

EFFECT OF OBESITY ON SHORT-TERM CLINICAL AND FUNCTIONAL OUTCOMES AFTER TOTAL KNEE REPLACEMENT: A PROSPECTIVE COMPARATIVE STUDY IN A TERTIARY CARE HOSPITAL OF SOUTH INDIA

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ABSTRACT

Background: Obesity is a growing global health concern and a known risk factor for knee osteoarthritis requiring total knee replacement (TKR). Its effect on postoperative outcomes remains variably reported, particularly in developing countries.

Objectives: To evaluate the effect of obesity on perioperative parameters, complications, and functional outcomes following total knee replacement in a tertiary care hospital in South India.

Methods: A prospective comparative study was conducted on 56 patients undergoing primary TKR between June 2014 and October 2014. Patients were divided into obese and non-obese groups based on body mass index (BMI). Perioperative variables, complications, and functional outcomes using Knee Society Score (KSS) were assessed and compared. Statistical analysis was performed using appropriate tests, with $p < 0.05$ considered significant.

Results: The study included 56 patients equally divided into obese and non-obese groups. Obese patients had longer operative time, higher blood loss, and slightly longer hospital stay compared to non-obese patients. Postoperative wound-related complications were more frequent in obese patients. Functional outcomes improved significantly in both groups; however, mean postoperative KSS was lower in obese patients compared to non-obese patients. Most patients in both groups achieved good to excellent outcomes.

Conclusion: Obesity is associated with increased perioperative morbidity and slightly reduced functional outcomes following total knee replacement. However, it does not significantly compromise overall surgical success, and most obese patients achieve satisfactory functional improvement.

Keywords: Total knee replacement; Obesity; Knee osteoarthritis; Knee Society Score; Arthroplasty; Postoperative complications; Functional outcome.

INTRODUCTION

Total knee replacement (TKR) is one of the most successful orthopedic procedures for relieving pain, correcting deformity, and restoring function in patients with advanced knee osteoarthritis. The prevalence of osteoarthritis has increased substantially worldwide owing to population aging, increasing life expectancy, and the growing burden of obesity. As a result, the demand for TKR continues to rise across both developed and developing countries, making optimization of postoperative outcomes an important public health and clinical priority [1].

Obesity has emerged as a major global health concern and is recognized as a significant risk factor for the development and progression of knee osteoarthritis. Excess body weight increases mechanical loading across the knee joint, leading to accelerated cartilage degeneration and structural joint damage. In addition to biomechanical factors, obesity is associated with systemic inflammation mediated by adipokines and pro-inflammatory cytokines, which may further contribute to joint deterioration [2,3]. Consequently, obese individuals are more likely to develop symptomatic osteoarthritis at a younger age and may require joint replacement surgery earlier than their non-obese counterparts [4].

Several studies have evaluated the relationship between obesity and outcomes following TKR. While many investigators have reported substantial improvements in pain relief and functional status irrespective of body mass index (BMI), concerns remain regarding increased perioperative risks among obese patients. These risks include wound complications, infection, prolonged operative time, thromboembolic events, delayed rehabilitation, and implant-related complications [5,6]. The extent to which obesity influences postoperative recovery and functional outcomes remains a subject of ongoing debate.

In high-income countries, large registry-based studies have demonstrated that obese patients generally experience significant functional improvement following TKR, although the magnitude of improvement may be lower than that observed in non-obese individuals. Furthermore, severe obesity has been associated with increased rates of postoperative complications and revision procedures in some cohorts [7]. However, findings across studies have been inconsistent, partly due to differences in patient populations, obesity classifications, outcome measures, and duration of follow-up [8].

The prevalence of obesity in India has increased markedly over the past two decades due to rapid urbanization, sedentary lifestyles, and dietary transitions. Simultaneously, osteoarthritis has become an important cause of disability among older adults. The increasing number of obese patients undergoing TKR presents unique challenges for orthopedic surgeons and healthcare systems in the Indian setting [9]. Despite this growing burden, evidence regarding the impact of obesity on TKR outcomes in Indian populations remains limited compared with data available from Western countries.

Regional variations in body composition, comorbidity profiles, healthcare access, rehabilitation practices, and socioeconomic factors may influence surgical outcomes. Therefore, findings from international studies may not be directly applicable to patients treated in South Indian tertiary care centers. Locally generated evidence is essential to guide preoperative counseling, risk stratification, perioperative optimization, and postoperative management strategies for obese patients undergoing TKR [10].

A review of the available literature up to 2014 reveals a relative paucity of studies evaluating the effect of obesity on postoperative functional outcomes and complications following TKR in South Indian populations. Addressing this knowledge gap may help clinicians better understand the implications of obesity on surgical outcomes and improve patient care.

Therefore, the present study was undertaken to assess the effect of obesity on outcomes after total knee replacement among patients treated at a tertiary care hospital in South India. The specific objectives were to compare postoperative functional outcomes and perioperative complications between obese and non-obese patients undergoing total knee replacement and to evaluate the association between body mass index and surgical outcomes.

METHODOLOGY

Study Design: A hospital-based prospective observational comparative study was conducted to evaluate the effect of obesity on outcomes after total knee replacement (TKR). Patients were categorized into obese and non-obese groups based on their preoperative body mass index (BMI), and postoperative outcomes were compared between the groups.

Study Setting: The study was conducted in the Department of Orthopedics at a tertiary care teaching hospital in South India, which serves as a referral center for joint replacement surgeries and provides comprehensive perioperative and rehabilitation services.

Study Duration: The study was conducted from June 2014 to October 2014.

Study Population: The study population comprised adult patients diagnosed with advanced knee osteoarthritis who underwent primary total knee replacement during the study period at the study institution.

Inclusion Criteria

- Patients aged 45 years and above.
- Patients diagnosed with primary osteoarthritis of the knee requiring total knee replacement.
- Patients undergoing primary unilateral or bilateral TKR.
- Patients willing to participate and provide written informed consent.
- Patients available for postoperative follow-up as per study protocol.

Exclusion Criteria

- Revision total knee replacement procedures.
- Inflammatory arthropathies such as rheumatoid arthritis.
- Post-traumatic arthritis of the knee.
- Active local or systemic infection.
- Severe neuromuscular disorders affecting gait or functional assessment.
- Patients unwilling to participate or provide informed consent.
- Patients with incomplete clinical records or loss to follow-up.

Sample Size: The sample size was calculated for comparison of postoperative functional outcomes between obese and non-obese patients undergoing TKR.

Using the formula for comparison of two proportions:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 [P_1(1 - P_1) + P_2(1 - P_2)]}{(P_1 - P_2)^2}$$

Where:

- $(Z_{\alpha/2}) = 1.96$ at 95% confidence level
- $(Z_{\beta}) = 0.84$ for 80% study power
- (P_1) = anticipated satisfactory functional outcome among non-obese patients
- (P_2) = anticipated satisfactory functional outcome among obese patients

Based on previous literature available before 2014 and considering feasibility within the study duration, the required sample size was estimated to be approximately 52 participants. After accounting for potential incomplete follow-up and missing data, a total sample size of 56 patients was included in the study.

Sampling Technique: A consecutive sampling technique was employed. All eligible patients undergoing primary total knee replacement during the study period who fulfilled the inclusion criteria and consented to participate were enrolled until the desired sample size of 56 was achieved.

Data Collection Tools and Procedure: Eligible patients were identified during preoperative orthopedic evaluation. After obtaining informed written consent, demographic characteristics, clinical history, comorbidities, body weight, height, and BMI were recorded using a structured data collection proforma. Patients were classified according to BMI into obese and non-obese groups using World Health Organization criteria. Preoperative clinical assessment included pain evaluation, knee range of motion assessment, and functional status measurement using the Knee Society Score (KSS). All patients underwent standard primary total knee replacement performed by experienced orthopedic surgeons using institutional protocols. Postoperative management, thromboprophylaxis, antibiotic prophylaxis, and rehabilitation protocols were standardized across participants. Follow-up assessments were conducted to evaluate functional outcomes and postoperative complications. Data regarding wound complications, infection, deep vein thrombosis, length of hospital stay, and functional recovery were recorded systematically.

Study Variables: The primary independent variable was obesity status as determined by body mass index (BMI). Other independent variables included age, sex, laterality of surgery, and presence of comorbid conditions such as diabetes mellitus and hypertension. Dependent variables included postoperative Knee Society Score, functional outcome category, length of hospital stay, postoperative complications, wound-related events, and early postoperative recovery parameters. The association between obesity and these outcome measures was analyzed.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Continuous variables were summarized using mean and standard deviation, whereas categorical variables were expressed as frequencies and percentages. Student's t-test was used for comparison of continuous variables between obese and non-obese groups when data followed a normal distribution. The Chi-square test or Fisher's exact test was applied for categorical variables as appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants after explaining the objectives, procedures, potential benefits, and risks of the study. Confidentiality and anonymity of patient information were maintained throughout the study. Participation was entirely voluntary, and patients were free to withdraw at any stage without affecting their treatment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and prevailing institutional guidelines for biomedical research involving human participants.

RESULTS

A total of 56 patients undergoing primary total knee replacement were included in the study and divided equally into obese and non-obese groups. The mean age of patients was comparable between the two groups, and a female predominance was observed in both cohorts.(Table 1)

Table 1: Baseline demographic distribution of study participants (n = 56)

Variable	Category	Obese (n=28)	Non-obese (n=28)
Age (years)	Mean $\pm$ SD	63.4 $\pm$ 6.8	64.1 $\pm$ 7.2
Gender	Male	10 (35.7%)	9 (32.1%)
	Female	18 (64.3%)	19 (67.9%)

BMI (kg/m ²)	Mean ± SD	32.6 ± 2.8	24.1 ± 2.3
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Comorbid conditions such as diabetes mellitus and hypertension were more frequently observed in the obese group.(Table 2).

Table 2: Distribution of comorbidities among study groups

Comorbidity	Obese (n=28)	Non-obese (n=28)
Diabetes mellitus	10 (35.7%)	6 (21.4%)
Hypertension	14 (50.0%)	11 (39.3%)
Both DM + HTN	6 (21.4%)	3 (10.7%)

Operative parameters demonstrated that obese patients had a longer mean operative time, increased intraoperative blood loss, and prolonged hospital stay compared to non-obese patients.(Table 3).

Table 3: Operative and perioperative parameters

Parameter	Obese (n=28)	Non-obese (n=28)
Operative time (minutes)	98 ± 12	88 ± 10
Intraoperative blood loss (mL)	420 ± 85	360 ± 70
Hospital stay (days)	7.6 ± 1.4	6.3 ± 1.2

Postoperative complications were more frequent among obese patients, particularly superficial wound infection and wound healing issues, although deep infection and thromboembolic events were infrequent overall.(Table 4).

Table 4: Postoperative complications

Complication	Obese (n=28)	Non-obese (n=28)
Superficial wound infection	3 (10.7%)	1 (3.6%)
Deep infection	1 (3.6%)	0 (0%)
Wound dehiscence	2 (7.1%)	0 (0%)
Deep vein thrombosis	1 (3.6%)	0 (0%)

Functional outcome assessment using Knee Society Score revealed that both groups showed substantial improvement following surgery. However, obese patients demonstrated comparatively lower mean postoperative KSS and a higher proportion of fair and poor outcomes, whereas non-obese patients had a higher proportion of excellent outcomes.(Table 5).

Table 5: Functional outcomes based on Knee Society Score (KSS)

Outcome category	Obese (n=28)	Non-obese (n=28)
Excellent	8 (28.6%)	12 (42.9%)
Good	12 (42.9%)	13 (46.4%)
Fair	6 (21.4%)	3 (10.7%)
Poor	2 (7.1%)	0 (0%)

Mean postoperative KSS	82.3 ± 8.1	88.5 ± 6.9
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DISCUSSION

This study evaluated the effect of obesity on perioperative parameters, complications, and functional outcomes following primary total knee replacement (TKR) in a tertiary care hospital in South India. The key finding was that obese patients had longer operative time, increased intraoperative blood loss, slightly prolonged hospital stay, and a higher rate of minor wound-related complications compared to non-obese patients. However, both obese and non-obese groups demonstrated substantial functional improvement after TKR, with most patients achieving good to excellent outcomes.

The observation of increased operative time in obese patients is consistent with previously published literature. Obesity is known to present technical challenges during surgery due to increased soft tissue mass, difficulty in exposure, and longer wound closure time. Similar findings have been reported in earlier studies where obese patients undergoing TKR had significantly longer surgical duration compared to non-obese individuals [11]. Increased blood loss observed in this study may also be explained by more extensive soft tissue dissection and longer operative time.

In terms of complications, obese patients in the present study showed a higher incidence of superficial wound infection and wound healing problems. This aligns with existing evidence suggesting that obesity is associated with impaired wound healing due to reduced vascularity of adipose tissue and increased tension on surgical wounds. Previous studies have demonstrated obesity as an independent risk factor for postoperative wound complications and prosthetic joint infection following arthroplasty procedures [12]. However, the absolute rate of deep infection remained low in both groups, which may reflect standardized perioperative antibiotic prophylaxis and sterile surgical techniques.

Functional outcomes assessed using Knee Society Score (KSS) indicated that both groups experienced significant improvement after surgery, although obese patients had slightly lower mean postoperative scores compared to non-obese patients. These findings are consistent with large registry-based studies that report clinically meaningful improvement in all BMI categories but relatively reduced magnitude of improvement in severely obese individuals [13]. The possible explanation may include persistent biomechanical overload on the prosthetic joint and reduced postoperative physical activity levels in obese individuals.

Interestingly, despite differences in complication rates and functional scores, the majority of obese patients still achieved good or excellent outcomes. This suggests that obesity alone should not be considered a contraindication for TKR. Instead, it should be viewed as a modifiable risk factor that requires careful perioperative optimization. Preoperative weight management, strict glycemic control, and structured rehabilitation protocols may help reduce complications and improve outcomes in obese patients.

From a public health perspective, the increasing prevalence of obesity in South India poses a significant challenge for orthopedic services. The dual burden of obesity and osteoarthritis is likely to increase demand for joint replacement surgery in the coming years. Therefore, understanding its impact on surgical outcomes is essential for resource planning and patient counseling.

The strengths of this study include a homogenous surgical protocol, standardized postoperative care, and direct comparison between BMI-based groups in a real-world tertiary care setting.

However, several limitations must be acknowledged. The relatively small sample size and short follow-up duration may limit the generalizability of the findings. Long-term outcomes such as

implant survival and revision rates could not be assessed. Additionally, potential confounders such as activity level and socioeconomic status were not fully controlled.

Overall, obesity appears to be associated with increased perioperative morbidity but does not prevent significant functional improvement following TKR. Further large-scale prospective studies with longer follow-up are required to better define the long-term impact of obesity on implant survival and patient-reported outcomes.

CONCLUSION

This prospective comparative study demonstrates that obesity is associated with increased perioperative challenges and a higher incidence of minor postoperative complications following total knee replacement. Obese patients had longer operative time, greater intraoperative blood loss, and slightly prolonged hospital stay compared to non-obese patients. Although wound-related complications were more frequent in obese individuals, the overall rate of major complications remained low in both groups. Functionally, both obese and non-obese patients showed significant improvement after total knee replacement, as reflected by increased Knee Society Scores. However, obese patients had comparatively lower postoperative functional scores and a higher proportion of fair outcomes, while non-obese patients achieved better overall functional grading. Despite these differences, obesity did not prevent satisfactory clinical improvement after surgery. The findings suggest that total knee replacement remains an effective intervention for patients across different BMI categories. Obesity should therefore be considered a risk modifier rather than a contraindication for surgery. Optimizing modifiable factors such as weight reduction, glycemic control, and early rehabilitation may further improve outcomes in obese patients. Larger long-term studies are recommended to evaluate implant survival and sustained functional outcomes in this population.

DECLARATIONS

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Conflict of Interest: None declared.

Consent: Written informed consent was obtained from all participants prior to enrollment.

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