

Title: Depression, pain and physical function in patients with osteoarthritis of the knee:
implications for interprofessional care

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Abstract

Background: Depression has been found to be associated with pain and poor physical function in patients with knee osteoarthritis although it has not been sufficiently documented in Nigeria. This study was aimed at investigating the relationship among pain, depression and physical function in patients with knee osteoarthritis in Ibadan.

Methods: Eighty individuals diagnosed with knee osteoarthritis were screened for depression using the mood/ depression assessment questionnaire. Depression, physical function and pain were assessed by Becks Depression Inventory, Ibadan Knee Hip Osteoarthritis Outcome Measure and Visual Analogue Scale, respectively. Data were analyzed using Pearson's correlation test and linear regression (alpha level set at 0.05).

Results: Screening for depression was positive in 28.8% of patients aged 62.69 ± 5.96 years. There were significant correlations between physical function and pain intensity ($r=-0.659$) and physical function and depression ($r = - 0.660$) and between pain intensity and depression ($r= 0.611$). Negative linear relationships exist between physical function and pain ($R^2=0.434$) and physical function and depression ($R^2=0.436$). A positive linear relationship exists between pain intensity and depression ($R^2=0.374$).

Conclusion: About a quarter of patients with knee osteoarthritis had depression.

Individuals with knee osteoarthritis who had higher levels of pain showed higher level of depression and had lower level of physical function.

Keywords: Depression, Pain, Functional Assessment.

Introduction

Osteoarthritis is a heterogeneous group of conditions characterized by a combination of joint symptoms and signs stemming from defects in the articular cartilage and changes in the adjacent tissues, such as bone, synovial joint capsule, muscles, and ligaments (Lozada, 2012). It is a common disorder, and its morbidity increases with ageing in both genders, especially if it affects the knee joint (Ozcetin et al. 2007). It is also one of the most common causes of pain and disability in middle-aged and older people. The prevalence of the disease increases dramatically among persons over age 50, probably because of age-related alterations in collagen and proteoglycans that decrease the tensile strength of the joint cartilage and because of a diminished nutrient supply to the cartilage (Lozada, 2012). Its incidence and prevalence are rising, possibly in relation to the aging of the population and increasing obesity. Risk factors for osteoarthritis include numerous person-level factors, such as age, sex, obesity, and genetics, as well as joint-specific factors that are likely to be reflective of abnormal loading of the joints (Neogi and Zhang, 2013). Osteoarthritis occurs all over the world, but the pattern and prevalence of the disease varies amongst nations (Ogunlade et al, 2005). In Nigeria, a study by Akinpelu et al, (2009) reported the point prevalence of symptomatic knee osteoarthritis to be 19.6% in the south-western part of the country; the prevalence was 21.4% and 17.5% in female and male individuals, respectively.

In Nigeria, osteoarthritis most frequently affects the knee joint followed by the hip joint (Ogunlade et al, 2005). Osteoarthritis can affect the main surfaces of the knee joint and the cartilage under the patella. This is probably due to the loading effect during weight-bearing activities (Merle-Vincent et. al, 2007). Symptoms of knee osteoarthritis include pain and reduced function as well as swelling, morning stiffness lasting less than 30 minutes, joint enlargement, deformity, grinding, clicking, and joint instability or buckling.

Signs include muscle atrophy, weakness, joint effusion, crepitus, bony tenderness and enlargement, altered gait, limitation of motion, deformity, and instability (Abramson et al, 2011).

Pain and disability are also major problems in patients with knee osteoarthritis; these lead to decreased physical functioning, and greater difficulty performing their activities of daily living, resulting in a decline in health-related quality of life (Kim et al, 2011).

Physical disability is associated with locomotor function derangement such as walking, ascending or descending stairs, sitting and standing, which are essential for the maintenance of daily activities (Ozcetin et al, 2007).

According to the National Institute of Mental Health, depression is a mood disorder that can be characterized by persistent sadness, feelings of helplessness, hopelessness, or worthlessness, pessimism and irritability. Depressive symptoms are often associated with functional disability and heightened concern about physical symptoms such as pain, and the impact of depression on functional disability is comparable with that of heart disease and other medical conditions (Lin et al, 2003; Abramson et al, 2011). Pain and depression each increase the risk and severity of the other, and the combination of these has pervasive negative effects on physical function (Abramson et al, 2011). Depression is prevalent in patients with knee osteoarthritis and is related to the severity of knee pain (Lin, 2008, Woong et al, 2011). Depressive symptoms in patients with osteoarthritis have not, however, been shown to significantly affect pain and physical function.

Fear and depression may both contribute to the fear-avoidance model in musculoskeletal disorders. The fear-avoidance model (Leeuw et al, 2005) is based on the idea that the way a person interprets pain may lead to either of two pathways: (1) an adaptive response in which acute pain, while an annoyance, is not perceived as threatening, and so the person confronts the pain and is more likely to return to and maintain daily activities that help

achieve functional recovery; or (2) a non-adaptive response in which pain is perceived as threatening and leads to maladaptive behaviours including pain-related fear, avoidance, and hyper-vigilance. In the long term, these behaviours may result in increased disuse and disability, which further decrease the opportunity to disprove the fear of movement and fear of pain. A person with depression may also lose interest in daily activities, hobbies and recreation; therefore, depression could be associated with poor physical function (NIMH, 2009).

Where knee osteoarthritis is concerned, there is conflicting evidence regarding the association of depression with measures of physical function, with some investigators reporting significant associations (Salaffi et al, 1991) and others finding no association (Creamer et al, 2000; Maly et al 2006). More studies in this area will only strengthen the evidence on either side of the divide. This study was therefore aimed at finding the relationships among pain, depression and physical function in individuals with osteoarthritis of the knee.

Methods

Study population and design

This study was designed as a descriptive cross-sectional survey documenting the associations among pain, depression and physical function in patients with osteoarthritis of the knee managed at three public hospitals in Ibadan metropolis.

Sampling

Participants were selected through a purposive sampling technique having met the inclusion criteria of a doctor diagnosis of knee osteoarthritis and screened for absence of other comorbid conditions such as high blood pressure and diabetes. Patients also had a score of 30 or less on the Beck depression inventory and were literate in either Yoruba or English language. Yoruba is the indigenous language of the people of south-western

Nigeria where the study was conducted. Participation in the study was totally voluntary, and participants were asked to complete the questionnaire by interview after their written informed consent was obtained.

Ethical considerations

Ethical approval (UI/EC/12/0168) of the study was obtained from the University of Ibadan/University College Hospital Health research committee.

Participants

Participants were patients diagnosed with knee osteoarthritis from general outpatient units, surgical outpatient units, accidents and emergency units of the University College Hospital (U.C.H), Ibadan, Ring-Road State Hospital, Adeoyo, Ibadan and Adeoyo General Hospital, Yemetu, Ibadan. They were invited to participate when they presented for treatment at the study locations. Participation in the study was totally voluntary and subjects were asked to complete the research questionnaires.

Measurements

The age, sex and marital status of the participants were obtained. Physical function, pain intensity and level of depression were obtained from the participants.

Measure of Physical Function in Osteoarthritis

The Ibadan Knee/Hip Osteoarthritis Outcome Measure (IKHOAM) (Akinpelu et al, 2007) and its Yoruba translation (Odole et al, 2006) were used in measuring participants' physical function. The 23-item questionnaire has three parts to measure the end result of care in hip/knee osteoarthritis patients. Part 1 measures disability in activity of daily living, Part 2 assesses participation restrictions due to knee/hip osteoarthritis while Part 3 comprises 5 physical performance tests that are rated by the clinician.

The English version has evidence of validity ($r= 0.38$), responsiveness and internal consistency (0.80-0.99) (Akinpelu et al, 2007), and minimal clinical important difference

(12.89) (Akinpelu et al, 2011). The Yoruba version has evidence of validity and internal consistency (Odole et al, 2006). For ease of administration, parts 1 & 2 of these measures were administered in this study. The questionnaire could be patient or interviewer administered. Part 1 rates 25 disability attributes on a 5-point ordinal scale for degree of difficulty experienced and nature of assistance required (maximum obtainable score of 200). Part 2 rates 3 attributes of participation restrictions on a 4-point ordinal scale (maximum obtainable score of 9). Part 3 rates 5 items (maximum obtainable score of 23). Total maximum obtainable score on IKHOAM is 232 (200+9+23). The maximum obtainable score for this present study was 209 (parts 1 & 2). Score for a subject is calculated as (subject's score/total maximum obtainable score) x 100.

Measure of Pain

Visual analogue scale (Price et al, 1983) was used to assess participants' pain severity. This is the most common simple scale used in pain research. It represents the intensity dimension by a 10cm plain line with anchor points of "no pain" and "worst pain I ever felt." The patient is requested to draw a line at the point that best describes his or her pain level. It is the most widely used scale in assessment of pain in the clinical setting and has been reported to be sensitive and reliable (Price et al, 1983). The Yoruba version of the questionnaire was administered on individuals who were not literate in English language. It has been shown to have a moderate correlation with the English version (Odole et al, 2009).

Measure of Depression

The Becks Depression Inventory (Beck et al, 1996^a and 1996^b) and its Yoruba translation (Atowoju, 2014) was used to assess the severity of depression. The Becks Depression Inventory (BDI) is a 21-item questionnaire. It was developed to measure the severity of

depression in adolescents 13 years of age and up, as well as adults. The BDI has been used for 35 years to identify and assess depressive symptoms, and has been reported to be highly reliable regardless of the population. It has a high coefficient alpha, (0.80), its construct validity has been established, and it is able to screen for major depressive disorders (Snijders et al, 2006). The Yoruba version of the BDI was used for individuals who were not literate in English. The questionnaire could be interviewer or patient administered. Each of the 21 items on the questionnaire is scored on a 4-point scale. The sum of the ratings on the 21 items was then simply compared to the cut score guidelines in order to identify the interpretation. After the patient had completed the test, the score for each of the 21 questions is added up to obtain the total score.

The lowest score for each of the 21 questions was three; the highest possible total for the whole test was 63 if the patient marked number 3 on all the questions. The lowest score for each question was 0, so the lowest possible score for the test was 0, if the patient marked 0 on each question.

Data Analysis

Data were analyzed using descriptive statistics of mean, standard deviation and range and inferential statistics of Pearson's correlation coefficient and linear regression. Level of significance was set at 0.05.

Results

Eighty individuals diagnosed with knee osteoarthritis were recruited to participate in the study. Only 23 (28.8%) of the individuals screened positive for depression. Twenty of the participants (87.0%) were females (Table 1).

Table 1: Socio-demographic profile of participants

Characteristic	N	%
Sex, n		
Males	3	13.1
Females	20	87.0
Marital status, n		
Married	22	95.7
Unmarried	1	4.3
Age, years		
>60	11	47.8
60-65	5	21.7
66-70	6	26.1
71-75	0	0
76-80	1	4.3

The mean pain intensity score of the participants with depression was 4.45 ± 1.26 .

Participants' mean physical function score was 152.47 ± 22.35 , and their mean depression score was 8.89 ± 3.39 . There was a significant positive association between participants' pain intensity and depression ($r = 0.611$; $p = 0.002$). There was also a significant correlation between depression and physical function ($r = -0.660$; $p = 0.001$). Similarly, a strong negative correlation was observed between physical function and pain intensity ($r = -0.659$; $p = 0.001$).

Discussion

The relationships among physical function, pain and depression among individuals with osteoarthritis of the knee were investigated in this study. Out of the 80 doctor-diagnosed individuals with osteoarthritis of the knee in this study, 23 (28.8%) had depressive symptoms.

This supports the findings of previous authors that patients with osteoarthritis are also prone to being depressed (Kim et. al., 2011; Ozcetin et al, 2007; Rosemann et.al. 2007; Alexopoulos, 2005). Ozcetin et.al. (2007) reported that 26.3% of patients with knee osteoarthritis had depression. Rosemann et al. (2007) reported that depression shows an increased prevalence among patients with osteoarthritis. Possley et al. (2009) in their study on the relationship between depression and physical measures in overweight and obese persons with osteoarthritis of the knee reported that 42 % of their sample of 102 overweight/obese individuals screened positively for depression with the Center for Epidemiologic Studies Depression Scale. The increased prevalence as compared with the findings of this study might be due to the fact that the participants in their study were invited to participate from the community while those in this study were only those who reported to the clinic. Alexopoulos (2005) reported that depression has a detrimental effect on functional ability among osteoarthritis patients.

Physical limitation, pain, and depression have frequently been found to be closely related to each other, and many studies have attempted to reveal the causality. The positive linear relationships between pain and depression and between physical function and depression observed in this study shows that pain and physical function are possible predictors of depression in individuals with knee osteoarthritis, and likewise depression is a possible predictor of pain and physical function. Several authors have reported that pain and depression are dependent on each other (Leite et. al., 2011; Creamer et. al., 2000).

Kim (2011) reported that depression can play a major role in the way patients experience the symptoms of knee arthritis. Ozcetin et al. (2007) reported a strong linear relationship between bodily pain subscale of SF-36 and depression. Pain has been reported as a strong predictor of depression, and, likewise, depression is a powerful predictor of pain, particularly persistent pain. Furthermore, concurrent pain and depression have greater

impact than either disorder alone on multiple domains of functional status (Kroenke et al., 2008). The fact that only individuals with osteoarthritis and depression were assessed for their associations with pain and physical function in this present study supports the directional relationship between pain and depression as reported by Kim et al. (2011). Bair et al (2008) reported that when subjects have clinically significant depression and anxiety they are more adversely affected with regard to musculoskeletal pain and pain-limiting function scores than when clinical anxiety or depression is present alone.

The study by Scopaz et al (2009) showed that depression was not significantly associated with any of their models of self-report function. The models of self-report measures of function used included the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index, the Lower Extremity Function Scale (LEFS), and the Knee Outcome Survey-Activity of Daily Living Scale. The Get Up and Go test was used as a physical performance measure of function. Other literature showed that these models could be associated with depression, possibly as a result of the use of different measures and outcomes. Another study found that depression was related only to the Medical Outcomes Study 36-Item Short-Form Health Survey, which is a generic health measure (Weinberger et al. 2008; Coulehan et al, 1997). They also postulated that depression has an impact on general health status but not functional status related specifically to osteoarthritis. In this present study, depression is strongly related to physical function of patients with osteoarthritis of the knee. Physical function of the patients was assessed using a Nigerian-environment friendly and osteoarthritis-specific outcome measure. This measure was developed to address cultural considerations in activity limitations and participation restriction in individuals with osteoarthritis of the knee in Nigeria and similar environments.

The negative linear relationship between pain and physical function observed in this study shows that pain is a possible predictor of physical function in individuals with knee osteoarthritis and likewise physical function is a predictor of pain. The higher the depression scores the lower the physical function of these individuals. This clearly shows that depression makes physical function worse in patients with knee osteoarthritis.

Aghdam et al. (2013) also reported a significant linear relationship between physical function and pain in 81 patients with knee osteoarthritis. It is suggested that both should be considered as simultaneous therapeutic targets during the management of patients with knee osteoarthritis. Therefore, even if the causal linkage between depression and physical limitation remains unclear, our finding that depression is associated with reduced physical functioning is in accordance with multiple previous studies and most likely reflects a bidirectional relationship; that is, functional disability can lead to depression and depression also has a detrimental effect on physical functioning.

Limitations

It is important to note that this present study has limitations, which suggest that the findings should be taken cautiously. The small sample size of this study presents an obvious challenge to the external validity of this study. Also the causality of this relationship cannot be established in the present study as other potential risk factors for depression, such as quadriceps strength, physical activity, socio-demographic factors and patients' education, were not controlled for. These factors could have contributed to the depressive state, pain severity and physical functioning at the time of recruitment for the study. We cannot report definitive statements on causality regarding the pain-depression and physical function-depression relationships because of the cross-sectional nature of the present study, and, thus, we suggest a prospective longitudinal study to be carried out in order to determine the nature of the bidirectional relationship between pain and

depression in knee osteoarthritis. We also suggest that these future longitudinal studies could take into consideration the possibility of having a control group in order to rule out co-morbid depression. The present study is an initial step in establishing that coexisting depression is present in individuals with osteoarthritis of the knee in Nigeria and that depression is strongly associated with pain and physical function in these individuals.

Implications for physiotherapy practice and interprofessional care

Our findings suggest that the assessment for and management of depression should be integrated into the health care of patients with knee osteoarthritis. Members of the health team involved in the management of osteoarthritis, including physiotherapists, should be trained in the screening and detection of those who have depressive symptoms. These individuals can be managed through pharmacological or non-pharmacological means. Patients detected with depression should be referred for appropriate management using the multi-disciplinary approach in order to improve their physical functioning.

Conclusion

The result of this study showed that individuals with knee osteoarthritis who had higher levels of pain were more depressed and had lower level of physical function.

Conflict of interest: None declared

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