

**Original research article****A systematic analysis of physical, psychological and general health changes after total knee replacement****<sup>1</sup>Dr. Sachin Patel L, <sup>2</sup>Dr. Nrupathunga KK, <sup>3</sup>Dr. Vijay Kumar S, <sup>4</sup>Dr. Punith N, <sup>5</sup>Dr. Ullas Mahesh****<sup>1,2</sup>Senior Resident, Department of Orthopaedic, East Point Medical College, Avalahalli, Bangalore, Karnataka, India****<sup>3</sup>Consultant Orthopaedic Surgeon, Mysore, Karnataka, India****<sup>4</sup>Senior Resident, Department of Orthopaedic, JSS Medical College, JSSAHER, Mysuru, Karnataka, India****<sup>5</sup>Professor, Malla Reddy Medical College, Hyderabad, Telangana, India****Corresponding Author:****Dr. Punith N****Abstract**

**Background:** Total knee arthroplasty (TKA) is the most common joint replacement surgery in India. Earlier work reported 1 in 10 TKA patients expressing dissatisfaction following surgery few decades back. A better understanding of satisfaction could guide program improvement. We investigated patient satisfaction post-TKA in India. This was a prospective study done in Tertiary care centre Bangalore considering all the patients undergoing primary unilateral/bilateral Total Knee replacement who satisfied the inclusion criteria from July 2020 to June 2021. A total of 92 patients were included in the study.

**Methods:** 92 adult TKA patients were recruited at a tertiary hospital Bangalore. Survey data were collected preoperatively and at 6 and 12 months, supplemented by administrative health data. The primary outcome measure was patient satisfaction with outcomes. Potential satisfaction drivers included demographics, patient-reported health, quality of life, social support, comorbidities, and insurance status. Multivariable growth modeling was used to predict satisfaction at 6 months and change in satisfaction (6 to 12 months).

**Results:** The multivariable model suggests satisfaction at 6 months is predicted by: pre-operative pain, mental health and physical health (odds ratios (ORs) 2.65, 3.25 and 3.16), and change in pain level, baseline to 6 months (OR 2.31). Also, improvements in pain, mental health and physical health from 6 to 12 months predicted improvements in satisfaction (ORs 1.24, 1.30 and 1.55). The comparison between pre and post op values showed significant improvement in walking distance post TKA which was statistically significant.

**Conclusions:** TKA is an effective intervention for many patients and most report high levels of satisfaction. However, if the TKA does not deliver improvements in pain and physical health, we see a less satisfied patient. In addition, dissatisfied TKA patients typically see limited improvements in mental health.

**Keywords:** TKR, BMI, Obesity, OKS, PROM, pedometer, SF-36

**1. Introduction**

A central issue in patients with OA is reduced level of physical activity. TKA is successful for decreasing pain and increasing functional performance, but less is known about the influence of TKA on restoring overall physical activity levels<sup>[1-3]</sup>. The other issue in patients with OA is obesity which is a well-recognized risk factor for osteoarthritis. The projected increase of obesity in the general population will have ramifications in OA and elective surgery such as TKA.

The effects of osteoarthritis can be significant and affect multiple aspects of the patient's life, including physical, social, emotional, relationships and independence<sup>[4]</sup>. People with osteoarthritis are more than twice as likely to report their health as poor (7.9%) compared to those without osteoarthritis (3.5%), and are less likely to report their health as excellent, or very good<sup>[5]</sup>.

The aim of our study was to better understand physical, psychological, and general health changes and also to determine its relationship with physical activity and obesity in patients undergoing Total Knee Replacement.

**2. Materials and Methods**

This was a prospective study done in Tertiary Care Hospital, Bangalore considering all the patients undergoing primary unilateral/bilateral Total Knee replacement who satisfied the inclusion criteria from July 2020 to June 2021. A total of 92 patients were included in the study.

Preoperative evaluation included medical examination to obtain fitness for surgery, preoperative radiographs: anteroposterior view (while standing), lateral view of both knees and skyline view of both patella. Standard and validated scores were used for the assessment pre and post operatively. OKS (Oxford Knee Score) was used as Patient Reported Outcome Measures (PROMs), Pedometer was used to assess the physical activity, BMI to assess obesity and SF-36 to assess the quality of life in the pre op and postop at the end of 6 months.

A correlated physical and mental health summary scores for the SF-36 (PCSc and MCSc) were obtained from a correlated (oblique) physical and mental health factor solution. This was based on the study “Correlated physical and mental health summary scores for the SF36 and SF-12 Health Survey, V.I” by Farivar *et al.* [6] Factor analysis of the 8 SF-36 scale scores with a two-factor oblique rotation was used to estimate the physical and mental health factor scoring coefficients (weights).

Data was analyzed using SPSS v.24 software. All categorical data was summarized using frequency and percentages, all continuous data was described using mean and standard deviation or median and inter quartile range based on the distribution. All clinical parameters were assessed for change after treatment using paired sample t-test or Wilcoxon sign rank test based on the distribution. The change in clinical parameter was compared by different demographic parameters using independent sample t-test or Mann Whitney U test based on the distributional assumption. For all comparison P-value is considered significant at 5% level of significance.

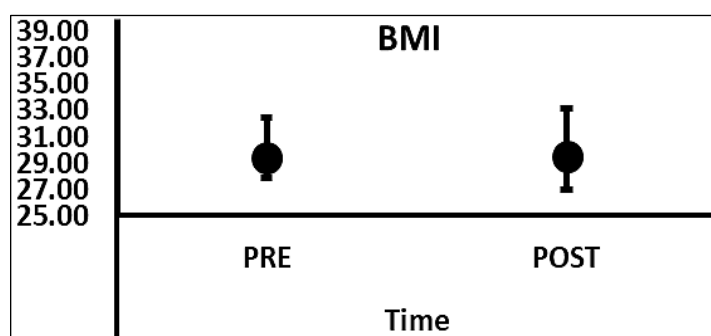
**3. Results**

In our study, distribution of age was between 44-84 years. Out of 92 patients, 14 (15.21%) were aged less than 50 years, 36 (39.13%) patients were between 51-60 years and 42 (45.65%) were >60 years. Among 92 patients, 61 (66.3%) were females and 31(33.69%) were males. 19(20.65%) underwent bilateral staged total knee replacement, 34(36.95%) underwent left side TKR and 39 (42.39%) underwent right TKR.

3(0.03) patients had normal BMI, 42(45.65%) patients were overweight, 27(29.34%) were obese grade I, 20(21.73%) were obese grade II. The BMI recorded pre op median of 29.4 and post op median of 29.5 showed no statistically significant correlation noted with the Total Knee Replacement and the change in BMI.

**Table 1:** Change in BMI

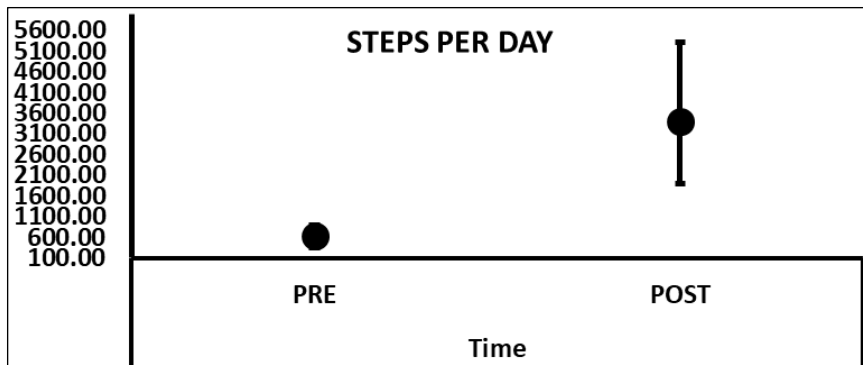
Time	BMI	
	Median	IQR
Pre	29.4000	(27.9,32.5)
Post	29.5000	(27,33.2)



The comparison between the preoperative values of steps per day with postoperative values at 6 months after the surgery showed a statistically significant improvement with preop median of 647 steps/day and postop median of 3407 steps/day. The P-value was <0.001.

**Table 2:** Changes in Steps per day (Comparison between Preoperative and Postoperative Median)

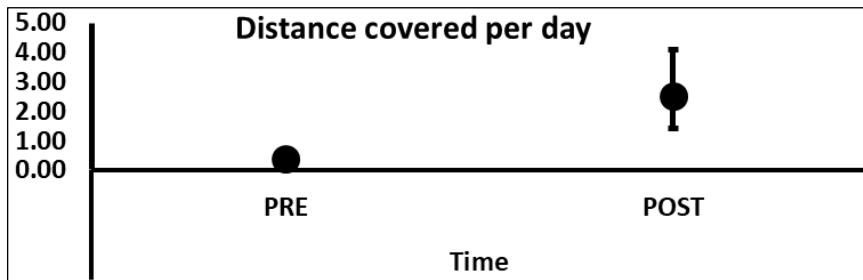
Time	Steps Per Day		P-Value
	Median	IQR	
PRE	647.00	(356,903)	<0.001
POST	3407.00	(1907,5323)	



The comparison between pre and post op values showed significant improvement in walking distance post TKA which was statistically significant. The median walking distance pre operatively was 390m and post op was 2500m. The P-value was <0.001.

**Table 3:** Changes in Distance covered per day (Comparison between Preoperative and Postoperative Median)

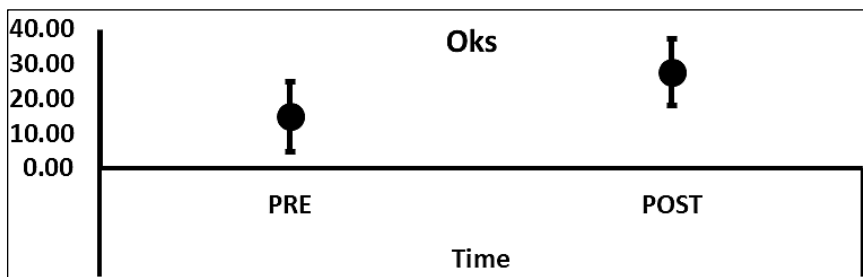
Time	Distance Covered Per Day		P-Value
	Median	IQR	
PRE	0.3900	(0.28,0.54)	<0.001
POST	2.5000	(1.4,4.1)	



The Oxford Knee Score (OKS) showed a significant improvement post operatively. The preoperative mean of OKS was 14.88 and postoperative mean OKS was 27.66. The P-value was <0.001 which was statistically significant.

**Table 4:** Comparison between Preoperative and Postoperative Oxford Knee Score Means

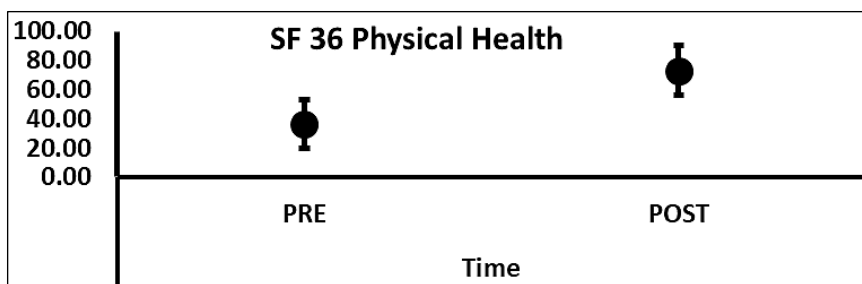
Time	Oks		P-Value
	Mean	Std. Deviation	
Pre	14.88	6.620	<0.001
Post	27.66	5.361	



The Physical health of the patients post TKA had a significant improvement which was evaluated using the SF-36 questionnaire.

**Table 5:** Comparison between Preoperative and Postoperative SF 36 Physical Health Score

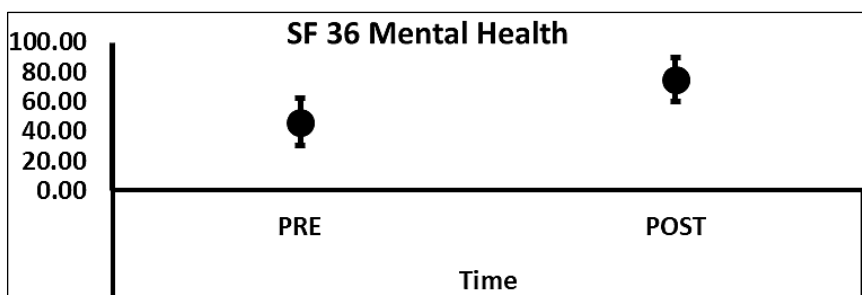
Time	SF 36 Physical Health		P-Value
	Mean	Std. Deviation	
Pre	36.5142	16.78578	<0.001
Post	73.2273	17.23857	



Similar to the physical health, mental health was also evaluated with SF-36 questionnaire. The mental health score was obtained by multiplying the components with mental health factor coefficient. The results showed an improvement in the mental health of the patients post TKA and was statistically significant.

**Table 6:** Comparison between Preoperative and Postoperative SF 36 Mental Health Score

Time	SF 36 Mental Health		P-Value
	Mean	STD. Deviation	
PRE	46.2864	16.23462	<0.001
POST	75.1424	14.94366	



**4. Discussion**

There are numerous outcome evaluation measures for TKA which are followed all across the world based on various parameters.

In our study we measured physical activity and assessed clinical outcome, including health-related quality of life in TKA patients before and after surgery to provide detailed information about the development of the activity level and its relationship to clinical outcome and health-related quality of life after TKA.

Though the results of our study showed no correlation between BMI and its effect on physical activity, functional recovery and outcome post TKA, it was able to substantiate that even in patients with high BMI there was significant improvement in quality of life post TKA similar to patients with normal BMI. There was a statistically significant improvement in the pedometer values i.e., steps per day and walking distance per day in patients post Total Knee Arthroplasty.

Our results were comparable with the study done by Brandes *et al.*, [7] who observed that physical activity increased significantly within 12 months of followup post TKA and concluded that TKA provides the possibility to return to a physically active lifestyle and to improve health-related quality of life for the majority of patients experiencing knee OA.

The Oxford Knee Score is a subjective scoring system i.e., Patient Reported Outcome Measure (PROMs) which showed significant improvement post TKA. The mean preoperative scoring was in the poor range of OKS and mean postoperative score was in moderate to good range.

Da Silva *et al.*, [8] in their systematic review “Quality of life after total knee arthroplasty” reviewed 31 articles addressing this topic using various quality-of-life evaluation protocols. SF-36/SF-12, WOMAC and Oxford were the ones most frequently used. The studies made it possible to define that TKA is capable of making an overall improvement in patients’ quality of life. Pain and function are among the most important predictors of improvement in quality of life, even when function remains inferior to that of healthy patients. Our study reported significant improvement in the Physical Health and Mental Health components of SF-36 HRQoL index post TKA.

The activity level of patients after treatment seems to be influenced by their general lifestyle and physical activity behavior before surgery rather than by the treatment itself.

**5. Conclusion**

Osteoarthritis, a multifactorial disease, manifests itself in a variety of clinical presentations. Two people

may have the same diagnosis and radiographic classification; however, their physical exam and subjective complaints of pain, functional limitations and disability may vary significantly, making treatment both challenging and unique to each patient<sup>[9, 10]</sup>.

Common outcome variables are reduction of pain, improvement of lower extremity function, and the success of the patient's return to a normal, physically active life after surgery<sup>[11, 12]</sup>.

Many studies have revealed improvements in QOL among patients who have undergone TKA, but the variety of instruments and measurement intervals used, different scoring algorithms and non-standardized presentations of results have also led to challenges in attempting to understand the literature on this topic. Many factors, including general health, psychological, and physical factors influence the expression of pain and dysfunction and also the physical activity behaviours in this population.

In our study, we have tried to address most of the components which help in understanding the improvements seen post TKR using standard instruments and measurement intervals and scoring algorithms.

The physical activity in patients pre and post TKA measured using a pedometer has given sufficient information to prove that physical activity significantly improves post TKA. BMI had no significant impact on the physical activity and the functional outcome post TKA. The Oxford Knee Score (OKS) used as patient reported outcome measures for patient's satisfaction, clinical and functional outcome post TKA showed a statistically significant improvement. Physical Health and Mental Health components of SF-36 used to assess the health-related Quality of Life showed a statistically significant improvement which signifies that the patient's overall health showed improvement post TKA.

## 6. References

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