Differences in quality of life between patients with severe hip and knee osteoarthritis

Razlike u kvalitetu života između pacijenata sa teškom artrozom kuka i kolena

Slavica Jandrić

University of Banja Luka, Faculty of Medicine, Banja Luka, Republic of Srpska, Bosnia and Herzegovina

Abstract

Background/Aim. Osteoarthritis (OA) is the clinical manifestation of degenerative joint changes. The aim of this study was to investigate differences in quality of life (QoL) between patients with severe hip and knee OA. **Methods**. This is the cross-sectional study of 195 patients (average age 63.2 ± 11.1 yrs), with a diagnosis of OA of the hip and knee that were assigned to receive a total hip or knee replacement. The patients were divided into three groups in relation to localization of OA. The first group included patients with hip OA; the second group consisted of patients with knee OA and the third group with both hip and knee OA. Demographic and clinical data were collected for each patient. We measured health-related quality of life (QoL) by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaires. Statistical significance of differences was at the level of $p < 0.05$. **Results**. The best QoL was in the group of knee OA (42.7 ± 11.3) and the worst in the group with both hip and knee OA patients (35.8 ± 12.7). QoL assessed by WOMAC score and the domain of physical function were significantly different among three groups of patients with OA (F = 5.377, $p < 0.01$ and F = 5.273, $p < 0.01$) respectively). Results of three multiple linear regression models where WOMAC score was dependent variable and age, body mass index (BMI), social class, pain, stiffness, physical function, hypertension, cardiomyopathy, diabetes mellitus were independent variables, have shown that QoL was statistically significantly associated with pain and physical function in the hip and knee OA groups, whereas in the group with both hip and knee OA patients, QoL was associated with BMI, pain, physical function and diabetes mellitus. **Conclusion**. QoL of patients with severe hip and knee osteoarthritis in relation to localization was significantly different. QoL in severe hip and knee OA patients was significantly associated with pain and physical function, but in patients with both hip and knee OA QoL was also associated with BMI and diabetes mellitus.

Key words:
osteoarthritis; hip; knee; quality of life.

Apstrakt

Uvod/Cilj. Osteoartritis je klinička manifestacija degenerativnih promena u zglobu. Cilj ove studije je bio da se istraži postojanje razlika u kvalitetu života (QoL) između bolesnika sa teškom artrozom (OA) kuka i kolena. **Metode**. Studijom preseka obuhvaćeno je 195 bolesnika (prosečne starosti 63.2 ± 11.1 godina) sa dijagnozom artroze kuka ili kolena, kojima je bila indikovana totalna artroplastika kuka ili kolena. Bolesnici su podeljeni u tri grupe u odnosu na lokalizaciju artroze. Prvu grupu su činili bolesnici sa artrozom kuka, drugu sa artrozom kolena i treću sa artrozom i kuka i kolena zajedno. Za svakog bolesnika smo beležili demografske i kliničke podatke. Kvalitet života ovih bolesnika merili smo pomoću Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) upitnika. Za statističku značajnost razlika uzimali smo nivo od $p < 0.05$. **Rezultati**. Najbolji QoL je bio u grupi bolesnika sa OA kolena (42.7 ± 11.3), a najlošiji u grupi bolesnika sa OA kuka i kolena zajedno (35.8 ± 12.7). QoL procenjen WOMAC skorom je bio značajno različit između tri grupe bolesnika sa artrozom (F = 5.377, $p < 0.01$), kao i domen fizičke funkcije (F = 5.273, $p < 0.01$). Rezultati tri modela multiple linerane regresije gde je WOMAC skor zavisna varijabla, a godine starosti, indeks telesne mase (BMI), socijalni status, bol, ukočenost, fizička funkcija, arterijska hipertenzija, miokardiopatija, dijabetes melitus nezavisne varijable, pokazali su da je QoL procenjen WOMAC skorom statistički značajno udružen sa bolom i fizičkom funkcijom u prvoj (OA kuka) i drugoj (OA koljena) grupi bolesnika, dok je u trećoj grupi bolesnika (sa OA kuka i koljena zajedno), WOMAC skor bio udružen sa BMI, bolom, fizičkom funkcijom i dijabetes melitusom. **Zaključak**. Kod bolesnika sa teškom OA kuka i kolena, QoL je, u odnosu na lokalizaciju, bio značajno različit. Bol i fizička funkcija su značajno udruženi sa QoL bolesnika sa teškom OA kuka i kolena. U grupi bolesnika sa OA kuka i kolena zajedno, QoL je bio značajno udružen i sa BMI i dijabetesom melitusom.

Ključne reči:
osteoartritis; kuk; koleno; kvalitet života.

Correspondence to: Slavica Jandrić, University of Banja Luka, Faculty of Medicine, Republic of Srpska, Bosnia and Herzegovina.
E-mail: slavajandric@yahoo.com

Introduction

Osteoarthritis (OA) is the clinical manifestation of degenerative joint changes [1–3]. The final stage is the phase of definite disability with severe pain, very restricted movements, greater functional disturbances and worse quality of life (QoL). OA is the most common joint disease, mainly affecting middle-aged and elderly people [4]. People with OA of the knee or hip experience pain and deconditioning that may lead to disability. Treatment goals include pain control, maximizing functional independence, and improving QoL within the constraints imposed by both OA and comorbidities [5]. Outcome measures can help us evaluate the functional status of the patients and they provide an objective tool for assessing the severity of impairment, functional disability and handicap at personal and community levels [6–9]. The Western Ontario and McMaster Osteoarthritis Index (WOMAC) questionnaires measure health-related QoL and specific outcome measures for OA. It has been developed for assessing the severity of knee and hip OA and it has shown greater responsiveness to change over time [8].

There are reports of differences between hip and knee severe OA [10, 11]. Differences between hip OA and knee OA patients in health state and QoL may have substantial direct costs to the health care system and indirect costs to society [10]. Results of this study could have clinical importance in rehabilitation and improve understanding of impact of various factors on differences in hip OA and knee OA patients. Studies of OA patients and their QoL published in recent years have reported that there are differences between hip OA and knee OA [10], but fewer of them were related to differences in QoL of hip and knee OA patients in relation to localization (hip, knee, both hip and knee) comorbidity, sex, age body mass index (BMI), and social class [12, 13].

Therefore, the aim of this cross-sectional study was to investigate differences in QoL in patients with severe hip OA and knee OA after adjusting for potential confounders.

Methods

Patients

In this cross-sectional study of 195 consecutive patients (average age of 63.2 ± 11.1 yrs) with diagnosis of OA of the hip or knee, according to the American College of Rheumatology [11], who had both clinical and radiographic evidence of severe OA (and were assigned to receive a total hip or knee replacement), participated and completed this study in the Department of Orthopaedics. Patients were divided into three groups (Table 1): the first group with hip OA (65 patients, average age of 63.2 ± 10.7 yrs), the second group with knee OA (65 patients, average age of 64.1 ± 11.3 yrs) and the third group with both hip OA and knee OA (65 patients, average age of 62.2 ± 11.5 yrs). A standardized joint examination and radiographs in two projections of the pelvis and knee with the participant standing, were obtained by a standardized procedure. Demographic and clinical data were collected for each patient including age, gender, height, weight, BMI, location of OA, social class and comorbidity (hypertension, cardiomyopathy, diabetes mellitus). Individuals with contra lateral limb injury or abnormality, major neurological or cardiovascular disorder and medical conditions limiting activity were excluded from the study. BMI (kg/m2) was calculated as follows: subjects were classified as normal-weight (BMI of 18.5–24.9 kg/m2), overweight (BMI of 25.0–29.9 kg/m^2), or obese (BMI of $>/= 30$ kg/m^2). Body weight and height were measured to the nearest 0.1 kg and 0.1 cm, respectively, by using standardized equipment and procedures [14]. Socio-economic level was scored by "1" (low - patients have no health insurance and have low income), "2" (middle - patients have health insurance and average income) and "3" (high - patients have health insurance and above average income).

Informed consent was obtained from all subjects. All parameters that were collected (sex, age, comorbidity, social

Table 1

Characteristics of the study participants (n = 195)

Parameters	Group I (Hip osteoarthritis)	Group II (Knee osteoarthritis)	Group III (Hip and knee osteoarthritis)	Total	Differences among three groups (*p*)
Age (years), x̄ ± SD	63.2 ± 10.7	64.1 ± 11.3	62.2 ± 11.5	63.2 ± 11.1	0.628
Osteoarthritis					
right side	35 (13.5)	34 (13.1)	76 (29.2)	145 (55.8)	0.672
left side	30 (11.5)	31 (11.9)	54 (20.8)	115 (44.2)	
Sex					
female, n (%)	41 (21.0)	41 (21.0)	42 (21.6)	124 (63.6)	0,978
male, n (%)	24 (12.3)	24 (12.3)	23 (11.8)	71 (36.4)	
Social class					
low, n (%)	4 (2.1)	2 (1)	2 (1)	8 (4.1)	0.480
middle, n (%)	57 (29.2)	58 (29.8)	54 (27.7)	169 (86.7)	
high, n (%)	4 (2)	5 (2.6)	9 (4.6)	18 (9.2)	
BMI (kg/m^2), x̄ ± SD	31.2 ± 4.6	31.5 ± 4.8	31.2 ± 5.0	31.3 ± 4.8	0.935
Comorbidity					
hypertension, n (%)	3 (1.5)	7 (3.6)	9 (4.6)	19 (9.7)	0.688
cardiomyopathia, n (%)	3 (1.5)	3 (1.5)	5 (2.6)	11 (5.6)	
diabetes mellitus, n (%)	1 (0.5)	1 (0.5)	3 (1.6)	5 (2.6)	

Note: Values are expressed as mean (x̄) ± standard deviation (SD) or numbers (%).
BMI – body mass index.

class and WOMAC Index) are part of the regular hospital procedures for all patients that were assigned to receive a total hip or knee replacement. Study methods were approved by the institutional Ethics Committee of Institute of Rehabilitation "Dr Miroslav Zotovic", Banja Luka, Bosnia and Herzegovina.

Questionnaire

QoL of patients with OA was measured by disease-specific instrument (WOMAC index). The WOMAC Index is an OA-specific health status instrument; its validity, reliability and responsiveness have been extensively demonstrated [15]. This is a self-administered instrument validated for OA in the legs. It was used to assess QoL of the patients with hip and knee OA as the disease-specific measure. QoL was measured by WOMAC, developed for OA in the hip and knee for each patient in our research.

The WOMAC is a multidimensional index containing 24 multiple choice questions: 5 dimensions for pain, 2 for stiffness, and 17 for physical function (for example regarding the ability to perform activities of daily living). The parameters of the pain were: walking, stair climbing, nocturnal rest and weight bearing. Stiffness included two parameters: morning stiffness and stiffness occurring later in the day. Physical function obtained parameters about descending stairs, ascending stairs, rising from sitting, standing, bending to floor, walking on flat, getting in or out of car, going shopping, putting on socks, rising from bed, taking off socks, lying in bed, sitting, getting on or off toilet, heavy domestic duties, light domestic duties. Each item is represented by a Likert scale between 0 (best health state) and 4 (worst state). Responses were: "none" scoring by "0", slight by "1", moderate by "2", severe by "3" and extreme by "4". Score was = SUM of all points for relevant items. Maximum pain subscore was 20, maximum stiffness subscore 8 and maximum physical function subscore was 68. Minimum total score was 0. Maximum total score was 96. The WOMAC summary score ranged from 0 (no pain or disability) to 96 (the most severe pain and disability). Global (i.e., total) score [16] is determined as sum x 100/96. Each subscale score was transformed to a range from 0 to 100 points, with a score of 100 indicating no pain, dysfunction, or stiffness. QoL was measured using WOMAC questionnaires for each patient with hip and knee OA. WOMAC Index (Serbian version) is part of the regular hospital procedures for all patients that were assigned to receive a total hip or knee replacement. Its linguistics and cultural validity were confirmed by hospital institution before this investigation.

Statistical analysis

Student's t test and Chi-Square test were used to compare baseline performances of the three groups of patients with hip and knee OA. Analysis of variance with single factor (ANOVA) was used to assess differences in QoL between three groups of the patients with OA and Multiple linear regression (in three multiple linear regression models of WOMAC scores) was used to assess the association between

QoL measured by WOMAC of three locations (hip, knee, both hip and knee osteoarthritis) where WOMAC score as continued variable was the dependent variable. The independent variables were age, sex, BMI, social class, pain, stiffness, physical function, comorbidities, (hypertension, cardiomyopathy and Diabetes mellitus). Statistical significance of differences was at the level of $p < 0.05$.

Results

Table 1 presents characteristics of the study participants. Average age of the participants in our study was 63.2 ± 11.1 yrs (63.2 ± 10.7 for patients with severe hip OA, 64.1 ± 11.3 for knee OA patients and 62.2 ± 11.5 for the third group of the patients with both hip and knee OA, candidates for arthroplasty). Average age of the patients among these three groups was not statistically significant ($p > 0.05$). In the total sample of patients there were 124 females and 71 males. Difference was statistically significant ($p < 0.001$). In the group with hip and knee OA 41 (21%) of cases were females and 24 (12.3%) of cases were males. In the group with both hip OA and knee OA there were 42 (21.6%) females and 23 (11.8%) males. There was no statistically significant difference among three groups of the patients in relation to sex ($p > 0.05$), but within the each group there was statistically significantly higher number of female than male patients ($p < 0.01$, $p < 0.01$ and $p < 0.001$, respectively). Thirty-five, or 13.5 % of the patients with hip OA had severe OA on the right side, 30, or 11.5% on the left side (Table 1). Severe knee OA was on the left side in the 31, or 11.9% of the patients and on the right side in 34, or 13.1% of the patients. There were hip OA on the right side in 34, or 13.1% and on the left side 31, or 11.9% , and knee OA on the right side in 42, or 16.1% and on the left side 23, or 8.9% of the OA localisation of the patients with both hip and knee OA. There was no statistically significant difference among the three groups of the patients in relation to a side of the OA. Average value of the BMI was 31.3 ± 4.8 kg/m^2. It was in the range of obesitas in all three groups of patients: the hip OA (31.2 ± 4.6 kg/m^2) the knee OA (31.5 ± 4.8 kg/m^2) and both hip and knee OA (31.2 ± 5 kg/m^2). The differences among the groups were not significant ($p > 0.05$). The majority of patients were in the middle social class: in the hip OA group 57, or 29.2%, in the knee OA patients 58, or 29.8% and in the group with both hip and knee OA 54, or 27.7%. Differences among the three groups of the patients were not statistically significant ($p > 0.05$). Nine, or 4.6% of the patients in the third group had hypertension, 7, or 3.6% in the second and 3 or 1.5% in the first group of the patients. Cardiomiopathy was registered in 3, or 1.5% in the first and second group and 5, or 2.6% in the third group of the patients. Diabetes mellitus was registered in 1, or 0.5% in the hip and knee group and in 3, or 1.6% in the group with both hip and knee OA (Table 1). Total number of comorbidities was highest in the third group of the patients with OA (17, or 8.7%) and at the least in the hip OA group (7, or 3.6%). There were not statistically significant diferences in the presence of comorbidities among three groups ($p > 0.05$).

Table 2 presents differences in QoL and its domains (pain, stiffness and function) among the three groups of patients with various localization of severe hip or knee osteoarthritis, obtained by the Analysis of variance with single factor. Each subscale score was transformed to a range from 0 to 100 points, with a score of 100 indicating no pain, dysfunction, or stiffness. The best QoL was in the group of knee OA (42.7 ± 11.3) and the worst one in the group with both hip and knee OA patients (35.8 ± 12.7). The results showed that there were statistically significant differences among the three groups of OA patients in QoL (F = 5.377, $p < 0.01$) and in the domain of physical function (F = 5.273, $p < 0.01$).

Table 3 presents the standardized regression coefficients obtained by three multiple linear regression analyses, when adjusted with confounders. QoL (WOMAC scores) was the dependent variables and independent variables were age, BMI, social class, pain, stiffness, physical function and comorbidities (hypertension, cardiomyopathy and Diabetes mellitus). The results have shown that QoL assessed by WOMAC score was statistically significantly associated with pain (t = 4.424, $p < 0.001$ and t = 2.862, $p < 0.01$) and physical function (t = 6.839, $p < 0.001$ and t = 7.209, $p < 0.001$) in the first (hip OA) and the second (knee OA) group respectively, whereas in the third group (both hip and knee OA), WOMAC score was statistically significantly associated with BMI (t = 2.361, $p < 0.05$), pain (t = 2.450, $p < 0.05$), physical function (t = 9.228, $p < 0.001$) and Diabetes mellitus (t = 2.418, $p < 0.05$).

Discussion

There are reports about risk, prognostic factors, disability, QoL of patients with knee or hip OA and guidelines used for management of hip and knee OA [17–19]. Therapeutic modalities may positively influence pain and function, mobility and QoL in patients suffering from OA of the lower limbs [5]. Possible differences in QoL between hip and knee OA and patients with both hip and knee localization of OA can have impact on planning the therapy for these patients. There are reports about associated increased risk of hip and knee replacement due to osteoarthritis [12, 20, 21] and outcome, QoL and differences of hip and knee OA patients [22, 23]. This cross-sectional study has helped to investigate differences in QoL in patients with severe hip OA, knee OA and with both hip and knee OA. Three multiple linear regression models were used to investigate association of QoL of patients with severe hip or knee OA with potential confounders in all three groups.

Global WOMAC score, which represented the QoL in the OA patients was significantly different (F = 5.377, $p < 0.01$) among the three groups of the OA patients (Table 2). Caracciolo and al. [22] also found that differences among the OA groups were evident.

The pain was important for decision whether or not to perform knee and hip surgery [7, 24]. It has significantly influenced QoL in all three groups of the OA patients in our research. Although we did not find that there was statistically significant difference in the domain of pain among patients with these three various localization of severe hip or knee OA.

Table 2
Differences in quality of life and its domains among three groups of patients with various localization of severe hip or knee osteoarthritis (n = 195)

Parameters	Group I (Hip osteoarthritis)	Group II (Knee osteoarthritis)	Group III (Hip and knee osteoarthritis)	F	p
WOMAC score	38.9 ± 12.3	42.7 ± 11.3	35.8 ± 12.7	5.377	0.005
Domain					
Pain	9.5 ± 3.7	9.6 ± 3.6	8.7 ± 4.2	1.044	0.354
Stiffness	0.97 ± 1.4	0.65 ± 1.3	0.7 ± 1.4	0.984	0.376
Physical function	27.5 ± 10.1	30.8 ± 8.2	25.4 ± 10.2	5.273	0.006

Note: Values are expressed as mean ($\bar{x}$) ± standard deviation (SD); WOMAC score presented from 0-100, i.e. from worst to best; WOMAC – Western Ontario and McMaster Osteoarthritis Index; F – value of F test statistics (ANOVA).

Table 3
Standardized regression coefficients in three multiple linear regression models of Western Ontario and McMaster Osteoarthritis Index (WOMAC) scores

Independent variables	Group I (Hip osteoarthritis)		Group II (Knee osteoarthritis)		Group III (Hip and knee osteoarthritis)	
	Beta	(t)	Beta	(t)	Beta	(t)
Age	-0.42	0.565 (0.580)	0.030	0.712 (0.371)	0.004	0.960 (0.051)
Body mass index	-0.076	0.308 (1.029)	-0.070	0.379 (0.887)	0.164	0.022 (2.361)
Social class	-0.021	0.781 (0.279)	-0.085	0.322 (0.999)	0.059	0.384 (0.878)
Pain	0.363	0.000 (4.424)	0.236	0.006 (2.862)	0.200	0.017 (2.450)
Stiffness	0.103	0.185 (1.342)	0.164	0.056 (1.949)	0.082	0.270 (1.115)
Physical function	0.573	0.000 (6.839)	0.608	0.000 (7.209)	0.726	0.000 (9.228)
Hypertension	-0.001	0.990 (0.012)	-0.125	0.164 (1.410)	0.043	0.564 (0.580)
Cardiomyopathy	-0.052	0.615 (0.506)	0.55	0.582 (0.554)	0.038	0.603 (0.524)
Diabetes mellitus	-0.012	0.900 (0.126)	0.032	0.751 (0.320)	0.166	0.019 (2.418)

Note: WOMAC score was dependent variable.

Domain of stiffness was not statistically significant different among groups, but physical function was. QoL was statistically significantly associated with physical function in all three groups of OA patients. The group with knee localization of OA had the highest score of physical function. These results are in accordance with other reports [12, 25].

Average age of the knee OA patients placed on the waiting list for total joint replacement was higher than in hip OA patients which is in accordance with other reports [25, 26], but there was no significant association between QoL and age in any of the three groups of the OA patients. The least average age was recorded in the third group with both hip and knee OA. Difference among the three groups of the patients was not statistically significant in our research. These results may be explained by the fact that function in the knee OA patients was better than in the hip OA patients and the patients with knee OA may have made a decision for arthroplasty later than patients with hip OA and patients with both hip and knee OA. The third group of the patients included both hip and knee OA, which could have influenced such result (the least average age).

Females had higher percentage of OA than males in our study. There was statistically significantly higher number of females than males in all three groups of the OA patients. These results are in accordance with findings that the prevalence of osteoarthritis-related disability is greater among women than among men [13]. Maillefert et al. [13] state that hip OA in women is more frequently part of polyarticular OA and displays greater symptomatic and structural severity. Severe hip and knee OA were more often on the right (55.8%) than on the left (44.2%) side in patients with OA in our research. But, we did not find statistically significant difference among the groups with hip, knee and both (hip and knee) localization in relation to side of the OA.

Comorbidities (hypertension, cardiomyopathy, diabetes mellitus) were not often in any of the three groups of the OA patients in our research (17.9%). This is in accordance with other findings [13]. Tuominen and al. [21] reported that incidence of comorbidity in their investigation was 73%. These results may be explained by the fact that comorbidities included in these two investigations were different. But, QoL was significantly associated with Diabetes mellitus in the group of patients with both hip and knee OA in our research. This is in accordance with recently published systematic literature review and meta-analysis study. It has shown an association of diabetes mellitus and OA, but causality is not yet clearly demonstrated [27].

All three groups of patients in our research were in range of obesitas, but differences were not statistically significant. QoL of the OA patients was significantly associated with BMI only in the group of patients with both hip and knee OA. Recent study indicates that obese patients were more present and underwent joint replacement surgery at a younger age as compared to nonobese patients [28]. Women in the highest category of BMI had a twofold increased risk of hip replacement due to OA [26], and BMI together with age and gender influence the decision to perform knee replacement surgery [24]. Arthritis was associated with an increasing negative impact on health and QoL for older women over time [29].

Social class did not significantly influence QoL of the patients with OA with different localization of OA in our research. Differences in relation to other reports may be due to different definition of social impact, design of the investigation and different social and country status as well as insurance.

QoL, pain and physical function were the worst in the group of OA with both hip and knee OA. The pain and physical function were significantly associated with the QoL in patients with all three localization of OA and could be the most important factors in making decision for arthroplasty. Also, the QoL of patients with both the hip and knee OA was significantly associated with BMI and diabetes mellitus. These findings are in accordance with other reports [19, 24, 25, 27].

OA hip and knee are often associated with significant pain, disability, and impaired QoL. The effect of size of a specific treatment might vary according to the site of the OA involvement owing to differences in anatomy, biomechanics, risk factors for development and progression, accessibility to local treatments and other factors [30]. Understanding what we know (and do not know) about hip, knee and OA with both, hip and knee localization differences is critical for improving quality of care for our patients and findings in this study could be useful in practice and in further investigations. These factors are the strengths of this study. The primary limitation of the study is that we could not include as confounders emotional domains and that we used only disease-specific instrument for measurement of QoL. Further studies are required to confirm our results in other sets of patients and better understand the underlying mechanisms of differences among the hip, the knee and both the hip and knee OA.

Conclusion

Our results show that there are differences between patients with severe hip, knee and both hip and knee osteoarthritis in QoL with the lowest WOMAC score in the group of the patients with both hip and knee osteoarthritis and the highest score in the knee osteoarthritis group of the patients. Domain of physical function was statistically significantly different among groups of osteoarthritis patients with the highest score in knee osteoarthritis group of the patients. The pain and physical function were significantly associated with QoL in the severe hip and knee OA patients. QoL in the group with both hip and knee OA patients was significantly associated with the pain, physical function, BMI and diabetes mellitus.

These findings are important and could be useful in practice and in further investigations for improving quality of care of osteoarthritis patients, especially in pain and function domains. They can help in considering the treatment of osteoarthritis patients and in decision of the time of surgery.

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