Determinants of Health-Related Quality of Life in Patients with Knee and Hip Osteoarthritis under Rehabilitation Care

Nur Aimi Asyrani Zamri[1], Sakinah Harith[1*], Noor Aini Mohd Yusoff[1], Nurulhuda Mat Hassan[2] and Ying Qian Ong[1]

[1]School of Nutrition and Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia; sakinahharith@unisza.edu.my
[2]Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, 20400 Kuala Terengganu, Terengganu, Malaysia

Abstract

The World Health Organization estimated Osteo-Arthritis (OA) to cause 80% sufferers to have movement limitation and 25% unable to perform major daily activities, which result in quality of life deterioration. This study aims to determine the factors associated with Health-Related Quality Of Life (HRQOL). A total of 131 OA patients were involved in a cross-sectional study which were recruited from the Rehabilitation Health Organization, Terengganu. Socio-demographic, clinical and lifestyle histories, and 24-hour dietary intake were assessed by using structured questionnaire while HRQOL was measured by using the Malay version of the Osteo-Arthritis Knee and Hip Quality Of Life (OAKHQOL) questionnaire. OAKHQOL questionnaire was evaluated via Likert scales in the items range from 0 (best) to 10 (worst). In each domain, the mean score of the items was calculated, yielding a score for each domain. The score is the standardized on a scale from 0 (best possible QOL) to 100 (worst possible QOL) scale. Anthropometric measurement was measured by using Tanita Body Fat Monitor and Seca height scale and Body Mass Index (BMI) was calculated. Multiple linear regression was performed. Age was positively associated with social functioning (p=0.005). Meanwhile, disease duration was positively associated with physical domain (p=0.043). Among the anthropometric measurement, only BMI was positively associated with physical domain (p=0.040). Higher vitamins C and D intake was associated with lower mental health. Next, better social functioning was observed in low vitamin K consumption. Patients who exercise were associated with better physical and mental health, lower pain, and greater social support. Monthly income, body mass index, waist circumference, and other nutrients intake were not associated with HRQOL. In summary, exercise was the best predictor for better HRQOL.

Keywords: Clinical, Health-Related Quality Of Life (HRQOL), Lifestyle, Nutritional Status, Osteoarthritis, Socioeconomic

1. Introduction

Osteo-Arthritis (OA) is the most prevalent form of arthritis[1] and the major cause of disability worldwide[2]. OA represents 2.4% of all Years Lived with Disability (YLD) and has been positioned as the 10th main contributor to worldwide YLDs. The patterns in OA YLDs from 1990 to 2013 demonstrated a 75% expansion, which is the third most quickly growing situation related to disability. Based on the Global Burden of Disease statistics, it is predicted that 242 million people worldwide suffered from symptomatic and movement restricting OA of the hip and/or knee, representing 13 million YLDs[3].

Author for correspondence

OA is more prevalent in the aging population. In 2010, the World Health Organization (WHO) estimated that 524 million people aged 65 or older suffered from OA and the number is expected to triple, representing 16% of the world's population by 2050[4]. It was estimated that 80% of people with OA have limitations in movement and 25% cannot perform their major daily activities, resulting in a decline in their QOL[5].

Most studies have only focused on the prevalence and risk factors of OA progression[6,7]. However, the factors associated with HRQOL among OA patients are often neglected. It has been shown that associated modifiable factors toward HRQOL (obesity, physical activity, adequate nutrition intake, level of education) can help result in a possibly better QOL among OA patients[8,9].

In order to achieve optimal HRQOL among the OA patients, there should be some kind of management for this disease including health improvement programs and health policies at the local community level. Thus, it is important to understand the factors related to HRQOL of OA patients, specifically those who continue their rehabilitation processes at outpatient rehabilitation clinics or centers and develop management and intervention programs for risk factors. In this study, we identified the possible contributed factors influencing HRQOL among OA patients.

2. Methods

2.1 Research Design and Sampling

A cross-sectional observational study with universal sampling method was conducted among 131 knee and/or hip OA patients who were referred to and followed-up in the Rehabilitation Health Organization (RHO), Terengganu. Patients were eligible for this study if they were diagnosed knee and/or hip OA by medical doctor, do not suffer from physical deformation that affect anthropometric assessment, able to communicate or assist from caregivers and agreed to participate (signed informed consent). On the other hand, patients were excluded if they were suffered from physical deformation that affect anthropometric assessment, not willing to give consent, not able to communicate, detected with mental disorder or terminally ill as well as degenerative disease that could affect their quality of life such as cancer, heart disease, Parkinson's disease and etc. Ethical clearance was sought from the Medical Research and Ethics Committee (NMRR-16-1937-30162) and UniSZA Human Research Ethics Committee (UHREC) (UniSZA C/1/uhrec/628-1). An information sheet was given to the patients together with the standard consent form prior to the commencement of the study.

2.2 Research Instrument and Statistical Analysis

This study utilized a standardized and structured questionnaire to gather data on the socio demographic, clinical and lifestyle histories, and dietary intake of the patients. The Malay version of the Osteoarthritis Knee Hip Quality of Life (OAKHQOL) questionnaire was used to assess HRQOL. This questionnaire consisted of five domains with the Cronbach's alpha of each domain between 0.865 to 0.933 and factor loading of each item score above 0.65[10]. Body weight was measured twice using an electronic weighing scale while height was measured twice using a portable stadiometer.

An alternative height measurement to predict the height for knee and/or hip OA patients with a hunchback was used instead of measuring their standing height. Height was estimated from the demi-span using the age and gender-specific demi-span equations[11]. Measurements were performed using an inelastic measuring tape on the dominant or non-paretic arm. Body Mass Index (BMI) was classified using WHO cut-offs: underweight ($<18.5kg/m^2$), normal (18.5 to $24.9kg/m^2$), overweight (25.0 to $29.9kg/m^2$), and obese ($>30.0kg/m^2$). Waist Circumference (WC) was measured twice by using a measuring tape.

Dietary intake was recorded for three days (2 week days and 1 weekend) by using a 24-hour dietary recall. The nutrient intake was analyzed using the Nutritionist Pro™ Diet Analysis (Version 7.0.0, Axxya Systems). The data were analyzed using IBM SPSS Statistics for Windows version 22.0 software. Descriptive statistics were performed for the characteristics of the respondents while multiple linear regressions were conducted to determine the predictors of HRQOL. A p-value of <0.05 was considered significant.

3. Results

3.1 Background Characteristics of Patients

The mean age of the patients was 61.81 (9.28) years old (range 38–83 years old). All the patients who participated in this study were Malay (100.0%). The majority of them were aged ≥60 years (65.6%), female (80.9%), married (54.9%), had secondary education (48.8%), unemployed (79.4%) and which classified as a housewife or pensioner and had low household income (90.8%) with an average household income of RM1020.39 (RM1702.56). The mean disease duration was 4.27 (4.68) years. Most of the patients (55.8%) had been diagnosed with knee and/or hip OA within one to five years, followed by 19.8% of the patients diagnosed within less than 1 year (at least 3 months).

There were an almost similar proportion of patients with family history of OA (48.1%) and no history of OA (51.9%). This is similar with the type of treatment performed by the patients; there was an almost similar proportion of the patients who had treatment (53.4%) and patients without treatment (44.6%). The type of treatment that the majority of the patients had was oral medication (44.3%). Out of 131 patients, a total of 49.6%, 26.0%, 12.2%, and 12.2% were diagnosed with bilateral knee OA, knee and hip OA, right knee OA, and left knee OA, respectively.

In terms of comorbidity, the percentages of the patients who had at least one comorbidity (22.9%), two comorbidities (26.7%) and three comorbidities (24.4%) were not too different. A total of 62.6% patients had hypertension, followed by 58.0% with hyperlipidemia and 36.6% with diabetes mellitus. However, only 6.8% of the patients presented other diseases such as asthma and gastritis. The majority of the patients had a sedentary lifestyle (84.7%), inadequate intake of vegetables (87.0%), fruits (87.8%) and milk (64.1%). Lastly, 35.9% of the patients had supplement intake.

Table 1 displays an overview of anthropometric and dietary data of knee and/or hip OA patients. It is shown that the mean weight, height, BMI, and WC were 72.61 (15.67) kg, 154.06 (7.26) cm, 30.51 (5.88) kg/m², and 98.89 (11.28) cm, respectively. Most of the patients were categorized as obese (49.6%), followed by overweight (36.7%), normal weight (12.2%), and underweight (1.5%). Next, in terms of dietary intake, the patients consumed 1693 kcal/day with 227g of carbohydrate, 67g of protein, and 53g of fat (Table 1). The HRQOL scores according to the domains are shown in (Table 2). The scores were standardized on a scale from 0 (best possible QOL) to 100 (worst possible QOL). Overall, social functioning recorded the highest value with a score of 41.25 (27.16), while mental recorded the lowest score, which was 21.15 (20.92).

Table 1. Anthropometric and dietary data of knee and/or hip OA patients (n = 131)

Variables	Frequency (%)	Mean (SD)	Range
Weight (kg)		72.61 (15.67)	34.4-130.0
Height (cm)		154.06 (7.26)	139.3-173.0
BMI (kg/m²)		30.51 (5.88)	17.7-53.39
WC (cm)		98.89 (11.28)	63.6-122.7
BMI category			
Underweight	1.5		
Normal	12.2		
Overweight	36.7		
Obese	49.6		
Energy (kcal)		1693.07 (610.41)	
Carbohydrate (g)		227.11 (57.57)	
Protein (g)		67.52 (20.28)	
Fat (g)		53.84 (21.31)	
Dietary Fibre (g)		2.80 (1.78)	
Sodium (mg)		1975.99 (968.58)	

Potassium (mg)		1448.92 (414.01)	
Calcium (mg)		432.07 (219.55)	
Cholesterol (mg)		159.50 (102.57)	
Vitamin A (RE)		739.43 (437.78)	
Vitamin D (µg)		8.22 (92.17)	
Vitamin E (mg)		4.15 (1.34)	
Vitamin K (µg)		18.44 (19.15)	
Vitamin C (mg)		62.37 (45.55)	

Table 2. HRQOL data of knee and/or hip OA patients (n = 131)

Domains	Mean (SD)
Physical activity	41.06 (22.81)
Mental health	21.15 (20.92)
Pain	38.78 (22.05)
Social functioning	41.25 (27.16)
Social support	21.32 (18.70)

3.2 Determinants of Health-Related Quality of Life

According to (Table 3), disease duration, knee and hip OA, having three comorbidities and no exercise were associated positively with the physical activity domain which indicated physical functioning decline. Next, patients with knee and hip OA, no exercise, high vitamin D and vitamin C intake had a lower emotional well-being.

Table 3. Associated factors of HRQOL among knee and/or hip OA patients (n = 131)

Variables	Regression Coefficient (β)[a]	95% CI	p-value[b]	R^2
Physical activity domain				
Disease duration (years)	1.028	0.242, 1.814	0.011*	
Type of OA				
Unilateral KOA	Reference			
Knee and hip OA	9.474	1.014, 17.935	0.028*	
No of comorbidity				0.161
None	Reference			
3 comorbidities	8.744	0.184, 17.304	0.045*	
Exercise				
Yes	Reference			
No	17.579	7.428, 27.731	0.001*	
Mental health domain				
Type of OA				
Unilateral KOA	Reference			
Knee and hip OA	10.319	2.678, 17.961	0.009*	
No of comorbidity				
None	Reference			
4 and above comorbidities	-15.128	-28.708, -1.548	0.029*	0.205
Exercise				
Yes	Reference			
No	11.285	1.842, 20.728	0.020*	
Vitamin D (µg)	0.042	0.006, 0.078	0.021*	
Vitamin C (mg)	0.114	0.039, 0.188	0.003*	

Pain Domain				
Educational level				0.103
Tertiary	Reference			
Secondary	7.333	0.022, 14.645	0.049*	
Type of OA				
Unilateral KOA	Reference			
Knee and hip OA	10.630	2.200, 19.060	0.014*	
Exercise				
Yes	Reference			
No	10.693	0.526, 20.861	0.039*	
Social Functioning Domain				
Age (years)	0.682	0.206, 1.159	0.005*	0.263
Educational level				
Tertiary	Reference			
No formal education	19.262	1.552, 36.972	0.033*	
No of comorbidity				
None	Reference			
1 comorbidity	15.449	5.206, 25.693	0.003*	
Hyperlipidaemia				
No	Reference			
Yes	9.686	0.704, 18.667	0.035*	
Vitamin E (mg)	5.339	2.156, 8.521	0.001*	
Vitamin K (µg)	-0.341	-0.560, -0.122	0.003*	
Social Support Domain				
No of comorbidity				0.206
None	Reference			
3 comorbidities	7.535	0.601, 14.470	0.033*	
Treatment				
None	Reference			
Surgery	24.414	4.627, 44.202	0.016*	
Exercise				
Yes	Reference			
No	8.843	0.605, 17.081	0.036*	
Fat (g)	0.245	0.105, 0.385	0.001*	
Vitamin D (µg)	0.045	0.012, 0.385	0.001*	

[a]Adjusted regression coefficient; [b]Forward MLR applied. *p<0.05. Model assumptions are fulfilled. There were no interactions among independent variables. No multicollinearity detected. R^2: Coefficient of determination; Final model equation $[Y = \beta_0 + \beta_1 (X_1) + \beta_2 (X_2) + \beta_3 (X_3) \ldots\ldots + + \beta_i (X_i)]$.

However, those who had four or more comorbidities were associated with better mental health. Besides, patients with secondary education, knee and hip OA, and no exercise complained about more pain as implied by the higher score in the pain domain.

By looking at the social functioning domain, significant linear positive relationships were observed in age, no formal education, Having one comorbidity, diagnosed with hyperlipidemia, and higher vitamin E intake. This indicated that social activities were more

affected. However, higher vitamin K consumption was associated with better social function. Lastly, patients having three comorbidities, underwent knee surgery, no exercise, higher fat, and vitamin D intake were associated with lower social support as indicated by the negative linear relationship (Table 3).

4. Discussion

The present study found that older aged knee and hip OA patients were associated with lower social functioning. This finding is consistent with a prior local study[12] and an international study[13] although the researchers used different questionnaires. Besides, the present study also reported that low level of education was associated with low HRQOL among knee and hip OA patients, especially in the pain and social functioning domains. This finding was in agreement with a previous study[8], which reported that low education level was significantly associated with poor HRQOL. A study reported by Jhun, et al.[14] stated that low educational level increases up to twice the chance of having OA. Usually, individuals with low education level have manual occupation activities or repetitive physical labor. A previous researcher reported that educational programs delivered by health care professionals reported an improved QOL in knee OA patients assessed at weeks 8 and 6 months based on the WOMAC and Short Form 36 Health Survey (SF-36) measures[15]. This is in contrast with a previous study, which reported that there was no significant association between employment status with HRQOL by using the SF-36 Questionnaire[12].

The present study also demonstrated that increased disease duration was associated lower physical activity among knee and hip OA patients. Another study reported that patients' QOL was negatively correlated with disease duration, indicating the longer disease duration, the worse QOL[16]. Another study also supported that an increased OA disease duration was significantly associated with low HRQOL[17]. Next, the present study found direct associations between the number of comorbidities with physical activity, social functioning, and social support, indicating the higher number of comorbidities, the poorer the physical activity, social functioning, and social support, which is in agreement with a previous study[12]. However, the present study also found that there was an inverse relationship between having four and above comorbidities and mental health, which indicated that

those who had four comorbidities and above were more likely to have better mental health. This finding shows discrepancy with a previous study by Norimatsu, et al.[18].

In addition, the present study revealed that HRQOL among knee and hip OA patients was more affected as compared to unilateral knee OA patients, especially in the physical activity, mental health, and pain domains. A previous study claimed that patients with bilateral knee OA had lower HRQOL than patients with unilateral knee OA according to Knee Osteoarthritis Outcome Score (KOOS) and SF-12 questionnaire[19]. The present study also found that patients who had performed knee surgery had higher social support score, which indicated that they were more likely to have poorer social support. A previous study found that patients who had performed a surgery intervention were more likely to have poorer QOL due to depression, higher BMI, and lower socioeconomic groups[15].

Patients with hyperlipidemia were associated with lower social functioning as reported in the present study. Hyperlipidemia is one of the cardiovascular factors. There were limited studies conducted directly between hyperlipidemia and HRQOL. Nevertheless, a previous study reported that patients with cardiovascular risk factors like hypertension and diabetes mellitus directly increased the risk for OA and will lead to lower QOL[20]. The present study found that a sedentary lifestyle was the main associated factor that influenced almost all the domains in HRQOL except for the social functioning domain. This is in agreement with a previous study conducted among Japanese women, where the researcher found that Japanese women had negatively correlated with physical activity[21]. Another previous study also reported that the QOL score among Chinese knee OA patients related to physical health and mental health was significantly lower in individuals who were living sedentary lifestyles when compared to all other groups, which included the exercise group, exercise and diet control group and only dietary control group[22].

For dietary intake, the present study found that fat and vitamin D showed a direct link to social support while vitamins D and C showed a positive relationship to mental health. Besides that, vitamin E had a significant positive association with social functioning but vitamin K showed an inverse relationship with social functioning. The present result is in accord with a previous finding, which found that a high fat intake increasingly contributed to OA and led to pain sensitization and depression[23].

The findings in the present study are in contrast with previous studies that reported supplementary vitamin D was strongly associated with lessened disability for knee OA patients. However, the findings in the present study are similar with the unexpected finding of another study associated with dietary vitamin D with greater knee pain[24]. Other than that, the findings in the present study are in contrast with previous studies on vitamins C and E intake, which reported that there were no associations between vitamins C and E intake with HRQOL[25,26].

5. Conclusion

The significant factors associated with poor HRQOL among OA patients were increasing age, low educational level, knee and hip OA, increasing number of comorbidities, diagnosed with hyperlipidemia, sedentary lifestyle, previous surgery, and higher fat, vitamins D, E, and C intake. On the other hand, higher vitamin K intake was associated with better social function. Overall, active lifestyle is a good predictor to better HRQOL of knee and/or hip OA patients in Kuala Nerus, Terengganu. It is suggested that health care organizations can promote active lifestyle with balanced dietary intake in order to maintain optimal nutritional status and HRQOL among the patients.

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7. Declaration of Conflicting Interests

The authors declare no conflict of interest.

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