Advanced Medical Journal, Vol.11, No.1, P.112-120,2026 https://doi.org/10.56056/amj.2026.435

The impact of gender on primary total knee replacement in Dohuk city

Hussein Muhyadeen Othman* Abdulkadr Muhammed Sleman Laween Omar Musa*****

Abstract

Background and Objectives: Osteoarthritis is the leading cause of disability and reduced quality of life among elderly patients, after a trial of conservative treatment, total joint arthroplasty is the gold standard treatment for symptomatic end-stage osteoarthritis. The aim is to assess the range of knee flexion, Oxford knee score, Knee Society Function and Knee Society Score after total knee replacement in both genders and find the differences.

Methods: This cross-sectional study was conducted in Duhok Emergency Teaching Hospital from October/2022 to October/2024. A total of 60 patients who underwent primary total knee replacement for end-stage knee osteoarthritis were involved in the study. We used non-probability (nonrandom) convenience sampling. Patients in both groups were evaluated preoperatively, as well as at 6, 12, and 24 months postoperatively. Knee flexion, oxford knee score, knee society score, and knee society function score were recorded preoperatively and postoperatively.

Results: The outcomes of primary total knee replacement showed significant differences between males and females at 6, 12, and 24 months postoperatively. Significant differences were observed in Knee Function and Knee Society Score, with p-values of 0.0012 and <0.0001, respectively, favoring females. However, no significant differences were found in Knee Flexion and Oxford Knee Score, with p-values of 0.2772 and 0.3340, respectively.

Conclusion: Compared to the male group, females showed better outcomes in Knee Society Score and Knee Society Function Score. However, no significant differences were observed in Knee Flexion and Oxford Knee Score. Age and BMI had minimal impact on postoperative outcomes following total knee replacement.

Keywords: Knee osteoarthritis, Outcome, Total Knee Arthroplasty

*M.B.Ch.B, Duhok Emergency & Trauma Teaching Hospital, Corresponding Author
Email; husseinaram1985@gmail.com
**M.B.Ch.B.,F.I.B.M.S., Assistant Professor in Orthopedic Surgery/ Erbil Teaching Hospital.
Email: amsalany70@yahoo.com
***M.B.Ch.B....F.I.C.M.S., Orthopedic Surgery/ Lecturer, University of Duhok/ Duhok Emergency& Trauma Hospital.

Introduction

Knee osteoarthritis (OA) is characterized by degeneration of the articular cartilage, morphological changes in the subchondral bone, and damage to the surrounding soft tissues.[1] These structural changes cause joint pain, quadriceps muscle weakness, decreased range of motion, and joint instability.[2,3] The prevalence and severity are higher in females than in males, especially among those over 55 years with severe OA in the knee joints, because the underlying physiological and psychosocial mechanisms of disease onset and severity differ depending on a person's sex.[4-6] For instance, the loss of ovarian hormones in postmenopausal women has been connected to dysfunction of the knee joint, though the precise physiological mechanisms underlying this association are still unknown, females with osteoarthritis have a higher perceived disability than males.[7,8] However, they frequently seek treatment later in the disease's course.[9] After total knee arthroplasty (TKA), 11% to 20% of patients report being unsatisfied, primarily due to limitations in their knee motion, functional limitations, and knee pain.[10-12] Males and females did not exhibit significantly different levels of pain at six weeks, three months, or six months following surgery.[13] Moreover, at six weeks. three months and six months following surgery, neither males nor females reported any differences in their postoperative levels of physical function.[13] There are many factors could affect function after primary total knee replacement, several preoperative and postoperative variables, including infection, postoperative alignment, and soft tissue balancing, have been linked to prosthesis failure.[14,15] However, relatively few studies have assessed the effect of surgical knee alignment on patient satisfaction, and few have found age and ROM correlate with satisfaction and function.[16 - 19] This study aimed to compare the clinical and functional outcomes of primary total knee replacement between male and female patients. It assessed the range of knee flexion, Oxford Knee Scores, Knee Society Scores, and Knee Society Function Scores post-total knee replacement to identify differences between the two groups. Additionally, the study examined the correlation of these outcomes with age and BMI in both genders.

Patients and methods

This cross-sectional study was conducted in Duhok Emergency Hospital from October/2022 to October/2024. During this period 60 cases 30 males and 30 females who underwent primary TKR were included. patients with severe stage 4 osteoarthritis (Kellgren and Lawrence classification) of both sex members. Patients with a history of bilateral total knee replacement, revision total knee replacement and knee stiffness were excluded from this study. An Ethical approval letter was obtained from the Ethical Committee/ Directorate of Health in Duhok. An assigned consent was obtained from the patients to enroll in the study. Patients are thoroughly evaluated prior to surgery, which includes a medical history, physical examination, and imaging procedures (such as X-rays). The patient is placed on the operating table, typically under general or spinal anesthesia. The surgical team cleans and disinfects the region surrounding the knee to prepare the surgical site. To reduce the risk of infection, the surgical team keeps an eye on the patient's vital signs and maintains aseptic conditions during the procedure. After that, the patient is taken to a recovery area for observation before being admitted to the ward. After surgery, patients are kept under strict observation in the recovery area until they are either sent home or moved to a ward. Soon after surgery, Physical therapy is initiated to strengthen the surrounding muscles, aid in the healing process, and restore knee movement. The patients were assessed preoperatively and at

https://doi.org/10.56056/amj.2026.435

6, 12, and 24 months postoperatively using knee flexion, the Oxford Knee Score, the Knee Society Function Score, and the Knee Society Score. And its correlation with age and BMI. Statistical analysis of the scores of TKR indicators were determined in mean and Sta. deviation. The Comparisons of total knee replacement outcomes between males and females before and post-operation were examined in an independent t-test. The correlations of TKR outcomes with BMI of the males and females at post-operations were examined in multivariate analyses. The significant level of difference was determined in a $p<0.05$. The statistical calculations were performed using JMP Pro; (JMP® Pro, Version 14.30. (2017) SAS Institute Inc., Cary, NC, 1989-2019). The permissions were obtained from the Division of Scientific Research – Department of Planning, Duhok Directorate General of Health Research Ethics Committee (Reference number: 27032024-2-5). All data were analyzed using SPSS version 26. A P value of < 0.05 was regarded statistically significant. Prevalence's and frequencies were assessed with the same program.

Results

The total number of participants was 60 patients (30 males and 30 females), Group differences in age and BMI of males and females are listed in Table (1) and Table (2), with a mean age of 62.83 (±8.03) (63.26 vs 62.4) and mean BMI of 30.17 (±3.94) (28.75 vs 32.08).

Table (1): Age characteristics of males and females

Age category no (%)	Female (n=30)	Male (n=30)	P (two-sided)	Mean Age (±SD)
41-50	2 (6.67%)	1 (3.33%)	0.9463	62.83 (±8.03)
51-60	7 (23.33%)	7 (23.33%)		
61-70	13 (43.33%)	14 (46.67%)		
71-80	8 (26.67%)	8 (26.67%)		

Table (2): BMI characteristics of males and females.

BMI category no (%)	Female (n=30)	Male (n=30)	P (two sided	Mean BMI (±SD)
Healthy weight	1 (3.33)	5 (16.67)	0.0851	30.17 (±3.94)
Overweight	10 (33.33)	14 (46.67)		
Obesity class I	12 (40.00)	10 (33.33)		
Obesity class II	5 (16.67)	1 (3.33)		
Obesity class III	2 (6.67)	0 (0.00)		

BMI (Body Mass Index) is a measurement that uses your height and weight to determine whether you are underweight, normal weight, overweight, or obese. Here's how it's

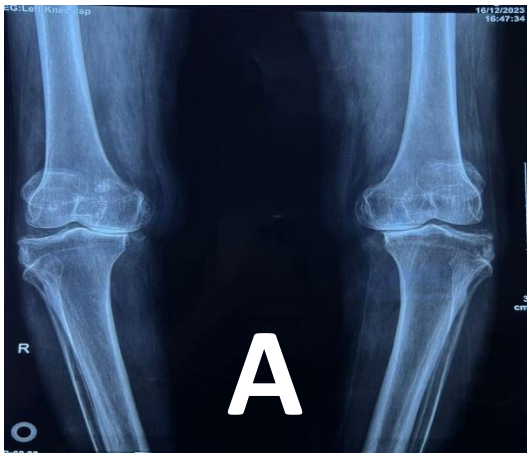
https://doi.org/10.56056/amj.2026.435

typically classified: Underweight: BMI less than 18.5, Normal weight: BMI between 18.5 and 24.9, Overweight: BMI between 25 and 29.9, Obese: BMI of 30 or greater. Obesity is categorized into different classes based on Body Mass Index (BMI). The classes are: Obesity Class 1 (Moderate Obesity): BMI of 30.0 to 34.9**,** Obesity Class 2 (Severe Obesity): BMI of 35.0 to 39.9**,** Obesity Class 3 (Very Severe or Morbid Obesity): BMI of 40.0 or height. Males and females were compared preoperatively and postoperatively at 6-, 12-, and 24-months regarding knee function Table (3). Preoperatively, the mean scores for males and females were as follows: knee flexion (97.00 vs. 95.83, p = 0.5625), Oxford Knee Score (22.43 vs. 27.30, p = 0.0006), Knee Function Score (56.2 vs. 50.7, p = 0.0894), and Knee Society Score (51.1 vs. 56.4, p = 0.0051).Postoperatively, the mean scores for males and females at 6 months were as follows: knee flexion (105.33 vs. 105.17, p=0.9200), Oxford Knee Score (38.57 vs. 38.53, p=0.9751), knee function (85.3 vs. 80.4, p=0.0302), and Knee Society Score (89.1 vs. 90.2, p=0.3871). At 12 months, the scores were knee flexion (111.5 vs. 112.83, p=0.2963), Oxford Knee Score (40.93 vs. 41.20, p=0.7828), knee function (88.2 vs. 90.3, p=0.3531), and Knee Society Score (92.2 vs. 93.4, p=0.3509). At 24 months, the scores were knee flexion (113.3 vs. 114.5, p=0.2772), Oxford Knee Score (41.9 vs. 42.6, p=0.334), knee function (90.0 vs. 94.7, p=0.0012), and Knee Society Score (93.1 vs. 95.8, p<0.0001).

Table (3): Outcomes of the study between male and female patients at different times after knee replacement therapy

	Pre-operation			Six months			One year			Two years		
	Female	Male	P	Female	Male	P	Female	Male	P	Female	Male	P
Knee flexion	95.83±9.2	97.00±6.0	0.5625	105.17±7.6	105.33±4.9	0.9200	112.83±4.5	111.50±5.3	0.2963	114.5 (3.8	113.3 (4.4	0.2772
Oxford knee score	27.30±4.7	22.43±5.6	0.0006	38.53±3.9	38.57±4.4	0.9751	41.20±3.9	40.93±3.5	0.7828	42.6 (3.3)	41.9 (2.3)	0.3340
Knee Function	50.7±12.4	56.2±12.2	0.0894	80.4±8.8	85.3±8.3	0.0302	90.3±9.6	88.2±8.0	0.3531	94.7 (0.8)	90.0 (1.1)	0.0012
Knee Society score	56.4±5.9	51.1±8.1	0.0051	90.2±5.6	89.1±3.7	0.3871	93.4±5.9	92.2±3.4	0.3509	95.8 (2.6)	93.1 (1.9)	<0.0001

Correlations of TKR outcomes with age of the males and females at post-operations Table (4). It shows a low degree of correlation between age and the outcome of TKR surgery postoperatively in males and females. Figure (1) which shows pictures of total knee replacement prior to operation anterior-posterior view (A), lateral view (B) compared to post-operative view.



https://doi.org/10.56056/amj.2026.435

Figure (1): Pre (Anterio-Posterior and Lateral) – and post- operative radiographs of knee joint (TKR); A, B, and C respectively.

Table (4): Correlations of TKR outcomes with age of the males and females at post-operations

Gender	TKR outcomes			
Female	Knee flexion	Oxford knee score	Knee Function	Knee Society score
Age r. value	0.0666	0.0275	-0.1208	0.0745
P. value	0.7268	0.8851	0.5248	0.6957
Male	Knee flexion	Oxford knee score	Knee Function	Knee Society score
Age r. value	0.1067	-0.2179	-0.2503	-0.0823
p. value	0.5745	0.2474	0.1822	0.6657
Multivariate regression was performed for statistical analyses.				

Correlations of TKR outcomes with BMI of the males and females at post-operations Table (5). It shows a low degree of correlation between BMI and the outcome of TKR surgery postoperatively in males and females.

Table (5): Correlations of TKR outcomes with BMI of the males and females at post-operations

Gender	TKR outcomes			
Female	Knee flexion	Oxford knee score	Knee Function	Knee Society score
BMI r. value	0.3493	-0.0745	-0.1595	0.0655
P. value	0.0585	0.6956	0.3998	0.7308
Male	Knee flexion	Oxford knee score	Knee Function	Knee Society score
BMI r. value	0.0747	-0.0650	0.1583	-0.0227
p. value	0.6949	0.7328	0.4033	0.9052
Multivariate regression was performed for statistical analyses.				

https://doi.org/10.56056/amj.2026.435

Discussion

The purpose of the study was to assess the impact of gender on the outcomes following TKA in correlation with age and BMI among a group of patients. Despite the procedure could be implemented in younger age groups, the mean age of the participants was 62.83 (±8.03) in our study, which was close to a cohort study conducted among 1792 patients who underwent elective primary total joint arthroplasty in which 921 had TKA between 2010 and 2013 with a mean age of 60.5.[20-22] According to Lim et al the Knee Flexion Score, Oxford Knee Score, and KSS score were better among men compared to women. However, women achieved greater improvement in Oxford Knee Score and KSS knee score.[23] In our study, significant improvement was observed postoperatively; however, there was no significant difference between genders in the Oxford Knee Score, Knee Function Score, Knee Flexion, and Knee Society Score after one year of follow-up. Clinically, other articles have also found no significant difference between males and females following total knee replacement (TKR).[24-26] After 24 months of follow-up, we found a significant difference in Knee Function and Knee Society Scores between genders, with outcomes favoring females over males. Contrary to our study, a study conducted by Parsley et al. on 698 patients between 1996 and 2007 found that males had better outcomes following total knee replacement compared to females.[27] Additionally, a study conducted by Teck Lim et al. found that females achieved greater improvement in the Knee Society Score after two years following surgery compared to males.[28] It has been found that BMI does not imply an adverse impact on the outcomes of TKA among patients with primary OA. Obesity has a contributing role to the length of time patients stays in the hospital and according to Abbas et al., BMI index plays a role on the duration of the surgery among patients of TKR.[30-31] In our study we found that BMI index among patients undergoing TKR surgery did not strongly correlate with outcomes in both genders. The improvement in perceived function and quality of life among patients does not differ between BMI groups.[32] However, according to Başdelioğlu, higher BMI is associated with worse deterioration of clinical and functional outcomes postoperatively, which implies a strong correlation and a further need for investigation.[33] Several limitations of our study should be acknowledged. First, our follow-up period was limited to one year. Longer-term studies are needed to assess the durability of outcomes and potential late complications. Second, our sample size of 60 patients, while providing valuable insights, may limit the generalizability of our findings. Larger, multi-center studies could provide more robust data. Additionally, we did not assess factors such as comorbidities, preoperative expectations, or rehabilitation protocols, which could influence outcomes. Future studies should consider these variables to provide a more comprehensive understanding of TKR outcomes.

Conclusion

Compared to the male group, the female group demonstrated better results in both the Knee Society Score and the Knee Society Function Score. The preoperative differences between males and females were significant concerning the Oxford Knee Score and the Knee Society Score. Postoperative outcomes showed favorable results for females in terms of the Knee Society Score and the Knee Society Function Score after a follow-up period of 24 months. Additionally, age and BMI did not correlate with the outcomes of total knee replacement. Further studies are needed to identify and evaluate the factors that correlate with and influence the outcomes of TKR.

https://doi.org/10.56056/amj.2026.435


Conflict of Interest

Authors Declare no conflict of Interest.

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