Influence of Kinesiophobia on Functional Mobility and Quality of Life among Individuals with Chronic Knee Osteoarthritis in Kano, Nigeria.

Bello, B[1]., Fatima, I., Jajimaji[1]., *[1]Mustapha Ibrahim Usman[2].

[1]*Department of Physiotherapy, Faculty of Allied Health Sciences, Bayero University, Kano, Nigeria.*
[2]*Orthopaedic Unit, Department of Surgery, Bayero University Kano, Nigeria.*

Abstract

Objective: *This study investigated the influence of kinesiophobia on functional mobility and quality of life (QoL) among individuals with chronic knee osteoarthritis (OA) in Kano, Nigeria.* ***Methods:*** *This cross-sectional design study involved 86 participants comprising 65 females (75.3%) and 21 males (24.7%) with diagnosed knee OA. Bio-demographic data of participants, weight, and height were measured and recorded. Tampa Scale of Kinesiophobia (TSK 11), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Short-Form Health Survey (SF- 12) to measure fear of movement, functional ability, and QoL respectively were used.* ***Results:*** *The mean age and BMI of the participants were 56.25 ± 8.92 years and 33.17 ± 5.13 kg/m^2 respectively, while the mean OA duration was 20.85 ± 16.5 months. The results of this study showed that participants had a high mean kinesiophobia score of 38.21 ± 5.25 with poor overall functional mobility (52.28 ± 12.0) and quality of life scores (37.49 ± 11.8). The overall QoL and functional mobility scores had a negative relationship with kinesiophobia ($r = -0.377$, $p = 0.000$; $r = -0.504$, $p = 0.0514$) respectively. The result also showed a significant negative relationship between kinesiophobia and physical and mental components of QoL ($r = -0.217$, $p = 0.045$, $r = -0.252$, $p = 0.019$) respectively.* ***Conclusion:*** *This study concluded that kinesiophobia negatively affects the functional ability and QoL of individuals with chronic knee osteoarthritis. Thus, clinicians should use treatment strategies that will help reduce fear among knee OA persons during rehabilitation.*

Keywords: *Knee osteoarthritis, Kinesiophobia, Functional mobility, Quality of Life*

Introduction:

Osteoarthritis (OA) is a heterogeneous group of conditions that leads to joint signs and symptoms which are associated with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins (Felson, 2013). Knee OA is the most common type of OA affecting about 6% of all adults in the world (Michael, Schlüter-Brust, & Eysel, 2010). The World Health Organization (WHO, 2003) Scientific Group on Rheumatic Diseases estimates that 10% of the world's population who are 60 years or older have significant clinical problems that can be attributed to OA. The prevalence of knee OA is 33.1% in rural South Africa (Usenbo, Kramer, Young, & Musekiwa, 2015). One out of every five adults aged ≥40 years in a

[1] ***Correspondent Author:*** Dr Mustapha Ibrahim Usman. Orthopaedic Unit, Department of Surgery, Bayero University Kano, Nigeria. Email: mustyibro90@gmail.com.

Nigerian south-western rural community has symptomatic knee OA, with a female preponderance in the ratio of 1.2:1 (Akinpelu, Alonge, Adekanla, & Odole, 2009).

Knee OA affects all structures within a joint, thereby leading to a series of changes that involves loss of hyaline cartilage, bony remodeling with the formation of osteophytes, intraarticular capsule stretching, and weakness of periarticular muscles. Synovitis and ligamentous laxity may also be present, and lesions in the bone marrow may also develop representing trauma to bone (Michael *et al*., 2010). Knee OA is the greatest contributor to the impairment of functional ability, leading to chronic disability among patients suffering from the disease (Michael *et al*., 2010)a.

Pain, muscle weakness, and decreased joint range of motion associated with chronic knee OA cause difficulty in rising from the chair, walking, and climbing stairs. These may lead to mobility impairment and difficulty in carrying out daily living activities thereby leading to social isolation (Al-Johani *et al*., 2014). Mobility impairment can affect the patient socially, psychologically, and financially. This may impose a burden on both the patient and the caregivers.

Kinesiophobia also known as fear of movement was originally defined by Vlaeyen and Linton (2000) as a state where an individual experiences excessive, irrational, and debilitating fear of physical movement and activity as a result of a feeling of susceptibility to painful injury or re-injury. Based on the fear-avoidance model, pain perception leads to pain catastrophizing which may lead to the development of pain-related fear and anxiety, in turn leading to avoidance behavior. This process may defeat the overall goal of rehabilitation and management of persons with chronic knee OA.

Functional limitations in terms of walking, stair climbing, and squatting are common complaints of chronic knee OA persons that greatly interfere with activities of daily living and leisure activities which may consequently lead to reduced quality of life (QoL). A previous study by Alkhawajah and Alshami (2019) has shown that individuals with knee OA have more reduced health-related QoL as compared with other chronic diseases and age-matched normal persons with musculoskeletal disorders.

Physical activity (PA) among individuals with OA has been shown to produce beneficial effects (Mesci, Icagasioglu, Mesci, & Turgut, 2015). However, many people suffering from OA still do not want to participate in PA due to fear, that movement may exacerbate their symptoms. Kinesiophobia seems to be relative to disease conditions and the population of persons involved. Literature on kinesiophobia and OA among the Nigerian population is scarce. This study is therefore aimed at investigating the influence of kinesiophobia on functional mobility and QoL among patients with knee OA in a Nigerian population and the extent of the influence of these gait parameters and kinesiophobia on functional mobility and QoL of patients with knee OA.

Methods

This cross-sectional design study involved 86 participants with chronic knee OA recruited via purposive sampling. Participants were included in the study if they were

independently ambulant and within stages 2 to 4 of Kellgren and Lawrence's classification of knee OA severity (Kohn, Sassoon, & Fernando, 2016). Individuals who are ambulant with walking aids or those who have had any knee surgeries were excluded from the study.

Ethical approval was sought and received from the Health Research and Ethics Committee, Kano State Ministry of Health with ID NO: MOH/Off/797/I/1/418. Consent was sought and obtained from persons with knee OA, willing to participate in the study after being informed of the nature of the study. Participants were screened individually on their clinic days for inclusion and exclusion criteria before any data were collected. After collecting bio-demographic data of participants, they were instructed to remove any heavy outer garments, shoes, and empty pockets or bags. Participants' weights and heights were measured and recorded using an electronic weighing scale and a stadiometer. The weight was divided by the height squared to obtain the body mass index (BMI).
Tampa Scale of Kinesiophobia (TSK 11), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Short-Form Health Survey (SF- 12) to measure fear of movement, functional ability, and QoL respectively. Participants were asked to fill out all the questionnaires at home and return them during their next visit to the clinic so as not to disturb their normal clinic routine.

Kinesiophobia
The Tampa Scale of Kinesiophobia (TSK) containing 17 items and scored by 4 points was used to measure the kinesiophobia level of participants. The scale is said to be very valid and reliable with tests from different languages on musculoskeletal pain conditions (Rusu, Kreddig, Hallner, Hülsebusch, & Hasenbring, 2014).

Functional Mobility
WOMAC was used to measure the functional ability of participants in this study. The WOMAC scale has three subscales: pain, stiffness, and physical function. The WOMAC scale is said to be a valid, reliable, and responsive instrument used to measure functional mobility among knee and hip OA patients (Mesci *et al*., 2015). In this study, the WOMAC scale was used to assess the functional mobility score, with a higher score indicating a poorer function.

Quality of Life
SF-12 is a multipurpose generic measure of the health status of an individual. It is a much shorter and more valid alternative for SF-36. The SF-12 has been known to be a psychometrically sound tool for the assessment of QoL in OA and RA patients (Gandhi *et al*., 2001). It was therefore used to assess the QoL of the participants in this study.

Sample Size
Sample size calculation formula for cross-sectional study, continuous variables (Fisher *et alet al* 1998) was used to determine the appropriate sample size for this study. $N=z^2pqD/d^2$, Where N=Sample size, p=0.06 out of every 100 adults in the world have

significant knee OA (Micheal *et alet al,* 2010). z=1.96, D=desired effect size =1, d=degree of accuracy (level of significance) which is set as 0.05. A minimum of 86 participants were recruited for the study.

Data analysis procedure

Descriptive statistics of mean, frequency, and standard deviation were used to describe the participants' socio-demographic characteristics. Pearson's correlation coefficient was used to determine the relationship between gait parameters, kinesiophobia, functional mobility, and QoL. Hierarchical multiple regression (sequential regression) was used to adjust for age, sex, and disease duration and determine if gait parameters, kinesiophobia, and functional mobility influence QoL. Stride length was not normally distributed, so log transformation to the base of 10 was done. SPSS version 25 was used to analyze the data. The level of significance, p-value, was taken as less than or equal to 0.05.

Results

Physical characteristics of the participants

A total of 86 participants comprising 65 (75.3%) females and 21 (24.7%) males with an established diagnosis of knee OA participated in the study. The mean age and body mass index of the participants were 56.25±8.92 years and 33.17±5.13 kg/m^2 respectively, while the mean OA duration of the participants was 20.85±16.5 months. The participants have a high mean kinesiophobia score of 31.21±5.25. The participants in this study showed moderate pain intensity and stiffness levels of 10.74±3.00 and 4.160±1.52, respectively. The WOMAC physical function sub-scale was 37.86±9.23 with overall functional mobility of 52.28±12.0. The participants also demonstrated a poor level of QoL on both physical (-19.24±8.17) and mental (-18.25±10.6) components of QoL, with an overall QoL of -37.49 ± 11.8. See Table 1.

Relationship between kinesiophobia, functional mobility, and QoL.

The result showed a significant negative relationship between kinesiophobia and the physical component of QoL (r = -0.217, p = 0.045). The mental component of QoL has a strong negative relationship with kinesiophobia (r = -0.252, p = 0.019), but has no significant relationship with functional mobility (r = -0.102, p = 0.504). The overall QoL has a strong negative relationship with kinesiophobia (r = -0.377, p = 0.000) where r is the coefficient of correlation. See Table 2.

Influence of Kinesiophobia and Functional Mobility

Hierarchical multiple regression was used to determine the influence of kinesiophobia and functional mobility on QoL among individuals with knee OA. According to the results in this study, OA duration (β= -0.284, p = 0.010) and sex (β= -0.262, p= 0.019) negatively influenced QoL, while age (β= 0.051, p= 0.630) have no statistically significant influence on QoL. The non-adjusted and adjusted R-squared values for model-1 are 0.120 and 0.076 respectively, indicating a very low percentage of variability. After controlling for age, sex, and disease duration, functional mobility (pain β= -0.916, p= 0.000; stiffness β= -0.785, p = 0.000; overall functional mobility β = 1.929, p= 0.000) and kinesiophobia (β= -0.357, p= 0.009) were statistically significant, with pain and stiffness contributing the highest influence on QoL compared

to kinesiophobia. The model-2 nonadjusted and adjusted R-squared values are 0.718 and 0.671 respectively, indicating a high percentage of variance as shown in Table 3.

Discussion

Most of the participants in this study were females, as reported in previous studies (Sarzi-Puttini *et al*., 2005; Zhang & Jordan, 2010). The high number of female participants could be due to peripheral joint laxity during pregnancy and reduction in estrogen levels at a later age, as estrogen receptors have been identified in the cartilage and influence chondrocytes metabolism (Richette, Corvol, & Bardin, 2003). The mean age of participants in this study falls under the middle age category indicating that knee OA affects both elderly and middle-aged individuals in Nigeria.

Previous studies have shown that knee OA is strongly correlated with obesity (Jiang *et al*., 2012; King, March, & Anandacoomarasamy, 2013) as similarly reported in this study where the mean BMI of the participants falls under the obesity category. The male participants in this study have slightly higher BMI scores. This could be due to decreased mobility because of the longer duration of the disease among males compared to their female counterparts.

The participants in this study have a high mean kinesiophobia score. This is similar to the findings of Sinikallio, Helminen, Valjakka, Väisänen-Rouvali, and Arokoski (2014) which shows that patients with knee OA have associated kinesiophobia which may lead to increased immobility and disability. The mean WOMAC physical function scores of the participants are also slightly high indicating poorer functional mobility which also, is likely to lead to poorer QoL as well as risk of other diseases of lifestyle like hypertension, diabetes, and obesity.

Kinesiophobia as a psychological factor was strongly correlated with physical, mental, and overall QoL scores in this study. Monticone *et al*. (2014) affirmed that exercises aimed at managing kinesiophobia improve QoL among patients with total knee arthroplasty. As kinesiophobia decreases, functional mobility improves. Although the research population is different, the causes of kinesiophobia and exercises targeted at managing kinesiophobia are similar in both populations. To improve the QoL of patients with chronic knee OA, kinesiophobia needs to be assessed and addressed properly.

The result of this study shows that, functional mobility which is the overall WOMAC score correlated positively with the physical component of QoL indicating that pain relief and restoration of function is an indirect prognostic factor for persons with chronic knee OA. This is corroborated by the findings of Araujo, Castro, Daltro, and Matos (2016), which stated that improvement in mobility, functional capacity, and the ability for daily living activities are major factors attributed to QoL in OA patients.

Multiple factors were documented to be associated with decreased QoL in persons with knee OA. Thus, management of knee OA targeted at improving the QoL of the patients becomes cumbersome as it is not known which of the factors has the greatest impact on QoL and needs to be addressed first. The present study investigated the effect of

kinesiophobia and functional mobility on QoL. Our results showed that kinesiophobia negatively correlated with QoL; indicating the less fear of movement the higher the QoL among individuals with knee OA. Thus, incorporating exercises that are targeted at reducing pain, stiffness, and managing kinesiophobia may enhance QoL, thereby reducing the burden of OA and time spent at the hospital.

Pain and stiffness have a greater influence on the QoL of persons with knee OA. This is in line with a study by Araujo *et al*. (2016) which affirmed that pain and functional limitation are the main causes of decreased QoL among individuals with knee OA. This indicates that improving pain and stiffness in knee OA management will have a great effect on enhancing the QoL of persons with knee OA.

Conclusion:

In conclusion, this study revealed that kinesiophobia and functional mobility negatively influence QoL, and therefore, reducing fear of movement, and improving functional mobility which encompasses the management of pain and stiffness, may enhance the QoL of individuals with knee OA.

Table 1: *Physical Characteristics of the Participants*

Variables	Total population (N=86)	Male (N=21)	Female (N=65)	p-value
Sex (%)	86 (100)	21(24.7)	65(75.3)	
Mean Age (years)	56.25 ± 8.92	56.67 ± 9.14	56.11 ± 8.91	0.806
BMI (kg/m^2)	33.17 ± 5.13	35.09 ± 7.05	32.64 ± 4.18	0.055
Duration of OA (months)	20.85 ± 16.5	26.95 ± 15.1	19.14 ± 16.4	0.060
Kinesiophobia	31.21 ± 5.25	31.81 ±6.96	31.17 ± 4.48	0.627
Pain	10.74 ± 3.00	10.33 ± 2.35	10.94 ± 3.18	0.425
Stiffness	4.160 ± 1.52	3.900 ± 1.72	4.280 ± 1.44	0.326
Physical function	37.86 ± 9.23	37.76 ± 10.4	38.14 ± 8.65	0.869
Functional mobility	52.28 ± 12.0	52.00 ± 12.5	52.73 ± 11.7	0.807
QoL physical	-19.24 ± 8.17	-16.15 ± 9.21	-20.38 ± 7.56	0.039
QoL mental	-18.25 ± 10.6	-17.56 ± 6.96	-18.47 ± 11.6	0.738
QoL	-37.49 ± 11.8	-33.71 ± 7.44	-38.85 ± 12.8	0.085

Key: BMI = Body Mass Index, QoL = quality of life

Table 2: *Relationship between Kinesiophobia, Functional mobility, and QoL*

Variables	Age	BMI	PI	Kinesio phobia	Stiffness	PF	FM	QoL1	QoL2	QoL
Age	1									
BMI	0.155	1								
PI	0.161	0.210	1							
Kinesio phobia	0.085	0.046	-0.041	1						
Stiffness	0.006	0.168	0.179	0.470**	1					
Function	0.005	0.349**	0.574**	0.745**	0.675**	1				
FM	0.051	0.342**	0.657**	0.755	0.719**	0.970**	1			
QoL1	-0.161	0.087	-0.202	-0.217*	-0.289**	-0.184	-0.224*	1		
QoL2	0.152	-0.112	-0.389**	-0.252*	0.042	-0.073	-0.102	0.232*	1	
QoL	0.026	-0.041	-0.490**	-0.377**	-0.162	0.193	-0.247**	0.483	0.740**	1

*significant at p<0.05 ** significant at p<0.01, BMI = body mass index, PI = Pain Intensity, PF = Physical function, FM = Functional Mobility, QoL = quality of life, QoL 1 = physical component of QoL, QoL 2 = mental component of QoL

Table 3: *Multiple Regression on the Influence of Gait Parameters, kinesiophobia, and Functional Mobility on QoL after Adjusting for Age, sex, and Oa Duration.*

Variables	Beta	p-value	t-value	95%CI
Model 1				
Duration	-0.284	0.010*	-2.646	-0.355 to -0.050
Age	0.051	0.630	0.484	-0.212 to 0.348
Model 2				
Pain	-0.916	0.000**	-7.315	-4.584 to -2.261
Stiffness	-0.785	0.000**	-6.129	-8.058 to -4.103
Physical function	-0.556	0.094	-1.695	-1.547 to 0.125
Kinesiophobia	-0.357	0.009**	-2.670	-1.399 to -0.203

**significant at 0.01, *significant at 0.05

References

Akinpelu, A. O., Alonge, T. O., Adekanla, B. A., & Odole, A. C. (2009). Prevalence and pattern of symptomatic knee osteoarthritis in Nigeria: A community-based study. *Internet Journal of Allied Health Sciences and Practice, 7*(3), 10.

Al-Johani, A. H., Kachanathu, S. J., Hafez, A. R., Al-Ahaideb, A., Algarni, A. D., Alroumi, A. M., & Alenazi, A. M. (2014). Comparative study of hamstring and quadriceps strengthening treatments in the management of knee osteoarthritis. *Journal of physical therapy science, 26*(6), 817-820.

Alkhawajah, H. A., & Alshami, A. M. (2019). The effect of mobilization with movement on pain and function in patients with knee osteoarthritis: a randomized double-blind controlled trial. *BMC musculoskeletal disorders, 20*(1), 452.

Araujo, I. L. A., Castro, M. C., Daltro, C., & Matos, M. A. (2016). Quality of life and functional independence in patients with osteoarthritis of the knee. *Knee surgery & related research, 28*(3), 219.

Felson, D. T. (2013). Osteoarthritis as a disease of mechanics. *Osteoarthritis and cartilage, 21*(1), 10-15.

Gandhi, S. K., Salmon, J. W., Zhao, S. Z., Lambert, B. L., Gore, P. R., & Conrad, K. (2001). Psychometric evaluation of the 12-item short-form health survey (SF-12) in osteoarthritis and rheumatoid arthritis clinical trials. *Clinical therapeutics, 23*(7), 1080-1098.

Jiang, L., Tian, W., Wang, Y., Rong, J., Bao, C., Liu, Y., . . . Wang, C. (2012). Body mass index and susceptibility to knee osteoarthritis: a systematic review and meta-analysis. *Joint Bone Spine, 79*(3), 291-297.

King, L. K., March, L., & Anandacoomarasamy, A. (2013). Obesity & osteoarthritis. *The Indian Journal of medical research, 138*(2), 185.

Kohn, M. D., Sassoon, A. A., & Fernando, N. D. (2016). Classifications in brief: Kellgren-Lawrence classification of osteoarthritis. In: Springer.

Mesci, E., Icagasioglu, A., Mesci, N., & Turgut, S. T. (2015). Relation of physical activity level with quality of life, sleep, and depression in patients with knee osteoarthritis. *Northern Clinics of Istanbul, 2*(3), 215.

Michael, J. W.-P., Schlüter-Brust, K. U., & Eysel, P. (2010). The epidemiology, etiology, diagnosis, and treatment of osteoarthritis of the knee. *Deutsches Arzteblatt International, 107*(9), 152.

Monticone, M., Ferrante, S., Teli, M., Rocca, B., Foti, C., Lovi, A., & Bruno, M. B. (2014). Management of catastrophising and kinesiophobia improves rehabilitation after fusion for lumbar spondylolisthesis and stenosis. A randomised controlled trial. *European Spine Journal, 23*(1), 87-95.

Richette, P., Corvol, M., & Bardin, T. (2003). Estrogens, cartilage, and osteoarthritis. *Joint Bone Spine, 70*(4), 257-262.

Rusu, A. C., Kreddig, N., Hallner, D., Hülsebusch, J., & Hasenbring, M. I. (2014). Fear of movement/(Re) injury in low back pain: confirmatory validation of a German version of the Tampa Scale for Kinesiophobia. *BMC musculoskeletal disorders, 15*(1), 1-9.

Sarzi-Puttini, P., Cimmino, M. A., Scarpa, R., Caporali, R., Parazzini, F., Zaninelli, A., . . . Canesi, B. (2005). *Osteoarthritis: an overview of the disease and its treatment strategies.* Paper presented at the Seminars on arthritis and rheumatism.

Sinikallio, S. H., Helminen, E.-E., Valjakka, A. L., Väisänen-Rouvali, R. H., & Arokoski, J. P. (2014). Multiple psychological factors are associated with poorer functioning in a sample of community-dwelling knee osteoarthritis patients. *JCR: Journal of Clinical Rheumatology, 20*(5), 261-267.

Usenbo, A., Kramer, V., Young, T., & Musekiwa, A. (2015). Prevalence of arthritis in Africa: A systematic review and meta-analysis. *PloS one, 10*(8).

Vlaeyen, J. W., & Linton, S. J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain, 85*(3), 317-332.

WHO. (2003). *THE BURDEN OF MUSCULOSKELETAL CONDITIONS AT THE START OF THE NEW MILLENNIUM*. Retrieved from Geneva:

Zhang, Y., & Jordan, J. M. (2010). Epidemiology of osteoarthritis. *Clinics in geriatric medicine, 26*(3), 355-369.