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Review

Impact of prior bariatric surgery on revision rates following total knee arthroplasty: a systematic review and meta-analysis

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ABSTRACT

Background: Total knee arthroplasty (TKA) is a common and increasingly performed procedure, particularly in patients with end-stage osteoarthritis. Obesity, a major risk factor for osteoarthritis, is also associated with higher rates of complications following TKA. Bariatric surgery (BS) has been proposed as a preoperative optimisation strategy to mitigate obesity-related risks. The objective of this study was to evaluate the effect of prior BS on revision rates following primary TKA in obese patients.
Methods: A systematic review and *meta*-analysis were conducted in accordance with Cochrane MECIR and PRISMA 2020 guidelines. MEDLINE, Embase, CENTRAL, and PubMed were searched through March 2025. The primary outcome was revision surgery (short-term ≤90 days, long-term >90 days); secondary outcomes included indications for revision and subgroup analysis by BS type and timing. Risk of bias was assessed using RoB-2 and ROBINS-I tools.
Results: Fifteen studies were included (n = 3,241,049; BS group n = 130,029). Pooled *meta*-analyses showed no significant difference in revision risk between BS and non-BS groups at 90 days (OR 1.24, 95% CI 0.66–2.34) or at 1–2 years (ORs 0.98–1.24; all p > 0.05). Data regarding timing of TKA suggests lower revision risks when performed within 2 years of BS.
Conclusion: Our pooled analysis showed that prior bariatric surgery did not significantly impact revision rates after TKA. However, no change in BMI status after BS was recorded. Future research should prioritise prospective studies and long-term registry follow-up with detailed nutritional and clinical data to clarify the role of BS as a pre-arthroplasty optimisation strategy.

1. Background

Primary total knee arthroplasty (TKA) is among the most frequently performed orthopaedic procedures [1]. According to projections from the National Joint Registry, the annual volume of TKA procedures in the United Kingdom (UK) is expected to increase by 36.6%, reaching approximately 137,000 by 2060 [1]. The predominant indication for TKA is end-stage osteoarthritis (OA), a degenerative joint disease strongly associated with modifiable risk factors, particularly obesity [2,3].

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Obesity prevalence is projected to rise substantially both in the UK and globally [4]. By 2029, it is estimated that up to 70% of patients undergoing primary TKA in the United States will be classified as obese or morbidly obese [5]. This trend is concerning, as obesity has been associated with greater risks of surgical site infections (SSI), revision surgery, and medical events, necessitating perioperative weight optimisation [6,7].

A range of strategies have been employed to support weight loss prior to surgery including structured exercise programmes, dietary interventions, and pharmacological therapies [8,9]. Among these, bariatric surgery has emerged as a particularly effective intervention, providing substantial and sustained reductions in body weight [10]. It has been hypothesised that prior bariatric surgery could improve TKA outcomes by mitigating obesity-related risk factors. However, the literature presents divergent conclusions: some have suggested that BS is associated with lower perioperative complications [11], while others have demonstrated no protective effect or even increased revision risk, particularly due to infection [12,13]. Furthermore, uncertainties remain regarding the optimal timing of BS before TKA and whether outcomes differ according to the type of bariatric procedure performed [14,15].

This systematic review aims to enhance the evidence base by combining all available data and investigate the discrepancies in the literature.

To our knowledge, this is the first review aiming to (1) compare all-cause revision rates after primary TKA in obese adults with versus without prior bariatric surgery at prespecified short-term (<=90 days) and long-term (>=1 year) time points (primary outcome), and (2) assess indications for revision, explore whether revision rate vary by bariatric procedure types, interval between bariatric surgery and TKA and stratify revision risk by magnitude of weight loss post BS (secondary outcomes).

2. Methods

This systematic review and *meta*-analysis was conducted in accordance with the Methodological Expectations of Cochrane Intervention Reviews (MECIR) standards for conduct and reporting, and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [16,17]. The protocol for this review was registered in the PROSPERO database; CRD420251129800.

2.1. Eligibility criteria

Studies were selected using predefined criteria based on the Population, Intervention, Comparator, and Outcome (PICO) framework. Eligible studies were required to clearly define BS as the exposure and revision surgery as the outcome of interest. Observational studies and both randomised and non-randomised controlled trials published in English were eligible. Case reports, abstracts without full-text, editorials and non-peer review publications were excluded.

The population of interest were adults (aged ≥18 years) with obesity as defined by individual studies undergoing primary TKA; revision cases were excluded. The intervention was defined as any form of BS performed prior to TKA, regardless of procedure type, delivery, or timing. The comparator group comprised patients undergoing TKA without prior BS. Studies involving simultaneous BS and orthopaedic procedures were excluded.

The primary outcome was to assess the effect of BS performed prior to TKA on revision rates in patients with obesity. Both short-term (≤90 days) and long-term (≥1 year) revisions were extrapolated. The secondary outcome was to categorise the reported causes for revision surgery, timing of TKA after BS and stratify whether outcomes differ by the type of bariatric surgery and by magnitude of weight loss post BS where data permitted.

2.2. Definition of revision

In this review, 'revision' was defined as any subsequent operation on the index knee in which one or more prosthetic components were removed, exchanged, or added (consistent with common arthroplasty registry definitions). Where studies used administrative or registry data, we accepted the study-specific definition of revision as reported; because most studies did not consistently capture or report reoperation, quantitative synthesis focused on revision only.

2.3. Search strategy

A comprehensive search of MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL), PubMed was conducted from inception to March 2025 to identify eligible studies. Our search strategy included use of terms relating to TKA, BS, revision and related outcomes. The full search strategy is provided in the supplementary table S1.

2.4. Study selection

All records identified through the database searches were imported into Mendeley reference management software for de-duplication and screening. A two-stage screening process was undertaken. In the first stage, two reviewers independently screened titles and abstracts to identify potentially eligible studies. In the second stage, the full texts of studies selected during title and abstract screening were independently assessed by the same two reviewers against the predefined inclusion and exclusion criteria. Discrepancies at any stage were resolved through discussion and consensus. Where eligibility data were unclear, attempts were made to contact study authors for clarification.

2.5. Data collection process

Data was extracted by one reviewer using a Microsoft Excel form and cross-checked by a second reviewer. Collected data included patient characteristics, intervention and outcome data. Discrepancies were resolved through discussion. When raw data was not available study authors were contacted for clarification.

2.6. Bias assessment and certainty of evidence

Risk of bias assessment was conducted using Cochrane Risk of Bias 2 (RoB-2) tool for randomised trials [18] and the Risk of Bias In Non-randomised Studies of Interventions (ROBINS-I) tool for observational studies [19]. Each study was graded as either low, moderate, serious or critical.

The certainty of evidence for each outcome was rated using the **GRADE** tool, considering risk of bias, inconsistency, indirectness, imprecision, and publication bias. Each outcome was graded as high, moderate, low, or very low in certainty.

2.7. Data synthesis and statistical analysis

Meta-analyses were performed using Review Manager software version 5.3. A random-effects model was employed for all syntheses to account for expected heterogeneity in study design and populations. The DerSimonian and Laird method was used to estimate between-study variance (τ^2), and Wald-type confidence intervals were calculated for summary effect estimates. Odds ratios (ORs) with 95% confidence intervals (CIs) were used for dichotomous outcomes. All results were displayed as forest plots.

Heterogeneity was assessed using the Chi2 test and quantified using the I2 statistic, interpreted as low (<50%), moderate (50–70%), or high (>70%) heterogeneity. Publication bias was assessed visually using a funnel plot and statistically using Egger's test, where more than 10 studies were included for the primary outcome. If *meta*-analysis was not feasible, findings were summarised narratively. All study-level effect estimates, characteristics, and outcome results were summarised in structured tables and presented alongside forest plots.

3. Results

3.1. Study selection

A comprehensive literature search identified 1323 records; this reduced to 669 after duplicates were removed. Of these, 601 were excluded for not meeting the inclusion criteria. Full-text assessment of 98 articles resulted in the inclusion of 15 studies for analysis. The study selection process is summarised in the PRISMA flow diagram below (Figure 1).

3.2. Study characteristics

Included studies comprised one randomised trial [20], eight unmatched retrospective studies [10,13–15,21–24], and six matched retrospective studies [12,25–29]. A total of (3,241,049) patients were included: (130,029) had undergone bariatric surgery (BS) prior to TKA, and (3,111,020) patients had no prior BS. Both registry-based analyses and single-centre cohorts were represented, and bariatric procedures included Roux-en-Y gastric bypass, sleeve gastrectomy, and laparoscopic adjustable gastric banding. Detailed demographics of each included study are summarised in Table 1.

3.3. Methodological quality/risk of bias assessment

Risk of bias was evaluated using RoB2 for the single RCT [20] and ROBINS-I for the observational studies. The RCT was judged to have some concerns in relation to allocation concealment and blinding but was otherwise at low risk of bias. All the included non-randomized studies were judged to be at either moderate or serious risk of bias, mainly due to potential confounding, selection of participants, and lack of adjustment for important prognostic factors such as pre-operative BMI and comorbidity burden. No study was considered to be at critical risk of bias. The data is summarised in Table 2.

Certainty of Evidence (GRADE): The overall certainty of evidence for the effect of prior BS on revision risk following TKA was judged to be low for both short-term and long-term outcomes, summarised in Table 2.

3.4. Primary outcome: All-cause revision surgery

The analysis of revision rates following TKA revealed considerable heterogeneity among the included studies. Seven studies observed no significant differences in revision risk associated with prior bariatric surgery. McLawhorn et al. (2018) found

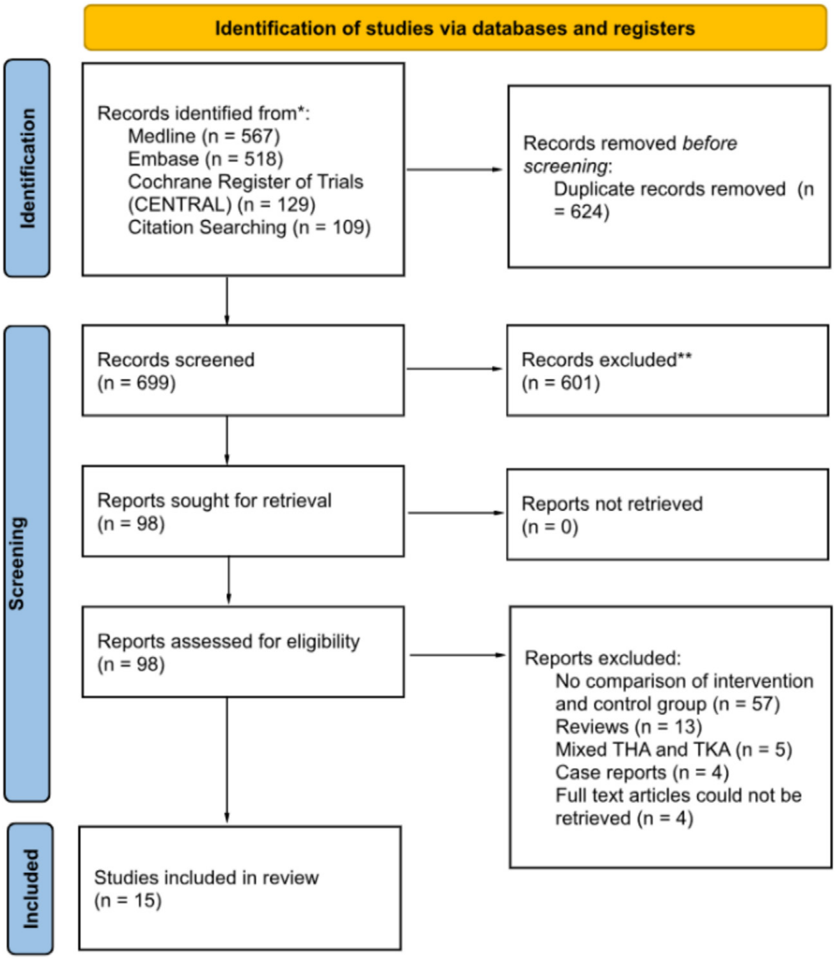

Figure 1. PRISMA flow diagram outlining the study selection process.

comparable revision rates between the bariatric group (4.1%) and controls (4.5%), reporting a hazard ratio of 0.90 (95% CI 0.69–1.17) [25]. Ighani Arani et al. (2023) also reported no significant difference in revision risk between groups (HR 1.5; 95% CI 0.5–4.5) [15]. In large-scale, registry-based study, Kubsad et al. (2024) reported similar five-year cumulative incidence of all-cause revisions between patients who had undergone bariatric surgery and matched class III obesity controls (4.2% vs. 4.3%, HR 0.96; 95% CI 0.89–1.04; $p = 0.362$) [27].

Conversely, five studies highlighted increased revision risk following bariatric surgery. Lee et al. (2018), using Medicare data, found significantly increased all-cause revision risks at 1, 2, and 5 years post-TKA in patients with prior bariatric surgery, with adjusted hazard ratios (AHRs) of 4.3, 3.58, and 3.37, respectively (all $p < 0.005$) [23]. Similarly, Nickel et al. (2016) noted significantly higher revision rates at both 90 days (OR 3.54, $p < 0.001$) and 2 years (OR 3.09, $p < 0.001$) following TKA in patients with previous bariatric surgery compared to both obese and normal-weight controls [22]. Ryan et al. demonstrated significantly reduced 10-year implant survivorship free from revision in the bariatric group (74%) compared to low BMI (92%) and high BMI (95%) control cohorts, with significantly increased risks (HR 3.5 and HR 8.9, respectively, $p < 0.01$) [26]. Meller et al. (2019) reported elevated 90-day revision rates among various bariatric procedures compared to non-bariatric patients, notably highest in sleeve gastrectomy patients (1.95% vs. 0.46% in non-BS patients) [14].

The single randomised trial included by Dowsey et al. (2022) found that bariatric surgery significantly reduced the composite complication rate post-TKA (14.6% vs. 36.6%, $p = 0.02$), though it noted no revisions within the bariatric surgery group and only one revision in the control group due to injury unrelated to the surgical procedure [20].

Only one study demonstrated outcomes favouring BS prior to TKA. Sax et al. found significantly lower rates of medical and surgical complications, including revisions, among BS cohorts compared to BMI > 40 patients ($p < 0.05$) [24].

Table 1
Characteristics of included studies.

Study name	Study Design	Country	Total number of participants (n)	BS	NBS	BS intervention type	BMI for NBS group	Age (Mean, SD)	Gender (Male) (n, %)	Mean BMI prior to TKA	Breakdown by procedure type	Follow up
Kulkarni et al. 2010	Unmatched retrospective	UK	84	53	31	Gastric banding, sleeve gastrectomy, gastric bypass, and gastric balloon insertion	Not documented	BS – 57 NBS – 57	NR	NR	NR	**30 d, 90 d, 1 y**
Severson et al. 2012	Unmatched retrospective cohort	US	125	86	39	Gastric bypass, Gastric banding	43.1 ± 6.3 (32.4, 58) kg/m2	BS – 59.1 NBS – 55.5	BS – 15 (17.4) NBS – 11 (28.2)	BS – 38.2 NBS – 43.1	NR	**Range: 22 m-14 years).**
Martin et al., 2015	Matched retrospective	US	182	91	91	NR	High BMI group: 51.2 ± 9 Low BMI group: 37.2 ± 7	BS – 58.1 NBS – 57.4	BS – 17 (18.6) NBS – 17 (18.6)	BS – 37.2 NBS – 51.2	NR	**1y**
Nickel et al. 2016	Unmatched retrospective	US	32,534	5918	26,616	NR	Morbidly obese NBS group BMI > 40 Normal weight NBS group BMI < 25 Exact values of BMI not documented	Age Distribution (%) <65 y: BS: 57.7%, NBS: 27%, >65y: BS: 42.3%, NBS: 73%	BS – 1003 (16.9) NBS – 6287 (23.6)	BS – NR NBS > 40	NR	**30 d, 90 d, 2 y**
Lee et al. 2018	Unmatched retrospective	US	86,609	70	86,539	NR	Not documented	≥65	NR	NR	NR	**0.5, 1, 2, and 5 y**
McLawhorn et al., 2018	Matched retrospective	US	5272	2636	2636	NR	NBS group BMI > 40 Exact values not documented	BS – 57.4 NBS – 57.3	BS – 448 (16.9) NBS – 479 (18.1)	BS – NR NBS > 40	NR	**90d**
Meller et al. 2019	Unmatched retrospective cohort	US	2,701,427	25,852	2,675,575	Gastric banding, sleeve gastrectomy, gastric bypass	NBS group BMI > 40 Exact values not documented	Age Distribution (%): 65 to 69 y: BS (60.7%), NBS (29.6%) 70 to 74 y: BS (28.8%), NBS (29%) 75 to 79 y: BS (8.0%), NBS (23.3%) >80 y: BS: (2.3%), NBS (17.9%).	BS – 5244 (20.2) NBS – 993,981 (37.1)	BS – NR NBS > 40	Yes	**90 d**
Ighani Arani et al. 2021	Unmatched retrospective	Sweden	96,389	441	95,948	Gastric bypass and sleeve gastrectomy.	35 (32–50)	BS – 57 (39–76) NBS – 66 (39–76)	BS – 105, NBS - 43,177	BS: 35 (32–50) NBS: 29 (17–50)	NR	**BS: 65 m, NBS: 62 *m***

(*continued on next page*)

Table 1 (*continued*)

Study name	Study Design	Country	Total number of participants (n)	BS	NBS	BS intervention type	BMI for NBS group	Age (Mean, SD)	Gender (Male) (n, %)	Mean BMI prior to TKA	Breakdown by procedure type	Follow up
Sax et al. 2022	Unmatched retrospective	US	105,409	17,960	87,449	Roux-en-Y bypass, Sleeve Gastrectomy	Morbidly obese NBS group BMI > 40 Non morbidly obese NBS group BMI 20–35 kg/m2	BS – 59 NBS – 61	BS – 3832 (21.3), NBS - 24,382 (21.7)	BS – NR NBS > 40	Yes	**90 d, 1, 2 y**
Dowsey et al., 2022	Randomised controlled trial	Australia	82	41	41	Laparoscopic Adjustable Gastric Banding	43.6 ± 6.3	BS – 58.7 NBS – 57	BS – 9 (22) NBS – 7 (17.1)	BS – 36.5 NBS – 43.6	NR	**1 y**
Ryan et al. 2022	Matched retrospective	US	284	142	142	Gastric bypass, Sleeve gastrectomy	Low BMI group BMI was 32.2 ± 4.9 High BMI group was 44.4 ± 4.1	BS – 62 NBS – 62	BS – 37 (18) NBS-37 (18)	BS – 36.9 NBS – 44.4	Yes	**2 y**
Ighani Arani et al. 2023	Unmatched retrospective	Sweden	584	465	119	Gastric bypass, Sleeve gastrectomy	40.5 ± 4.5	BS –57 (6.8) NBS – 56 (5.7)	BS – 116 (25) NBS – 28 (24)	BS – 31 NBS – 38	NR	**BS: 2y, NBS: 3.25y**
Kubsad et al. 2024	Matched retrospective	US	97,350	19,504	77,846	Gastric bypass, Lap gastroenterostomy, Lap gastroplasty	Not documented	Age Distribution (%):<55y: BS: 18.7%, NBS: 18.7%, 55–64y: BS: 40.7%, NBS: 40.7%, 65–74y: BS: 33.6%, NBS: 33.6%, >75y: BS: 7.0%, NBS 6.9%	BS – 4546 (23.3) NBS - 18,132 (23.3)	BS – NR NBS – BMI > 40 *	NR	**5 y**
Oettl et al. 2025	Matched retrospective	US	2136	479	1657	NR	33.1 ± 6.1	BS – 60 NBS – 61	BS – 86 (18). NBS – 295(17.8)	BS – 36.5 NBS – 36.4	NR	**90d**
Maman et al. 2025	Matched retrospective	Israel	112,582	56,291	56,291	NR	Not documented	BS – 60.8 NBS – 60.8	BS 18.0%, NBS 18.2%	Reported % by categories of BMI	NR	**NR**

[BS: Prior bariatric surgery, NBS: no prior bariatric surgery, TKA: total knee arthroplasty, SD: standard deviation, NR: not reported, d: days, m: months, y: years].

Table 2
Risk of Bias and GRADE quality of evidence assessments.

RCT	Cochrane risk- of-bias for randomized trial (RoB2) Domains					
	1	2	3	4	5	Overall risk of bias
Dowsey et al. 2022	Low	Low	Some concerns	Low	Low	Low

RS	Risk of bias in randomized studies of interventions (ROBINS-I) Domains							
	1	2	3	4	5	6	7	Overall risk of bias
Kulkarni et al. 2011	Serious	Serious	Some concerns	Low	Low	Low	Low	Serious
Severson et al. 2012	Serious	Serious	Some concerns	Low	Low	Low	Low	Serious
Martin et al. 2015	Some concerns	Some concerns	Some concerns	Low	Low	Low	Low	Some concerns
Nickel et al. 2016	Serious	Serious	Some concerns	Low	Low	Low	Low	Some concerns
McLawhorn et al. 2018	Some concerns	Some concerns	Some concerns	Low	Low	Low	Low	Some concerns
Lee et al. 2018	Serious	Serious	Some concerns	Low	Low	Low	Low	Serious
Meller et al. 2019	Serious	Serious	Some concerns	Low	Low	Low	Low	Serious
Ighani Arani et al. 2021	Serious	Some concerns	Some concerns	Low	Low	Low	Low	Some concerns
Sax et al. 2022	Serious	Serious	Some concerns	Low	Low	Low	Low	Serious
Ryan et al. 2022	Some concerns	Some concerns	Low	Low	Low	Low	Low	Some concerns
Ighani Arani et al. 2023	Some concerns	Some concerns	Some concerns	Low	Low	Low	Low	Some concerns
Kubsad et al. 2024	Some concerns	Some concerns	Low	Low	Low	Low	Low	Some concerns
Oettl et al. 2025	Some concerns	Some concerns	Some concerns	Low	Some concerns	Low	Low	Some concerns
Maman et al. 2025	Serious	Some concerns	Some concerns	Low	Low	Low	Low	Some concerns

Judgement for risk of bias: Low | Some concerns | Serious | Critical

GRADE approach to assess quality of evidence									
Outcomes	No of patients (studies)	Phase of investigation 1= exploratory 2/3= explanatory Phase 1: ↓	Study limitations including 'critical risk of bias' study Yes: ↓	Inconsistencies I^2> 50%: ↓	Indirectness Yes: ↓	Imprecision CI effect size (<1 and >2, range >2) Yes: ↓	Publication bias Yes or unclear: ↓	Effect size OR (95% CI) Lower limit OR >2.0: ↑	Overall quality of evidence
Short-term revision	2,844,082 (5 studies)	1 ↓	No	Yes ↓	No	No	Unclear ↓	No	Low
Long-term revision	2,856,138 (11 studies)	1 ↓	No	Yes ↓	No	No	Yes ↓	No	Low

[RCT: randomized controlled trial, RS: retrospective studies, CI: confidence interval, I^2: heterogeneity, OR: odds ratio].

3.5. Meta analysis

Short-term Revision Outcomes (≤90 days): Five studies reported revision rates within 90 days postoperatively. Pooled analysis showed no significant difference in revision rates between BS and NBS groups (OR = 1.24, 95% CI = 0.66–2.34, $p = 0.51$), with high heterogeneity ($I^2 = 97\%$) as illustrated in Figure 2 below.

Long-term Revision Outcomes (≥ 1 year): Twelve studies evaluated long-term revision rates. At 1-year follow-up, pooled odds ratios from five studies showed no significant difference in revision rates between groups (OR = 0.98, 95% CI = 0.58–1.87, $p = 0.96$, $I^2 = 98\%$). At 2-year follow-up, pooled data from six studies also indicated no significant difference (OR = 1.24, 95% CI = 0.87–1.76, $p = 0.23$, $I^2 = 95\%$). This is demonstrated in Figure 3 below.

3.6. Secondary outcome: Indications for revision surgery

The commonest indications for revision were reported included prosthetic joint infection (PJI), aseptic loosening, mechanical instability, wear, periprosthetic fractures, and other mechanical complications. Infection-related revisions were notably lower in BS patients as demonstrated by Kubsad et al. (HR 0.77, $p = 0.001$) and Lee et al. (AHR = 0; $p < 0.001$) [23,27]. Conversely, Ryan et al. highlighted significantly increased risks of revision due to instability (HR 16.7, $p < 0.01$) and infection

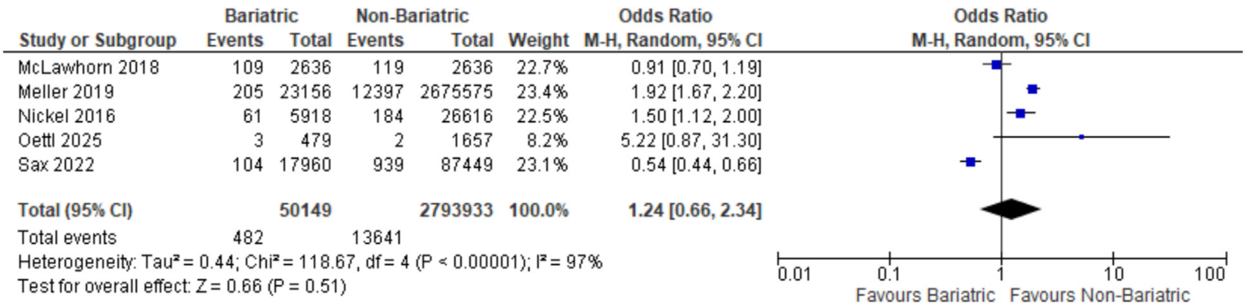

Figure 2. Forest Plot indicating the *meta*-analysis of association of short-term revision risks.

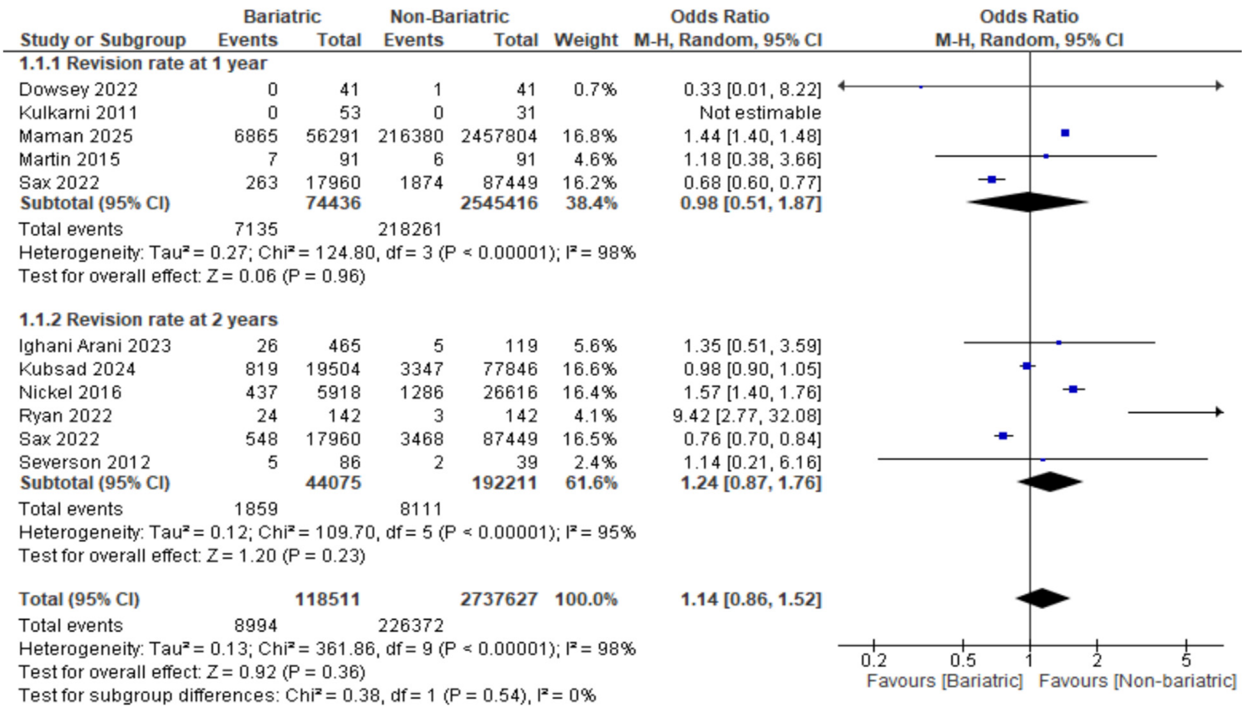

Figure 3. Forest Plot demonstrating the *meta*-analysis of association of long-term revision risks with subgroup analysis. [CI, confidence interval; M–H, Mantel- Haenszel; df, degrees of freedom].

(HR 5.7, $p = 0.03$) in BS patients compared to high BMI controls [26]. Additionally, Ighani et al. (2021) reported an increased risk of revisions due to suspected or confirmed infection (HR 2.2, CI 1.0–4.7) in the BS group [13].

3.7. Secondary outcome: Revision by bariatric procedure type

Three studies explicitly analysed revision outcomes stratified by types of bariatric procedures. Ryan et al. found no significant difference in revision (HR 1.7, 95% CI 0.2–13.5, $p = 0.53$) rates when comparing Roux-en-Y gastric bypass (RYGB) to sleeve gastrectomy/lap-band [26]. Similarly, Sax et al. reported comparable 90-days ($p = 0.999$) and 2-year revision rates ($p = 0.159$) between RYGB and sleeve gastrectomy cohorts, with neither type identified as an independent risk factor for PJI or revisions [24]. Meller et al. stratified by each of the following type of BS: gastric banding, sleeve gastrectomy and bypass compared to patients with morbid obesity who have not undergone previous BS and found no statistical difference for gastric banding (HR 0.97, $p > 0.05$) and SG (HR 0.73, $p > 0.05$) cohorts but a statistically and clinically significant reduction in revision rates in the gastric bypass cohort (HR = 0.411, $P < 0.05$) [14].

3.8. Secondary outcome: Timing of TKA after bariatric surgery

Timing between BS and subsequent TKA varied across studies. Three studies stratified their BS in terms of timing of TKA after BS. Ryan et al. found a significantly higher risk of revision in patients who underwent TKA more than two years after BS (HR 11.6, 95% CI 1.6–1477.9, $p = 0.01$) [26]. Sax et al. compared outcomes between patients undergoing BS between 6 months to 1 year versus more than 1 year prior to TKA, finding no significant difference in revision rates at 90 days ($p = 0.063$) or 2 years ($p = 0.295$); neither timing cohorts were identified as an independent risk factor for revisions [24]. Severson et al. similarly evaluated timing, observing no revisions within 2 years post-BS but an 8% revision rate among those with more than 2 years elapsed since BS, though this finding was underpowered due to the small sample size [10].

3.9. Secondary outcome: Revision by magnitude of weight loss post-bariatric weight

Reporting of weight loss success was limited. Only a minority of studies provided postoperative BMI or change in obesity class after bariatric surgery, and none reported revision risk stratified by magnitude of weight loss. In the sequence-of-surgery cohort reported by Ighani Arani et al. (2023), postoperative BMI decreased after bariatric surgery, but many patients remained in an obese category; the available data were insufficient to determine whether greater weight loss was associated with lower revision risk.

4. Discussion

Bariatric surgery (BS) has been proposed as a strategy to improve joint arthroplasty outcomes in patients with obesity. However, the relationship between BS and revision risk following TKA remains unclear.

Our pooled analysis showed that prior bariatric surgery did not significantly impact revision rates after TKA compared to obese non-bariatric cohort. Large registry studies found similar revision risks in bariatric and non-bariatric groups [15,25,27]; although some studies signalled higher infection-related failures in select subgroups [13,26], this was not sustained in aggregate. Isolated reports suggested perioperative advantages or improved implant survival in certain populations [20,24], but these findings were not uniform. Overall, the totality of evidence indicates that bariatric surgery appears safe to consider before TKA and does not, on average, worsen revision risk. This heterogeneity underscores that weight loss alone may not eliminate the biological and mechanical risk factors associated with morbid obesity in arthroplasty patients, underscoring the importance of patient selection and timing.

Evidence regarding infection related revision risk is mixed. Ryan et al. [26] and Ighani 2021 [13] identified higher infection-related revisions among BS patients, possibly linked to nutritional deficiencies, altered immunity, or persistent obesity. Conversely, Kubsadet al. [27] and Leeet al. [23] attributed lower risk of infection related revisions in BS cohort.

Several authors have suggested that worse outcomes in patients with prior BS may be due to a combination of metabolic imbalance, catabolic state, post-surgical malabsorption, and micronutrient deficiencies and bone quality changes post BS, all of which could adversely affect bone health, implant integration, and immune function [30–33].

The randomised controlled trial by Dowsey et al. [20] did not find excess complications in their BS cohort attributable to metabolic or nutritional derangements, and our updated pooled analysis likewise did not demonstrate a consistent biological disadvantage associated with pre-TKA bariatric surgery. It is therefore plausible that reports of worse outcomes reflect residual confounding rather than a direct detrimental effect of BS. Patients undergoing BS often present with higher baseline comorbidity burden, and many database studies lack granular clinical or nutritional data, limiting risk adjustment. Additionally, sample size limitations in some cohorts reduce statistical power. Together, these factors may explain the variability in reported outcomes.

4.1. Timing and type of bariatric surgery

Timing of bariatric surgery relative to TKA remains uncertain and the available evidence is limited. The few studies that stratified timing used different thresholds (e.g., 6–12 months, 1 year, or 2 years) and were observational. Collectively, these data suggests improved revision risk when performed within 2 years of BS. Based on the available evidence, we suggest a pragmatic approach is to proceed with TKA once weight has stabilised and nutritional status is optimised, within 2 years of BS. Regarding BS type, both Roux en-Y gastric bypass and sleeve gastrectomy appear to have comparable outcomes with respect to revision and infection risk [24,26], although malabsorptive procedures may theoretically predispose to nutritional complications [31].

4.2. Clinical implications

These findings have important implications for surgical counselling. While BS is effective for sustained weight loss and metabolic optimisation, it does not reliably reduce revision risk after TKA. Surgeons should weigh the benefits of improved comorbidity control against potential risks such as nutritional deficiencies and persistent infection susceptibility. The decision to perform BS before TKA should be individualised, incorporating patient comorbidities, nutritional status, and expectations.

4.3. Strengths and limitations

This review builds upon earlier analyses by incorporating more contemporary data and applying rigorous methodological framework, thereby providing an updated review of current evidence. To the best of our knowledge, it represents the largest dataset specifically focused on revision surgery outcomes in TKA patients with or without BS, surpassing the scope of previous reviews [34]. Notably, we have included large registry-based datasets from studies such as Kubsad et al. and Mamanet al. [27,29]. Furthermore, through direct author correspondence, we obtained unpublished raw data from Ighani Arani et al. (2023) [15], allowing for a more accurate analysis than that presented in previous reviews [35]. This review also offers methodological advantages over prior analyses being conducted in accordance with Cochrane standards and PRISMA 2020 guidelines.

Nevertheless, several limitations in the available evidence must be acknowledged. Most studies included were retrospective cohort designs, with only one randomised controlled trial, thereby limiting the ability to draw causal inferences. There was substantial heterogeneity across studies in terms of design, patient populations, bariatric procedure types, and follow-up duration, which contributes to uncertainty in the pooled effect estimates. Additionally, data regarding key subgroups such as the timing of bariatric surgery in relation to TKA, and the specific type of bariatric procedure performed were sparsely and inconsistently reported, limiting the ability to conduct subgroup analyses. Additionally, 'revision' was not defined uniformly across studies. This limits our ability to compare broader failure patterns and may result in outcome misclassification. Finally, reporting of bariatric surgery effectiveness (postoperative BMI, obesity class change, and nutritional status) was sparse, precluding analysis of whether greater weight loss or resolution of morbid obesity modifies revision risk.

5. Conclusion

In summary, this systematic review and *meta*-analysis demonstrates that bariatric surgery appears safe to consider before TKA and does not increase revision risk, although some evidence suggests perioperative benefits in select patients. The type of bariatric procedure does not appear to significantly influence outcomes. Data regarding timing of TKA suggests lower revision risks when performed within 2 years of BS. Future research should prioritise prospective studies and long-term registry follow-up with detailed nutritional and clinical data to clarify the role of BS as a pre-arthroplasty optimisation strategy.

Consent for publication

Not applicable.

CRediT authorship contribution statement

Haroon Zaffar: Writing – original draft, Data curation, Conceptualization. **Krishna Oochit:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Manasi Dedhia:** Writing – review & editing, Writing – original draft. **Mehvish Usman:** Writing – review & editing, Writing – original draft. **Akash Patel:** Writing – review & editing, Writing – original draft, Supervision.

Ethics approval and consent to participate

Not applicable.

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Data availability

The datasets used and analysed during this study are available from the corresponding author on reasonable request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.knee.2026.104456.

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