

Health-Related Quality of Life Post Total Knee Arthroplasty among Patients Treated at Muhimbili Orthopedics Institute (MOI), Dar es Salaam, Tanzania

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Abstract

Health-related quality of life (HRQoL) outcomes post total knee replacement (TKA) is measured using a broad array of dimensions and is influenced by socio-demographic characteristics as well as medical co-morbidities. Despite substantial advances in TKA patient selection, surgical techniques, and implant design, studies have shown that 82% to 89% of patients have reported satisfaction with activities of daily living post-TKA. Pain relief and restoration of function are the main goals and expectations of patients and are used to rate HRQoL post-TKA and general health status. This study aims to assess health-related quality of life (HRQoL) and its association with medical comorbidities among patients following total knee arthroplasty (TKA) at a Tanzanian tertiary Orthopedics Institute. This was a cross-sectional study carried out at Muhimbili Orthopedics Institute. Participants were post-TKA patients aged more than 40 years. A convenient sampling method was used to obtain a total sample size of 72. Data were collected from July 2020 to April 2021 using a socio-demographic questionnaire, the WOMAC, and SF-36. Data were analyzed using SPSS version 23. Categorical variables, frequency distribution tables, and mean with standard deviation were used. Continuous variables were summarized as mean and standard deviation, and evaluation was done using the Student T-test with a P-value ≤ 0.05 for statistical significance. In this study, 72 patients met the criteria; 47 (65.3%) were female. Fifty-three (73.61%) participants had medical comorbidities, but there were no significant differences between males and females (P-value = 0.986). Participants had satisfactory

quality of life as per findings of WOMAC, scored as follows: 15.68 at 6 weeks, 7.47 at 3 - 7 months, 6.45, and 9.56 units at 8 - 12 months and more than a year, respectively, for pain, stiffness, and physical function. This shows that pain and stiffness relief improves from six weeks but more from three months to one year post-TKA, hence positively rewarding. The mean (SD) SF-36 scores of participants were 83.5 (18.3) for physical functioning, 76.9 (15.9) for bodily pain, 75.3 (17.8) for general health, 69.2 (12.7) for emotional limitation, 64.7 (22.4) for social functioning, and 59.8 (9.1) and 96.0 (16.2) for vitality and mental health, respectively. The mean SF-36 scores indicated that post-TKA patients had generally good health with only mild pain; the difference between patients with and without medical comorbidities was not statistically significant ($P = 0.5264$). Patients post-TKA had improved quality of life in pain relief, physical function, and knee movement, and their general health status using WOMAC and SF-36, respectively. The burdens of medical comorbidities found in this study need attention using a multidisciplinary approach for more improvement of QoL of patients during follow-up.

Keywords

Health-Related Quality of Life, Patient-Reported Outcomes, Total Knee Arthroplasty, Muhimbili Orthopedics Institute, WOMAC, SF-36

1. Introduction

The essence of health-related quality of life as a desired long-term post-TKA outcome has increased in importance in clinical practice [1]. Knee arthroplasty is associated with significant improvement in health-related quality of life after a period of knee pain, stiffness, and impaired function (HRQoL) [2]. The primary reasons for using HRQoL in assessing outcomes in arthroplasty are that the results of arthroplasty are not specific to the joint or limb but to the overall impact on health [3].

The term QoL began to be used in the early 1960s following changes in health and the demographic profile of late modern societies [4]. In an editorial titled "Medicine and Quality of Life", the author [5] argued that emerging technologies, including total knee arthroplasty, raised new concerns for surgeons. Among these concerns were the questions of how a surgeon can protect a patient's quality of life, and how quality of life can be improved in other patients in the future without jeopardizing that of the particular patients through whom this new knowledge is gained.

In the 1970s, early QoL assessments led surgeons to favor function-preserving procedures over radical operations when patient-reported pain and mobility predicted superior postoperative functioning. Medical practices have always involved dilemmas, tragic and painful choices leading to seeking attention during the selection of patients for surgical treatment [6]. Innovative and aggressive therapies/treatments like TKA have successful outcomes, thus generating increased de-

mand for evaluation of the quality of life among patients postoperatively [7].

The sacrifices required for the increased length of life and the side effects associated with some therapeutic procedures have highlighted the need to consider not only survival but also the QoL of a human being post-TKA [8].

In the 1980s, QoL began to be considered as a means of guiding decisions about whether to limit treatments if patients had comorbidities or for the selection of patients after optimization, as health care resources were scarce to meet the expectations and satisfaction of patients [9]. The concept of health had undergone more changes, passing from negative health measures such as death, disease, disability, discomfort, and dissatisfaction, towards more positive domains as per the definition of WHO: “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” [10] [11].

With increasing national populations and changing lifestyles in the developing world of Sub-Saharan Africa, most agreed that the disease burden due to knee osteoarthritis is most likely to increase dramatically over the next decade and beyond [12] [13]. Assessing patients' quality of life in light of the projected increase in health care service, baseline data are needed [14]. However, assessing a patient's health condition that comes from the patient without interpretation of the patient's response by the surgeon or anyone has gained importance among post-TKA patients [15]. The holistic approach of HRQoL evaluation of patients enables one to determine how TKA or comorbidities influence their general well-being [16] [17]. Socio-demographic characteristics and comorbidities have pervasive effects on quality of life [18] [19]. Each comorbid disease may have its own impact on QoL. For instance, uncontrolled hypertensive patients have risks for stroke or ischemic heart disease. Post-TKA outcomes, socio-demographic characteristics, and comorbidities are among the success stories of modern medicine for both administrators and health care providers regarding the quality of life of patients during follow-up [20].

Quality of life among post-TKA patients has been studied more in North America, Asia, Europe, and partly in Northern and West Africa [21]-[23]. There is a relative scarcity of data on HRQoL post-TKA in Sub-Saharan African countries, including Tanzania. It is high time for this study to evaluate the HRQoL post-TKA among patients attended at Muhimbili Orthopedics Institute after more than a decade of this procedure. Findings from this study will serve as a baseline for other studies in our country.

2. Material and Methods

Post-TKA patients were identified in the Arthroplasty clinic during follow-up by research assistants. Six weeks and above post-TKA, patients were interviewed on their demographic information, medical comorbidities, and information on quality of life based on relief of pain and stiffness of the knee, as well as on physical function. The patient-reported outcomes model was applied. The WOMAC and SF-36 are the most used measures for assessing HRQoL post-TKA and general

health status, respectively.

Presentation of the scale [36-Item Short Form Survey (SF-36)] ranging from 0 to 100, with a higher score considered a better general health status. Evaluation of knee-specific outcomes post-TKA was conducted using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), whose general score ranged from 0 to indicate no pain, stiffness, or limitation of physical function; as it increases up to 100, it indicates the presence of impairment and unsatisfactory outcomes of surgery. Presence of medical comorbidities was correlated with the general health status of participants post-TKA.

Collected data were checked for completeness, coded, and entered into SPSS software version 23 for storage and subsequent analysis. Categorical variables are summarized in proportions, while continuous variables were summarized into means and standard deviations. Data analysis was done using the Chi-square test, and Fisher's exact test was used to determine the association between different variables. Significance was considered where the p-value was less than 5%.

3. Results

1. Socio-demographic characteristics

A total of 72 patients met the inclusion criteria with all information found, of whom 47 (65.28%) were female. Participants' ages ranged from 41 to 83 years, with the majority of participants in the 51 - 60 age group. The majority of patients were retired, with approximately 45.8%. Approximately 88% were more than two months post-TKA, while 13 (18.06%) were those who underwent TKA more than 1 year ago. These variations in time were due to follow-up in physiotherapy and medical clinics for different comorbidities they had (Table 1).

Table 1. Socio-demographic characteristics of respondents.

Variable	Frequency (N = 72)	Percent (%)
Sex		
Female	47	65.28
Male	25	34.72
Age group		
40 - 50	8	11.11
51 - 70	48	66.66
70+	16	22.22
Work status		
Retired	33	45.83
Employed	25	34.72
Unemployed/self employed	14	19.44

Continued

Duration post TKA		
6 Weeks - 3 month	9	12.5
4 - 7 Months	37	51.39
8 - 12 Months	13	18.06
1 Year+	13	18.06

Table 1 shows a female predominance of 65.28%; most of the participants were retirees, ≥ 51 yrs.

Other medical conditions reported include obesity, heart disease, renal diseases, neuropathy, and degenerative diseases of other joints.

2. Medical co-morbidities among participants

Out of the 72 participants, 53 (73.6%) reported medical co-morbidities. The conditions reported included hypertension with a median of 22.8, ranging from 10.9 to 58.7, and diabetes mellitus with a median of 18.5. Additionally, many also reported more than one chronic condition such as back pain, heart disease, hip pain, renal diseases, neuropathy, and contralateral knee pain on top of hypertension and diabetes mellitus (**Figure 1**).

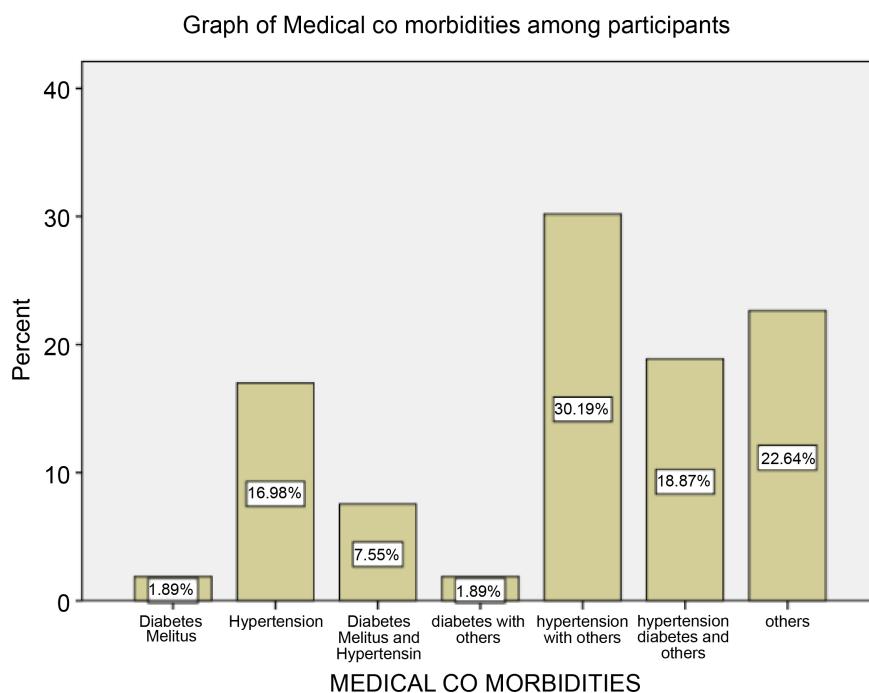


Figure 1. Graph of medical comorbidities among participants.

Most of the participants who had more medical comorbidities were female, accounting for 50% (36/72). The distribution of medical comorbidities did not differ significantly between the sexes (p-value of 0.986). **Table 2** depicts the distribution of medical comorbidities reported by study participants based on gender.

Table 2. Distribution of medical co-morbidities by sex.

Variables	Male	Female	Total	P Value
	Frequency (N = 25)	Frequency (N = 47)		
Medical Co morbidities				
DM only	0 (0.00)	1 (100.00)	1	0.986
HTN only	4 (44.44)	5 (55.56)	9	
DM & HTN only	1 (25.00)	3 (75.00)	4	
DM with other medical	0 (0.00)	1 (100.00)	1	
HTN with other medical	5 (31.25)	11 (68.75)	16	
HTN, DM, and other medical	3 (30.00)	7 (70.00)	10	
Others medical condition	4 (33.33)	8 (66.67)	12	

Key: DM—Diabetes mellitus; HTN—Hypertension; other medical conditions reported (obesity, heart disease, endocrine disease (prostate disease), renal diseases, neuropathy).

Interpretation of pain dimension:

None 100%, *Very mild* 84%, *Mild* 72%, *Moderate* 61%, *Severe* 52%, *Very severe* 40%

Interpretation of the general health dimension:

Excellent 100%, *Very good* 85%, *Good* 60%, *Fair* 25%, *Poor* 0%.

3. Health-related quality of life—SF-36 score

The lowest quality of life observed mean score and standard deviation of SF-36 were general health 50.3 (17.8), and the highest score was mental health—96%. Other scores are shown in (Table 3).

Table 3. Quality of life post TKA using SF-36 scores of participants.

Variables	Mean (%)	Std. Dev.	Min	Max
SF-36 score				
General health well-being (GH)	50.3	17.8	10.0	100.0
Bodily pain (BP)	76.9	15.9	43.3	100.0
Physical functioning (PF)	83.5	18.3	50.0	100.0
Emotional limitation (RE)	69.2	12.7	36.4	100.0
Role of physical (RF)	50.0	19.6	20.0	100.0
Vitality (VT)	59.8	9.1	29.2	100.0
Social function (SF)	64.7	22.4	20.0	100.0
Mental health (MH)	96.0	16.2	55.0	100.0

Key: Mean value 0 to 100 meaning from worse to better HRQoL.

4. Health-related quality of life—WOMAC Score

The total mean score of WOMAC for evaluation of quality-of-life post TKA

was 38.4 at 6 weeks; 18.3 at 3 - 7 months; 15.8 and 23.4 at 8 - 12 months and more than a year, respectively.

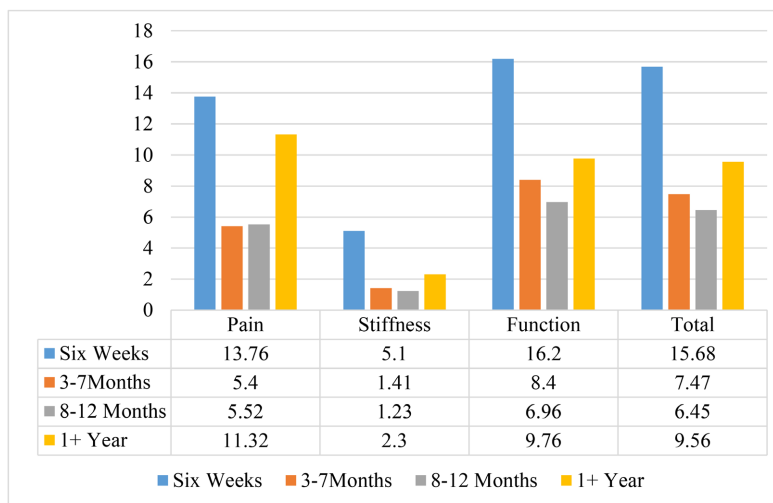


Figure 2. Graph of the mean score of quality of life post-TKA of participants (WOMAC). Key: WOMAC scores: Pain 0 - 20, stiffness 0 - 68, function 0 - 8; higher scores indicate greater difficulty.

The mean score at only six weeks post-TKA shows that pain relief was 13.76, while knee stiffness relief was 5.1. The function was least improved, with a mean score of 16.2. From three to twelve months post-TKA, all dimensions of pain, stiffness, and function showed improvement in quality compared to those patients operated on one year and above (Figure 2).

5. Association of medical comorbidities and health-related quality of life

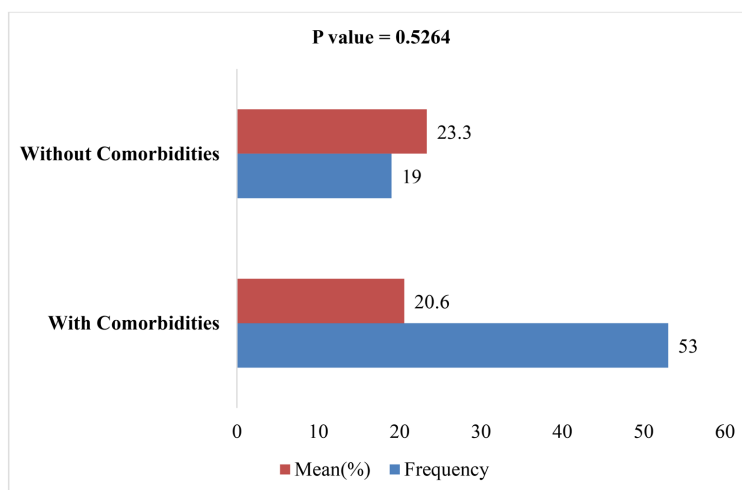


Figure 3. Graph of mean scores of participants with/without medical comorbidities.

In this study, the mean score and standard deviation of patients without comor-

bidities were 23.3 (SD = 10.49), and the mean score and standard deviation of those patients with medical comorbidities were 20.6 (SD = 15.83). There was no statistical difference between the two groups with effect on health-related quality of life ($P = 0.5264$) (Figure 3).

4. Discussion

Quality of life in postoperative patients, especially TKA, has many aspects that might be used to monitor it. Some of these factors are patient-related (socio-demographic characteristics) and clinically related (medical comorbidities), which influence the outcomes of the operation. Patient-reported outcome measurements, including WOMAC and SF-36, are vital since patients provide information according to their expectations and satisfaction. This study was set out to assess the health-related quality of life in patients who have undergone a Total Knee Arthroplasty at Muhimbili Orthopaedic Institute (MOI).

A total of 72 post-TKA patients met the inclusion criteria and were interviewed, of which females predominated accounting for 63.9%. This finding is slightly similar to a study by Maram *et al.* [1] in Saudi Arabia, which found that 76.9% of patients post-TKA were female. Another study was done in Nigeria by Katchy *et al.* [24] assessing the quality of life on early functional outcomes, and reported a male-female ratio of 5:8. Some studies [25] [26] have, however, demonstrated even higher female predominance among patients who underwent TKA. Papakostidou *et al.* [27], in a cohort study of 224 patients evaluating HRQoL post-TKA, found that 79.4% of patients were female. Studies done [7] [17] in different parts of the world have found that women were either more adversely affected by osteoarthritis or presented with a worsening disease process due to multiple reasons, including hormonal differences in men and women (exogenous and endogenous), which play a great role in OA, the anatomical difference of the knee, active lifestyle like athletes, and work which exposes to mechanical stress. The population of Tanzania according to the projection of 2021, women were 51% [13].

The study showed that 61.11% of patients had financial support of health services through the National Health Insurance Fund, while cost-sharing and full government support were 22.22% and 16.67%, respectively. These findings were similar to those of Felix *et al.* a [28] study conducted in Germany, whereby 69% of respondents had insurance for health services. These results were different from the study conducted at National Orthopedics Hospital, Enugu in Nigeria [24] whereby most of the patients use their own money due to the unestablished health insurance scheme of the country. Constraints of financial support among patients pre- and post-TKA have ties with HRQoL. Socio-economic support of patients in the study revealed a better quality of life during follow-up. Cultural beliefs, which encourage unorthodox health care patronage as cheap treatment, cause loss in follow-up clinics. In this regard, close follow-up of post-TKA patients is needed using specific and generic tools to address biological, social, and psychological fac-

tors for improvement of QoL.

In this study, the burden of medical comorbidities among patients who had undergone TKA was 73.6%, of whom 81.1% (43/53) had more than one comorbidity. Patients with hypertension were 17.0% (9/53), while hypertension and diabetes mellitus were recorded in 7.5% of patients (**Table 2**). These results were similar to an observational study by Mukasa *et al.* [29] done in Zambia at Zambian-Italian Orthopaedic Hospital, which showed that 41.18% (21/51) of patients had comorbidities and hypertensive were 13.7%, while those who had diabetes and hypertension were 5.9%. Zambia, as a neighbor of Tanzania, has many similarities in culture and disease burden. Studies done by Souza *et al.* [25] and Pugely *et al.* [19] showed that the prevalence of comorbidities among post-TKA patients was 82.7% and 85%, respectively, which is slightly higher than in this study. This difference could be due to the habit of regular medical checks among citizens without waiting for symptomatic presentation of diseases. The presence of comorbidities among patients is associated with prolonged use of medications to control disease(s) or symptoms, as well as additive use of other resources due to multiple admissions in health facilities, hence, reduced quality of life [8] [30]. In this study, the distribution of comorbidities differed between males and females, whereby females who had comorbidities were 67.92% (36/53), more with hypertension and other medical comorbidities in combination; however, there was no significant difference with men (P -value = 0.986), **Table 2**. Though this study did not assess the costs of optimization of each comorbidity pre- and post-TKA, other studies have advocated the importance of a National Joint Arthroplasty Registry to synchronize information for easy retrieval when needed by administrators, economists, and policymakers [19] [31].

The ultimate goal of TKA is to improve quality of life and minimize knee pain among operated patients. WOMAC scores are specific for pain, stiffness, and function of the knee. SF-36 has eight domains relating to self-reported HRQoL: physical functioning (PF), role-physical (RF), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). The outcomes of these four (PF, RP, BP, GH) assess physical component scores, and the other four (VT, SF, RE, MH) are for mental component evaluation.

This study showed improvement of physical function by a WOMAC score of 16.2 units, and the stiffness in the knee was 5.1 units, but pain relief did not improve during six weeks post-TKA. Contrary to the study by Papakostidou *et al.* [27], which showed that patients, especially elders, first improved from pain and knee stiffness due to coping with age-related changes, followed by recovery of functional limitations postoperatively. For young (≤ 65 years), improvement starts from functional disability, followed by remnants of moderate pain. From their study, the number of patients aged ≥ 65 years was more than fifty percent, which correlates with findings from this study (**Table 1**).

Quality of life six months up to a year postoperative; this study revealed that

pain and stiffness improved by more than 50% six weeks after surgery. This was similar to a cohort study conducted in Barcelona, Spain, where the participants had WOMAC scores on physical function—13.26 units, pain—5.38 units, and stiffness—1.39 units post-TKA reported during follow-up [32]. The results of this study were different from a study conducted in Blantyre-Malawi at Beit CURE International Hospital, which demonstrated that the health-related quality of life post-TKA using WOMAC score was as follows: pain 17.36 units, physical function 58.41 units, and knee stiffness 7.04 units [13] as shown in **Figure 2**. These authors reported that patients were operated on by visiting surgeons from high-income countries, who had no experience with TKA in limited-resource countries, and there was also no close follow-up of patients. It is different from MOI since all TKA are done by indigenous arthroplasty surgeons experienced for more than two decades. Follow-up is done based on clinical and radiological measures, not including patient-reported outcome measures.

The SF-36 in this study showed good results in the physical domains, such as physical function—83.5%, role physical—50.0%, or bodily pain—76.9%, which are relevant domains that showed patients have a positive quality of life post-TKA (**Table 3**). This was also demonstrated by a study conducted by Kapetanakis *et al.* [33] in Greece, which observed an improvement in quality of life and physical activities post-TKA, with a bodily pain score of 62.25% in SF-36 [34]. The results suggest that despite large postoperative improvement in physical function, the patients' knees that underwent TKA still may not achieve the same functioning and movement as a normal joint, as found in a physical role score—50%.

5. Conclusion and Recommendations

5.1. Conclusion

This study found that many post-TKA patients at MOI have comorbidities, and the cohort was predominantly female, yet the between-group comparisons by comorbidity status were not statistically significant ($P = 0.5264$), possibly due to limited power and sampling bias. Health-related quality of life among patients showed good progress over time in pain, joint stiffness relief, and physical function. Evaluation of quality of life using patient-reported outcome measures during follow-up clinics will enable both surgeon and patient to meet expected outcomes during this era of competitive quality health services provision in Tanzania.

5.2. Recommendations

1. More research needs to be done on the health-related quality of life after TKA, starting with preoperative assessments, so as to compare improvement in outcomes between more than one center with THA.
2. There is a need for future studies to investigate how unmanaged comorbidities correlate with increased healthcare utilization and costs after TKA to better inform health policymakers.

Ethical Clearance

It was obtained from the MUHAS and MOI Research and Publication Committee.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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List of Abbreviations

ADL	Activities of daily living
DJD	Degenerative joint disease
HIV	Human Immunodeficiency Virus
HAART	Highly Active Antiretroviral Therapy
HRQoL	Health-related quality of life
IRB	Institutional Review Board
MoHCDEC	Ministry of Health, Community Development, Gender, Elderly & Children
MOI	Muhimbili Orthopedics Institute
MUHAS	Muhimbili University of Health and Allied Sciences
NHIF	National Health Insurance Fund
OA	Osteoarthritis
PRO	Patient-reported outcome
PROMs	Patient-reported outcome measures
QoL	Quality of life
SF-36	Short Form Health Survey 36 items
TKA	Total knee arthroplasty
WHO	World Health Organization
WOMAC	Western Ontario and McMaster University Osteoarthritis