

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.

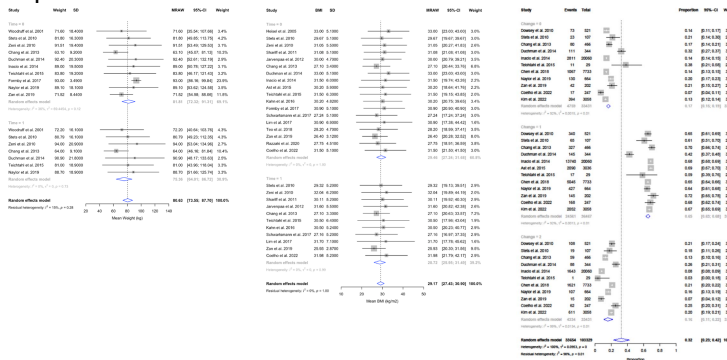
METHODS: This study followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Ovid MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials databases were queried from the time of inception through July 2022. Included studies: 1) reported on weight, 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 (\pm 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	Weight Mean-kg (range)	BMI Mean-kg/m² (range)	Clinical outcome
Chen et al. 2012	Retrospective cohort	TKA	45	71.0 (50.0-100.0)	25.0 (18.0-32.0)	-10% of operative weight
Chen et al. 2013	Retrospective cohort	TKA	118	74.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2014	Retrospective cohort	TKA	221	75.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2015	Retrospective cohort	TKA	107	76.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Zou et al. 2013	Retrospective cohort	TKA	106	77.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2017	Retrospective cohort	TKA	91	78.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2018	Retrospective cohort	TKA	90	79.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2019	Retrospective cohort	TKA	66	80.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Dickson et al. 2014	Retrospective cohort	TKA	144	77.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2020	Retrospective cohort	TKA	2000	78.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2021	Retrospective cohort	TKA	29	79.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2022	Retrospective cohort	TKA	140	80.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2023	Retrospective cohort	TKA	183	81.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2024	Retrospective cohort	TKA	91	82.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2025	Retrospective cohort	TKA	118	83.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2026	Retrospective cohort	TKA	144	84.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2027	Retrospective cohort	TKA	2000	85.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2028	Retrospective cohort	TKA	29	86.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2029	Retrospective cohort	TKA	140	87.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2030	Retrospective cohort	TKA	183	88.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2031	Retrospective cohort	TKA	91	89.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2032	Retrospective cohort	TKA	118	90.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2033	Retrospective cohort	TKA	144	91.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2034	Retrospective cohort	TKA	2000	92.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2035	Retrospective cohort	TKA	29	93.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2036	Retrospective cohort	TKA	140	94.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2037	Retrospective cohort	TKA	183	95.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2038	Retrospective cohort	TKA	91	96.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2039	Retrospective cohort	TKA	118	97.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2040	Retrospective cohort	TKA	144	98.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2041	Retrospective cohort	TKA	2000	99.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2042	Retrospective cohort	TKA	29	100.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2043	Retrospective cohort	TKA	140	101.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2044	Retrospective cohort	TKA	183	102.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2045	Retrospective cohort	TKA	91	103.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2046	Retrospective cohort	TKA	118	104.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2047	Retrospective cohort	TKA	144	105.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2048	Retrospective cohort	TKA	2000	106.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2049	Retrospective cohort	TKA	29	107.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2050	Retrospective cohort	TKA	140	108.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2051	Retrospective cohort	TKA	183	109.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2052	Retrospective cohort	TKA	91	110.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2053	Retrospective cohort	TKA	118	111.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2054	Retrospective cohort	TKA	144	112.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2055	Retrospective cohort	TKA	2000	113.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2056	Retrospective cohort	TKA	29	114.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2057	Retrospective cohort	TKA	140	115.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2058	Retrospective cohort	TKA	183	116.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2059	Retrospective cohort	TKA	91	117.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2060	Retrospective cohort	TKA	118	118.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2061	Retrospective cohort	TKA	144	119.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2062	Retrospective cohort	TKA	2000	120.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2063	Retrospective cohort	TKA	29	121.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2064	Retrospective cohort	TKA	140	122.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2065	Retrospective cohort	TKA	183	123.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2066	Retrospective cohort	TKA	91	124.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2067	Retrospective cohort	TKA	118	125.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2068	Retrospective cohort	TKA	144	126.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2069	Retrospective cohort	TKA	2000	127.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2070	Retrospective cohort	TKA	29	128.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2071	Retrospective cohort	TKA	140	129.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2072	Retrospective cohort	TKA	183	130.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2073	Retrospective cohort	TKA	91	131.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2074	Retrospective cohort	TKA	118	132.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2075	Retrospective cohort	TKA	144	133.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2076	Retrospective cohort	TKA	2000	134.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2077	Retrospective cohort	TKA	29	135.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2078	Retrospective cohort	TKA	140	136.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2079	Retrospective cohort	TKA	183	137.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2080	Retrospective cohort	TKA	91	138.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2081	Retrospective cohort	TKA	118	139.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2082	Retrospective cohort	TKA	144	140.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2083	Retrospective cohort	TKA	2000	141.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2084	Retrospective cohort	TKA	29	142.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2085	Retrospective cohort	TKA	140	143.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2086	Retrospective cohort	TKA	183	144.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2087	Retrospective cohort	TKA	91	145.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2088	Retrospective cohort	TKA	118	146.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2089	Retrospective cohort	TKA	144	147.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2090	Retrospective cohort	TKA	2000	148.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2091	Retrospective cohort	TKA	29	149.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2092	Retrospective cohort	TKA	140	150.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2093	Retrospective cohort	TKA	183	151.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2094	Retrospective cohort	TKA	91	152.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2095	Retrospective cohort	TKA	118	153.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2096	Retrospective cohort	TKA	144	154.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2097	Retrospective cohort	TKA	2000	155.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2098	Retrospective cohort	TKA	29	156.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2099	Retrospective cohort	TKA	140	157.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight
Chen et al. 2100	Retrospective cohort	TKA	183	158.0 (50.0-110.0)	26.0 (18.0-34.0)	-10% of operative weight