10 months from July 2021 to April 2022.

Participants meeting the inclusion criteria were screened, and informed consent was obtained. Demographic data and pain history were recorded. The participants completed the TSK-G and ODI-G questionnaires. The data collection sessions lasted 15-20 minutes. The data were screened for transcription errors, normality, and homogeneity of variance. Statistical analyses were conducted using IBM SPSS Statistics version 20.0, with the significance set at $p<0.05$ (two-tailed).

The mean and standard deviation of variables such as age, weight, height, BMI, duration, NPRS, ODI Total, and Tampa Total were calculated, and the frequency was calculated for variables such as BMI, Duration of CLBP, NPRS, and ODI total. The normality of the NPRS, ODI-G, and TSK-G Total was checked using the Shapiro-Wilk test.

Table 1: Demographic and Health Data (N=110)

Variables	Mean	Std. Deviation
Age (in years)	52.11	7.616
Weight (Kg)	64.20	8.840
Height (cm)	158.74	5.302
BMI	25.55	3.822
Duration of Pain (in months)	33.28	40.887
NPRS	5.12	2.141
ODI Total	36.045	12.408
TSK Total	36.889	7.463

According to our findings regarding BMI distribution among the participants, 2 individuals were categorized as underweight, 51 individuals fell within the normal weight range, 42 individuals were classified as overweight, 15 individuals were deemed obese, and no participants were classified as morbidly obese.

Our findings showed the distribution of the duration of chronic low back pain (CLBP) among the 110 participants. The majority of participants (59) reported experiencing low back pain for 3–12 months. Additionally, 24 participants had pain lasting between 12 and 48 months, 20 participants reported pain lasting 48 to 96 months, and seven participants experienced pain persisting for 96 to 240 months.Our findings indicate that 2% of participants had pain scores of 1, while 2% scored 2. A total of 5% had a pain score of 3, 7% scored 4, 9% scored 5, 11% scored 6, 13% scored 7, 15% scored 8, 16% scored 9, and the highest percentage (18%) scored 10.

In the ODI-G, scores ranging from 0 to 20 indicate minimal disability, whereas scores from 21 to 40 indicate moderate disability. Severe disability was represented by scores falling between 41 and 60, and a score range of 61 to 80 indicated crippling. Our analysis of ODI-G data revealed that 13% of the participants exhibited minimal disability, 49% displayed moderate disability, 36% showed severe disability, and 2% were categorized as crippled.

Pearson's correlation coefficient, which is based on covariance, was used to assess the association between the two continuous variables. In this study, we examined the relationship among kinesiophobia, pain, and disability.[24]

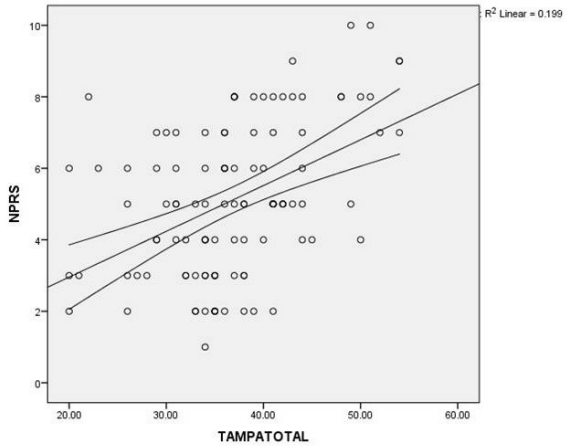
Table 2: Values for interpretation of Pearson's correlation

Pearson's correlation coefficient	Interpretation
0.90 to 1.00 (-0.90 to -1.00)	Very strong positive (negative) correlation
0.70 to 0.89 (-0.70 to -0.89)	Strong positive (negative) correlation
0.40 to 0.69 (-0.40 to -0.69)	Moderate positive (negative) correlation
0.10 to 0.39 (-0.10 to -0.39)	Weak positive (negative) correlation
0.00 to 0.10 (-0.00 to -0.10)	Negligible correlation

Table 3: Pearson's correlation coefficient (r) of TSK-G with NPRS and ODI-G

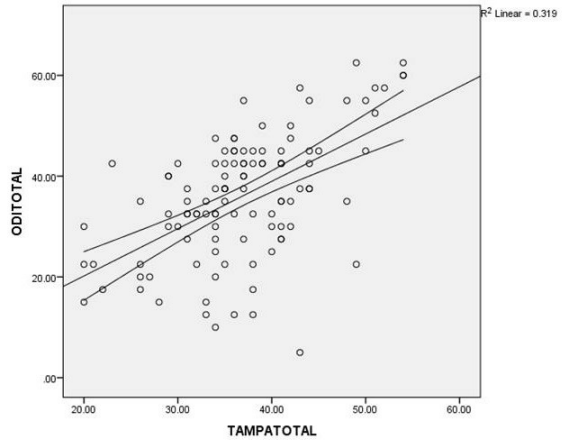
	Variables	TSK-G
NPRS	Pearson's correlation (r)	0.447**
	Sig. (2-tailed) (p)	0.000
ODI-G	Pearson's correlation (r)	0.565**
	Sig.(2 tailed) (p)	0.000

**. Correlation is significant at the 0.01 level (2-tailed)



Graph 1: Scatter Plot of TSK-G Total vs. NPRS Scores

The Graph 7.1 scatter plot depicts a moderately positive linear relationship between TSK-G-TOTAL and NPRS, reflecting a significant positive correlation coefficient of 0.447.



Graph 2: Scatter Plot of TSK-G Total vs. ODI-G Scores

The Graph 2 scatter plot depicts a moderate-to-strong positive linear relationship between TSK-G and ODI-G-TOTAL, reflecting a significant positive correlation coefficient of 0.565.

Table 2 outlines the interpretation of Pearson's correlation coefficients, indicating the strength of the correlation between variables. Table 3 presents the correlation coefficients (r) of TSK-G with the NPRS and ODI-G, along with their significance levels (p-values).The correlation coefficients indicated that a) TSK-G exhibited a moderate positive correlation with the pain score (NPRS), with a highly significant p-value. b) TSK-G demonstrated a moderate positive correlation with the disability score (ODI-G), with a highly significant p-value.

Linear regression analysis was used to assess the predictive capacity of kinesiophobia for pain and disability. The model utilized TSK-G as the independent variable and NPRS and ODI-G as the dependent variables.

Table 4: Regression analysis of TSK-G with ODI-G and NPRS

Dependent variable	R Square	Beta	Sig.
ODI-G	0.319	0.939	>0.001
NPRS	0.199	0.128	>0.001

The regression model revealed the following: a) For the ODI-G, the R Square value was 0.319, indicating that kinesiophobia could explain 31.9% of the variability in disability, signifying high significance. b) For the NPRS, the R Square value was 0.199, suggesting that kinesiophobia could explain 19.9% of the variability in pain, which also demonstrated high significance.

DISCUSSION

Kinesiophobia plays a pivotal role in low back pain (LBP) due to the fear of pain and potential injury, leading individuals to limit their movements. Various factors contribute to the development of Kinesiophobia. This study enriches the existing body of research on CLBP by examining the association between kinesiophobia, pain, and disability, with a particular focus on its predictive value in postmenopausal women with CLBP.

Correlation of Kinesiophobia with Pain

This study explored the correlation between kinesiophobia and pain in postmenopausal women with CLBP. Our findings revealed a moderate positive correlation (r=0.447, p<0.001) between the TSK-G and NPRS scores, indicating that kinesiophobia is associated with pain intensity. This aligns with previous research by Larsson *et al.*[25], who also observed a significant association between high pain intensity and kinesiophobia. However, contrary to our results, some studies, such as those by Picavet *et al.*[1] and Luque-Suarez *et al.*[19], suggest that while kinesiophobia may predict low back pain severity and disability, it does not

necessarily influence changes in pain intensity over time. Rogério Sarmento Antunes[1] *et al.*[26] reported that individuals with low back pain and depression reported more severe pain, heightened fear of movement, and reduced quality of life. They also found that individuals with lower back pain and depression reported more severe pain, heightened fear of movement, and reduced quality of life. Furthermore, studies by Walton *et al.* [27] found significant correlations between kinesiophobia and pain intensity in different musculoskeletal conditions, supporting our findings. Overall, our study contributes to the growing body of evidence that indicates a moderate correlation between kinesiophobia and pain in postmenopausal women with CLBP.

Correlation of Kinesiophobia with Disability

This study examined the relationship between kinesiophobia and disability in postmenopausal women with CLBP. The results showed a moderate positive correlation ($r = 0.517$, $p = 0.001$), suggesting that higher levels of kinesiophobia were linked to greater disability. Furthermore, regression analysis demonstrated that kinesiophobia can explain 31.9% of the variance in disability scores, highlighting its significance in predicting disability among postmenopausal women with CLBP.

Earlier research has also indicated a similar association between kinesiophobia and CLBP disability. Syamala Buragadda *et al.* [28] reported that CLBP-related disability is linked to fear-avoidance beliefs, emphasizing the importance of addressing such beliefs in disability management.

Suzanne G. Leveille *et al.*[29] found a strong correlation between back pain and functional difficulties in older women, supporting our findings. Additionally, studies by Alejandro Luque-Suarez *et al.* [19] and Chung *et al.* (2) provided evidence for a correlation between kinesiophobia and disability in CLBP, further corroborating our results.

Moreover, Mishra *et al.* [30] demonstrated that kinesiophobia has a moderate to severe impact on disability, whereas Yahia *et al.* [31] reported a high positive correlation between kinesiophobia and disability scores. Telci *et al.*[32]highlighted the detrimental effects of CLBP on physical performance and the exacerbation of fear avoidance behavior and depressive symptoms in elderly adults. Marina de Góes Salvetti *et al.*[33] identified modifiable factors associated with disability in CLBP patients, emphasizing the importance of interventions targeting these factors. Our study provides evidence for a significant association between kinesiophobia and disability in postmenopausal women with CLBP.

This study had several limitations that warrant consideration. One potential limitation is the possibility of response bias, wherein participants may have provided answers that they believed would please the researcher, potentially affecting the accuracy of the collected data.

This study offers several recommendations for future research in this area. First, future studies should diversify the sample population beyond Surat to enhance generalizability. Additionally, incorporating algometry as an objective measure of pain could provide valuable insight into pain perception.

CONCLUSION

Our study shows a moderate positive correlation between kinesiophobia and pain and disability in postmenopausal women with chronic low back pain (CLBP). Kinesiophobia also serves as a reliable predictor of both pain and disability in this group. These results emphasize the importance of assessing and addressing kinesiophobia in the management of CLBP among postmenopausal women.

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