

ORIGINAL ARTICLE

Outcome of Total Knee Replacement in Morbid Obese PatientsHAZIQ DAD KHAN¹, SAYED SOHAIL AKHTAR², WALEED ALI³, ADIL SAIDULLAH⁴, SUMMAR FATIMA⁵¹Professor Orthopedic, Department of Orthopaedic, MMC Mardan²Senior Registrar Orthopedic BKMC, Swabi³Consultant Orthopaedic Surgeon, DHQ Hafizabad⁴Senior Medical Officer, Orthopaedics Surgery, Federal Govt. Polyclinic Hospital (FGPC), Islamabad⁵MBBS, DA, MS Anaesthesia, Specialist Anaesthetist, Al Nafees Medical College and Hospital Isra University Islamabad CampusCorresponding author: Sayed Sohail Akhtar, Email: doctorsohailakhtar@gmail.com**ABSTRACT****Aim:** The purpose of our study was to determine the outcomes of total knee replacement in morbidly obese patients.**Methodology:** This prospective analysis was carried out on 128 morbidly obese patients (BMI > 40 kg/m²) in the Department of Orthopedic Surgery, Federal Govt. Polyclinic Hospital (FGPC) Islamabad, Mardan Medical Complex, Mardan and Bacha Khan Medical Complex, Swabi for the duration from January, 2021 to June, 2022. Demographic details, anthropometric parameters, and radiological assessment were recorded. Pre and post-operative radiological assessments included alignment, implant position, and radiolucent lines presence around the implant were compared. Outcome of TKR such as pre and post-operative functional score, knee society score, age, diagnosis, gender, laterality, and type of prosthesis were assessed and compared. SPSS version 25 was used for data analysis.**Results:** Of the total 128 TKR in morbid obese patients, the incidence of unilateral and bilateral TKR was 10 (7.8%) and 118 (92.2%) respectively. The overall mean age of the patients was 62.00 ± 8.12 years. Out of 126 TKR patients, there were 11 (8.6%) males and 117 (91.4%) females. Out of 10 unilateral TKR groups, males and females were 4 (40%) and 6 (60%) respectively. In the bilateral TKR group, there were 7 (5.9%) males and 111 (94.1%) were females. The mean BMI was 42.84 ± 3.46 kg/m² with a range of 40-60 kg/m². Based on Knee Society Scores and Functional Scores, Pre-operative mean knee score and functional score was 26.4 and 48.8, p=0.01 compared to post-operative 83.7 and 74.2, p=0.07 respectively. A higher prevalence for post-operative radiolucent lines was 28% against pre-operative 9%, p=0.01 were observed. During follow-up, the complications rate was 17.2% (n=22). Post-TKR complications such as superficial wound infection, deep joint infection, and deep vein thrombosis was found in 12.5% (n=16), 1.6% (n=2), and 3.1% (n=4) respectively.**Conclusion:** Our study found that prior to total knee replacement, patients with BMI > 40 kg/m² should lose weight to maintain weight reduction criteria. Knee arthroplasty's growth rate and epidemiological changes in morbid obese patients were the particular issues regarding total knee replacement highlighted in the present study. Based on our study, morbidly obese patients could be suitable candidates for total knee replacement. Morbid obese patients should be counseled.**Keywords:** Total Knee Replacement, Unilateral, Bilateral, Morbid Obese Patients**INTRODUCTION**

Knee osteoarthritis (OA) is a major source of total knee replacement in disable adult population [1]. Morbid obese patients are reflected as poor contenders for total knee replacement (TKR). Obesity is a significant risk factor increasing three- to five-fold risk of total knee replacement in obese patients compared to non-obese patients [2, 3]. Due to the growing number of overweightness and obesity in population, the need of knee arthroplasty procedures in morbid obese patients is growing in turn, the rate of total knee replacement increased. Risk of developing knee OA at an early stage and post total knee replacement complications are more likely to develop in obese patients [4, 5]. Previous studies found inferior outcomes of TKR in obese patients [6, 7]. TKR could not be performed in patients with increasing BMI and suffering from painful, advanced knee osteoarthritis [8]. Based on WHO criteria, BMI of normal, non-obese, and obese patients are 19-25 kg/m², <30 kg/m², and >30 kg/m² respectively [9]. Morbid obese patients had BMI > 40 kg/m². Obese patients in class III had a significantly increased risk of developing immediate and post-operative complications after TKR. End-stage osteoarthritis patients could be treated with the TKR procedure. TKR procedure could result in improving life quality, cognitive capacity, and lower discomfort [10]. Bilateral TKR or unilateral procedure can be adopted for treating patients with bilateral symptoms.

Majority of obese patients had hypertension and diabetes increasing the risk of infection 7 times in obese compared to non-obese patients. Diabetic obese patients was a risk factor for post TKR infection [11]. The incidence of post TKR complications varies from 10% to 30% in morbid obese patients (BMI > 40 kg/m²) [12]. Obese patients should be advised about prosthetic joint infection at higher rates before total knee replacement [13]. Complications such as abdominal pain, extra-surgical-site infections, peripheral edema, wound infection, and lung infections were morbidity associated with early complications [14]. Prior to TKR, obese

patients should be encouraged to lose weight and go through bariatric surgery. Post-TKA induced vein thrombosis could be caused by obesity [15]. The total knee replacement long-term outcome is debatable in obese patients. Fewer studies have shown promising results while others have contradictory results [16, 17]. Mixed results have been reported in a study conducted on obese versus non-obese regarding primary TKA outcome [18]. Lower functional scores, increasing revision rates, and complication rates were reported in some studies [19, 20]. Patients who underwent TKR had similar complication rates in both obese and non-obese patients. Despite a weak association between pre-operative complications and BMI, survival rates could be mid and long-term. The present study aimed to assess the outcomes of total knee replacement in morbid obese patients.

METHODOLOGY

This prospective analysis was carried out on 128 morbidly obese patients (BMI > 40 kg/m²) in the Department of Orthopedic Surgery, Federal Govt. Polyclinic Hospital (FGPC) Islamabad, Mardan Medical Complex, Mardan and Bacha Khan Medical Complex, Swabi for the duration from January, 2021 to June, 2022. Demographic details, anthropometric parameters, and radiological assessment were recorded. Pre and post-operative radiological assessments included alignment, implant position, and radiolucent lines presence around the implant were compared. Patients with BMI > 30 kg/m², stable diabetes, hypertension, and medical conditions with primary knee osteoarthritis were enrolled. Exclusion criteria included post-traumatic knee OA, knee instability, secondary knee osteoarthritis, previous fractures, and post-menisectomy were recorded. Demographic details such as age, BMI, gender, TKR indication were recorded. Standard method was followed for all the surgical procedures.

Outcome: During follow-up the following outcomes were assessed: Outcome of TKR such as pre and post-operative functional score, knee society score, age, diagnosis, gender,

laterality, and type of prosthesis were assessed and compared. Standard protocol was followed for managing the post-surgical complications. Pre-designed proforma was used for recording all the information and data. SPSS version 20 was used for data analysis. Quantitative variables such as age and BMI were expressed as mean and standard deviation. Qualitative variables such as gender, TKR indications, outcome and laterality such as unilateral or bilateral were expressed in terms of frequency and percentage. Chi-square test was used for comparing outcomes in both groups. Data was stratified for gender, the indication of TKR, BMI, and age. Post-stratification chi-square test was performed for comparing both groups' outcomes taking 5% level of significance.

RESULTS

Of the total 128 TKR in morbid obese patients, the incidence of unilateral and bilateral TKR was 10 (7.8%) and 118 (92.2%) respectively. The overall mean age of the patients was 62.00 ± 8.12 years. Out of 126 TKR patients, there were 11 (8.6%) males and 117 (91.4%) females. Out of 10 unilateral TKR groups, males and females were 4 (40%) and 6 (60%) respectively. In the bilateral TKR group, there were 7 (5.9%) males and 111 (94.1%) were females. The mean BMI was 42.84 ± 3.46 kg/m² with a range of 40-60 kg/m². Based on Knee Society Scores and Functional Scores, Pre-operative mean knee score and functional score was 26.4 and 48.8, p=0.01 compared to post-operative 83.7 and 74.2, p=0.07 respectively. A higher prevalence for post-operative radiolucent lines was 28% against pre-operative 9%, p=0.01 were observed. During follow-up, the complications rate was 17.2% (n=22). Post-TKR complications such as superficial wound infection, deep joint infection, and deep vein thrombosis was found in 12.5% (n=16), 1.6% (n=2), and 3.1% (n=4) respectively. Figure 1 illustrates the prevalence of unilateral and bilateral TKR in morbid obese patients. Post-TKR complications such as superficial wound infection, deep joint infection, and deep vein thrombosis are shown in Figure 2. Pre-operative characterization is shown in Table-I whereas Table-II represents the post-operative characterization of morbid obese patients.

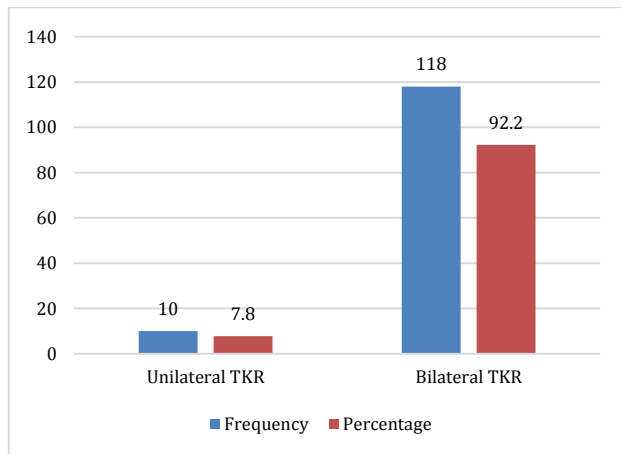


Figure-1: laterality (unilateral or bilateral) in morbid obese patients (n=128)

Table-1: Pre-operative baseline characteristics (n=128)

Parameters	Value	P-value
Total patients n	128 (10 unilateral, 118 Bilateral)	
Age (mean ±SD) years	62.00 ± 8.12	0.6
Gender	M 11 (8.6%), F 117 (91.4%)	
BMI (Kg/m ²)	42.84 ± 3.46 kg/m ² (40-60 kg/m ²)	<0.001
Diagnosis N (%)		
Osteoarthritis	116 (90.6)	
Rheumatoid arthritis	12 (9.4)	

Prosthesis N (%)		
Press-fit condylar	37 (28.9)	
Sigma	91 (71.1)	
Knee Society Scores (Range)		0.01
Mean knee score	26.4	
Mean function score	48.8	

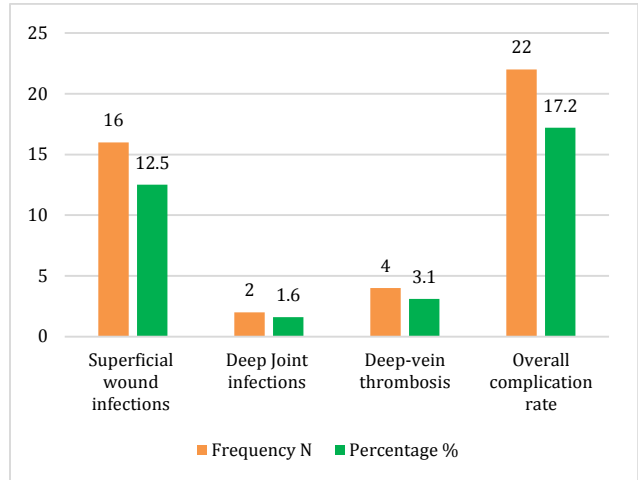


Figure-2: post-TKR complications (n=22 (17.3%))

Table-2: Post-operative characterization (Clinical and radiological results)

Parameters	Value	P-value
Radiolucent lines N (%)	36 (28.1)	0.01
Progressive radiolucent lines	26 (20.3)	
Radiologically loose	10 (7.8)	
Anteroposterior radiographs Angle (range)	94.6 (92-101)	0.02
Mean femoral angle	86.5 (82-91)	
Mean tibial angle	4.5 (-3-10)	
Mean total valgus angle		
Lateral radiographs Angle (range)		
Mean femoral flexion	0.3 (-5-5)	0.7
Mean tibial angle	84.4 (79-98)	0.6
Knee Society Scores (Range)		0.07
Mean knee score	83.7	
Mean function score	74.2	

DISCUSSION

The present study focused on outcome of total knee replacement in morbid obese patients and found that total knee replacement in morbid obese patients is significantly related to higher complications rate, inferior survivorship, and inferior scores of clinical outcomes. It has been observed that pre-operative Knee Society Scores (KSS) and functional score was lower as compared to post-operative scores in morbid obese patients. Prior studies have found higher complication rates after bilateral total knee arthroplasty compared to unilateral TKA. There were no significant differences among morbidly obese patients. Based on our study, morbidly obese patients could be suitable candidates for total knee replacement. Morbidly obese patients should be counseled on inferior functional outcomes, increased risk of failure, and should be encouraged to lose weight before going through TKR. The complication and revision rates are higher among obese patients compared to non-obese patient population.

Total knee-associated preoperative complications such as prosthetic joint infection and superficial wound infections risk have been widely investigated in morbid obesity patients [21, 22]. In obese patients, weakened immune response could be the reason for the exact mechanism of preoperative complications. Also, the number of macrophages that mature from monocytes was reported to be less significant in obese patients [23]. Obesity is significantly related to oxygenate subcutaneous tissue reduction which in turn

is associated with higher rates. Moreover, in non-hyperglycemic and non-kinetic diabetic patients, inhibiting factors for lymphocyte migration release is insulin resistance [24]. The present study found a higher prevalence of morbid obese associated complications in patients. Siman et al. [25] found higher variations in complication rates. However, in the control group, no complications were found in 32% of the morbid obese knee of TKR patients.

Melin et al. [26] investigated 41 TKR cases and found that post-TKR complications overall rate was substantially higher in morbid obese patients. The incidence of overall complication was 32%. These complications were superficial wound infections, deep infection, and deep vein thrombosis. According to their study, seven patients out of 41 had deep wound infections, two had deep joint infections, and four had deep vein thrombosis. No mortality was reported in pre-operative procedures. In the present study, the overall complications rate was 17.2% (n=22) which included 12.5% superficial wound infections, 1.6% deep joint infections, and 3.1% deep vein thrombosis.

Another study by Drager et al. investigated 27,301 bilateral TKR and 45,419 unilateral TKR patients. Patients undergoing simultaneous surgery had a significantly increased adjusted risk of death, thromboembolic events, urinary complications, and a lower adjusted risk of hematoma. The probability of complications among fourteen patients had an incidence of <2% and chances of outcomes >3%. Overall, the risk variation was <1% for any complication. There was a significant increase in complications investigated in bilateral TKR compared to unilateral TKR discovered by researchers [27].

Mufarrh et al carried out their investigation on 272 (41.3%) unilateral and 386 (58.7%) bilateral TKR and found an irregular prevalence of complications in both groups. The incidence of surgical site infection was similar (1.8%) in both unilateral and bilateral groups. Cardiac events in the unilateral group were lower (1.1%) compared to the bilateral group (2.8%). However, the occurrence of urinary tract infection was higher (3.3%) in the unilateral group compared to bilateral TKR at 2.3% (P>0.05) [28].

Based on previous research [29], longer hospital stay and staged operation were the key parameters for the prediction of prosthetic joint infection. Knee joint associated infection that requires synovectomy, ebridement, arthrotomy, and liner replacement could be considered as deep infection. However, any skin infection that had short-term consequences and reacted to antibiotics were considered as superficial infections.

The risk of stage operation could be concentrated by avoiding staged idlers and related complications. In general, risks of both kinds are unpopular and there are minor variation in staged cohorts and simultaneous cohorts. Periprosthetic joint infection could be caused by surface surgical infection and longer hospitalization [30]. In contrast, surgical procedures took longer duration but overall shorter operation time in bilateral TKR cases which decrease the risk of deep infection. The prevalence of deep infection in unilateral and bilateral TKR was the significantly different indicating the likelihood of deep infection [31].

A higher rate of complications and blood transfusion in patients who underwent bilateral TKR had a higher pulmonary embolism rate compared to the unilateral group. In staged patients, a lower incidence of knee infection was reported. Bilateral and unilateral TKR patients had similar results in terms of hospital mortality [32].

TKR outcome and obesity had a contradictory association reported in numerous studies. Various studies compared the post-TKR knee scores in obese versus non-obese patients and found that the TKR score was lower in obese patients [33-35]. Another study by Woo et al. [36] studied 445 consecutive total knee replacement obese and non-obese patients and found that implant survival and overall complications were similar in both groups. Also, lower function scores were reported in morbid obese patients compared to non-obese patients. Other authors observed similar

results, indicating that obesity does not result in poor outcomes [37, 38].

Wooten et al suggested that morbid obese patients should lose weight before undergoing TKR [39]. Another study by Seth et al [40] on morbid obesity and TKR patients reported that nutritional status should be optimized in patients undergoing TKR such as weight loss and bariatric surgery [41]. In morbidly obese patients, bone support might not be applied to the peripheral zone in the oversized implant which can lead to early failure and rapid loosening caused by the implant's enormous forces for a moment. Furthermore, during TKR, patellar sclerotic bones and tibia should be exposed to multiple drillings for bone proper implant fixation. In morbidly obese patients, minimal marginal patellar release is also recommended to realm the vascular supply and skin necrosis prevention along with patellar osteonecrosis.

CONCLUSION

Our study found that prior to total knee replacement, patients with BMI>40 kg/m² should lose weight to maintain weight reduction criteria. Knee arthroplasty's growth rate and epidemiological changes in morbid obese patients were the particular issues regarding total knee replacement highlighted in the present study. Based on our study, morbidly obese patients could be suitable candidates for total knee replacement. Morbid obese patients should be counseled. These patients, however, should not be denied TKA solely on the basis of their BMI.

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