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ORIGINAL ARTICLE

Primary Total Knee Arthroplasty in Obese Patients; A Systematic Review

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ABSTRACT

Background: According to the World Health Organization (WHO), 500 million people around the globe are overweight. There is a growing demand for TKR due to the increased prevalence of OA, which is exacerbated by both the aging population as well as the obesity epidemic. Obesity and a high body mass index (BMI) may reduce the lifespan of primary care physicians. Implant survivability was substantially reduced in severely obese patients when compared to the obese and nonobese patients after an average 5-year follow-up. The use of tibial stems for prevention purposes may improve tibial fixation among obese patients undergoing total knee arthroplasty (TKA), as this condition increases the likelihood of aseptic loosening. The aim of this systematic review is to assess relevant, up-to-date data on the safety, outcomes, and complications associated with total knee replacement in morbidly obese patients. And the impact of these complications on total knee replacement on the patients. Review also aiming to avoid these complications and improve total knee arthroplasty decision in the view of these data.

Methods: In the beginning, we found 241 studies when we searched five databases. There were 197 unique papers left after removing duplicate research. After perusing the article titles and abstracts, 59 studies were found to be possibly relevant and were subjected to full-text evaluation as part of the screening procedure. only fourteen studies were ultimately considered for inclusion in our systematic review.

Results: The Postoperative Knee Society Objective Score has been researched in a total of seven different studies over 3,138 patients. In such studies, 400 patients have been classified as morbidly obese while 2,738 were non-obese. Non-obese patients apparently performed better in knee function after surgery, as they scored 8.7 points higher on the average scale than the morbidly obese patients.

Conclusion: this study demonstrated that obesity negatively impacts functional outcomes following total knee arthroplasty. Furthermore, obesity was linked to an increased rate of complications after the procedure.

Keywords: Obesity, Body Mass Index (BMI), Primary Knee Osteoarthritis, Total Knee Arthroplasty, Functional Outcomes.

INTRODUCTION

When conventional medical treatments for severe knee arthritis have not been successful, a new approach to patient care known as total knee replacement (TKR) has emerged. Because it is one of the most effective orthopedic operations for relieving knee pain and impairment, the number of total knee replacements performed every year is on the rise. [1]

Total knee arthroplasties have become more common over the previous 20 years, and their

popularity is only going to continue to balloon. Obesity continues to be a contentious issue in the medical community with reference to outcomes after total knee arthroplasties, and the role of overweightness in these success rates or complications is still being discussed. [2]

While some writers state that obesity negatively affects outcome, others state that obese and non-obese patients had comparable outcomes. In the absence of typical signs of infection, the topmost reason for failure of total knee replacement is aseptic loosening of the tibial component during the gradual loss of stability of implant. [3]

In addition, nearly one third of the US and UK populations are overweight or obese, making it a worldwide epidemic. Among the most pressing issues in modern public health, obesity is on the rise. Many researchers believe it to be a significant independent risk factor for OA. [4]

According to an earlier report by the World Health Organization (WHO), 500 million people around the globe are obese. There is a growing demand for TKR due to the increased prevalence of OA, which is exacerbated by both the aging population and the obesity epidemic. [5]

Computational formula for body mass index (BMI) is derived from weight regarding kilogram divided by height squared expressed in meters. Indicators of excess body fat include a high body mass index (BMI). A person's health and body fatness cannot be determined by a body mass index (BMI), although it can identify risk groups for health concerns. [6]

Tools such as body mass index (BMI), waist size, skin thickness, differential energy x-ray spectroscopy (DEXA), and air displacement plethysmography (ADP) are used to categorize different weight kinds, which include underweight, optimum, overweight, class I, class II, in addition to class III. [7]

A high body mass index (BMI) and excess weight may reduce the lifespan of primary (TKR). Implant survivability was substantially reduced in severely obese patients compared to obese and nonobese patients after an average 5-year follow-up. The use of tibial stems for prevention purposes may improve tibial fixation in obese patients undergoing total knee arthroplasty (TKA), as this condition increases the likelihood of aseptic loosening. [8]

The aim of this systematic review is to assess relevant, up-to-date data on the safety, outcomes, and complications associated with total knee replacement in morbidly obese patients. And the impact of these complications on total knee replacement on the patients. Review also aiming to avoid these complications and improve total knee arthroplasty decision in the view of these data.

METHODS

This review focuses on assessing the outcomes and failure rates in obese patients suffering from primary osteoarthritis who had total knee arthroplasty. It also assesses the functional and imagery outcomes, alongside overall failure rates attributable to the intervention. This review is limited to human adults with a diagnosis of primary ostroarthritis of the knee with a focus on their obesity as a significant variable of interest. Approval was taken from the Institutional review board (IRB) of the Faculty of Medicine Zagazig University (ZU-IRB#10995/1-8-2023).

Studies with a follow-up period lasting more than two years were sought after first. Each study was thoroughly analyzed for methodological quality to ensure appropriate definition of outcomes and validity of the findings provided.

Selection Criteria for Studies

Relevant studies were captured through a detailed comprehensive search strategy. The sources searched were the Cochrane Library, PubMed and Medline, as well as publications from the January 2000 to January 2024. Specific keywords were utilized to conduct the search, including “obesity,” “body mass index,” “primary knee osteoarthritis,” and “total knee replacement.” Also, the references from the utilized articles were referenced to indicate other identified studies that could have been missed in the electronic search. All studies that adhered to the pre-specified criteria in the time

frame during the study were included in the analysis.

Search Strategy for Identification of Studies

Once the specified keywords and MeSH terms were utilized for the initial search, studies meeting the inclusion criteria were downloaded. Papers not meet exclusion criteria were not considered to be included. The selected studies were vetted with supervisors first to ensure the pointers used for the data sources were correct. The search and screening sought to find studies aimed at the treatment of primary osteoarthritis among obese patients undergoing total knee arthroplasty.

Studies that had been duplicated were omitted, as well as studies that did not meet the inclusion criteria. Important practices are focused on, and titles and abstracts of these practices are screened and cut through peruse practices which are very valuable to the studies.

Study Procedure

Participant credentials for the practices chosen included obtaining demographic information including age, gender, and BMI, as well as details for treatment eligibility. Baseline characteristics like previous knee surgery, comorbidities, and health status were also recorded for thorough analysis.

Statistical Considerations

The outcomes from the incorporated studies were synthesized within systematic review management software while adhering to other pre-defined criteria. This study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a structured and transparent review process. A PRISMA flowchart was utilized to outline the selection process for studies included in the systematic review and meta-analysis. This flowchart monitored participants, controls, objectives, results, and number of studies included in the review as well as monitored the number of studies that were screened and checked for eligibility.

Data Extraction

Data extraction was done systematically in three phases; subtitle selection concerning relevancy, abstract screening, and full text of articles evaluation. Using the standardized data extraction form the primary ones focused on total knee arthroplasty in obese patients, while other reviewers went over the data checking it for accuracy. Discrepancies found were analyzed through discussion. An extraction form and Microsoft Excel were used to capture the participant's demographics and the study results.

RESULTS

Literature search results

Our preliminary search across five databases yielded a total of 241 studies. Following the removal of duplicate research, 197 distinct articles were available for further screening. The screening approach entailed the evaluation of titles and abstracts of the publications, resulting in the identification of 59 possibly relevant studies that were subjected to full-text review. a conclusive selection of 14 studies that satisfied the inclusion criteria for our systematic review.

A comprehensive summary of the characteristics of the studies we incorporated can be found in Table (1).

Comprehensive complication: Complication rates were methodically assessed throughout seven investigations, encompassing a total of 11,059 knees. Among these, there were 1,972 morbidly obese individuals with knee conditions and 9,087 non-obese patients (Table 2). Complications were found to be seen in mostly morbidly obese subjects (16.5%) in comparison with the non-obese group where only 6.2% showed complications.

Complication rates were uniformly greater in morbidly obese patients compared to their non-obese counterparts in all studies. Morbid obesity further aggravated the complications that included increased incidence rates of superficial wound infections, prosthetic joint infections, implant loosening, wound healing-related complications, and thromboembolic events such as deep vein thrombosis (DVT) and pulmonary embolism (PE). (Table 3).

Infection rate: Eight studies documented the infection rate, encompassing 1682 patients

across both cohorts, with 697 individuals in the morbidly obese patients and 985 patients in the non-obese group. Infection was more prevalent among obese patients, with a risk ratio of 7.3%. The risk ratio in the non-obese cohort was 3.3%.

Revision rate: Twelve studies were included that reported on primary total knee replacement (TKR) revision; in total, the studies included 15,442 patients from both cohorts. Among them, 2,390 were included as morbidly obese, while 13,052 included in the non-obese cohort. The incidence of revision TKR was higher among the morbidly obese with a risk ratio of 3.8% (91 patients) as compared to 2.2% (290 patients) for the non-obese.

Aseptic revision rate: Eight studies documented the aseptic revision total knee replacement (TKR), encompassing 7,834 patients across both cohorts, with 768 patients in the morbid obesity group exhibiting a calculated risk ratio of 2.2%, and 7,066 patients in the non-obese group demonstrating a calculated risk ratio of 1.8%.

Furthermore, seven studies documented septic revision total knee replacements (TKR), encompassing 7970 patients across both cohorts: 810 patients in the morbid obesity group with a calculated risk ratio of 2.0%, and 7160 patients in the non-obese group with a calculated risk ratio of 0.7% (Table 4).

Seven distinct studies documented the preoperative Knee Society Objective Score, including a total of 3,138 patients across both groups—400 in the morbid obesity group and 2,738 in the non-obese group. The results indicated that non-obese patients had a higher Knee Society Objective Score compared to morbidly obese patients, with a mean difference of 5.2 points.

The Postoperative Knee Society objective score was referenced in seven separate studies involving 3138 patients across both cohorts: 400 individuals in the morbid obesity group and 2738 patients in the non-obese group. The Knee Society Objective Score was elevated in non-obese patients compared to morbidly obese patients, exhibiting a mean difference of 8.7 points (Table 5).

Furthermore, in contrast to morbidly obese patients, non-obese patients had greater enhancement in postoperative scores relative to preoperative scores.

Table 1: Characteristics of included studies, mean BMI, mean follow-up duration in years, and mean age for morbidly obese (MO) and non-obese (NO) patients in each study

Study ID		Site	Study design	Sample size (knees)		Mean age (years)		Mean Follow-up (years)		**Mean BMI (kg /m2)**	
				MO	NO	MO	NO	MO	NO	**MO**	**NO**
1	Amin 2006	Scotland	Prospective	38 (41)	38 (41)	62 (40-80)	63 (42-80)	3.2	3.7	43 (40-61)	**27 (23-30)**
2	Baker 2012	England	Prospective	1018	1292	NR	NR	NR	NR	40-60	**15-24.9**
3	Bordini 2009	Italy	Retrospective	NR (172)	NR (6532)	72 (71.8-72.1)	72 (71.8-72.1)	3.1 (1.5-6)	3.1 (1.5-6)	NR (>40)	**NR (<30)**
4	Chen 2016	Singapore	Retrospective	117 (117)	2108 (2108)	61	68	2 to 10	2 to 10	NR (>40)	**NR (<30)**
5	Daniilidis 2016	Germany	Retrospective	17	24	NR	NR	8	8	>40	**<25**
6	Deakin 2017	UK	Retrospective	633	381	71.3	68.6	5	5	<30	**40**
7	Dewan 2009	Houston	Retrospective	31 (41)	67 (85)	58	66	4	6	44 (>40)	**25 (20-29)**
8	Ersozlu	Turkey	Retrospective	21 (42)	20 (40)	60(NR)	67(NR)	2.7 (2-3.3)	2.7 (2-3.3)	42 (40-45)	**27 (24-30)**

	2008										
9	Hakim 2020	Haifa, Palastine	Prospective	37 (38)	255 (336)	64.3	64.3	10.8	10.8	21-29.9	**30-45**
10	Krushell 2007	England	Retrospective	NR (39)	NR (39)	67 (48-81)	69(39-82)	7.5 (5.2-14.1)	7.5 (5-13.2)	44	**26**
11	Naziri 2013	USA	Retrospective	95 (101)	95 (101)	60(43-74)	59(45-75)	5.2 (3-7.1)	NR	54	**28**
12	Ponnusamy 2018	London	Retrospective	195 (195)	260 (260)	61	70	3	3	47	**25**
13	Spicer 2001	London	Retrospective	NR (59)	371 (425)	63	70	6.1 (4-12)	6.3 (4-12)	>40	**<30**
14	Zingg 2016	Switzerland	Prospective	118	493	67.2	73.7	NR	NR	44.3	**22.7**

Table *2:* Comparative complication rates between the two groups

Study	Morbid obese		Non-obese	
	Event	Total	Event	Total
Amin 2006	13	41	0	41
Baker 2012	168	1018	121	1292
Bordini 2009	9	172	289	6532
Daniilidis 2016	34	126	35	104
Deakin 2017	29	78	80	381
Dewan 2009	26	135	13	85
Ersozlu 2008	7	21	5	20
Hakim 2020	21	162	4	38
Naziri 2013	14	101	5	101
Zingg 2015	5	118	12	493
Total	326	1972	564	9087
Relative risk ratio	16.5%		6.2%	

Table 3: Complication rates for morbidly obese (MO) and non-obese (NO) participants across each research

Study	Morbid obese	Non-obese
Amin 2006	Overall complication rate: 32% Superficial wound infection: 17% Radiographic loosening: 4.9%	Overall complication rate: 0% Superficial wound infection: 0% Radiographic loosening: 0%
Baker 2012	Wound problems (17%) Bleeding problems (6%) Readmission (10%) Reoperation (2%)	Wound problems (9%) Bleeding problems (5%) Readmission (10%) Reoperation (4%)
Bordini 2009	Overall complication rate: 5.2% General complications (3.5%) Thromboembolic events: 0% Hematoma (1.1%) Other (0.5%)	Overall complication rate: 4.4% General complications (3%) Hematoma (0.9%) Thromboembolic events (0.1%) Nerve injury (0.1%) Other (0.4%)
Chen 2016	30-day readmission: 6%	30-day readmission: 3%

Study	Morbid obese	Non-obese
Daniilidis 2016	Overall complications (6.45%) Infection (5.8%) Instability (0%) Limitation of movement (0%) Loosening (0%) Periprosthetic Fracture (0%) Persisting Pain (0%)	Overall complications (16.13%) Infection (8.3%) Instability (0%) Limitation of movement (4.1%) Loosening (0%) Periprosthetic Fracture (0%) Persisting Pain(0%)
Deakin 2017	Wound/SSSI (4%) DVT/PE (3%) Infection (4%) Stiffness (4%) Hematoma (1%) Swelling (9%) Pain (6%) Other (1%)	Wound/SSSI (4%) DVT/PE (<1%) Infection (2%) Stiffness (1%) Hematoma (0%) Swelling (1%) Pain (7%) Other (1%)
Dewan 2009	Overall complication rate: 26% Infection 7%	Overall complication rate: 15% Infection 4%
Ersozlu 2008	Overall complication rate: 30% Superficial wound infection: 19%	Overall complication rate: 25% Superficial wound infection: 5%
Hakim 2020	Overall complication rate: 9.9% Superficial wound infection: 2% Late deep infection: 0.6% Skin necrosis: 0.6% Transient peroneal palsy: 0.6% Thromboembolic event: 1.9% Patellar clunk syndrome: 1.2%	Overall complication rate: 10.5 % Superficial wound infection: 3% Late deep infection: 0% Skin necrosis: 0% Transient peroneal palsy: 0.6% Thromboembolic event: 2.6% Patellar clunk syndrome: 2.6%
Krushell 2007	Wound healing problems 20.5% Osteolysis or wear: 2.6% Deep vein thrombosis: 2.6%	Wound healing problems 0% Osteolysis or wear: 0% Deep vein thrombosis: 2.6%
Naziri 2013	Overall complication rate: 14% Superficial wound infection: 1% Wound healing problems 1%	Overall complication rate: 5% Superficial wound infection: 0% Wound healing problems 0%
Ponnusamy 2018	Thromboembolic events: 0.5% Superficial wound infection: 9.2% 90 days readmission: 8.7%	Thromboembolic events: 1.9% Superficial wound infection: 4.6% 90 days readmission: 6.2%
Spicer 2001	NR	NR
Zingg 2015	Overall complication rate: 4.2%	Overall complication rate: 2.4%

Table 4: Infection rate, revision rate, aseptic revision rate, and septic revision rate among morbidly obese (MO) and non-obese (NO) patients in each research

Study	Infection rate				Revision rate				Aseptic revision rate				Septic revision rate			
	Morbid obese		Non-obese		Morbid obese		Non-obese		Morbid obese		Non-obese		Morbid obese		Non-obese	
	Event	Total	Event	Total	Event	Total	Event	Total	Event	Total	Event	Total	Event	Total	Event	Total
Amin 2006	7	41	0	41	11	41	0	41	4	41	0	41	2	41	0	41
Baker 2012	-	-	-	-	25	1018	49	1292	-	-	-	-				
Bordini 2009	-	-	-	-	3	172	131	6532	4	172	123	6532	1	172	41	6532

Study	Infection rate				Revision rate				Aseptic revision rate				Septic revision rate			
	Morbid obese		Non-obese		Morbid obese		Non-obese		Morbid obese		Non-obese		Morbid obese		Non-obese	
Chen 2016	-	-	-	-	2	117	21	2108	-	-	-	-				
Daniilidis 2016	-	-	-	-	-	-	-	-	0	17	1	24	1	17	2	24
Deakin 2017	3	78	14	381	1	78	4	381	-	-	-	-				
Dewan 2009	3	41	4	85	3	41	4	85	0	41	1	85	3	41	3	85
Ersozlu 2008	8	40	2	40	0	42	0	40	-	-	-	-	0	42	0	40
Hakim 2020	3	162	1	38	3	162	1	38	2	162	1	38	1	162	0	38
Krushell 2007	8	39	0	39	2	39	0	39	2	39	0	39	0	39	0	39
Naziri 2013	1	101	0	101	7	101	3	101	4	101	0	101	1	101	1	101
Ponnusamy 2018	18	195	12	260	14	195	18	260	1	195	2	206				
Spicer 2001	-	-	-	-	3	59	13	425	-	-	-	-				
Total	51	697	33	985	91	2390	290	13052	17	768	128	7066	17	810	128	7160
Relative risk ratio	7.30%		3.30%		3.80%		2.20%		2.20%		1.80%		2.00%		0.70%	

Table 5: Comparison of preoperative and postoperative Knee Society objective scores between morbidly obese (MO) and non-obese (NO) individuals in each study.

Study	Preoperative Knee Society objective score						The Postoperative Knee Society objective score					
	Morbid obese			Non-obese			Morbid obese			Non-obese		
	Mean	SD	Total	Mean	SD	Total	Mean	SD	Total	Mean	SD	Total
Amin 2006	28	16	38	30	9.3	38	76	17.5	38	83	16.25	38
Chen 2016	33	4.5	117	40	0.17	2108	58	1.16	117	74	0.3	2108
Dewan 2009	53	6	31	55	13	67	68	6	31	66	4	67
Ersozlu 2008	61	5.6	21	70	5.5	20	80	7	21	86	10	20
Krushell 2007	30	12.7	39	34	14.25	39	44	22.5	39	64	20	39
Naziri 2013	53	7	95	50	5.6	95	82	11.6	95	90	6	95
Spicer 2001	45	15.5	59	48	5	371	60	13	59	68	7	371
Total			400			2738			400			2738

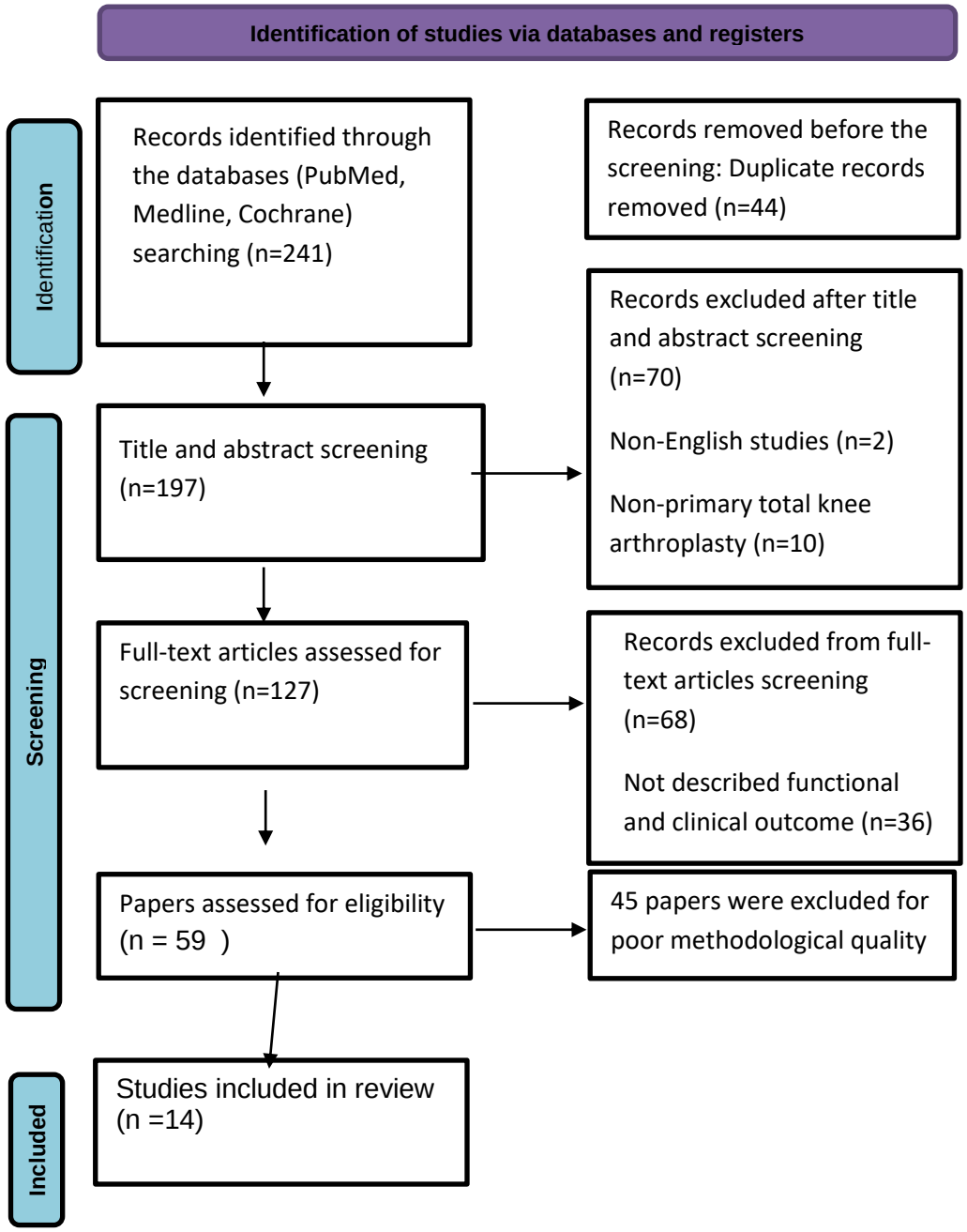

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart for showing the identification of the included studies

DISCUSSION

The relationship between BMI and TKR outcomes post-surgery is ambiguous, necessitating additional research. The systematic review consolidates analogous study findings, so augmenting the sample size and enhancing statistical validity, particularly in instances of divergent outcomes from prior studies. A systematic review can yield findings derived from existing research and thorough analysis, thereby aligning more closely with real-life scenarios.

Herein, we conducted this systematic review to assess the effect of body mass index on the outcome of total knee replacement in morbidly obese patients. This systematic review included 14 met the inclusion criteria. [9-22]

Regarding pre-operative (knee society objective score) KSOS, the pooled data of 7 studies included in the current review revealed a better pre-operative KSOS in non-obese patients compared to patients with morbid obesity. These results established the negative impact of obesity on the preoperative knee function of patients who underwent TKR. [9, 12, 15, 16, 18, 19, 21]

The study has confirmed the findings of a previous systematic review and meta-analysis by van Tilburg & Andersen [23] involving 12 studies, 1,031 morbid obesity subjects, and 9,797 non-obese controls. The morbidly obese patients had significantly low preoperative Knee Society Objective Scores (KSOS) compared to their non-obese counterparts before undergoing total knee arthroplasty (TKA) ($P < 0.001$).

Boyce et al. [7] performed a systematic review and meta-analysis including nine studies that encompassed a total of 624 knee arthroplasties in morbidly obese individuals and 9,449 knee arthroplasties in non-obese individuals. The average BMI was 45.0 kg/m² (40–66 kg/m²) for the morbidly obese cohort and 26.5 kg/m² (11–30 kg/m²) for their non-obese counterparts. Mean preoperative KSOS was significantly lower in morbidly obese patients at 43 (0–78) than non-obese ones at 47 (0–83), although not statistically so ($p = 0.65$).

Regarding post-operative (knee society objective score) KSOS, the pooled data of 7 studies included in the current review revealed a better post-operative KSOS in non-obese patients compared to patients with morbid obesity. These results established the negative impact of obesity on the functional outcome of patients who underwent TKR. [9, 12, 15, 16, 18, 19, 21]

Thus, it has been determined that the mean KSOS score attained at the time of last follow-up was significantly less in the post-obese patients (87, range: 32-100) than nonobese patients (91, range: 45-100) as portrayed in the recent systematic review and meta-analysis by Boyce et al. [7]. This indicates that morbid obesity incurs lower repeat and/or functional outcomes following total knee replacement. The average improvement thereby in KSOS was similar for both groups (44 points), indicating that body mass index was not significantly related to the functional recovery, as determined by the Knee Society Functional Score (KSFS), in patients who underwent TKR.

Regarding preoperative (knee society function score) KSFS, the pooled data of 7 studies included in the current review revealed a better pre-operative KSFS in non-obese patients when compared to patients who had morbid obesity. [9, 12, 15, 16, 18, 19, 21]

In agreement with the current review, a systematic review and meta-analysis by van Tilburg & Andersen [23], revealed that the morbidly obese scored lower in KSFS score preoperatively compared with the non-obese before TKA ($P < 0.001$). However, the systematic review and meta-analysis by Boyce et al., [7] showed that mean preoperative KSFS was lower in obese patients 40 (range 0–85) than non-obese patients 47 (range 0–97) without statistical significance. [7, 23]

Regarding postoperative (knee society function score) KSFS, the pooled data of 7 studies included in the current review revealed a better post-operative KSFS in non-obese patients

compared to patients with morbid obesity. [9, 12, 15, 16, 18, 19, 21]

Consistent with the present study, a comprehensive review and meta-analysis by van Tilburg & Andersen demonstrated that morbidly obese individuals exhibited poorer KSFS scores postoperatively compared to their non-obese counterparts. Nonetheless, both groups exhibited equivalent improvements in the function score KSFS (P =0.834). [23]

However, the systematic review and meta-analysis included by Boyce et al. [7] stated that the post-operative mean Knee Society Functional Score (KSFS) was actually less for the group of obese patients (67: 0 to 100) comparing to that of non-obese patients (76: 20 to 100), although not statistically significant. Mean improvements in the score were 27 for morbidly obese patients and 29 for non-obese patients (p = 0.78). According to these statements, it can interpreted that there was no major difference found between groups based on BMI which affects the functional outcomes measured according to the KSFS in people undergoing total knee replacement.

Jester and Rodney [24] reduced the work to a scoping analysis of 71 studies on the link between obesity and the total knee replacement (TKR) surgery. It was pointed out that around 30 of these studies indicated poor results for obese patients compared with their lean counterparts. In contrast, 40 reported that their outcomes showed no significant difference, with some even suggesting that obese patients do better than their non-obese counterparts.

Regarding complications, the current review included 10 studies and showed a higher rate of overall complications among the morbidly obese group compared to non-obese. The overall complication risk ratio in the morbid obesity group was 16.5% and 6.2% in the non-obese group. With regards to infection rate, the current review included 8 studies and showed a higher infection rate among the morbidly obese group compared to non-obese. Overall, infection occurred more often in obese patients, with a risk ratio of 7.3%. However, the risk ratio in the non-obese group was 3.3% In terms of revision rate, in this review, twelve studies reported the revision of TKR. In this review, revision TKR, whatever the cause was observed more frequently in obese patients, with a calculated risk ratio of 3.8% (91 patients). Conversely, the non-obese patients' risk ratio was 2.2% (290 patients). Eight studies reported the aseptic revision of TKR, the morbid obesity group showed a calculated risk ratio of 2.2% and 1.8%. in the non-obese group. In addition, seven studies reported the septic revision TKR the morbid obesity group showed a calculated risk ratio of 2.0% and 0.7% in the non-obese group. [9-22]

In line with the current findings, a complete review with meta-analysis by van Tilburg and Andersen [23] demonstrated that the overall risk of complications was 19.5% for morbidly obese patients compared with 10.0% for non-obese individuals. The risk ratio of overall complications for morbidly obese patients versus non-obese individuals was 1.56 (P = 0.06). This review, however, presented inconclusive evidence that morbid obesity is associated with an increased risk for revision surgery (P = 0.06).

Furthermore, congruent with the findings of the present study, Boyce et al.'s [7] systematic review and meta-analysis revealed that morbidly obese patients subjected to total knee replacement (TKR) were at an increased risk of overall complications. Such patients also exhibited significantly increased incidences of superficial wound infections, infections of prosthetic joints, and complications or delays in wound healing when compared with non-obese patients across all studies.

Moreover, our results were validated by Campi et al., who illustrated that patients with a BMI greater than 30 had a significantly elevated likelihood of revision (p = 0.02), whereas the risk of septic revision was similar (p = 0.79) in those who underwent partial knee arthroplasty. Musbahi et al. established that the average revision rate in obese patients (BMI > 30) was 0.33% more than in non-obese patients; yet, this disparity was not statistically significant (p

= 0.82) in persons receiving unicompartmental knee arthroplasty. [25]

In their review, Martin and colleagues [26] did not commit to any definitive position on whether preoperative bariatric surgery was necessary or not. In contrast, Nelson and his co-authors [27] propose that morbid obesity is not the sole risk factor for challenges faced perioperatively. They consider low serum albumin levels as a significant confounder related to increased perioperative difficulties.

Advantages of the Study

This systematic review provides a comprehensive analysis of total knee arthroplasty (TKA) outcomes in obese patients by incorporating up-to-date data from multiple databases. The inclusion of 14 high-quality studies following PRISMA guidelines ensures a rigorous selection process, reducing bias and enhancing reliability. The study's large sample size (over 15,000 patients) strengthens its statistical power, making the findings more clinically relevant for orthopedic surgeons and healthcare professionals.

The review highlights key postoperative outcomes, showing that morbid obesity is associated with lower functional scores, increased complication rates (16.5% vs. 6.2% in non-obese patients), higher infection risks (7.3% vs. 3.3%), and greater revision rates (3.8% vs. 2.2%). By synthesizing results from multiple studies, it provides strong evidence for decision-making regarding patient selection, surgical techniques, and perioperative management. Additionally, it validates prior research, aligning with findings from van Tilburg & Andersen and Boyce et al., further supporting its credibility.

Limitations of the study

However, the study has some limitations, including a relatively small number of included studies (14 out of 241 initially screened) and variability in study methodologies. Differences in definitions of obesity, surgical techniques, and follow-up durations introduce heterogeneity, making direct comparisons challenging. Moreover, functional outcomes were not uniformly reported across studies, and key confounding factors such as comorbidities, rehabilitation adherence, and implant types were not fully accounted for, which could influence results.

The review is also limited by short-to-medium follow-up durations (mostly 2–5 years), preventing conclusions on long-term implant survival in obese patients. Additionally, publication bias may be present, as studies with negative or inconclusive results may be underreported. Future research should focus on long-term outcomes, standardized functional assessments, and alternative preoperative interventions (e.g., bariatric surgery) to optimize TKA success in obese patients.

CONCLUSION

In conclusion, this study demonstrated that obesity negatively impacts functional outcomes following total knee arthroplasty. Furthermore, obesity was linked to an increased rate of complications after the procedure.

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