



Chronic knee osteoarthritis: Relationships of body mass index and selected psychosocial factors among Nigerians

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Background: Knee Osteoarthritis is the most commonly affected joint among Africans. There is a shred of preliminary evidence that a high body mass index (BMI) is associated with high kinesiophobia. Little is known about the relationships of psychosocial factors such as Kinesiophobia, Pain Catastrophizing (PC), Self-Efficacy (SE), and BMI among Nigerians with knee OA.

Objective: This study aims to determine the relationships between BMI and selected psychosocial factors (kinesiophobia, pain catastrophizing, and self-efficacy) among individuals with knee OA in Nigeria.

Methods: Seventy-seven consecutively sampled patients diagnosed with knee OA from three selected public hospitals in Enugu, South-East Nigeria, participated in this cross-sectional survey. Brief Fear of Movement Scale for Osteoarthritis (BFMSO), Pain Catastrophizing Scale (PCS), and Arthritis Self-Efficacy Scale-8 item

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(ASES-8 item) were used to assess Kinesiophobia, PC, and SE, respectively. Also, a stadiometer and weighing scale were used to determine height and weight respectively. Data were analyzed using Pearson's correlation coefficient at $p < 0.05$ and multiple linear regression.

Results: Participants were aged 58.04 ± 12.46 years. Female participants had a higher BMI (31.51 ± 6.82) than the males (26.86 ± 3.03). The mean scores for BMI of the right knee, left knee, and bilateral knees were 29.00 ± 5.35 , 24.78 ± 3.74 , and 33.02 ± 6.80 , respectively. Significant positive correlations were found between BMI and PC ($r = 0.35$) whereas significant negative correlations existed between BMI and SE ($r = -0.30$). Significant predictive markers of BMI were PC ($\beta = 0.21$) and SE ($\beta = -0.89$).

Conclusion: Body mass index, PC, and SE correlate significantly in individuals with knee OA. The results call for the routine integration of psychologically-informed physiotherapy practice in the management of knee OA.

Keywords: Body mass index; kinesiophobia; pain catastrophizing.

Introduction

Osteoarthritis (OA) of the knee causes the greatest burden to the adult population through disability which is the resultant effect of joint pain and stiffness.¹ Accordingly, it is the most common form of OA among Africans.¹ In Nigeria, it accounts for 65–78% of cases in hospitals.^{2–4} Epidemiological studies have revealed that there are both endogenous or systemic (such as age, gender and genetic) and exogenous or local (for example obesity, microtrauma, knee joint alignment, repetitive use of joints, bone density, muscle weakness, and joint laxity play) risk factors for knee OA.^{5–7} One of the strongest and best-established modifiable exogenous potent risk factors is also included but is not limited to overweight and obesity.^{5,8,9}

The literature suggested that the relationship between obesity {Body Mass Index (BMI) > 30 } and knee OA is stronger than with hip OA.⁷ The Chingford study showed that for every two-unit increase in BMI (approximately 5 kg), the odds ratio for developing radiographic knee OA increased by 1.36.^{10,35} A strong association exists between high BMI and the incidence of knee OA. Higher BMI values (greater or equal to 30 kg/m^2) negatively impact the musculoskeletal system as mechanical stress and inflammation increase in joints and body tissues result in pain and limitation to physical activities.^{11–13} Furthermore, these BMI values are associated with greater adverse effects such as a higher risk of several negative psychological alterations, especially, among obese women; probably due to increased societal pressures on women to be thin.¹⁴ These psychological discomforts include but are not limited to stigma, fear

of falling, low self-efficacy pain catastrophizing (PC) and fear of movement particularly due to joint pain.^{13,15–17}

Preliminary evidence reveals that high BMI (morbid obesity) is associated with high kinesiophobia.^{13,34} More so, higher PC relates to lower SE for pain control, physical function emotional symptoms as mediators among individuals with high BMI values (between 25 kg/m^2 and 42 kg/m^2).¹⁸ It has been reported that Nigerians, generally have low physical activity levels.^{19–21} We, therefore, hypothesized that owing to knee OA and the resultant avoidance of physical activity, disability, and worsening of pain,¹³ there would be lower levels of psychological health, especially among obese individuals with knee OA in Nigeria. Published studies on the relationships between BMI and kinesiophobia, pain catastrophizing, SE among individuals with knee OA are limited particularly in Nigeria. This study was, therefore, designed to investigate the relationships between BMI and selected psychosocial factors (kinesiophobia, pain catastrophizing, and self-efficacy) among patients diagnosed with OA of the knee in Nigeria.

Method

Ethical approval was sought and obtained from the University of Ibadan/University College Hospital Health Research Ethics Committee as well as the selected hospitals (University of Nigeria Teaching Hospital, Parklane and National Orthopaedic hospitals) for data collection before the commencement of the study.

Participants

Consecutive sampling technique was used to recruit 77 patients who fulfilled all the inclusion criteria. After recruitment, all patients consented to participate in the study and therefore, completed demographic/clinical data forms and the selected instruments. They were Igbo-literate or English-literate patients with chronic clinical and radiological features of only knee OA using the American College of Rheumatology (ACR) Clinical Classification Criteria for OA of the knee. Patients with prior knee surgery, acute knee trauma, and any other form of arthritis or intra-articular corticosteroid injection to the knee(s) three weeks before recruitment for the study were excluded from the study. Each participant's height (in meters) and weight (in kilogram) were measured to determine their BMI [m/kg^2].

Measures

- Kinesiophobia

The **Brief Fear of Movement Scale for Osteoarthritis (BFMSO)** is an adapted version of the Tampa Scale of Kinesiophobia (TSK) for patients with OA which consists of six items. The scale has sound psychometric properties including convergent validity.²² Possible scores range from 6 to 24, with higher scores (≥ 15) representing a high degree of kinesiophobia.²³

- Pain Catastrophizing

The **Pain Catastrophizing Scale (PCS)** was used as a measure of pain catastrophizing. The PCS is a 13-item self-report measure with three subscales of magnification, rumination, and helplessness.²⁴ The PCS has excellent psychometric properties, including adequate to excellent internal consistency,^{25–27} test–retest reliability, good convergent validity, and constructs validity. Total score ranges from 0 to 52 with scores 30 and above representing a clinically relevant level of catastrophizing.²⁵

- Self-efficacy

SE was assessed with **Arthritis Self-efficacy Scale-8 Item (ASES-8)**, the shortened form of the original ASES 20-item which consists of eight items with no subscales. The total score is the mean of the eight items with higher scores denoting greater SE.²⁸ The scale demonstrates high internal

consistency²⁸ and positively correlates with other measures of self-rated health status and physical performance but negatively correlates with arthritis symptoms (pain, fatigue, and stiffness).²⁸

- Anthropometric characteristics

Each participant's height was measured in centimeters (converted to meters) and weight was measured without shoes to the nearest 1 kg using a weighing scale balance (electronic digital) with a height meter (Zt-120). BMI was calculated from these measures using the formula: $\text{BMI} (\text{kg}/\text{m}^2) = \text{weight} (\text{kg})/(\text{height} (\text{m}))^2$.

- Demographic characteristics

Age, gender and joint affected were assessed using a demographic questionnaire.

Data analysis

Categorical variables (gender and joint affected) were represented using counts and proportions (%). Descriptive statistics (mean and SD) were calculated for selected psychosocial variables (kinesiophobia, pain catastrophizing, and self-efficacy) and BMI for each category. Pearson's correlation coefficient was used to determine the correlation between the scores of each selected psychosocial variable and BMI. The closer the coefficient is to zero (from either + or -), the less strong the relationship and vice versa.²⁹ From this study, the correlation coefficient (r) values for most of the variables were weak (very close to zero: 0.20–0.39). The relationships would have been stronger if the correlation coefficient were closer to one. Multiple linear regression analysis was used to determine the effect of each of the independent/predictor variables (selected psychosocial factors) on the dependent (outcome) variable (BMI). The level of significance was set at 0.05.

Results

Summary of participant's characteristics

Seventy-seven (15 males, 62 females) consecutively sampled patients with knee OA (mean age: 58.04 ± 12.46 years) participated in this study. The mean scores of Kinesiophobia, Pain Catastrophizing, and SE of all the participants were 14.05 ± 3.61 , 16.43 ± 9.99 , and 7.53 ± 1.87 , respectively. Overall

Table 1. Characteristics of participants and mean scores of body mass index, kinesiophobia, pain catastrophizing, and SE across descriptive variables.

Variables	Categories	Mean scores					
		Frequency	Percentage (%)	BMI (kg/m ²)	K	PC	SE
Sex	Male	15	19.5	26.86 ± 3.03	12.53 ± 3.58	13.13 ± 12.73	7.40 ± 1.90
	Female	62	80.5	31.51 ± 6.82	14.42 ± 3.55	17.23 ± 9.16	7.56 ± 1.88
Joint affected	Right only	32	41.6	29.00 ± 5.35	13.19 ± 3.72	18.34 ± 10.35	7.87 ± 1.72
	Left only	7	9.1	24.78 ± 3.74	15.29 ± 3.35	8.00 ± 5.54	8.36 ± 1.01
	Right and left	38	49.4	33.02 ± 6.80	14.55 ± 3.49	16.37 ± 9.68	7.09 ± 2.03
Total		77	100	30.60 ± 6.51	14.05 ± 3.61	16.43 ± 9.99	7.53 ± 1.87

Table 2. Relationship among body mass index, kinesiophobia, pain catastrophizing, and self-efficacy: Pearson's correlation matrix.

Variables	Correlation coefficients				
	Body mass index	Kinesiophobia	Pain catastrophizing	Self-efficacy	
Body mass index	r	1	0.06	0.35*	-0.30*
	p	0.60	0.00	0.01	
Kinesiophobia	r	0.06	1	0.28*	-0.01
	p	0.60	0.01	0.92	
Pain catastrophizing	r	0.35*	0.28*	1	-0.28*
	p	0.00	0.01		0.01
Self-efficacy	r	-0.30*	-0.01	-0.28*	1
	p	0.01	0.92	0.01	

Notes: r - Correlation coefficient, p - Probability of error, and * - Significant Correlation at $p < 0.05$.

Table 3. Variables associated with BMI in the multivariate analyses.

Outcome variables	Predictor variables	β	Standard error	t	p	F	R^2
Body mass index	Kinesiophobia	-0.08	-0.05	-0.42	0.68	5.69 ($p < 0.05$)	0.19
	Pain catastrophizing	0.21*	0.33	2.96	0.00		
	Self-efficacy	-0.89*	0.37	-2.40	0.02		

Notes: β = Contribution of each variable (Unstandardized coefficient for applied studies), R^2 = Quality of the fitness of the models; coefficient of determination, F = Joint significance of all the variables in the model, p = Probability of error, and * = Significant predictor variables at $p < 0.05$.

average BMI was $30.60 \pm 6.51 \text{ kg/m}^2$. For joint affection, the mean BMI of the right knee only, left knee and bilateral knee were $29.00 \pm 5.35 \text{ kg/m}^2$, $24.78 \pm 3.74 \text{ kg/m}^2$, $33.02 \pm 6.80 \text{ kg/m}^2$, respectively as shown in Table 1. The BMI of female participants ($31.51 \pm 6.82 \text{ kg/m}^2$) was more than the male ($26.86 \pm 3.03 \text{ kg/m}^2$). Furthermore, women reported higher scores on kinesiophobia

(14.42 ± 3.55), PC (17.23 ± 9.16), and SE (7.56 ± 1.88) than the males (12.53 ± 3.58 , 13.13 ± 12.73 , 7.40 ± 1.90 , respectively). Significant positive correlations were found between BMI and PC ($r = 0.35$) whereas significant negative correlations existed between BMI and SE ($r = -0.30$) (Table 2). Significant predictive markers of BMI were PC ($\beta = 0.21$) and SE ($\beta = -0.89$) (Table 3).

Discussions

This study appears to be the first to examine the relationship between BMI and selected psychosocial factors among individuals with knee OA in Nigeria. The mean age (58.04 ± 12.46 years) of the participants from this study supports the definition of OA by the American College of Rheumatology as a disease that most often affects middle-aged to elderly people.³⁰ One of the most interesting findings of this study was that the BMI of female participants appeared higher (class I obesity) than that of the male participants (overweight), even though both genders had BMI values above the normal range. On a general note, the average BMI of all the participants was high (30.60 ± 6.51); this reveals that Nigerians with knee OA (particularly middle-aged) appear to be obese. More so, the mean scores of the selected psychosocial factors were higher among women than men. This is not consistent with previous studies whereby no difference in PC was found between men and women with knee OA and on kinesiophobia, men reported higher scores than women.^{31,32} The mean scores of both kinesiophobia and PC (14.05 ± 3.61 , 16.43 ± 9.99 , respectively) of the participants appeared clinically insignificant. However, the mean BMI score for bilateral knee OA was observed to be higher (mildly obese) than unilateral OA. A significant positive correlation was found between BMI and PC ($r = 0.35$, $p \leq 0.01$) whereas a significant negative correlation existed between BMI and SE ($r = -0.30$, $p \leq 0.01$). This supports the findings from the study of Somers and colleagues³³ that both BMI and PC are directly proportional. An insignificant correlation was found between kinesiophobia and BMI ($r = 0.06$, $p \leq 0.60$). This suggests that the high mean BMI value of the participants was not significant enough to lead to kinesiophobia. Taking together, these findings suggest that BMI though relates statistically significant with pain catastrophizing, but in a clinically insignificant manner. Also, high BMI in knee OA has a negative influence on self-efficacy.

Our findings regarding the relationship between BMI and kinesiophobia, pain catastrophizing, SE among patients with knee OA have two important clinical implications. First, they suggest that clinicians working with patients with knee OA should be more aware of their BMI. It could be useful, for example, to include an assessment of kinesiophobia, pain catastrophizing, and SE in the clinical

evaluation of patients with high BMI. Secondly, identifying patients with increased BMI who are prone to these psychosocial factors could lead to timelier referral of patients for interventions designed to reduce both BMI and psychosocial factors. BMI is a modifiable risk factor of knee OA and reductions in this could potentially decrease PC and enhance the SE of individuals with knee OA. It would be pertinent to study the relationship between kinesiophobia and BMI in classes II and III obese individuals with knee OA, as no significant relationship existed between the two variables in this study, that is, among overweight and class I obese individuals. Studies on the relationship between BMI and other psychosocial factors are needed.

Summary

This study appears to be the first to demonstrate significant relationships amongst BMI, PC and SE in Nigerians with knee OA. BMI has psychosocial effects, especially, among individuals with knee OA in Nigeria. The predominance of knee OA and increased BMI value among Nigerian women with knee OA calls for a more detailed and adequate assessment and management. Our findings regarding the relationships between BMI and pain catastrophizing, and SE raises the intriguing possibility that robust assessment of BMI and these psychosocial factors in the management of knee OA could lead to better diagnosis with resultant optimal care. In addition to this, Psychologically-Informed Physiotherapy Practice (PIPP) would be ideal in the management of patients with knee OA who have an overlay of these psychosocial factors.

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Ethical Approval

University of Ibadan/University College Hospital Health Research Ethics Committee (UI/EC/15/0059).

Conflict of Interest

None declared.

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Author Contributions

AO conceptualized the idea, supervised the study, and reviewed the manuscript.

EE collected and coded the data, took part in data analysis, and prepared the manuscript. EE was also involved in the conceptualisation.

END analyzed the data and reviewed the manuscript.

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