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Research Article

Clinical Outcomes of Total Knee Arthroplasty TKR in Obese Versus Non-Obese Patients: A Prospective Observational Study

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ABSTRACT

Background: Total Knee Arthroplasty (TKA) is an effective surgical intervention for end-stage knee osteoarthritis. With the rising prevalence of obesity, an increasing number of obese patients are undergoing TKA. Obesity has been associated with altered functional recovery and higher complication rates; however, outcomes remain variable across studies, particularly in the Indian population.
Objectives: To compare the clinical and functional outcomes of Total Knee Arthroplasty in obese versus non-obese patients and to assess postoperative complications associated with obesity.
Materials and Methods: This prospective observational study was conducted at Maratha Vidya Prasarak Samaj's Dr. Vasantrao Pawar Medical College, Hospital & Research Centre, Nashik, from March 2024 to February 2025. A total of 100 patients undergoing primary TKA for knee osteoarthritis were included and categorized into obese (BMI ≥30 kg/m²) and non-obese (BMI <30 kg/m²) groups. Patients were evaluated preoperatively and postoperatively for functional outcomes, range of motion, early ambulation, and complications. Comparative analysis was performed between the two groups, and a p-value <0.05 was considered statistically significant.
Results: Of the 100 patients, 46% were obese and 54% were non-obese. Both groups showed significant postoperative improvement; however, non-obese patients achieved higher mean postoperative functional scores (82.9 ± 7.6 vs 78.4 ± 8.2), greater knee range of motion (114.2° ± 8.6° vs 108.6° ± 9.4°), and earlier independent ambulation (85.2% vs 73.9%). The overall complication rate was significantly higher in obese patients (26.1%) compared to non-obese patients (7.4%), with wound-related complications being more common in the obese group.
Conclusion: Total Knee Arthroplasty provides substantial clinical and functional improvement in both obese and non-obese patients. However, obesity is associated with comparatively reduced functional outcomes and a higher risk of postoperative complications. Careful patient counseling, optimization of comorbidities, and meticulous perioperative management are essential to improve outcomes in obese patients undergoing TKA.

Keywords*: Total knee arthroplasty, Obesity; Knee osteoarthritis, Functional outcome, Postoperative complications, Body mass index.*

INTRODUCTION

Osteoarthritis (OA) of the knee is one of the most prevalent degenerative musculoskeletal disorders and a leading cause of chronic pain, functional limitation, and disability worldwide. According to the Global Burden of Disease (GBD) 2019 study, knee osteoarthritis ranks among the top causes of years lived with disability globally, with a steadily increasing burden attributable to population ageing and lifestyle-related risk factors [1]. In India, the prevalence of knee osteoarthritis has been reported to range from 22% to 39%, making it a significant public health concern and a major contributor to reduced mobility and quality of life among adults [2].

Total Knee Arthroplasty (TKA) has become the gold standard surgical intervention for end-stage knee osteoarthritis when conservative management fails. TKA is associated with substantial pain relief, improved joint function, and enhanced health-related quality of life, with long-term implant survival exceeding 90% at 10–15 years in many series [3]. As surgical techniques, implant designs, and perioperative care have evolved, the indications for TKA have expanded, resulting in an increasing number of procedures performed annually worldwide [4].

Obesity is a well-established risk factor for both the development and progression of knee osteoarthritis. Excess body weight increases mechanical loading across the knee joint and contributes to cartilage degeneration, while adipose-derived inflammatory mediators further accelerate joint destruction [5]. The World Health Organization (WHO) estimates that worldwide obesity has nearly tripled since 1975, with over 650 million adults classified as obese [6]. In India, data from the National Family Health Survey-5 (NFHS-5) reported that approximately 24% of women and 23% of men are overweight or obese, with higher prevalence in urban populations [7]. Consequently, a growing proportion of patients undergoing TKA are obese.

The effect of obesity on outcomes following Total Knee Arthroplasty remains controversial. Several studies have demonstrated that obese patients are at increased risk of perioperative complications such as wound healing problems, surgical site infection, thromboembolic events, and delayed rehabilitation [8,9]. Additionally, higher body mass index (BMI) has been associated with longer operative time, increased blood loss, and higher revision rates in some studies [10]. Conversely, other authors have reported that obese patients achieve comparable pain relief and functional improvement after TKA when compared with non-obese patients, despite higher complication risks [11,12]. This inconsistency in existing literature underscores the need for further prospective evaluation.

In the Indian context, data comparing clinical and functional outcomes of TKA between obese and non-obese patients remain limited. Differences in body composition, lifestyle factors, healthcare access, and postoperative rehabilitation may influence outcomes and complication profiles. Therefore, generating institution-based prospective data is essential to guide patient counseling, risk stratification, and perioperative planning.

The aim of this study is to evaluate and compare the clinical and functional outcomes of Total Knee Arthroplasty (TKA) in obese versus non-obese patients. The objectives include assessment of postoperative pain relief, functional improvement, range of motion, complication rates, and overall patient satisfaction in both groups during the follow-up period. The future outcomes of this study are expected to provide evidence-based guidance for patient selection, preoperative counseling, and perioperative optimization in obese patients undergoing TKA, thereby aiding surgeons in risk stratification, improving functional results, reducing complication rates, and enhancing the overall quality of care in routine orthopedic practice.

MATERIALS AND METHODOLOGY

This **prospective observational study** was conducted in the Department of Orthopaedics at **Maratha Vidya Prasarak Samaj's Dr. Vasantrao Pawar Medical College, Hospital & Research Centre, Vasantdada Nagar, Adgaon, Nashik**, over a period of **one year from March 2024 to February 2025**. A total of **100 patients** undergoing **primary Total Knee Arthroplasty (TKA)** for end-stage knee osteoarthritis were included in the study after obtaining **written informed consent** and approval from the Institutional Ethics Committee.

Patients aged **40 years and above** with clinically and radiologically confirmed primary osteoarthritis of the knee, who were planned for unilateral or bilateral primary TKA, were enrolled. Patients were categorized into **obese and non-obese groups** based on **Body Mass Index (BMI)** as per **WHO classification**, with BMI ≥30 kg/m² considered obese and BMI <30 kg/m² considered non-obese. Patients with inflammatory arthritis, post-traumatic arthritis, revision TKA, active infection, severe systemic illness, neuromuscular disorders affecting ambulation, or those unwilling to participate were excluded from the study.

All patients underwent a detailed **preoperative evaluation**, including demographic data, BMI calculation, clinical examination, radiological assessment using weight-bearing knee radiographs, and routine laboratory investigations. TKA was performed using a **standard medial parapatellar approach** under regional or general anesthesia by experienced orthopedic surgeons, employing cemented prostheses. Postoperative management followed a uniform protocol, including antibiotic prophylaxis, thromboprophylaxis, pain management, and standardized physiotherapy with early mobilization.

Patients were followed up at regular intervals postoperatively to assess **clinical and functional outcomes**. Outcome measures included **pain relief, range of motion, functional scores** (such as Knee Society Score / WOMAC / Oxford Knee Score, as applicable), time to ambulation, and **postoperative complications** including wound-related problems, infection, thromboembolic events, and implant-related issues. All data were recorded in a structured proforma and entered into Microsoft Excel for analysis.

Statistical analysis was performed using appropriate software. Descriptive statistics were used to summarize baseline characteristics and outcomes. Comparative analysis between obese and non-obese groups was carried out using suitable statistical tests, and a **p-value < 0.05** was considered statistically significant.

In this study of **100 patients** undergoing Total Knee Arthroplasty, **46 patients (46%) were obese** and **54 patients (54%) were non-obese**. The mean age was comparable between the obese (**66.2 ± 6.8 years**) and non-obese groups (**65.1 ± 7.2 years**). Obese patients had a higher prevalence of associated comorbidities, with **diabetes mellitus present in 39.1%** and **hypertension in 45.7%**, compared to **16.7%** and **25.9%**, respectively, in non-obese patients. Preoperatively, obese patients demonstrated slightly lower mean knee range of motion (**92.4° ± 10.2° vs 96.8° ± 9.6°**) and greater dependence on walking aids (**73.9% vs 57.4%**).

Postoperatively, significant functional improvement was observed in both groups. The mean postoperative functional score at 6 months was **78.4 ± 8.2** in obese patients and **82.9 ± 7.6** in non-obese patients, with a greater mean improvement in the non-obese group (**38.8 ± 8.4 vs 35.8 ± 9.1**). Mean postoperative knee range of motion was also higher among non-obese patients (**114.2° ± 8.6°**) compared to obese patients (**108.6° ± 9.4°**). Independent ambulation by 6 weeks was achieved by **85.2%** of non-obese patients, compared to **73.9%** of obese patients.

Postoperative complications were more frequent in the obese group. Overall, **26.1% of obese patients** experienced at least one complication, compared to **7.4% of non-obese patients**. Wound-related complications were observed in **13.0%** of obese patients versus **3.7%** of non-obese patients, while superficial infection occurred in **6.5%** and **1.9%**, respectively. No cases of implant failure or revision surgery were noted in either group during the study period.

Statistical analysis revealed that postoperative functional score, knee range of motion, early independent ambulation, and overall complication rate were **significantly associated with obesity status ($p < 0.05$)**. These findings demonstrate that although Total Knee Arthroplasty leads to substantial clinical improvement in both obese and non-obese patients, obesity is associated with relatively lower functional gains and a higher complication rate, directly addressing the objectives of the present study.

Table 1. Demographics and Clinical History of Study Participants

Variable	Obese (n = 46)	Non-Obese (n = 54)
Mean age (years)	66.2 ± 6.8	65.1 ± 7.2
Gender (Male : Female)	18 : 28	24 : 30
Mean BMI (kg/m²)	32.8 ± 2.4	25.1 ± 2.1
Duration of symptoms (years)	6.4 ± 2.1	5.8 ± 2.0
Bilateral knee involvement	29 (63.0%)	31 (57.4%)
Diabetes mellitus	18 (39.1%)	9 (16.7%)
Hypertension	21 (45.7%)	14 (25.9%)

Table 2. Comparison of Pre-operative Clinical Examination Findings

Examination Parameter	Obese (n = 46)	Non-Obese (n = 54)
Mean pre-op knee ROM (degrees)	92.4 ± 10.2	96.8 ± 9.6
Fixed flexion deformity present	14 (30.4%)	10 (18.5%)
Varus deformity	32 (69.6%)	36 (66.7%)
Valgus deformity	6 (13.0%)	8 (14.8%)
Use of walking aid	34 (73.9%)	31 (57.4%)
Pre-op functional score (mean)	42.6 ± 7.5	44.1 ± 6.9

Table 3. Comparison of Post-operative Outcomes (Objective-Based)

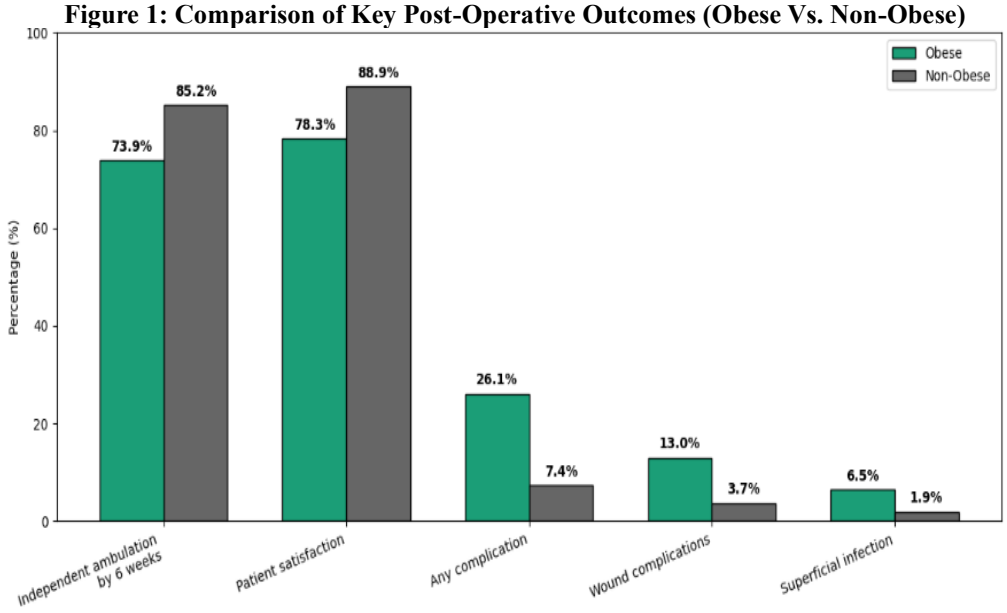
Outcome Parameter	Obese (n = 46)	Non-Obese (n = 54)
Post-op functional score (6 months)	78.4 ± 8.2	82.9 ± 7.6
Mean improvement in score	35.8 ± 9.1	38.8 ± 8.4
Mean post-op knee ROM (degrees)	108.6 ± 9.4	114.2 ± 8.6
Independent ambulation by 6 weeks	34 (73.9%)	46 (85.2%)
Wound-related complications	6 (13.0%)	2 (3.7%)

Any post-operative complication	12 (26.1%)	4 (7.4%)
Patient-reported satisfaction	36 (78.3%)	48 (88.9%)

Table 4. Test of Significance Between Obese and Non-Obese Groups

Parameter Compared	Test Used	p-value	Significance
Age	Student's t-test	>0.05	Not significant
Pre-op functional score	Student's t-test	>0.05	Not significant
Post-op functional score	Student's t-test	**<0.05**	Significant
Mean ROM at 6 months	Student's t-test	**<0.05**	Significant
Independent ambulation	Chi-square test	**<0.05**	Significant
Overall complication rate	Chi-square test	**<0.05**	Significant

Figure 1: Comparison of Key Post-Operative Outcomes (Obese Vs. Non-Obese)



DISCUSSION

In this study, both obese and non-obese patients showed clear improvement after Total Knee Arthroplasty (TKA), but the **non-obese group demonstrated relatively better recovery parameters**. The mean postoperative functional score at 6 months was **78.4 ± 8.2 in obese** versus **82.9 ± 7.6 in non-obese**, with a greater mean improvement in the non-obese group (**38.8 ± 8.4 vs 35.8 ± 9.1**). This pattern—**similar improvement but lower absolute postoperative scores in obese patients**—has also been described in the literature. For example, **Giesinger et al. (2018)** reported that BMI influences patient-reported outcome metrics after TKA, with obese groups often showing **lower absolute postoperative scores**, even when meaningful improvement occurs in all BMI categories [13]. Likewise, **Bagge et al. (2023)** noted that obese patients can still achieve clinically important improvements after TKA, though absolute outcomes may remain lower in higher BMI strata, supporting the direction of findings in this study [14].

With respect to knee motion and early rehabilitation, this study observed lower postoperative ROM in obese patients (**108.6° ± 9.4°**) compared with non-obese (**114.2° ± 8.6°**) and a lower proportion achieving independent ambulation by 6 weeks (**73.9% vs 85.2%**). Similar recovery trends have been reported in expectation and satisfaction studies. **Baum et al. (2022)** found that non-obese patients more frequently reported meeting or exceeding expectations and had higher satisfaction proportions early after TKA compared with obese individuals, reflecting a consistent gap in perceived and functional recovery [15]. In the current study too, patient-reported satisfaction was lower in obese patients (**78.3%**) compared with non-obese (**88.9%**), suggesting that obesity may influence not only objective recovery but also subjective outcome perception [15].

Regarding complications, this study found a clearly higher overall complication rate in obese patients (**26.1%**) compared with non-obese (**7.4%**), with wound-related problems being notably higher in obese (**13.0%**) versus non-obese (**3.7%**). This aligns well with the broader evidence base. A meta-analysis by **Onggo et al. (2021)** concluded that obese and morbidly obese patients have higher risks of complications including infection after TKA, emphasizing the need for counseling and risk mitigation strategies [16]. Similarly, the narrative review by **Aggarwal et al. (2022)** highlighted that

obesity is consistently associated with increased surgical complications after TKA, particularly wound complications and surgical site infections, which parallels the complication pattern observed in this study [17]. The findings of the present study, therefore, reinforce that the complication burden in obese patients is clinically relevant even when functional gains are achieved.

From a longer-term perspective, the literature suggests that while obese patients benefit functionally, they may face greater mid- to long-term risks in specific BMI categories (especially morbid obesity). **Boyce et al. (2019)** reported higher overall complication rates and increased revision tendency in morbidly obese patients following primary TKA, although functional improvement may still be comparable in magnitude [18]. Similarly, registry-based evidence such as **Rassir et al. (2020)** has explored revision risks across BMI levels, showing that obesity may influence early revision risk in certain contexts, supporting the need for careful perioperative optimization and follow-up in obese cohorts [19]. In practical terms, the current study's finding of a significantly higher early complication rate in obese patients ($p < 0.05$) supports targeted strategies such as strict wound care protocols, glycemic optimization, and enhanced rehabilitation planning.

Overall, this study demonstrates that TKA provides meaningful benefit in both obese and non-obese groups; however, obese patients showed **lower postoperative functional scores (78.4 vs 82.9), reduced ROM (108.6° vs 114.2°), delayed early ambulation (73.9% vs 85.2%), and higher complication rates (26.1% vs 7.4%)**. These findings are consistent with published evidence indicating that obesity is associated with higher perioperative risk and somewhat reduced functional recovery compared with non-obese patients, while still allowing substantial clinical improvement after arthroplasty [13–20].

CONCLUSION

The present prospective observational study demonstrates that Total Knee Arthroplasty (TKA) provides significant clinical and functional improvement in both obese and non-obese patients. However, non-obese patients achieved comparatively better postoperative functional scores, greater knee range of motion, earlier independent ambulation, and higher satisfaction rates. Obese patients, although showing substantial improvement from baseline, experienced a significantly higher incidence of postoperative complications, particularly wound-related problems. These findings indicate that while obesity does not preclude successful outcomes after TKA, it adversely influences the extent of functional recovery and complication profile. Careful patient selection, meticulous perioperative management, and realistic preoperative counseling are essential to optimize outcomes in obese patients undergoing TKA.

LIMITATIONS

This study has certain limitations that should be acknowledged. Being a single-center study with a relatively short follow-up period, long-term outcomes such as implant survival, late complications, and revision rates could not be assessed. The sample size, although adequate for comparison, may limit generalizability to broader populations. Additionally, obesity was assessed solely using BMI, which does not account for body fat distribution or muscle mass. The study did not stratify patients based on different grades of obesity, which could have provided more detailed insights into outcome variations across BMI subgroups.

RECOMMENDATIONS

Based on the findings of this study, Total Knee Arthroplasty can be safely recommended for both obese and non-obese patients with end-stage knee osteoarthritis, provided appropriate perioperative precautions are taken. Obese patients should receive thorough preoperative counseling regarding the higher risk of complications and relatively lower functional outcomes. Optimization of comorbidities such as diabetes and hypertension, weight reduction strategies prior to surgery, and strict postoperative wound care are strongly advised. Future studies with larger sample sizes, multicentric design, longer follow-up, and stratification according to obesity grades are recommended to better understand long-term outcomes and refine management protocols for obese patients undergoing TKA.

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