Do Overall Body Weight, Body Mass Index, or Clinically Significant Weight Changes Occur after Total Knee Arthroplasty? A Meta-Analysis of 41,338 Patients

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INTRODUCTION: Obesity is a leading risk factor for knee osteoarthritis and a well-documented risk factor for periprosthetic joint infection, revision arthroplasty, and worse functional outcomes as compared to non-obese counterparts. Recent trends have suggested patients who undergo total knee arthroplasty (TKA) are younger and more obese; therefore, it is critical to characterize the potential impact TKA may have on body weight/body mass index (BMI). Previous studies have shown most TKA patients maintain their preoperative body weight after arthroplasty; however, many of these studies are confined to single institutions or small patient cohorts. Additionally, there has been no attempt to meta-analyze reported body weight/BMI changes after TKA. The goal of this meta-analysis was to quantitatively assess whether patients lose, gain, or maintain body weight/BMI after TKA.

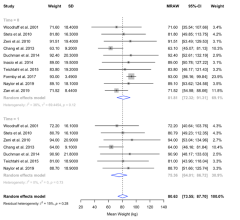
METHODS: This study followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Ovid MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials databases were queried from the time of inception through July 2022. Included studies: 1) reported on weight, BMI, or body composition after elective, primary TKA and 2) weight/BMI change was deemed to be associated with TKA. Excluded studies: 1) included weight/BMI interventions or 2) reported on unicompartmental/partial arthroplasty, revision arthroplasty, or joint arthroscopy. The primary outcome was reported weight/BMI change after elective, primary TKA. Secondary outcomes included whether weight/BMI change was clinically significant based on the established FDA threshold of >5% and patient and clinical factors associated with clinically significant change. Meta-analyses for weight change, BMI change, and proportion of patients achieving clinically significant change after arthroplasty were performed using random-effects models. Patient and clinical factors associated with clinically significant loss or gain were systematically reported.

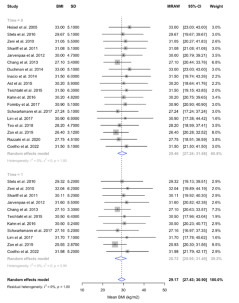
RESULTS:

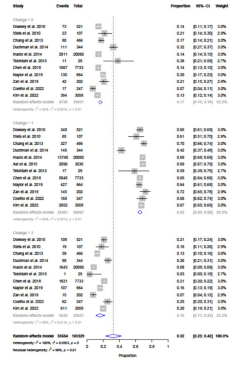
A total of 41,338 patients (from 27 studies) were included. The average age (± standard deviation) of TKA patients was 67.0 ± 8.1 years. The reported proportion of female patients was 60.0% (18,315/30,556). Follow up ranged from 6 months to 10.8 years. (Table 1). Pooled analyses demonstrated no statistically significant differences between preoperative and postoperative weights (p=.28) (Figure 1) or BMIs (p=1.0) (Figure 2) after TKA. Some 65% of TKA patients (p<.01) did not experience clinically significant weight/BMI change after arthroplasty (Figure 3). The factor most often associated with clinically significant weight/BMI loss was preoperative BMI, while age was most often associated with clinically significant weight/BMI gain (Table 2).

DISCUSSION AND CONCLUSION:

Two out of every 3 patients undergoing TKA maintain their preoperative body weight/BMI after arthroplasty. A patient's preoperative BMI and age were associated with variable clinically significant weight/BMI losses and gains, respectively. With these results, orthopaedic surgeons can better optimize TKA risk factors, like high BMI, and manage patient expectations before and after TKA to maximize patient outcomes.







Author and year	Study design	Intervention	Number of patients	Longest follow-up time point (months)	Clinically significant threshold used
Woodhall et al. 2001	Prospective cohort	TKA	68	12	
Hsiao et al. 2010	Prospective cohort	TKA	45	32	
Lavernia et al. 2008	Prospective cohort	TKA	188	24	>=5% of preoperative weight
Downey et al. 2018	Prospective cohort	TKA	521	12	>=5% of preoperative weight
Stein et al. 2010	Retrospective cohort	TKA	107	20	>=5% of preoperative weight
Zeni et al. 2010	Prospective cohort	TKA	106	24	
Sharif et al. 2011	Prospective cohort	TKA	91	12	
Jarvenpaa et al. 2012	Retrospective cohort	TKA	48	130	
Fadila et al. 2013	Prospective cohort	TKA	917	60	>=5% of operative weight
Cheng et al. 2013	Prospective cohort	TKA	466	60	>=5% of preoperative weight
Dochtman et al. 2014	Prospective cohort	TKA	344	57	>=5% of preoperative weight
Inacio et al. 2014	Retrospective cohort	TKA	20060	12	>=5% of operative weight
Ast et al. 2015	Retrospective cohort	TKA	3856	24	>5% of preoperative BMI
Teichtahl et al. 2015	Prospective cohort	TKA	29	6	>=5% of body weight
Kahn et al. 2016	Prospective cohort	TKA	148	32	
Formby et al. 2017	Retrospective cohort	TKA	185	36	
Schwartzmann et al. 2017	Retrospective cohort	TKA	91	>18	
Lim et al. 2017	Retrospective cohort	TKA	168	37	
Cvetko et al. 2018	Retrospective cohort	TKA	7733	24	>=5% of preoperative BMI
Teo et al. 2018	Prospective cohort	TKA	905	24	
Nayfeh et al. 2019	Prospective cohort	TKA	664	36	>=5% of preoperative weight
Zan et al. 2019	Prospective cohort	TKA	202	24	>5% of preoperative BMI
Razzaki et al. 2020	Prospective cohort	TKA	602	24	>5% of preoperative BMI
Khow et al. 2021	Prospective cohort	TKA	560	24	>=5% of preoperative BMI
Stucken et al. 2022	Retrospective cohort	TKA	362	12	>=5% of preoperative BMI
Cvetko et al. 2022	Prospective cohort	TKA	247	12	>5% of preoperative BMI
Kim et al. 2022	Retrospective cohort	TKA	3858	38	>=5% of BMI