Available Online at www.ijpscr.info
International Journal of Pharmaceutical Sciences and Clinical Research 2022; 2(4):139-146

RESEARCH ARTICLE

Quality of Life Post Elective Total Joint Replacement: A Cross-sectional Study from Saudi Arabia

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Received: 15-09-2022; Revised: 22-10-2022; Accepted: 10-11-2022

ABSTRACT

Objective: The aim of this study is to assess the quality of life (QoL) and patients' satisfaction post total knee replacement (TKR) and total hip replacement (THR) surgeries. **Methods:** This is a cross-sectional study; 241 patients were interviewed in the outpatient clinic within 2 medical centers in Saudi Arabia. SF-12, the short version of SF-36, was translated into the Arabic language and validated before being used to measure the QoL post replacement surgeries. **Results:** The mean age for the participants was 64.5 ± 8.52. Males represented only 24.5% of the respondents. The mean body mass index was 32.4 ± 3.97. Regarding replacement surgery satisfaction, 55% of the participants were very highly satisfied and 35% were highly satisfied. Only 2.4% of them were not satisfied with their surgeries. The mean value of the physical component score was 38.8 ± 4.8 and 48.3 ± 5.99 for mental component score. **Conclusion:** This is a cross-sectional study, which has indicated a high satisfaction rate for joint replacement surgeries in Saudi Arabia. Additionally, post joint replacement surgeries, patients reported physical and mental health scores which closely matched those of healthy American population aged 75 years and above. In short, joint replacement surgeries in Saudi Arabia are successful solutions for patients with degenerative joint diseases as the surgeries will improve their QoL.

Keywords: Patients' satisfaction, Quality of life, Surgery success, Total hip replacement, Total knee replacement

INTRODUCTION

Osteoarthrosis, osteoarthritis, or degenerative joint diseases are major causes of physical disability among elderly people. The pain and functional limitation over the joints of the lower limbs results in reduced quality of life (QoL) for these patients. In patients with severely degenerative joints (end-stage osteoarthrosis), joint replacement surgeries represent an effective procedure to restore the functions of the joint and to relieve the pain.[1] Congenital hip dislocation (congenital hip dysplasia) is another indication for total hip replacement (THR). THR has been proven to greatly improve the patients' QoL.[2] In addition, patients with rheumatoid arthritis (RA) are also recommended to undergo total knee replacement (TKR) that can improve the QoL of patients in the advanced stages of the disease. Among the

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many treatment modalities for RA, TKR has been the most successful intervention in reducing knee pain and improving physical function.[3] In view of this, joint replacement procedures are attractive choices for many patients. Therefore, this has greatly increased the demand for such procedures.[1] To the best of our knowledge, QoL assessment for patients who underwent TKR and THR in Saudi Arabia has not been studied before and local evidence is also poorly covered in the literature. Thus, this study aims to be the first study to evaluate the QoL of patients undergoing these procedures in Saudi Arabia.

MATERIALS AND METHODS

This cross-sectional study was conducted in 2 medical centers in Riyadh, Saudi Arabia. All patients who underwent primary TKR or THR in these 2 centers for more than 3 months or more between the period of October 2018 and April 2019 were included. Patients who underwent revision surgeries during the 12 months from the primary procedure and patients who were planned for a second joint replacement during the study period were excluded. Convenience sampling was used to recruit patients who fulfilled the inclusion criteria in the outpatient orthopedic clinics. Convenience sampling method is considered a source for selection bias.

The study instrument consisted of 7 items on demographic characteristics and 5 items on patients' satisfaction regarding the surgery which were adapted from 3 different studies.[4-6] The last part of the questionnaire was the validated Arabic version of the SF-12.[7] SF-12 was chosen to assess the QoL post surgeries as it is a well-validated questionnaire and represents an adequate summary of SF-36. Webster and Feller (2016) proved that the component scores and measures of SF-12 were able a good replication of SF-36 and SF-12 manages to produce similar responsiveness to change as SF-36. Thus, SF-12 is a suitable alternative to be used in patients with TKR surgeries.[8] Data analysis was done using SPSS version 20 and both descriptive and inferential statistics were used to describe the data. The study was approved by the Institutional Review Board in both centers with reference numbers (HP-01-R-079 and H-01-R-059) for PSMMC and KAAUH, respectively.

Sample size calculation

To calculate the sample size, the researcher used Modified Cochran Formula, since the author is targeting all the patients who have joint replacement in a given period. According to the Health Affairs of Ministry of National Guard in the Kingdom of Saudi Arabia 2018, about 5000 joint replacement procedures have been performed over the last 10 years, with an average of 500 joint replacements annually. Consequently, 500 represents our target population, so the sample size according to Modified Cochran Formula at 95% confidence interval and 0.05 significance level is 217.

RESULTS

A total of 258 patients were approached in the outpatient orthopedic clinics between October 2018 and April 2019 in the 2 medical centers. Only 6 patients rejected to participate in this study, another 11 patients were excluded either because they were due for revision surgery or a second replacement surgery. Therefore, a total of 241 participants were included in this study, with a response rate of 93.4% (241/258).

Demographic data

Demographic characteristics of the participants such as age, body mass index (BMI), education level, gender, type of surgery, and history of chronic diseases were outlined with frequency analysis. The mean age for the participants was 64.5 ± 8.52. Table 1 indicates that majority of the respondents were females (75.5%). The mean value of BMI was 32.4 ± 3.97. As for the education level, most of the participants have attained at least primary school education. Only 1.2% of them had a master's degree. As high as 29.9% of the respondents had both hypertension (HTN) and diabetes mellitus (DM) while another 19.9% had HTN and ischemic heart disease (IHD). About 1 in 8 of them (12.4%) had HTN, DM, and cardiomyopathy and another 11.2%

had a combination of HTN, DM, and hypothyroidism. A small number of them (11.6%) had only HTN. As for past surgeries, more than half of the respondents had bilateral TKR (58.1%), another 36.9% underwent unilateral TKR, and a small number of them (5.0%) had THR. The results indicated that 41.9% of the respondents had undergone the surgery in the past year, as compared to 25.7% of them who the surgery more than 3 years ago.

Surgery success

To measure patients' satisfaction with the replacement surgery to reflect the success of the surgery, 5 questions were asked. The value of Cronbach's alpha (reliability measure) of these 5 items was 0.827, indicating that the 5 items were measuring what they were supposed to measure. As shown in Table 2, the first question asked was "How satisfied are you with your joint replacement?" It was asked on a 5-point Likert scale, with 5: Very high satisfaction level to 0: Not at all satisfied. More than half of the respondents (55%) were very highly satisfied with their replacement surgeries compared to only 2.4% of them who were not satisfied at all. In the second question, respondents were required to answer yes/no to the question of "If you had the choice, would you undergo the procedure again under the same conditions?" The results showed that 82% of the people said that they would undergo the surgery again under the same conditions if they had the choice to repeat the procedure. The subsequent question was "Did the surgery increase your functional capacity?" This was important to indicate surgery success. As high as 90.5% of the respondents answered yes to the questions. For the fourth question, "Did the surgery relieve your pain?", a total of 93.4% of the respondents agreed with the statement. For the last question on "Would you recommend this surgery

Table 1: Summary statistics of demographic data

Demographic characteristics	Frequency (%)
Gender	
Male	59 (24.5%)
Female	182 (75.5%)
Education level	
Primary school	105 (43.6%)
Secondary school	98 (40.7%)
Bachelor	35 (14.5%)
Master	3 (1.2%)
Chronic disease	
HTN	28 (11.6%)
DM	15 (6.2%)
HTN and DM	72 (29.9%)
HTN and IHD	48 (19.9%)
HTN, DM, and dyslipidemia	17 (7.1%)
HTN, DM, and cardiomyopathy	30 (12.4%)
HTN, DM, and hypothyroidism	27 (11.2%)
HTN, dyslipidemia, and asthma	4 (1.7%)
Type of surgery	
One knee joint replacement	89 (36.9%)
Both knees replacement	140 (58.1%)
Hip joint replacement	12 (5%)
Surgery date	
<1 year and more than 3 months	101 (41.9%)
1 year	48 (19.9%)
2 year	6 (2.5%)
3 year	62 (25.7%)
More than 3 year	24 (10%)
BMI	
Mean (SD)	32.36 (3.97)
Age	
Mean (SD)	64.49 (8.52)

Frequency table of nominal and scale variables is explored using frequency analysis. BMI: Body mass index, DM: Diabetes mellitus, HTN: Hypertension, IHD: Ischemic heart disease, SD: Standard deviation

Table 2: Summary Statistics for surgery success questions

Variables	Frequency (%)
How satisfied are you with your joint replacement?	
Very highly	133 (55.2%)
Highly satisfied	84 (34.9%)
Moderately	18 (7.5%)
Minimally	3 (1.2%)
Not satisfied at all	3 (1.2%)
If you had the choice, would you undergo the procedure again under the same conditions?	
Yes	197 (81.7%)
No	44 (18.3%)
Did the surgery increase your functional capacity?	
Yes	218 (90.5%)
No	23 (9.5%)
Did the surgery relief your pain?	
Yes	225 (93.4%)
No	16 (6.6%)
Would you recommend this surgery for your friends or relatives?	
Yes	221 (91.7%)
No	20 (8.3%)

Frequency table of nominal and scale variables is explored using frequency analysis

for your friends or relatives?", as high as 91.7% said that they would recommend the surgery to their friends or relatives.

To determine the direction of the success of the surgery indicators, pairwise correlations were calculated and are presented in Table 3. All the correlation coefficients were highly positive, indicating a direct relationship. The correlation coefficient value of 0.639 for satisfaction with joint replacement and increased functionality after surgery showed that people who felt satisfied with joint replacement also felt an increased capacity of their joint functioning. The correlation coefficient value of 0.821 between "Did the surgery relief your pain?" and "Did the surgery increase your functional capacity?" indicated that people who were relieved from the pain also felt increased functional capacity of their body. Similarly, correlation coefficient value 0.926 value for the questions "Did the surgery increase your functional capacity?" and "Would you recommend this surgery for your friends or relatives?" indicated that people who noticed an increased capacity of the functioning of their bodies after the replacement surgery would be more likely to recommend the surgery to their friends and relatives. All the correlation coefficient values were positive and statistically significant, with a *P*-value of less than 0.05 (Table 3).

QOL health survey

SF-12 is a standard QoL questionnaire that had been validated several times. The Cronbach's alpha value for the SF-12 questionnaire in this study was 0.749, indicating that SF-12 was measuring what it was supposed to measure. After measuring the reliability of the SF-12, the SF-12 scores are measured by dividing the 12 items into the physical component score (PCS) and mental component score (MCS). These scores were calculated by following the steps of deleting out-of-range values, creating indicator variables from items, weighting, and aggregating data with physical and mental regression weights before scaling the data through a norm-based standardization method. As shown in Table 4, the mean score of PCS is 38.8 ± 4.8, which was lower than the mean score for MCS (48.3 ± 5.99). The difference was significant with $P < 0.05$.

Table 5 presents the summary measures of PCS-12 and MCS-12 scores for sociodemographic analysis. ANOVA was used to compare the means for more than 2 groups of qualitative factors. In this study, these factors included age groups, education level, chronic disease, and disease type. As for gender, a two-sample t-test assuming equal variance was used for gender.[9] The results showed that patients in the

Table 3: Correlation* analysis for surgery success questions

Questions	2. If you had the choice, would you undergo the procedure again under the same conditions?	3. Did the surgery increase your functional capacity?	4. Did the surgery relief your pain?	5. Would you recommend this surgery for your friends or relatives?
1. How satisfied are you with your joint replacement?				
Correlation	0.619	0.639	0.481	0.657
P-value	0.000	0.000	0.000	0.000
2. If you had the choice, would you undergo the procedure again under the same conditions?				
Correlation	1	0.687	0.564	0.637
P-value		0.000	0.000	0.000
3. Did the surgery increase your functional capacity?				
Correlation	0.687	1	0.821	0.926
P-value	0.000		0.000	0.000
4. Did the surgery relief your pain?				
Correlation	0.564	0.821	1	0.886
P-value	0.000	0.000		0.000
5. Would you recommend this surgery for your friends or relatives?				
Correlation	0.637	0.926	0.886	1
P-value	0.000	0.000	0.000	

*Pearson correlations were done

Table 4: Descriptive analysis of PCS-12 and MCS-12

Summary statistics	PCS-12	MCS-12
N	133	133
Mean	38.79	48.34
Standard deviation	4.80	5.99
Minimum	32.32	21.70
Maximum	60.92	57.43
Significance (2-tailed) *P*-value	0.000	

Descriptive analysis and two-tailed t-test were done, N: Number

different age groups had statistically significantly different scores for MCS and PCS. When testing the assumption of the equal conception of physical and mental health conditions in male and female patients, the results indicated that males and females behaved differently for PCS as their mean difference was statistically significant. However, there was no statistical significance for the mean difference of MCS between males and females. The education level of patients also did not create any impact on the survey results of the physical and mental health conditions. As for chronic diseases, people with different types of chronic diseases behaved differently in terms of mental health conditions, but there was no difference for physical. Tukey's test was used as a *post hoc* test to identify which chronic disease produced a significant difference for the MCS-12 scoring, and the results indicated that patients who had only HTN behaved significantly differently compared to the rest. There was no impact on the PCS-12 and MCS-12 scores of the respondents by the type of surgery.

Table 6 shows the results of the correlation analysis between mental and physical health scores. The value of the correlation coefficient was negative and statistically significant, indicating that people who had a low score for physical conditions would record a high score for mental health conditions. Table 6 also presents the results of the correlation analysis between types of disease, BMI, and age of patients with the PCS and MCS, respectively. Patients with chronic disease were found to have a correlation with mental health conditions but not with physical health conditions. Patients with high BMI had a low score for physical health conditions and a high score for mental health conditions. However, all these correlations were weak and

Table 5: Descriptive statistics of sociodemographic variables for PCS-12 and MCS-12

Demographic variables	N	PCS-12 Mean (SD)	MCS-12 Mean (SD)
Age groups			
45–54	1	37.77	33.99
55–64	33	37.98 (2.49)	49.69 (4.49)
65–74	53	40.10 (6.41)	47.63 (7.58)
Above 75	46	37.88 (3.53)	48.52 (4.25)
(Significance)		(0.086)	(0.04)
Gender			
Male	29	36.62 (3.40)	48.40 (4.33)
Female	104	39.39 (4.97)	48.33 (6.40)
(Significance)		(0.006)	(0.952)
Education level			
Primary	70	39.01 (5.78)	47.22 (7.27)
Secondary school	50	39.20 (3.40)	49.64 (3.45)
Bachelor	13	35.99 (2.21)	49.38 (5.19)
(Significance)		(0.085)	(0.074)
Chronic disease			
HTN	18	41.21 (10.34)	40.31 (9.59)*
DM	7	35.89 (1.72)	47.84 (6.26)
HTN and DM	39	38.04 (3.34)	49.95 (2.26)
HTN and IHD	29	37.83 (2.80)	49.91 (5.39)
HTN, DM, and dyslipidemia	7	40.99 (1.80)	46.18 (4.61)
HTN, DM, and cardiomyopathy	20	38.25 (3.05)	49.23 (3.70)
HTN, DM, and hypothyroidism	10	40.97 (2.45)	51.88 (2.04)
HTN, dyslipidemia, and asthma	3	41.1907 (0.00)	49.01 (0.00)
(Significance)		(0.051)	(0)
Type of surgery			
One knee joint replacement	50	36.67 (6.54)	48.03 (7.61)
Both knees replacement	75	38.68 (3.45)	48.48 (5.04)
Hip joint replacement	8	40.53 (2.55)	49.00 (1.36)
(Significance)		(0.576)	(0.873)

ANOVA is applied to test the equality of more than two groups' means for qualitative factors such as age groups, education level, chronic disease, and disease type, two-sample t-test assuming equal variance is used for gender.
BMI: Body mass index, DM: Diabetes mellitus, HTN: Hypertension, IHD: Ischemic heart disease, MCS: Mental component score, PCS: Physical component score, SD: Standard deviation

Table 6: Correlation* of disease with PCS and MCS

Correlations	PCS	MCS
Between PCS and MCS (significance)	−0.421 (0.000)	−0.421 (0.000)
Disease (significance)	0.023 (0.790)	0.350 (0.00)
BMI (significance)	−0.047 (0.588)	0.152 (0.081)
Age (significance)	−0.047 (0.592)	−0.21 (0.807)

*Pearson correlations were done. BMI: Body mass index, MCS: Mental component score, PCS: Physical component score

insignificant as the *P*-value was greater than 5%. In other words, there was no significant correlation between BMI and physical and mental health scores. There was also no correlation between the age of patients with PCS and MCS.

Figure 1 illustrates that as the age of patients increases (more than 55 years), they recorded a higher score for mental health conditions and a lower score for physical health conditions. As for those less than 55 years of age, they scored higher for mental health conditions and lower for physical health conditions. Regression analysis was done to identify the predictors of low PCS and MCS scores. Table 7 presents the results of regression analysis of PCS-12 and MCS-12 scores for age, education level, BMI, and chronic disease. As education level and chronic disease are qualitative variables, one category of these variables was taken as the benchmark category to calculate the value of model intercept. The R-square value was 0.205 and 0.373 for PCS-12 and MCS-12, respectively. This meant that only 20.5% of the variability in the PCS-12 was due to age, education level, BMI, and chronic disease of the patients, whereas 79.5% was due to other factors. Similarly, for MCS-12, only 37.3% of the variability in the MCS-12 scores was accounted by age, education level, BMI, and chronic diseases. In the regression analysis for PCS-12, only education level was found to be a significant predictor of the SF-12 scores. As for the regression analysis for MCS-12, chronic disease had a significant impact ($P<0.05$) on the mental health condition survey. All the other variables were not significant predictors.

In Table 8, the SF-12 findings were compared with the national mean scores of the United States (US) for both components. It was assumed that both countries had the same scores for different age categories. For the first age category of 45–54 years, the PCS-12 scores in the US were significantly higher than this study ($P<0.05$). The same finding was observed for the age group of 55–64 years. However, for the age group of 75 years and above, both countries showed the same mean score of PCS-12 ($P=0.1903$). For MCS-12 scores, there was a significant difference between both countries for the age category of 45–54 years and 65–74 years ($P < 0.05$). However, there was no significant difference in the MCS-12 scores for the age groups of 55–64 years and above 75 years, as both *P*-values were more than 0.05.

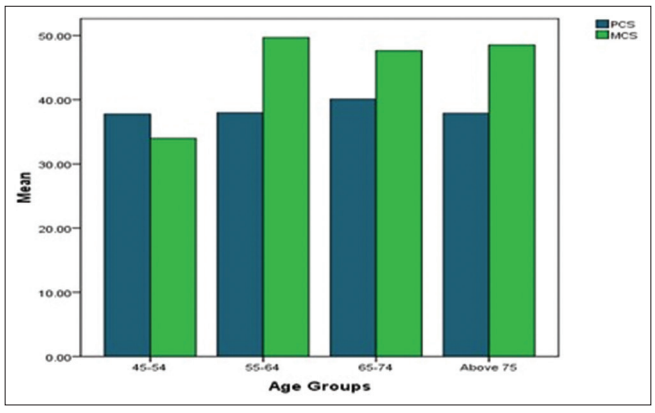

Figure 1: Mean scores of physical component score and mental component score for age groups

DISCUSSION

This is one of the first studies in Saudi Arabia that measured surgery success as well as the QoL post joint replacement surgeries. The results showed a high surgery success rate with an acceptable QOL based on the SF-12 scores for the participants in the study. Joint replacement surgeries represent a good and successful solution for patients with degenerative joint diseases as these surgeries are able to improve the QoL of these patients. The

Table 7: Regression analysis for PCS-12 and MCS-12

Model	PCS-12		MCS-12	
	Coefficients (SE)	t-statistic (P-value)	Coefficients (SE)	t-statistic (P-value)
(Constant)	49.769 (5.701)	8.730 (0.000)	40.197 (6.743)	5.962 (0.000)
Age	−0.061 (0.052)	−1.174 (0.243)	−0.007 (0.061)	−0.116 (0.908)
educational level	−1.548 (0.714)	−2.169 (0.032)	1.245 (0.844)	1.475 (0.143)
BMI	−0.176 (0.113)	−1.553 (0.123)	0.092 (0.134)	0.686 (0.494)
Chronic disease	0.347 (0.264)	1.315 (0.191)	0.970 (0.312))	3.108 (0.002)

BMI: Body mass index, MCS: Mental component score, PCS: Physical component score, SE: Standard error

Table 8: Comparison between SF-12 components' scores in the current study with the normal SF-12 components' scores for the general U.S. population

Demographic Variables	N	PCS-12 Mean (SD)	US-PCS-12 Mean (SD)	Sig	MCS-12 Mean (SD)	US-MCS-12 Mean (SD)	Sig
Age groups							
45–54	1	37.77	49.71 (9.5)	<0.05	33.99	50.45 (9.55)	<0.05
55–64	33	37.98 (2.49)	46.55 (10.63)	<0.05	49.69 (4.49)	50.57 (9.82)	0.189
65–74	53	40.10 (6.41)	43.65 (11.02)	<0.05	47.63 (7.58)	52.10 (9.53)	<0.05
Above 75	46	37.88 (3.53)	38.68 (11.04)	0.1903	48.52 (4.25)	50.06 (10.94)	0.0565

MCS: Mental component score, PCS: Physical component score, SD: Standard deviation, US: United States

demographic analysis indicated that most of the patients in the survey were female 182/241 (75.5%) and above 50 years old. The mean age of the participants was 64.5 ± 8.52, indicating that replacement surgeries in Saudi Arabia were mostly done for elderly patients. Most participants were obese as the mean value of BMI was 32.4 ± 3.97. This showed the presence of an obesity epidemic in the Saudi community, which, in turn, affects the physical activities of the patients. It was shown that patients with high BMI recorded a low score for physical health conditions. Despite being a weak correlation in this study, the association between high BMI and low physical activities has been proven in other studies. The most common chronic diseases among the participants were HTN and DM. More than half of the patients underwent bilateral TKR, indicating that this was the most frequently performed type of joint replacement surgeries in Saudi Arabia as compared to THR being the least common procedure. As for surgery success, 9 out of 10 people were very highly satisfied with the surgical results and most of them will undergo the surgery again if they need that. Furthermore, most of the participants revealed that the surgery increased their functional capacity and relieved their pain. Thus, it is not surprising that 9 out of 10 of them would recommend the surgery to their relatives. In short, the results indicated the success of joint replacement surgeries in Saudi Arabia. With regard to the QoL, SF-12 scores range from 0 to 100 and a higher score represents a better health status.[10] In this study, participants showed significantly lower PCS-12 scores than MCS-12 scores. When comparing these findings with the US national mean scores for both components, the scores of the normal SF-12 components closely matched those of the general U.S. population,[11] except for 2 age groups which showed significant differences for both scores. For those above 75 years old, there was no significant difference, thus indicating comparable health status for the patients who were post replacement surgeries with the US normal populations. These closely matching scores for the physical and mental health with American population show a good health status of the respondents and reflect the success of the joint replacement procedures in Saudi Arabia. This is a cross-sectional study that assessed the QoL post replacement surgery only, and this is considered limitation for this study. The results would be more comprehensive if the QoL before and after joint replacement surgeries can be collected to reflect a better picture on the improvement in the QoL. Another limitation is that most of the participants had low educational levels, and this might affect their understanding of the questionnaire, and this may be a source for information bias.

Highlights

QoL assessment for patients who underwent replacement procedures (TKR and THR) in Saudi Arabia (SA) is not studied before, and it is poorly covered in the literature, so this study will be the first in SA.

- Patients' satisfaction for joint replacement procedures has not been studied before, and this study will be the first study that shed light on this.
- This study is needed by both surgeons and patients, especially with the growing number of patients who underwent these replacement procedures.
- Joint replacement surgeries in Saudi Arabia are successful solutions for patients having

degenerative joint diseases, which will improve their QoL.

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