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# A Prospective study on assessment of changes in physical activity and health related quality of life during the first 6 months after total knee arthroplasty

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**Abstract**
240 per 100,000 population suffer from symptomatic osteoarthritis (OA) of knees every year. This restricts them from performing their daily routine activities due to pain. The literature has yet to identify a potentially viable alternative option for the regeneration of cartilage in those with end stage degenerative changes compromising multiple compartments of the knee. The aim of this study is to analyze the changes recorded in physical activities and health related quality of life in post total knee replacement (TKR) in 159 patients through various parameters over 6 months follow-up period after the procedure conducted at Hospital for Orthopaedics, Sports Medicine, Arthritis and Accident – Trauma (HOSMAT), Bangalore, between July 2020 to June 2021. There was a statistically significant improvement in the parameters at the end of our study.

**Keywords:** Arthroplasty, TKR, osteoarthritis, BMI, Obesity, OKS, NKSS, PROM, pedometry, SF-36

## 1. Introduction
TKR is an elective surgery for patients with symptomatic knees which has demonstrated reproducible, long term, successful results with decreased pain and improved overall quality of life [1]. But, less is known about the influence of TKA on restoring overall physical activity levels [2-4]. The number of arthroplasties will further increase in the next decades because of the aging population and an associated increasing prevalence of arthritic diseases and joint degeneration [5-6]. 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 [7-8]. 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 [9-10]. The aim of our study is to assess the changes in physical activity and health related quality of life post Total Knee Arthroplasty and to better understand how various physical, psychological, and general health factors influence physical activity and also to determine its relationship with obesity.

| Age | | BMI (Median) | | Steps per day (Median) | | Distance per day (Median) | |
|---|---|---|---|---|---|---|---|
| <=60 | >60 | Pre-op | Post-op | Pre-op | Post-op | Per-op | Post-op |
| 73 | 86 | 29.4 | 29.5 | 647 | 3407 | 390m | 2500m |

## 2. Materials and methods
This prostective study was done at Hospital for Orthopaedics, Sports Medicine, Arthritis and Accident – Trauma (HOSMAT), Bangalore, which is a tertiary care referral Centre for Orthopaedics and sports medicine. Patients with osteoarthritis of the knee were assessed for the need of surgery. All patients were explained regarding their participation in the study and written informed consent were taken. Preoperative clinical evaluation included medical evaluation to obtain fitness for surgery, preoperative radiographs included anteroposterior view (while standing), lateral view of both knees and skyline view of both patella. Standardized and validated scores were used for the assessment.

The scoring was done following necessary instructions and standard protocol prescribed by the source. OKS (Oxford Knee Score), NEW KSS (Knee Society Score) were used as PROMs (Patient Reported Outcome Measures), PEDOMETRY was used to assess the physical activity, BMI to assess obesity and SF-36 questionnaire to assess the quality of life in the pre-op and postop at the end of 6 months. 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. A total of 159 patients were included in the study. All the knees are posteriorly stabilized. This study was conducted for a duration of 12 months between April 2020 to March 2021. All patients who have underwent primary unilateral/bilateral TKR are included in this study.

Exclusion criteria:

1. Patients who are lost for follow-up.
2. Patients with post op complications.
3. Patients with gross deformity requiring semi constrained prosthesis.
4. Patients undergoing revision TKRs.
5. Patients who have undergone hip arthroplasty.

## 3. Results

In our study, distribution of age was between 40 – 82 years. Out of 159 patients 51(32.07%) were aged less than 55 years, 40(25.15%) patients were between 56 – 65 years and 68(42.76%) were >65 years. The youngest patient was 40 years and oldest was 82 years. In our study among, 121(76.1%) patients were females and 38(23.89%) were males. 45(28.3%) underwent bilateral staged total knee replacement. Patients with unilateral OA knee, 68(59.64%) underwent left side TKR and 46(40.35%) underwent right TKR. 75(47.16%) patients were overweight, 43(27.04%) were obese grade I, 30(18.86%) 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. 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 which was statistically significant. The median walking distance pre operatively was 390m and post op was 2500m with P-value <0.001. The preoperative mean of OKS was 14.88 and postoperative mean OKS was 27.66 with P-value was <0.001 which was statistically significant. The New Knee Society Score – Patient Expectation component showed a significant reduction in the postoperative scores with pre op median of 11 and post op median 9. The NKSS Patient Satisfaction component showed a significant improvement with a pre op median of 4 and post op median of 16 with P-value was <0.001 which proved that there was a statistically significant satisfaction among the patients after TKA. The Functional Score component of NKSS showed improvement in the patient's functional abilities with a pre op median of 18 and post op median of 34 with P-value was <0.001. The 8 components of the SF-36 questionnaire were multiplied with physical health factor coefficient and the correlated physical health score with a pre op mean of 36.5142 and post op mean of 73.2273 with P-value was <0.001. The mental health was also evaluated with SF-36 questionnaire score with a pre op mean of 46.2864 and post op mean of 75.1424 with P-value was <0.001. The results showed an improvement in the mental health of the patients post TKA and was statistically significant. Changes in steps per day pre and postoperatively was compared between the age groups <=60 years and >60 years. It showed better results in patients <=60 years with steps per day change median of 3650 steps compared to patients >60 years with a median of 2307 steps per day change. Similarly changes in walking distance pre and postoperatively was compared between the age groups <=60 years and >60 years. It also showed better results in patients <=60 years with distance covered per day change median of 2900m compared to patients >60 years with a median of 1770m distance covered per day change.

**Table 1:** Patient expectation score

| Time | Oks | | P-value |
|---|---|---|---|
| | Mean | Std. dev | |
| Pre-op | 14.88 | 6.620 | <0.001 |
| Post-op | 27.66 | 5.361 | <0.001 |

| Time | NKSS (PES) | | P-Value |
|---|---|---|---|
| | Mean | IQR | |
| Pre-op | 11 | (10,11) | <0.001 |
| Post-op | 9 | (8,9) | <0.001 |

**Table 2:** Patient satisfaction

| Time | NKSS (PS) | | P-Value |
|---|---|---|---|
| | Mean | IQR | |
| Pre-op | 4 | (4,8) | <0.001 |
| Post-op | 16 | (14,20) | <0.001 |

**Table 3:** Functional satisfaction

| Time | NKSS (FS) | | P-Value |
|---|---|---|---|
| | Mean | IQR | |
| Pre-op | 18 | (13,23) | <0.001 |
| Post-op | 34 | (27,36) | <0.001 |

**Table 4:** Physical health

| Time | SF-36 (PH) | | P-Value |
|---|---|---|---|
| | Mean | Std. dev | |
| Pre-op | 36.5142 | 16.78578 | <0.001 |
| Post-op | 73.2273 | 17.23857 | <0.001 |

**Table 5:** Mental health

| Time | SF-36 (MH) | | P-Value |
|---|---|---|---|
| | Mean | Std. dev | |
| Pre-op | 46.2864 | 16.23462 | <0.001 |
| Post-op | 75.1424 | 14.94366 | <0.001 |

## 4. Discussion

Total Knee Arthroplasty is one of the most commonly performed elective surgical procedures which attracts a lot of questions on the patient's wellbeing after the surgery. 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. Although the patients were expected to mobilize more easily and lose weight after Total Knee Arthroplasty procedure, there was no significant change in the body mass index (BMI) after TKA noted in our study and also there was no significant impact of BMI on the physical activity and the functional outcome post TKA. However, we were 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. Li, Wenjun *et al.* [11] in their study "Functional Gain and Pain

Relief after Total Joint Replacement According to Obesity Status" concluded that six months after total joint replacement (TJR), severely or morbidly obese patients reported excellent pain relief and substantial functional gain that was similar to the findings in other patients. Overgaard *et al*. [12] in 2019 in their study "Patient-reported 1-year outcome (PRO) not affected by body mass index in 3,327 total knee arthroplasty patients" Interpreted that the degree of improvement in PROs 1 year after TKA surgery does not seem to be affected by BMI. In our study there was a statistically significant improvement in the pedometry values i.e., steps per day and walking distance per day in patients post Total Knee Arthroplasty. Thus our study to measure the physical activity in patients, pre and post TKA using a pedometer has given sufficient information to prove that physical activity significantly improves post TKA. Brandes *et al*. [13] who observed that physical activity increased significantly within 12 months of follow-up 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 results of patient satisfaction, expectation and functional outcomes from NKSS in our study showed significant improvement in patient satisfaction and functional outcome, whereas showed a significant negative outcome with respect to patient expectation. Felix *et al*. [14] in 2019 in their study have concluded that on average, patients benefited from TKA. Preoperative WOMAC and EQ-5D VAS were predictors of postoperative outcomes after TKA in their study. Particularly patients with high absolute preoperative PRO scores were more likely to remain unsatisfied. 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. Da Silvaa *et al*. [15] in 2013 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.

## 5. Conclusion

There was a statistically significant improvement in the pedometry values i.e., steps per day and walking distance per day in patients post Total Knee Arthroplasty. Thus our study to measure the physical activity in patients pre and post TKA using a pedometer has given sufficient information to prove that physical activity significantly improves post TKA. There was no significant change in the body mass index (BMI) after TKA noted in our study and also there was no significant impact of BMI on the physical activity and the functional outcome post TKA. Hence our study results show that patients with high BMI are also expected to have improved quality of life post TKA. The Oxford Knee Score (OKS) and New Knee Society Score (NKSS) used as patient reported outcome measures for patients satisfaction, clinical and functional outcome post TKA showed a statistically significant improvement. There was a statistically significant improvement in the Physical Health and Mental Health components of SF-36 used to assess the Health-related Quality Of Life which signifies that the patients overall health showed improvement post TKA. Though most of the outcome measures used showed significant improvement, the patients expectation component of NKSS had a negative correlation with other subjective and objective outcome measures. Thus requiring further studies to determine the psychological and somatic factors that influence patients expectations and fulfilment.

On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Conflict of Interest**

Not available

**Financial Support**

Not available

## 6. References

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