Assessment of Family Functioning amongst Patients with Knee Osteoarthritis in Nigeria: A Multicentre Cross-Sectional Study

Abubakar Yerima[1], Richard Akintayo[2], Akpabio A Akpabio[3] Hakeem Olaosebikan[4], Courage Uhunmwangho[5]

ABSTRACT

Background: Osteoarthritis (OA) is a leading cause of disability and reduced quality of life. The disability associated with OA depends on the cultural and socioeconomic context. Therefore, the role of family in the management of OA cannot be over emphasized. **Objective:** To determine the levels of family functioning and the predictors of poor family functioning amongst patients with knee OA. **Method:** A multicentre cross-sectional study involving 250 adults satisfying the American College of Rheumatology (ACR) clinical criteria for Knee OA were recruited over a period of 3 months after approval by the Ethical Review Committee of each of the study centres. Interviewer-administered questionnaire was used to obtained relevant demographic and clinical information. Family functioning was assessed using Family APGAR (Adaptation, Partnership, Growth, Affection, and Resolve) questionnaire. Other variables assessed were pain, functional class, Sleep Quality, depression and radiographs. Analysis was done using Statistical Package for Social Sciences (SPSS) version 21. Binary logistic regression was used to determine predictors of family functioning. A P value < 0.05 was considered significant. **Results:** The mean age was 59.9±10.62 and 209 (83.6%) were females. One hundred and ninety-nine (79.6%) reported a highly functional family, 40 (16.0%) and 11 (4.4%) had moderate and severely dysfunctional family respectively. APGAR scores were significantly associated with ethnicity (p=0.007) and functional class (p=0.020) and depression (p=0.013) and was best predicted by ethnicity (p=0.018, OR-1.360, CI [1.054 – 1.754]. **Conclusion:** Patients with knee OA seen in this study have a good level of family support. Ethnicity was the best predictor of dysfunctional family.

Keywords: knee osteoarthritis, family functioning, depression, ethnicity.

Departments of Medicine, [1]University of Maiduguri Teaching Hospital, Maiduguri, Borno state, Nigeria; [2]University of Ilorin Teaching Hospital, Ilorin; [3]University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria; [4]Lagos State University Teaching Hospital 1-5 Oba Akinjobi way, GRA, Ikeja, Lagos; and [5]Jos University Teaching Hospital, Jos, Nigeria.

Corresponding Author:
Dr Abubakar Yerima.
Department of Medicine,
University of Maiduguri Teaching Hospital,
Maiduguri, Borno state, Nigeria.
Email: abybuni@yahoo.com

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Introduction

Osteoarthritis (OA), a complex heterogenous articular disease is the most common form of arthritis in the world and a leading cause of disability, increased morbidity, mortality and reduced quality of life amongst individuals aged 50 years and older.[1,2] The

enormous burden of OA morbidity was revealed by the WHO study on the Global Burden of Disease in 2010; OA was the 11th leading cause of years lived with disability in the world.[3] The burden was higher in East Asia, high-income East Pacific countries and Eastern Europe and slightly lower in North America and Western Europe. In France, OA was the main contributor to limitations in activities (difficulties in walking, carrying objects and dressing) and was also a contributor to the need for human assistance with 9.2% of the need for help from immediate family members.[4]

The role of the family in the management of OA cannot be over emphasized, since the disability associated with OA depends on the cultural and socioeconomic context.[5] Family members provide the daily settings for patient self-management; they already have active roles in self-management and medical care and are crucial support providers.[6] Despite these roles identified, studies have shown that 39% of patients aged 44 years and older experience variable degrees of inadequate social support for their healthcare from family members.[7] In a study involving 90 patients with knee OA, Lim et al[8] found 9 (10%) and 28 (31.1%) of them to have a severely and moderately dysfunctional family respectively. Prazeres et al[9] reported that 9.2% and 20.3 % of patients with multiple chronic morbidity (300 with knee OA) had severely and moderately dysfunctional families respectively. In most studies of family functioning, factors associated with dysfunctional family were gender, knee pain, limitation of functions, marital status, social class, depression and reduced quality of life.[8-10]

There are no multicentre studies on the assessment of family functioning amongst knee OA patients in Nigeria. The aim of this study is to determine the levels of family functioning and the predictors of poor family functioning amongst patients with knee osteoarthritis in a multi-centre setting.

Methodology

Study design

This is a multi-centre, hospital-based cross-sectional study conducted in the Rheumatology and General Out-Patient Department (GOPD) clinics of five tertiary institutions in Nigeria (University of Maiduguri Teaching Hospital, University of Jos Teaching Hospital, University of Ilorin Teaching Hospital, Lagos State University Teaching Hospital and University of Uyo Teaching Hospital).

Study population

This comprised of individuals aged 18 years and above, satisfying the American College of Rheumatology (ACR) clinical classification criteria for Knee OA[11] recruited over a period of 3 months (1st March to 31st may, 2018). Consenting patients who satisfied the ACR clinical classification criteria for Knee OA were recruited. Patients with a history of previous knee surgery, known mental illness, inflammatory arthritis, systemic infection and other symptomatic chronic diseases e.g. diabetes mellitus, chronic liver disease, chronic obstructive lung disease were excluded from the study.

Sample size determination

Based on the reported knee OA prevalence of 11.5% determined by Adebusoye et al in Ibadan, Nigeria,[12] a sample size of 156 was obtained using Fisher's statistical formula for estimating minimum sample size in descriptive health studies when population size is greater than 10,000.[13] However, to increase the power of the study, we recruited a total of 250 patients at a rate of 50 patients per centre.

Sampling method

Patients were recruited using a systematic random sampling method in which every other patient with knee OA was recruited. A prior communication with the co-investigators representing each of the participating hospitals revealed that a median of 100 patients with knee OA were seen over a period of three months. With a recruitment plan of 50 participants per centre, a sampling interval of 2 was chosen. The first patient seen each day meeting the inclusion criteria for the study was chosen followed by the 3rd patient and so on. If an individual does not satisfy the inclusion criteria, or the person refused to participate, the next individual was recruited. Patients' folders were labelled, and a research register was kept to avoid double sampling. The procedure was repeated each day until the sample size was attained.

Data collection

An informed verbal and written consent was obtained from all participants while a semi-structured interviewer-questionnaire was administered to collect demographic and relevant clinical information. The WOMAC (Likert) pain subscale was also used to grade pain intensity. Individuals were grouped into four functional classes using the Steinbrocker functional classification.[14]

Each knee was examined separately for the presence or absence of joint line tenderness, crepitus, effusion and deformities. The range of motion (ROM) and alignment of the knee joint was measured using an International Standard Goniometer. Quadriceps strength was graded using the Medical Research Council grading scale. [15]

The weight to the nearest 0.01kg and height to the nearest 0.01m were measured using a Seca electronic weighing/height scale (Seca Deutschland, Hamburg Germany) using standard techniques. Body mass index (BMI) was calculated using the formula, weight $(kg)/height^2$ (m).[16] Standard anteroposterior (AP) and lateral semi-flexed radiographs of knees in weight bearing position were taken by qualified radiographers of the radiology department of the hospitals. The radiographs were interpreted and graded by both the radiologists and the principal investigators using the Kellgren and Lawrence Criteria.[17] The radiographs are graded after the two have agreed on a particular KL grade. The higher KL grade of the two knees was used in the final analysis.

Family functioning was assessed by the Family APGAR (Adaptation, Partnership, Growth, Affection, and Resolve) questionnaire. The measure consists of five parameters of family function: Adaptability, Partnership, Growth, Affection and Resolve. The response format is a three-point scale ("almost always"—two (2) points; "some of the time"—one (1) point; or "hardly ever"—zero (0) points. It has a minimum score of 0 and maximum score of 10. Family APGAR's scores were interpreted as follows: 7-10 = highly functional family; 4-6 = moderately dysfunctional family; 0-3= severely dysfunctional family. The correlation of the instrument with the previously validated instrument (Pless-Satherwhite index) is 0.80 and correlation with clinical report is 0.64.[18] Family APGAR has been validated and used for previous studies in Nigeria.[19]

The sleep quality of respondents was assessed using the Pittsburgh Sleep Quality Index (PSQI).[20] The 19 -item questionnaire generates seven components: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications and daytime dysfunction. The global score ranges from 0 to 21, and a higher score is indicative of poorer subjective sleep

quality. PSQI has been validated in Nigeria by Aloba *et al* with the best cut-off score set at 5.[21] We dichotomized patients into two groups scores less than 5 (no sleep abnormality) and score ≥5 (poor sleep quality).

Depression was assessed using the Patient Health Questionnaire (PHQ-9).[22] It has a minimum score of 0 and maximum score of 27. Component scores are rated 0 to 3. The interpretation of the total scores is as follows: 0-4 =no depression; 5-9= mild depression; 10-14= moderate depression; 15-19= moderately severe depression; 20-27 = severe depression. It has been validated for use in Nigeria, having a good concurrent validity with Beck's depression inventory (BDI) (r=0.84, p<0.001) and good one month test-retest reliability (r=0.84, p<0.001).[23] The sensitivity and specificity with 5 as cut-off score for minor depressive disorder is 0.989 and 0.973 respectively, and 0.846 and 0.994 respectively with 10 as cut-off for major depression. [23] PHQ-9 has also been shown to be a valid and reliable tool for assessing depressive disorders and depression severity among patients with knee OA.[24] We dichotomized patients into two groups; PHQ-9 <5 (no depression) and PHQ-9 ≥ 5 (has depression).

Data Analysis
All data obtained were analysed using statistical package for social science, IBM SPSS statistics® 2012 version 21.0 for windows by IBM USA, Armonk, NY 10504. Demographic and clinical data were summarized using frequencies, percentages and proportions. Test of normality was performed using Shapiro–Wilk statistics. Means of normally distributed continuous variables of participant within various APGAR group were compared using ANOVA, while median of skewed variables were compared using Kruskal-Wallis test.

Test of association between levels of family functioning and each of the determinants under consideration (Age, sex, ethnic group, BMI, KL grades, functional status, sleep quality, depression) were done using Chi-Square Test. Fisher's exact was used where frequencies are less than 5. For the purpose of regression analysis individuals with APGAR scores of 0-3 and 4-6 were combined and considered to have a dysfunctional family, while those with scores of 7-10 were classified as having a functional family. Predictors of poor family functioning were determined using binary logistic regression analysis with APGAR score of 0-6 (dysfunctional family) and 7-10 (functional family) as binary outcomes, after controlling for age and sex. A P value < 0.05 was considered statistically significant for all tests.

Ethical considerations
The study was approved by the Ethics Review Committee of each of the study centres.

Results
Demographic, clinical characteristics and frequency of family functioning
The 250 osteoarthritic patients comprised of 209 (83.6%) females and 41 (16.4%) males. One hundred and ninety-nine (79.6%) reported a highly functional family (APGAR score 7-10), 40 (16.0%) had a moderately dysfunctional family (Apgar score 4-6) while, 11 (4.4%) had a severely dysfunctional family (APGAR score 0-3). Their mean age was 59.9±10.62. There was no significant difference in gender and age distribution between the three groups of family functioning (p=0.290 and p=0.455 respectively). Majority of the patients (81.6%) had one form of education, 185 (74.0%) were married, 175 (70%) were employed and 136 (54.4%) were obese (BMI ≥ 30kg/m²). Participants with severely dysfunctional

family had lower BMI compared to those with functional family (p=0.003). The APGAR scores were significantly associated with ethnicity (p=0.007) with a higher proportion of Yoruba tribe in the severely dysfunctional group. Table 1 shows the demographic and clinical characteristics of the participant across various APGAR scores.

Relationship between family functioning and knee pain, stiffness, functional class and radiographic grades

All participants reported knee pain in the preceding month with a median duration of knee pain of 48 month [IQ range 24 -96 month]. The median WOMAC pain score for all participant was 8 [IQ range 5-12] and WOMAC pain scores did not differ significantly between participants with or without dysfunctional family (p=0.554). One hundred and forty-eight (59.6%) had brief early morning stiffness lasting less than 30 minutes with a median duration of stiffness of 8.5 minutes [IQ range 5 – 15 minutes]. There was no significant difference in the duration of stiffness among the various group of family functioning (p=0.409). One hundred and thirty participants (52%) were in functional class II at presentation with only 7 (2.8%) in functional class IV. There was significant association between APGAR scores and functional class (p=0.020). Majority (97.2%) of participants had radiographic knee OA with 106 (42.4%) having KL grade III OA. There was no association between family functioning and radiographic grades of knee OA (p=0.109). Table 2 shows the distribution of the participant across various APGAR scores.

Table 1: Demographic characteristics of the participant across various APGAR scores

Variable	Category	Highly functional (APGAR 7-10) n =199	Moderately dysfunctional (APGAR 4-6) n =40	Severely dysfunctional (APGAR 0-3) n= 11	P=value
Age (mean)		59.48±10.39	61.50±12.14	61.82±8.99	0.455*
Sex n (%)	Male	36 (18.1)	5 (12.5)	0 (0)	0.290#
	Female	163 (81.9)	35 (87.5)	11 (100)	
Education n (%)	None	34 (17.1)	11 (27.5)	1 (9.1)	0.072#
	Primary	35 (17.6)	4 (10.6)	4 (36.4)	
	Secondary	33 (16.6)	9 (22.5)	3 (27.3)	
	Tertiary	59 (29.6)	12 (30.0)	3 (27.3)	
	Postgraduate	20 (10.1)	4 (10.0)	0 (0)	
	Others	18 (9.0)	0 (0)	0 (0)	
Marital St n (%)	Single	4 (2.0)	0 (0)	1 (9.1)	0.584#
	Married	149 (74.4)	29 (72.5)	7 (63.6)	
	Divorced	5 (2.5)	0 (0)	0 (0)	
	Separated	3 (1.5)	0 (0)	0 (0)	
	Widowed	38 (19.1)	11 (27.5)	3 (27.3)	
Occupation n (%)	C/servant	34 (17.1)	10 (25)	2 (18.2)	0.136#
	Business	40 (20.1)	13 (32.5)	2 (9.1)	
	Others	62 (31.2)	10 (25)	3 (27.5)	
	Retired	48 (24.1)	6 (15)	5 (45.5)	
	Unemployed	15 (7.5)	1 (2.5)	0 (0)	
Ethnic Grp n (%)	Hausa	17 (8.5)	2 (5.0)	1 (9.1)	**0.007#**
	Igbo	13 (6.5)	4 (10.0)	2 (18.2)	
	Yoruba	61 (30.7)	20 (50.0)	7 (63.6)	
	Others	108 (54.3)	14 (35.0)	1 (9.1)	
Weight	Mean ±SD	82.16±14.85	78.25±14.54	67.18±22.17	**0.003***
Height	Mean ±SD	1.62±0.07	1.62±0.07	1.61±0.09	0.713*
BMI	Mean ±SD	31.26±5.29	29.99±5.39	25.82±6.78	**0.003***

APGAR-Adaptation, Partnership, Growth, Affection and Resolve, n-number, St-status, Grp-group, BMI- Body Mass Index, *- p value by ANOVA, #-Fisher's Exact test.
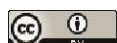
Table 2: Duration of Pain, Pain intensity, Stiffness and Functional class of the participant with various APGAR score

Variable	Highly functional (APGAR 7-10) n=199	Moderately dysfunctional (APGAR 4-6) n=40	Severely dysfunctional (APGAR 0-3) n=11	P value
Pain/duration in month*	48 [24 – 96]	48 [24 – 120]	36 [24 – 120]	0.541#
WOMAC pain score*	8.0 [5.0 – 12.0]	9.5 [5.0 – 13.0]	10.0 [6.0 – 12.0]	0.554#
Duration of stiffness (min)*	9 [5 – 15]	6 [3 – 15.8]	11.5 [7.5 – 13.5]	0.409#
Functional class				
Class I n (%)	42 (21.1)	8 (20.0)	8 (72.7)	**0.020^**
Class II n (%)	109 (54.8)	19 (47.5)	2 (18.2)	
Class III n (%)	43 (21.6)	11 (27.5)	1 (9.1)	
Class IV n (%)	5 (2.5)	2 (5.0)	0 (0)	
KL grade				
Grade I	6 (3.0)	1 (2.5)	0 (0)	0.109^
Grade II	53 (26.6)	4 (10.0)	4 (36.4)	
Grade III	85 (42.7)	19 (47.5)	2 (18.2)	
Grade IV	55 (27.7)	16 (40.0)	5 (45.4)	
PSQI Median score*	5 [3 – 8]	6.5 [4 – 11.8]	6 [5 – 10]	0.097#
PHQ-9 Median score	4 [1 – 7]	5 [3.3 – 8.8]	4 [2 – 6]	**0.013#**

APGAR-Adaptation, Partnership, Growth, Affection and Resolve, n-number, WOMAC-Western Ontario and McMaster Universities, min- minutes, n- number, %-percentage, KL-Kellgren-Lawrence, PSQI- Pittsburgh Sleep Quality Index, *- Median 0.137) and interquartile range, PHQ-9- Patient Health Questionnaire score-9, #- Kruskal-Wallis test, ^- Fisher's Exact test.

Relationship between sleep quality and depression with family functioning

One hundred and forty-one (56.4%) of participant had poor sleep quality. The total median PSQI score was 5 [IQ range 3 – 9] and did not differ significantly between APGAR groups (p=0.097). One hundred and five (42%) participants were depressed (PHQ9 score >5). The median PHQ9 score was higher among patient with moderately dysfunctional family (p=0.013). Family functioning was not significantly associated with PSQI scores (p=0.137) nor PHQ-9 scores (p=0.097).

Predictors of poor family functioning (Table 3)

For the purpose of statistical analysis, we combined participants with moderate and severely dysfunctional family in one group and those without dysfunctional family as the second group as a binary outcome variable. A binary logistic regression analysis using explanatory variables with strong association with APGAR scores and those with biological plausibility of affecting family functioning revealed ethnicity to be the best predictor of poor family functioning (p=0.018, OR-1.360, CI [1.054 – 1.754]. The other associating

factors were not good predictors of poor family functioning.

Table 3: Predictors of poor family functioning amongst patients with knee osteoarthritis

Variable	B	Wald	P-value	Odds Ratio	CI
Ethnicity	0.307	5.590	**0.018**	1.360	1.054 – 1.754
KL grade	-0.398	2.975	0.085	0.672	0.428 – 1.056
PSQI score	-0.553	2.034	0.154	0.575	0.269 – 1.230
PHQ-9 score	-0.250	1.381	0.240	0.779	0.514 – 1.181
BMI	0.244	0.188	0.665	1.277	0.423 – 3.851
Func- class	0.074	0.101	0.751	1.076	0.683 – 1.695
WOMAC pain	0.056	0.053	0.817	1.057	0.659 – 1.696

CI- Confidence Interval, BMI-Body Mass Index, KL-Kellgren- Lawrence, WOMAC - Western Ontario and McMaster Universities pain score, PHQ-9- Patient Health Questionnaire score-9, Func-class- Functional class, PSQI- Pittsburgh Sleep Quality Index,

Discussion

This study found that 20.4% of participant with knee OA had poorly functional family unit of which 4.4% had a severely dysfunctional family. Levels of family functioning was associated with functional status, depression and ethnic group and can largely be predicted by ethnic group. However, we found no association between family functioning and age, gender, pain scores, KL grade and poor sleep quality.

Knee OA, being a chronic and disabling disease that affects the elderly often requires multidisciplinary approach in management.[1, 2] Pain and disability associated with OA, signifies poor functional status and contributes largely to why individuals with OA seek a lot of support among family members. Studies have shown that family members play a significant role in the management of OA and other chronic illness.[6, 7, 25] The proportion of our participant, 16.6% and 4.4%, with moderately and poorly dysfunctional families respectively, was lower than the 20.3% and 9.2% reported by Prazeres et al.[9] Our patients were of similar average ages to theirs (59.9 vs 58.2 years). However, Lim et al[8] reported a much higher frequency of 31.1% and 10% with moderate and severely dysfunctional families, but their patients were much older with an average age of 70.14. Elderly patients have multiple comorbidities that will warrant them to seek multiple assistance from relatives and loved ones. This enormous burden placed on families providing supports can easily lead to disharmony culminating into a dysfunctional family.[25]

Most studies in the past found no relationship between gender and family dysfunction,[26, 27] we also didn't find a significant relationship between dysfunctional family and gender, although, a higher proportion of our participants with highly dysfunctional family were women and sex did not predict a dysfunctional family. However, Prazeres et al reported that women were 2 times more likely to perceive a dysfunctional family than men.[9]

Previous studies have shown that loneliness, low level of education and employment

status are associated with low quality of life and impacts negatively on family functioning.[28-30] We found no association between marital status, level of education and occupation with poor family function probably because, majority of our patients were married, educated and had an active job. In addition, spouses play a role in the modification of patient's mood and perceptions of pain and their illness and also influence pain intensity which in turn can affect family functioning.[31]

The relationship between obesity and knee OA is well documented in previous studies,[32,33] but its impact on family functioning is not well understood. Our study revealed that patients with highly dysfunctional family were having lower BMI compared to those with good family functioning. This sounds counter intuitive considering the correlation between obesity and severity of knee OA.

The participants with low BMI might possibly have less pain, good functional class and less stiffness and might be perceived as being well by their relatives and will therefore be offered less social support. Lower BMI could also result from poorer nutrition and care among patients with dysfunctional families.

Pain, stiffness and functional status have significant impacts on the quality life of patients with knee OA, however we found no difference in WOMAC pain scores and stiffness between participant with dysfunctional and those without dysfunctional families.

There was equally no association between family dysfunction and severity of radiographic knee OA. Previous studies reported an inverse correlation between pain, stiffness, functional status and APGAR scores, different from ours.[8] Our patients with moderately dysfunctional family had a higher proportion of individuals with

functional class 3 and 4 compared to the other two groups.

Poor sleep quality has been shown to affect marital harmony, with spouses who had poor sleep waking up angrier in the morning especially among critical spouses, although poor sleep has not been shown to be a good predictor of marital tension.[34] We found more than half of our patients to have poor sleep quality but there was no difference in median sleep quality scores between participants with dysfunctional and non-dysfunctional families. It was also not a good predictor of family dysfunction.

Forty two percent of our patients were depressed with a quarter of them having moderate to severely dysfunctional family. A study by Souza et al[35] revealed that family dysfunction was commoner among families with depressed elderly individuals. Our study did not show a strong association between depression and dysfunctional family but patients with moderately dysfunctional families had higher median depression score compare to those without.

Ethnicity was a good predictors of poor family functioning in this study. This is contrary to findings from previous studies which reported falls and previous acute myocardial infarction as best predictors.[27] Ethnicity and race have longed been considered to influence family functioning. Ethnicity intertwined with poverty and ignorance fuels the development of family dysfunction as reported from previous studies.[36,37] Apart from the three major Nigerian tribes (Hausa, Igbo and Yoruba) there are so many tribes with diverse cultural background in Nigeria, thus making a sub analysis to explain our findings difficult.

In conclusion, patients with knee OA seen in this study have a good level of family support. In spite of the number of patients

with poor sleep quality and depression, ethnicity was the best predictor of dysfunctional family. We recommend a larger study to look at the effect of ethnicity on family support in knee OA patients.

Conflict of interest

All authors declare no conflict of interest.

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