

## A Retrospective Study Determining the Predictors of Health-Related Quality of Life after Total Knee Arthroplasty

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### Abstract

**Aim:** The aim of the present study was to evaluate the health related quality of life patients compared to healthy people and the factors affecting the health related quality of life after total knee arthroplasty.

**Methods:** The present study was conducted in the Department of Orthopedics, Government medical college West Champaran, Bettiah, Bihar, India for 18 months and 200 patients with OA of the knee who underwent TKA were compared with 200 healthy controls.

**Results:** The mean age of the case and control groups was  $66.74 \pm 7.71$  and  $66.89 \pm 6.95$  years, respectively. ( $p:0.89$ ) 170 (85%) of case group and 168 (84%) controls were women. The mean follow-up of the patients was  $25.8 \pm 3.65$  months. No significant difference was observed in demographic characteristics between the two groups. ( $P > 0.05$ ). The mean overall SF-36 score 12 months after surgery significantly improved compared to before surgery ( $64.21 \pm 22.2$  vs.  $37.55 \pm 15.13$ ,  $p < 0.001$ ). Also, the mean score in all SF-36 subscales improved significantly twelve months after TKA compared to before surgery. ( $p < 0.05$ ). No significant difference was observed in the MCS score in the two groups. The results of the univariate analysis showed that age, sex, BMI, Educational Level, Number of comorbidities, and Complications were significantly associated with the health related quality of life of patients. ( $p < 0.05$ ). The results of multivariate analysis showed that female gender, BMI  $> 30(\text{kg}/\text{m}^2)$ , number of comorbidities  $> 2$ , bilateral TKA, non-compliance, and complications were significantly related to the decrease in patients' health related quality of life.

**Conclusion:** Our study showed that TKA can significantly improve the health related quality of life of patients compared to before surgery. Twelve months after TKA, the mean overall SF-36 score in patients who underwent TKA was similar to the healthy population except for the two subscales of happiness/vitality and physical performance.

**Keywords:** health related quality of patients, factors, total knee arthroplasty

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### Introduction

Osteoarthritis of the knee is a prevalent problem that causes pain and functional limitations, especially in the elderly population ( $>80\%$  in population above 65 years). [1] Common treatments for osteoarthritis involve the use of medications (e.g., nonsteroidal anti-inflammatory drugs). [2] Other treatment approaches involve physical therapy, for example, backward walking on static stability [3], topical sesame oil [4] and topical *Linum usitatissimum* L. (flaxseed) oil. [5] End-stage osteoarthritis, disability, and loss of HQOL all necessitate TKR, which relieves pain, improves long-term function, and restores mobility. The TKR is one of the common procedures performed globally and is considered cost-effective with excellent long-term

survivorship, with substantial variations in rates across different countries. [6,7]

Although most patients have a favorable clinical outcome after TKR, several studies have reported that more than 20% of patients are dissatisfied with the outcome after procedure. [8-10] This deficiency in patient satisfaction drives research and development in this field. Improving outcomes can be done by changing implant design, implantation methods, improving preoperative care for patients, etc. Therefore, measuring patients' quality of life and their perception of the procedure is of paramount value to improve this procedure and increase the proportion of patients who have

successful outcomes and improved quality of life. [10]

Several scores are developed for this purpose, which features the patient in the assessment of the TKR outcome. These scores can be divided into two types: those measuring HQOL for aspects that can be influenced by feelings of physical well-being or mental state and those evaluating the knee function and pain. Examples of the former are the 36-Item Short Form (SF-36) and 12-Item Short Form (SF-12) that are not specific for the outcome after TKR. However, more specific scores are available, such as the Osteo Arthritis Knee and Hip Quality of Life (OAKHQOL) and the Knee Quality of Life-26 (KQOL-26). The second type of score is called functional scores, which evaluate the knee function and pain, such as the Knee Society Score, WOMAC, and Oxford Knee Score. A combination of these two types of scores is mostly used to evaluate the outcome after TKR. [11,12]

The aim of the present study was to evaluate the health related quality of patients compared to healthy people and the factors affecting the health related quality of after total knee arthroplasty.

### Materials and Methods

The present study was conducted in the Department of Orthopedics, Government medical college West Champaran, Bettiah, Bihar, India for 18 months and 200 patients with OA of the knee who underwent TKA were compared with 200 healthy controls. To control for confounding variables, cases and controls were matched by frequency matching regarding age, gender, body mass index, comorbidity, smoking, alcohol consumption, and education level. The control group was selected from among healthy people referring to the hospital who had no history of knee joint involvement and TKA. The sampling method of patients was done as available and among the patients who met the criteria for inclusion in the study. Informed consent was obtained from all patients.

### Inclusion and Exclusion Criteria

Inclusion criteria included: history of TKA, aliveness of the patient at the time of follow-up, patients who had at least 12 months of surgery, patients who had a file, and cooperation for follow-up and completing the questionnaire. History of previous knee surgery for any reason, secondary TK or revision; Total hip arthroplasty (THA), cancer in any organ, drug, and alcohol addiction; patients with untreated severe depression or other neuropsychiatric diseases, including MS,

Parkinson's, and Alzheimer's, and patients with chronic viral infection including Viral hepatitis and HIV, and death were defined as exclusion criteria.

### Data Collection

Demographic data of cases and controls (age, gender, body mass index (BMI), education level, comorbidities, smoking, alcohol consumption, follow-up, and DJD grade) was collected using a checklist. Clinical findings, revision, and operation complications were also evaluated for the patients. This questionnaire contains 36 questions in eight dimensions (physical performance, physical role, physical pain, general health, vitality, social performance, emotional role, and mental health).

The study's objectives were evaluated in two parts: 1. Comparing the quality of life of patients before surgery and 12 months after TKA; 2. Comparing the quality of life of patients 12 months after TKA compared to the healthy population. After obtaining consent from the patients to participate in the study, the HRQoL questionnaire was completed by the patients or by the researcher (in cases where the patient could not complete the questionnaire) 12 months after TKA.

### Statistical Analysis

The data was analyzed using SPSS version 22 statistical software (IBM, -SPSS, New York, USA). Descriptive statistics (frequency and %) were used to report qualitative variables. Quantitative variables were reported using mean and standard deviation. The normal distribution of quantitative variables, such as the mean score of the questionnaire, was evaluated using the Shapiro-Wilk test. The chi-square test was used to compare qualitative variables in two groups. A paired samples t-test was used to compare quantitative variables in matched case-control groups, assuming a normal distribution of quantitative variables. If the assumption of normality was not established, the Wilcoxon test was used. A paired samples t-test was used to compare the mean HRQoL before and 12 months after surgery. All variables with a P less than 0.15 in the univariate analysis were entered into multivariate Conditional logistic regression to control the confounding variables. The effect size was reported with the adjusted odds ratio (OR) in the 95% confidence interval (95% CI). Conditional logistic regression analysis was used to estimate the variables predicting the quality of life in TKA patients. A level of statistical significance of less than 0.05 was considered.

### Results

**Table 1: Comparison of demographic characteristics in two groups**

Variable	Group		P value
	Case (N = 200)	Control (N = 200)	
Age (year)	66.74 ± 7.71	66.89 ± 6.95	0.89
<i>Gender</i>			
Female	170 (85%)	168 (84%)	0.71
Male	30 (15%)	32 (16%)	
BMI (kg/m <sup>2</sup> )	29.66 ± 4.58	30.1 ± 4.68	0.35
<i>Educational status</i>			
Illiterate	20 (10%)	18 (9%)	0.26
< diploma	50 (25%)	52 (26%)	
Diploma	52 (26%)	50 (25%)	
> diploma	78 (39%)	80 (40%)	
<i>Smoker</i>			
Positive	80 (40%)	76 (38%)	0.42
Negative	120 (60%)	124 (62%)	
<i>Number of comorbidities</i>			
0	100 (50%)	96 (48%)	0.11
1	74 (37%)	76 (38%)	
2	14 (7%)	16 (8%)	
> 2	12 (6%)	12 (6%)	

The mean age of the case and control groups was 66.74 ± 7.71 and 66.89 ± 6.95 years, respectively. (p:0.89) 170 (85%) of case group and 168 (84%) controls were women. The mean follow-up of the patients was 25.8 ± 3.65 months. No significant difference was observed in demographic characteristics between the two groups. (P > 0.05).

**Table 2: Comparison of the SF-36 questionnaire total and sub-scales' score in cases before and 12 month after TKA**

SF-36 sub-scale	200 patients underwent TKA		P value
	Before TKA	12 month after TKA	
Physical performance	32.2 ± 19.3	65.2 ± 25.3	< 0.001
Physical role	43.2 ± 14.2	75.7 ± 21.2	< 0.001
Mental health	50.23 ± 12.33	69.38 ± 22.2	< 0.001
Happiness and vitality	24.25 ± 17.16	50.5 ± 20.16	< 0.001
Emotional role	35.33 ± 15.6	62.2 ± 25.2	< 0.001
Social role	31.2 ± 19.2	55.5 ± 21.6	< 0.001
Physical pain	24.41 ± 12.3	55.68 ± 32.5	< 0.001
General health	50.11 ± 18.3	79.25 ± 21.2	< 0.001
Total score	37.55 ± 15.13	64.21 ± 22.2	< 0.001
MCS	38.25 ± 9.54	50.89 ± 9.2	< 0.001
PCS	25.33 ± 7.33	42.58 ± 9.2	< 0.001

The mean overall SF-36 score 12 months after surgery significantly improved compared to before surgery (64.21 ± 22.2 vs. 37.55 ± 15.13, p < 0.001). Also, the mean score in all SF-36 subscales improved significantly twelve months after TKA compared to before surgery. (p < 0.05).

**Table 3: Comparison of the SF-36 questionnaire total and sub-scales' score in case and controls**

Sub-scale	Group		P value
	Case (N = 200)	Control (N = 200)	
Physical performance	65.2 ± 25.3	76.78 ± 22.1	0.006
Physical role	75.7 ± 21.2	83.25 ± 12.2	0.098
Mental health	69.38 ± 22.2	71.25 ± 25.5	0.11
Happiness and vitality	50.5 ± 20.16	75.66 ± 17.1	0.001
Emotional role	62.2 ± 25.2	65.2 ± 25.2	0.39
Social role	55.5 ± 21.6	58.25 ± 25.5	0.16
Physical pain	55.68 ± 32.5	63.25 ± 33.2	0.086
General health	79.25 ± 21.2	86.2 ± 11.2	0.62

Total score	64.21 ± 22.2	72.53 ± 25.3	0.061
MCS	50.89 ± 9.2	52.35 ± 8.65	0.62
PCS	42.58 ± 9.2	61.33 ± 8.5	0.001

No significant difference was observed in the MCS score in the two groups.

**Table 4: Univariate analysis**

Variable	200 patients underwent TKA	
	Mean total SF-36	P value
<i>Age (year)</i>		
<40	67.24 ± 19.25	0.048
40–60	66.58 ± 20.33	
>60	59.25 ± 18.66	
<i>Gender</i>		
Female	58.12 ± 17.25	0.035
Male	70.25 ± 12.33	
<i>BMI (kg/m<sup>2</sup>)</i>		
20–25	78.24 ± 12.63	0.001
25.1–30	63.99 ± 11.58	
>30	52.33 ± 20.36	
<i>Educational level</i>		
< diploma	59.19 ± 20.35	0.023
≥ diploma	74.36 ± 16.31	
<i>Smoker</i>		
Positive	62.55 ± 21.56	0.17
Negative	65.61 ± 20.54	
<i>Number of comorbidities</i>		
<2	60.65 ± 19.8	0.036
>2	73.51 ± 20.5	
<i>Complication</i>		
No	62.35 ± 20.32	0.001
Yes	80.25 ± 12.52	
<i>Compliance with physiotherapy</i>		
No	59.34 ± 18.6	0.001
Yes	78.25 ± 19.1	
<i>TKA side</i>		
Uni lateral	80.22 ± 18.55	0.001
Bilateral	54.22 ± 22.3	

The results of the univariate analysis showed that age, sex, BMI, Educational Level, Number of comorbidities, and Complications were significantly associated with the health related quality of life of patients. ( $p < 0.05$ ).

**Table 5: Factors related to quality of life based on the results of multivariate regression analysis**

Variable	OR adj	P value
Sex (Female Vs Male)	1.78	0.025
BMI > 30 Vs < 30 (kg/m <sup>2</sup> )	2.54	0.001
Number of comorbidities > 2 Vs < 2	1.45	0.04
Complications yes Vs. No	2.09	0.001
compliance with physiotherapy (No Vs. Yes)	1.92	0.012
Bilateral vs. unilateral	1.88	0.033

The results of multivariate analysis showed that female gender, BMI > 30(kg/m<sup>2</sup>), number of comorbidities > 2, bilateral TKA, non-compliance, and complications were significantly related to the decrease in patients' HRQoL.

### Discussion

Knee osteoarthritis (OA) is one of the most common joint diseases in the world, which causes significant disabilities, especially in the elderly.<sup>13-15</sup> This disease leads to the involvement of both knees and

the pain and functional disorder caused by this, often with the patient's inability to ambulate and walk in advanced stages, disrupts the patients' Health-related quality of life (HRQoL). [16,17] Total knee arthroplasty (TKA) is one of the most common joint replacement procedures worldwide, known as the end stage of treatment for these patients. [17-19]

The mean age of the case and control groups was  $66.74 \pm 7.71$  and  $66.89 \pm 6.95$  years, respectively. ( $p:0.89$ ) 170 (85%) of case group and 168 (84%) controls were women. The mean follow-up of the patients was  $25.8 \pm 3.65$  months. No significant difference was observed in demographic characteristics between the two groups. ( $P > 0.05$ ). The mean overall SF-36 score 12 months after surgery significantly improved compared to before surgery ( $64.21 \pm 22.2$  vs.  $37.55 \pm 15.13$ ,  $p < 0.001$ ). Also, the mean score in all SF-36 subscales improved significantly twelve months after TKA compared to before surgery. ( $p < 0.05$ ). No significant difference was observed in the MCS score in the two groups. Our study showed that 12 after TKA, the mean overall score and all subscales of SF-36 were significantly higher than before surgery. Compared to the healthy population, the mean overall SF-36 score was slightly lower in the case group than in the control group. However, this difference was not statistically significant, and the mean overall SF-36 score of the patients 12 months after TKA was similar to the healthy population. The comparison of the subscales showed that, apart from the two scales of happiness and vitality and physical performance, whose mean score in the case group was lower than the control, no significant difference was observed in the other subscales for the mean score in the two groups. The mean pain subscale score was similar in both groups. No significant difference was observed for the mean score of MCS in the two groups. The average score of PCS in the control group was higher than the case group, which can be due to the lower mean score of the subscales of physical performance and physical role in the case group compared to the control group, which was in line with the studies done in this field. [20,21]

The results of the univariate analysis showed that age, sex, BMI, Educational Level, Number of comorbidities, and Complications were significantly associated with the HRQoL of patients. ( $p < 0.05$ ). The results of multivariate analysis showed that female gender,  $BMI > 30(\text{kg}/\text{m}^2)$ , number of comorbidities  $> 2$ , bilateral TKA, non-compliance, and complications were significantly related to the decrease in patients' HRQoL. E Yakobov et al [22] showed the female gender and  $BMI > 30(\text{kg}/\text{m}^2)$  were significantly associated with a decrease in patients' HRQoL after TKA. M Núñez et al [23] showed that obesity and complications after TKA were significantly associated with a decrease in the HRQoL of patients. In another study, M Bahardoust

et al [24], showed in a case-control study that post-operative care and adherence to physiotherapy were associated with improved HRQoL of patients after TKA. Physiotherapy can help the patient return to daily activities faster because during the period of OA and before surgery, the patient's muscles are significantly weakened due to lack of use, and physiotherapy can be associated with better results by strengthening the muscles. Because the studies that examined the HRQoL of patients after TKA with a healthy group were very limited, we could not compare the results of our study with studies with similar and opposite results compared to a healthy group.

### Conclusion

Our study showed that TKA can significantly improve the health related quality of life of patients compared to before surgery. Twelve months after TKA, the mean overall SF-36 score in patients who underwent TKA was similar to the healthy population except for the two subscales of happiness/vitality and physical performance. Female gender, obesity, overweight, comorbidity, bilateral TKA, non-compliance with postoperative physiotherapy, and complications were related to the decrease in health related quality of life.

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