Original Article

Health Related Quality of Life in Osteoarthritis Patients with Total Knee Replacement: A Longitudinal Cohort Study

Orthopaedics Section

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ABSTRACT

Introduction: End-stage knee results in pain, loss of physical function and a decrease in Quality Of Life (QOL). Total Knee Replacement (TKR) is one of the most successful surgical interventions, providing substantial relief from pain. Because patient's perceptions of treatment outcomes may vary from clinician's judgment; measuring patient's perspectives using Health Related Quality of Life (HRQOL) instruments has become an important approach for outcome evaluation.

Aim: To assess the HRQOL outcome after TKR in patients with Osteoarthritis (OA) Knee.

Materials and Methods: A longitudinal cohort study was conducted in Orthopaedic Department of tertiary care teaching hospital from July 2018 to June 2020. Of 63 patients eligible for the study, 56 completed the follow-up data. Knee injury and Osteoarthritis Outcome Score (KOOS) was measured preoperatively. Patients were followed-up at three months and six months, and postoperative KOOS were measured to evaluate HRQOL after TKR. Student t-test was used to analyse differences between KOOS mean aggregate and subscale scores.

Results: There were 34 (60.71%) females and 22 (39.29%) males in the study. Mean age of the study population was 58.93±9.57 years. Left knee was involved in 33 (58.93%) cases and right in 23 (41.07%) cases. There was significant difference in preoperative KOOS (prKOOS) and postoperative KOOS (psKOOS) in the patients (p-value <0.001). It was observed that 29 (51.79%) patients were having excellent HRQOL outcome (psKOOS ≥90), 9 (16.07%) each good (psKOOS 80-89), 8 (14.29%) fair (psKOOS 70-79) HRQOL outcome and 10 (17.86%) poor HRQOL outcome (psKOOS <70) at six 6 months follow-up.

Conclusion: At six months follow-up there was significant improvement in KOOS as well as subscales of symptom, pain, Activities of Daily Living (ADL), sport/recreation and QOL score. Thus, it can be said that TKR leads to significant improvement in HRQOL.

INTRODUCTION

Osteoarthritis (OA) is the single most common cause of disability in older persons [1]. There is consequent loss of Health Related Quality of Life (HRQOL) with advancing OA of knee joints [2,3]. There is significant impact on the QOL with increasing knee pain and decrease in the functional Range Of Motion (ROM) along with deformity of knees [4-6].

Osteoarthritis being one of the most prevalent musculoskeletal diseases in the world is the most common reason of joint disability in approximately 100 million people among world having age over 45 years [7,8]. Partial or total knee replacement is most drastic treatment for OA knee with development of smaller incisions techniques in recent years. With advancing facilities, availability of TKR performing hospitals too is getting higher in number.

Functional outcome of total joint replacement should be assessed not only on the basis of imaging, technical results, and objective functional/physiological findings, but also in relation to the patient's perception of the benefit gained, as regards domains of importance to them in their everyday life and their overall satisfaction after TKR [10]. HRQOL outcomes have been developed to determine efficacy and cost-effectiveness of treatment for OA knee. There are substantial enhancements in patients' HRQOL scores for physical health after TKR surgery [11-14]. In particular, substantial improvements are found in the pain dimension [11,12,15].

There are parameters like Western Ontario and McMaster Universities Arthritis Index (WOMAC) and the Oxford-12 to evaluate physical functions like pain, stiffness, using stairs, rising from sitting, putting on or removing socks etc. required for daily living only, while others like KOOS [16-20] also evaluate physical functions required for sports and recreation activities. The aim of this study was to assess the HRQOL outcome of TKR in patients with OA knee.

MATERIALS AND METHODS

This was a two year longitudinal cohort study carried out in Orthopaedic Department of Government Medical College, Patiala, Punjab, India, from July 2018 to June 2020. Ethical committee approval was taken from Government Medical College and hospital, Patiala, Punjab, India (letter number 229/7/5/18/gmc/ptl). All patients were explained about different aspects of surgical procedure to be done in detail and gave informed consent. A total of 63 participants were included in the study, out of which seven were lost to follow-up and 56 participants completed the follow-up data. HRQOL outcome was assessed using KOOS.

Inclusion and Exclusion criteria: Patients with age range of 35-80 years with a diagnosis of primary OA knee having extensive articular cartilage damage, severe deformity along with unremitting pain despite conservative measures were included in the study. Patients having associated congenital deformities of limb, deformities of hip and spine were excluded from the study. All cases had unilateral TKR.

Study Procedure

Knee extensor mechanism was assessed for any quadriceps contractures. Standard knee standing anteroposterior and lateral views radiographs were taken. Prosthesis used in the surgery was either Posterior Stabilising (PS) or Cruciate Retaining (CR) knee. Medial parapatellar approach was used to incise the retinaculum. Aggressive physiotherapy protocol was followed. Knee bending and walking was started on day two of surgery.

The HRQOL assessment was done using pre-operative (pre-op) and postoperative (post-op) KOOS score. KOOS consists of 42 items questionnaire. It is self-administered and self-explanatory and covers five dimensions that includes pain (nine items), other symptoms (seven items), activities and functions in daily living (ADL) (17 items), sport and recreation functions (sport/rec) (five items) and knee related QOL (four items) [18-20]. All patients' baseline prKOOS were assessed before the day of surgery. Follow-up psKOOS was taken at three months and six months follow-up time period. Grading of KOOS was done as follows: excellent as more than 90; good as 80 to 89; fair as 70 to 79 and poor below 70 [21]. Body Mass Index (BMI) of all cases was calculated by following formula [22]:

$$BMI = \frac{Weight\ (kg)}{Height\ (m^2)}$$

STATISTICAL ANALYSIS

The student t-test was used to analyse differences between KOOS mean aggregate and subscale scores at baseline, three months and six months follow-up time period. Statistical analysis was performed using IBM Statistical Package for the Social Sciences (SPSS) statistics version 22.0 for Windows. The p-value <0.05 was considered as significant.

RESULTS

There were 34 (60.71%) females and 22 (39.29%) males in the study. Mean age of the study population was 58.93±9.57 years. Left knee was involved in 33 (58.93%) cases and right in 23 (41.07%) cases Average prKOOS of present study group was 19.05±8.95. More than half of the patients had prKOOS in the range of 15-30 [Table/Fig-1].

prKOOS	Patients (n)	Percentage (%)
<15	12	21.4
15-30	30	53.6
>30	14	25
Total	56	100
Mean±SD		19.05±8.95

[Table/Fig-1]: Preoperative Knee injury and Osteoarthritis Outcome Score (KOOS) distribution.
SD: Standard deviation

There was significant improvement in psKOOS aggregate at three months and six months as compared to prKOOS [Table/Fig-2]. There was also significant improvement in all the subscale scores (p-value <0.001).

KOOS subscale	Preop-erative, mean± SD	Three months, mean± SD	p-value preoperative and after three months of follow-up	Six months, mean± SD	Mean differ-ence	p-value preoperative and after six months of follow-up
Aggregate score	19.05± 8.95	78.53± 9.17	<0.001	83.13± 9.96	64.08	<0.001
Symptom	25.26± 12.37	77.80± 10.78	<0.001	85.20± 11.45	59.94	<0.001
Pain	20.14± 10.08	84.43± 9.12	<0.001	84.89± 9.83	68.75	<0.001
ADL	21.83± 10.11	80.88± 11.12	<0.001	83.72± 10.24	61.89	<0.001
Sport/Rec	7.86± 9.85	66.79± 11.52	<0.001	71.61± 12.02	63.75	<0.001
QOL	7.14± 10.58	71.21± 12.66	<0.001	78.37± 12.41	71.23	<0.001

[Table/Fig-2]: Preoperative and postoperative Knee injury and Osteoarthritis Outcome Score (KOOS) comparison.
p-value <0.001 (significant) at 3 months, p-value <0.001 (significant) at 6 months; test used- student t-test

There was no statistically significant effect of age of the patient on psKOOS (p-value=0.214). However, patients with age ≥66 years had the lowest average psKOOS of 75.90±15.36 [Table/Fig-3].

Variable	Age group	Number	Mean±SD	p-value
Postoperative KOOS (six months)	36-45	8	86.60±8.84	0.214
	46-55	8	82.03±11.32	
	56-65	28	85.55±11.43	
	≥66	12	75.90±15.36	
	Total	56	83.13±9.96	

[Table/Fig-3]: Effect of age on postoperative Knee injury and Osteoarthritis Outcome Score (KOOS) at 6 months.
p-value 0.214 (non significant); test used- student t-test

Out of 56 patients, 29 (51.79%) patients were having excellent HRQOL outcome (psKOOS ≥90) at six months follow-up, 9 (16.07%) good (psKOOS 80-89) and 8 (14.29%) fair (psKOOS 70-79) HRQOL outcome. A 10 (17.86%) patients (17.86%) were having poor HRQOL outcome (psKOOS <70) at six months follow-up.

Mean prKOOS in males was 20.42±17.21 and psKOOS; 83.89±14.49 [Table/Fig-4]. Mean prKOOS in females was 18.16±16.31 and psKOOS; 82.64±13.78 at 6 months final follow-up. Males had higher mean psKOOS than females. However, this difference in psKOOS was not statistically significant (p-value=0.751). There was no statistically significant differences in psKOOS on side (right/left) of knee operated (p-value=0.653).

Gender	prKOOS, mean±SD	Six months psKOOS mean±SD	p-value PsKOOS at six months
Males	20.42±17.21	83.89±14.49	0.751
Females	18.16±16.31	82.64±13.78	

[Table/Fig-4]: Gender wise preoperative and postoperative Knee injury and Osteoarthritis Outcome Score (KOOS) comparison.
p-value 0.751 (non significant); test used- student t-test

The average BMI was 27.20±SD 3.63 (range 20.10 to 34.10). Patients having lower BMI had higher average psKOOS as compared to patients having higher BMI [Table/Fig-5]. However, this difference in psKOOS was not statistically significant (p-value=0.051).

Variable	BMI	Number	Mean±SD	p-value
Postoperative KOOS (six months)	18.0-23.0	10	88.70±8.23	0.051
	23.1-28.0	26	86.08±10.02	
	28.1-33.0	14	77.56±9.94	
	33.1-38.0	6	74.03±12.32	
	Total	56	83.13±9.96	

[Table/Fig-5]: Effect of Body Mass Index (BMI) on Postoperative Knee injury and Osteoarthritis Outcome Score (KOOS).
p-value 0.051 (non significant); test used- student t-test

Out of 56 patients in this study, only 1 (1.79%) case suffered from periprosthetic fracture; 4 (7.14%) cases had Superficial Infection (SI). All SIs were treated conservatively.

DISCUSSION

In the present study, the average age of patients was 58.93±9.57 (minimum 39 years; maximum 80 years). Mean age in similar studies was higher than present study as observed by Mahomed NN et al., and Lingard EA et al., (2004; WOMAC score); 66 years and 70 years respectively [23,24]. The lower mean age of patients in present study may be attributed to the evolving trend of relatively younger patients opting for TKR in recent times. Clement ND (2013) reported that patient's functional outcome after TKR was not influenced by their age which is consistent with present study which showed that there was no statistically significant effect of age on postoperative KOOS score [25]. The present study was also consistent with study conducted by Nunez M et al., who, in 2007, did not find that age affected TKR outcomes in terms of HRQOL [15].

The present study included 34 (60.71%) females and 22 (39.29%) males. Brander VA et al., studied 116 patients of which 55.2% were women [26]. In the present study, even though males had slightly higher average psKOOS score as compared to females, this difference in average post operative scores was not statistically significant. This finding is consistent with study of Bourne RB et al., concluded that male and female patients had similar increases in postoperative scores after TKR [21]. This finding is also consistent with study conducted by Nunez M et al., who did not find that gender affected TKR outcomes in terms of HRQOL [15].

Authors observed average BMI of 27.20 (SD 3.63, range 20.10 to 34.10). In a similar study, Bourne RB et al., had average BMI as 32 (SD 6) [21]. In the present study, cases with lower BMI had higher mean psKOOS score than of cases with higher BMI, but the difference was not statistically significant. Bourne RB et al., found no difference in postoperative functional scores in obese and normal patients [21]. Similarly, Baker P et al., observed that improvements in patient reported outcome measures were not related with BMI [27]. Rodriguez Merchan EC also observed TKR to be justifiable in obese patients because the functional improvements were equivalent to those of patients with a lower BMI [28]. Hence, obese patient may also be extended boons of TKR.

In present study, average prKOOS was 19.05 and average psKOOS at six months was 83.13. This difference is statistically significant and hence statistically significant improvement observed in HRQOL outcome from preoperative status after TKR; which is consistent with Núñez M et al., and Bourne RB et al., [15,21].

Authors observed 51.79% patients as having excellent HRQOL outcome at six months, 16.07% good; 14.29% fair outcome and 17.86% poor HRQOL. Bourne RB et al., found excellent outcome for 77% patients at two years, good outcome in 13%, fair 6% and poor in 4% patients at two years. In the same study, at five years follow-up, Bourne RB et al., found excellent outcome for 80% patients, good 11%, fair 4% and poor outcome 5% cases [21]. Lower number of excellent cases in our study may be due to a shorter follow-up.

Potential complication of TKR may include joint instability, rotational malalignment, thromboembolic disease vascular injury, neural deficit, periprosthetic fracture and wound complication etc., [29]. One of present patients (1.79%) suffered from periprosthetic fracture and four patients (7.14%) suffered from SI. In the present study, complication rate was lower than Heo SM et al., (2020) who reported 14.4% cases as having major complications like infection and reoperation [30]. In the present study, patient with periprosthetic fracture did not give consent for fracture fixation. So, this complication was managed by immobilisation and rest to the limb along with calcium supplements and bisphosphonates and the fracture went on to unite. This led to decreased HRQOL outcome in this patient as postoperative aggressive physiotherapy protocol could not be followed. This patient had the poorest psKOOS in present study (58.9 at six months). SI was managed conservatively and resolved in 15 days.

Limitation(s)
Sample size was small. This could increase the likelihood of a type II error skewing the results, and hence decreases power of study. Maximum follow-up was six months only. This was a non comparative, non randomised patient cohort study. Authors did not correlate patient subjective outcome measures with objective measures like flexion contracture, ROM, varus/valgus deformity and extension lag.

CONCLUSION(S)
The TKR is a highly successful and effective surgery. TKR not only relieves pain which decreases use of harmful analgesics along with correction of deformity but also improves status of ADL and better HRQOL. Authors suggested that the main aim of TKR should be improvement in HRQOL outcome which is patient centric rather than surgeon centric parameters such as improvement in joint mechanics and other radiological parameters.

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