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Systematic Review and Meta-Analysis

Are 20% of Patients Actually Dissatisfied Following Total Knee Arthroplasty? A Systematic Review of the Literature

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ABSTRACT

Background: Total knee arthroplasty (TKA) is among the most performed orthopaedic surgeries in the United States with at least 1,000,000 cases performed per year. Dissatisfaction following TKA has often been reported as 20% or more, with a multitude of causes including sociodemographic, preoperative, and postoperative factors. The purpose of this study was to re-examine the rate and causes of dissatisfaction following TKA.

Methods: A systematic review of the literature was performed searching databases from 2010 to 2022. Only primary TKA cases were included and all cases of unicompartmental arthroplasty and revisions were excluded. After abstracts were reviewed, 35 articles were selected for a full-length review, which was ultimately reduced to 21 articles for final inclusion.

Results: The average rate of patient dissatisfaction was 10%. Excluding complications, the average rate of dissatisfaction was 7.3%. The most common sociodemographic factors for dissatisfaction were age < 65 years, lower income, and non-White patients. Preoperative factors included lower Kellgren-Lawrence scores, depression/anxiety, and pain catastrophizing. Postoperatively, most dissatisfaction was due to complications, unmet expectations, persistent pain, and stiffness.

Conclusion: Based on our review, the average rate of patient dissatisfaction following TKA is 10%. Improved counseling for known risk factors may have reduced dissatisfaction rates by increasing preoperative patient optimization. Many studies in recent years have demonstrated the issue of poor patient coping skills, such as pain catastrophizing and anxiety/depression as a common cause of dissatisfaction. Ultimately, dissatisfaction following TKA still continues to affect a high portion of patients but less than historical reports of 20%.

Estimates of annual total knee arthroplasties (TKAs) performed in the United States are approximately 1 million with an expected 401% increase by 2,050 compared to cases performed in 2014 [1]. Patient outcomes following TKA have been studied for decades with several validated assessments including the Oxford Knee Score (OKS), Knee Injury and Osteoarthritis Outcome Score, Western Ontario and McMaster Universities Osteoarthritis Index, and Knee Society Clinical Rating System [2]. Whether patients are satisfied or not has often been considered the ultimate measure of TKA success independent of other objective measures. Although the vast majority of patients are satisfied following TKA, there continues to be a cohort of patients that is dissatisfied. Historically, the existing body of literature has often cited dissatisfaction levels of 20% or more [3–6]. A recent literature review by Gunaratne et al also examined this topic and found approximately 20% rates of dissatisfaction, corroborating previous findings [7].

The purpose of this study was to re-examine the existing body of literature to determine the current rate of patient dissatisfaction. Secondary aims were to identify demographic, preoperative, intraoperative, and postoperative factors which were predictive of patient dissatisfaction following TKA.

Methods

This study was exempt from an institutional review board approval because it was a systematic review of published literature.

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Search Strategy

Two blinded reviewers independently searched the online databases: PubMed, Cochrane, Embase, and Google Scholar from January 1, 2010 to March 1, 2022 for literature addressing TKA and patient dissatisfaction. The research question, inclusion, and exclusion criteria were decided on a priori. The key terms "Total Knee Arthroplasty," "Satisfaction," and "Dissatisfaction" were used in our search. Query results were screened to remove all duplicates. All abstracts were first reviewed to determine if the study met inclusion criteria. Studies selected were then subject to review of the full text to determine final selection in this literature review. Figure 1 demonstrates the Prisma diagram in the study selection process. The two reviewers discussed articles to resolve any disagreements with ultimate selection deferred to the senior author. Studies were included if they contained (1) the study investigated primary TKA; (2) the study performed between January 1, 2010 and March 1, 2022; (3) the study analyzed dissatisfaction; and (4) the study was written in the English language. The following components were made part of the exclusion criteria: (1) the study included unicompartmental knee arthroplasty; (2) the study included revision TKA; and (3) the study was not specific to TKA (eg, total hip arthroplasty). All citations for selected studies were searched for additional references missed in the search query which did not yield any new studies.

Data Abstraction and Analyses

Two reviewers abstracted data in duplicate and recorded the results in Microsoft Excel 2022 spreadsheet (Microsoft, Redmond, Washington). For each article selected for final inclusion, the study design, participants, time to follow-up, dissatisfaction rate, and major findings were recorded by the reviewer. Dissatisfaction was defined in this review as "Dissatisfied" or "Highly Dissatisfied" on a Likert Scale [8]. Ratings of "Neutral" on the Likert scale were not defined as dissatisfied even if the specific reference classified Neutral as dissatisfied. The dissatisfaction rate was extracted from each study or recalculated depending on whether individual studies included "Neutral" as part of their dissatisfied cohort. The overall dissatisfaction rate for this review was determined by calculating the average dissatisfaction rate of all studies included. Some studies published a range of dissatisfaction rates or dissatisfaction rates at multiple time periods. In these instances, the higher dissatisfaction rate was selected.

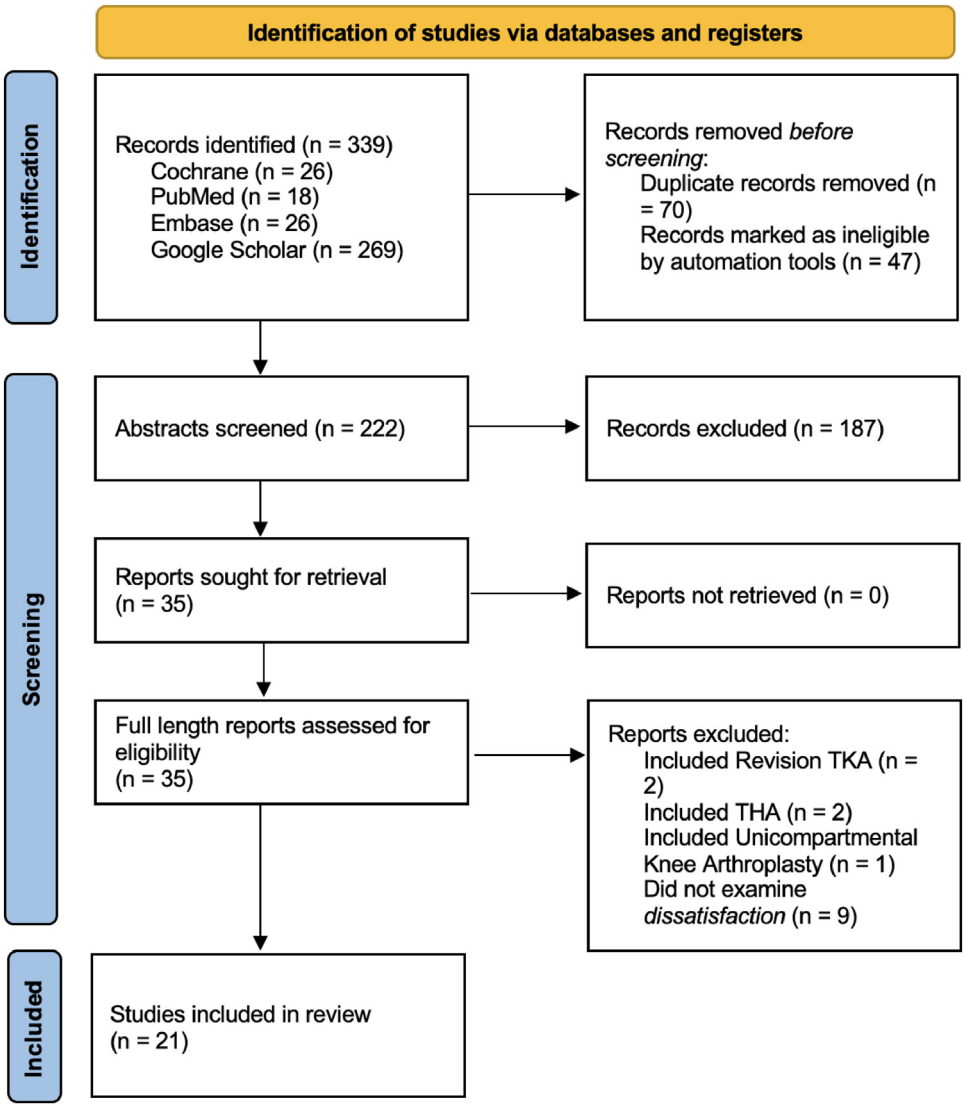

Fig. 1. Prisma diagram for study selection.

A total of 21 articles were selected for inclusion in this systematic review comprising 25,235 patients. The average age of TKA patients was 64 years (average range, 50-74 years) with women comprising 56.6% of the study population.

Results

The overall calculated rate of patient dissatisfaction following TKA was 10% ranging from 5% to 16.3%. Tables 1-3 demonstrate the factors shown to be statistically associated with patient dissatisfaction following TKA.

Sociodemographic Factors

Six of the studies analyzed found statistically significant results concerning sociodemographic factors. Lower financial status was shown to be predictive of patient dissatisfaction as seen in studies by Khatib et al and Nam et al in addition to being more likely to experience limitations in all functional outcomes compared to higher income earners [9,11].

Patient age had conflicting results in this systematic review. Leppanen et al and Ayers et al both found that patients aged < 65 years were more likely to experience dissatisfaction, whereas Bourne et al, Kunze et al, and Orr et al showed contradicting results that age > 70 years was more predictive of dissatisfaction [3,10,12–14]. Huijbregts et al in a retrospective analysis demonstrated more favorable results for patients aged > 69 years with a reduction in dissatisfaction by 4% for every increased year of age [15]. Bourne et al also found that patients living alone and those who were presenting for alternate surgical opinions were prone to dissatisfaction following TKA [3].

Ayers et al found that non-White race was associated with dissatisfaction following TKA with an odds ratio (OR) of 1.71 [12]. This was consistent with findings by Orr et al that Black race had an OR of 1.41 predictive of patient dissatisfaction [13]. Nam et al's analyses also found women to be significantly associated with dissatisfaction with an OR of 3.13 predicting dissatisfaction [11]. Education level was predictive of dissatisfaction following TKA with those having a high school education or less having a much higher rate of dissatisfaction at all time points assessed by Ayers et al [12].

Preoperative Factors

The most common preoperative factor predictive of patient dissatisfaction following TKA was mild osteoarthritis (OA) levels. Scott et al found that a lower radiographic severity of OA was significantly associated with dissatisfaction with an additional risk of reoperation [18]. These findings were corroborated in studies by Leppanen et al and Schnurr et al, respectively [10,23].

Anxiety, depression, pain catastrophizing, and axial back pain were common preoperative psychological causes predictive of dissatisfaction following TKA. Dhurve et al performed a prospective study and found that dissatisfied patients had significantly higher pain catastrophizing scores (PCS), higher depression scores, and a lower internal locus of control [17]. Clement et al found that depression and back pain were predictors of dissatisfaction at one year ($P < .001$); however, these factors were not associated with dissatisfaction at 5 years ($P = .46$ and $P = .58$, respectively) [20]. Scott et al performed a prospective study of 1,217 patients and also demonstrated depression, back pain, and lower Short Form−12 mental component scores to be predictive of dissatisfaction at 1 year. Van Onsem et al found significantly lower PCS rumination, PCS helplessness, total PCS in dissatisfied patients, and Euroqol Anxiety/Depression scores [19]. In addition, Ali et al found that patients who had anxiety/depression had a 6-times higher risk of TKA dissatisfaction at 4 years postoperatively compared to those without a history of anxiety/depression [24]. Pronk et al also found preoperative anxiety to significantly predict dissatisfaction at 1 year compared to those who did not have anxiety [16].

Preoperative knee functional status played a major role in determining patient dissatisfaction. When considering OKSs, Van Onsem and two studies by Scott et al found worse scores to be predictive of dissatisfaction [18,19,21]. Worse Western Ontario and McMaster Universities Osteoarthritis Index, Knee Injury and Osteoarthritis Outcome Score, and Knee Society Clinical Rating System scores were also seen preoperatively in studies performed by Leppanen, Kunze, and Clement [10,14,22]. Bourne et al examined a range of motion (ROM) and found preoperative flexion < 90° and extreme pain at rest to be significantly predictive of dissatisfaction at 1 year [3]. The presence of prior knee surgery and multiple painful joints was a risk factor noted by Scott et al with the latter corroborated by Ayers et al [12,18,21].

Less healthy patients fared worse after TKA in several studies. Khatib et al found that American Society of Anesthesiologists Classification > 2 was significantly associated with dissatisfaction at 1 year along with a history of obstructive sleep apnea [9]. Kunze et al also correlated multiple drug allergies and the presence of multiple medical comorbidities with higher dissatisfaction rates at 2 years postoperatively [14]. In addition, Clement et al found that the presence of active lung disease at 1 year postoperatively was associated with patient dissatisfaction [27]. Body mass index (BMI) had conflicting results with Pronk et al finding lower BMI a risk factor for dissatisfaction, whereas Ayers et al saw an increased BMI being associated with dissatisfaction [12,16].

Table 1
Sociodemographic Factors That Achieved Statistical Significance for Dissatisfaction Following Total Knee Arthroplasty.

Reference	Type of Study	Sample Size: Follow-Up Period (Mean Years)	Sociodemographic Factors	Dissatisfaction Rate %
Bourne et al [3]	Prospective	1,703 pts:1	Age > 70 y ($P = .012$) Lives alone ($P = .013$) Referral patient ($P = .047$)	11.6
Khatib et al [9]	Prospective	1,017:1	Lower Financial Status ($P < .0001$)	7
Leppanen et al [10]	Prospective	186:2	Younger <65 ($P = .029$)	12
Nam et al [11]	Retrospective	661: >2	Income < 25,000 (P .012) Women ($P = .0016$)	10
Ayers et al [12]	Retrospective	4,402:1 and 5	Age < 65 y ($P = .007$) High School or Less ($P = .01$) Non-White ($P < .001$)	12.7
Orr et al [13]	Retrospective	5,274:1	Age > 65 y ($P = .05$) Non-White ($P = .05$)	16.3
Kunze et al [14]	Retrospective	430:>2	Age > 71 y	9
Huijbregts et al [15]	Retrospective	205: 1	Younger age ($P = .038$)	12

Table 2
Preoperative Factors That Achieved Statistical Significance for Dissatisfaction Following Total Knee Arthroplasty.

Reference	Type of Study	Sample Size: Follow-Up Period (Mean Years)	Preoperative Factors	Dissatisfaction Rate %
Bourne et al [3]	Prospective	1,703 pts:1	< 90° flexion ($P = .022$) Extreme pain at rest ($P < .0001$)	11.6
Pronk et al [16]	Retrospective	1,239:2	Lower BMI ($P = .026$) Lower QoL Scores ($P = .024$)	9.8
Khatib et al [9]	Prospective	1,017:1	OSA ($P = .04$) ASA Grade > 2 ($P = .04$)	7
Leppanen et al [10]	Prospective	186:2	KL grade 2 ($P = .003$) Poorer KOOS scores ($P < .05$)	12
Dhurve et al [17]	Prospective	301:3	Depression ($P = .01$) Pain Catastrophizing ($P = .02$) Lower internal locus of control ($P = .02$)	8
Scott et al [18]	Prospective	117:1	KL Grade 1-2 ($P = .003$) Poorer OKS ($P = .004$) Prior Knee Surgery ($P = .004$)	8
Kunze et al [14]	Retrospective	430:>2	Mult. Medical Comorbidities Mult. Drug Allergies Poorer KSS scores	9
Van Onsem et al [19]	Retrospective	113:<1	Poorer KOOS scores ($P < .01$) Poorer OKS scores ($P < .01$) PCS ($P < .01$)	12
Clement et al [20]	Retrospective	1,369:5	Lung Disease ($P = .04$) Depression ($P = .001$) Back Pain ($P < .001$) Poorer WOMAC Pain/Stiffness ($P < .04$)	9.9
Scott et al [21]	Prospective	1,217:1	Poorer SF-12 Mental Scores ($P < .001$) Depression ($P < .001$) Back Pain ($P < .001$) Pain in other Joints ($P = .001$) Poorer OKS Pain/Function ($P < .001$)	5.6
Clement et al [22]	Retrospective	2,392:1	Back Pain ($P < .001$)	5
Schnurr et al [23]	Retrospective	996:>2	KL grade 2 ($P = .001$)	14.8
Ali et al [24]	Retrospective	186:4	Anxiety/Depression ($P < .001$)	15
Ayers et al [12]	Retrospective	4,402:5	Multiple Painful Joints ($P = .01$) Increased BMI ($P = .01$)	12.7

Postoperative Factors

Postoperatively, several studies found an increased dissatisfaction relating to poor functional outcomes. Lin et al found that persistent knee pain and decreased postoperative ROM at 20 months were associated with dissatisfaction ($P < .0001$ and $P = .002$, respectively) [25]. Scott et al and Dhurve et al also found that reduced total ROM, flexion < 90°, and lower postoperative OKS scores corresponded to statistically higher rates of dissatisfaction [17,18]. Also, Clement and Burnett found that patients who had poor postoperative Short Form−12 physical component scores were associated with greater patient dissatisfaction [27].

Unmet expectations were relevant postoperatively. Ghomrawi et al in their retrospective study of 2,279 patients at 2 years found that unmet patient expectations were significantly associated with dissatisfaction following TKA, findings that were similar to Bourne et al at 1 year ($P < .05$) [3,26].

Complications including infection were found to be significant predictors of patient dissatisfaction with Bourne et al, Scott et al, Ali et al, and Ayers et al [3,12,21,24]. Similarly, an increased length of

Table 3
Postoperative Factors That Achieved Statistical Significance for Dissatisfaction Following Total Knee Arthroplasty.

Reference	Type of Study	Sample Size: Follow-Up Period (Mean Years)	Postoperative Factors	Dissatisfaction Rate %
Bourne et al [3]	Prospective	1,703 pts:1	Worse knee functional score ($P < .0001$) Less functional score improvement ($P < .0001$) Not willing to have additional surgery ($P < .0001$) Expectations not met ($P < .0001$) Complications ($P < .0001$)	11.6
Lin et al [25]	Retrospective	374:20 mo	Persistent Knee Pain ($P < .0001$) Decreased ROM ($P = .002$)	10.2
Ghomrawi et al [26]	Retrospective	2,279:2	Unmet Expectations ($P < .05$)	8
Dhurve et al [17]	Prospective	301:3	Discharge to Rehab ($P < .05$) Reduced ROM ($P < .05$) Poorer OKS score ($P < .05$)	8
Scott et al [18]	Prospective	117:1	Poorer OKS score ($P = .004$) Flexion < 90° ($P = .002$) Persistent Knee Pain ($P < .001$) Complications ($P < .001$)	8
Ali et al [24]	Retrospective	186:4	Infection ($P = .03$) Longer LOS ($P < .001$)	15
Ayers et al [12]	Retrospective	4,402:5	Complications ($P < .0001$)	12.7
Clement and Burnett [27]	Retrospective	551:>1	Poorer SF-12 PCS ($P < .001$)	5

stay in the hospital and discharge to rehabilitation were associated with increased dissatisfaction rates [17,24].

Discussion

Following our review, the average rate of patient dissatisfaction was found to be 10%, which is less than what has historically been reported in the literature [7]. This review also sought to determine the common causes of patient dissatisfaction found in the most recent literature to date.

When considering sociodemographic factors, many of the causes for dissatisfaction have previously been demonstrated, including lower financial status, lower education status, and non-White race which were confirmed by this study. These factors themselves are likely not a direct cause of dissatisfaction but are associated with an increased risk of poor outcomes through associated relationships. Patient age in this review had conflicting results with several studies identifying youth as a risk factor for patient dissatisfaction. Younger patients may have higher expectations in restoration of functional status after TKA with desires to return to more physically demanding activities. The studies suggesting older age associated with dissatisfaction may have had patients who had increased medical comorbidities and less improvements in function, thus physiologically older, which has previously been demonstrated by Noble et al [4].

Psychological factors have played an important role in causing dissatisfaction. Since the previous systematic review in 2017 by Gunaratne et al, mental health relating to TKA has become a prominent issue in the literature. PCS is defined as a "negative cognitive-affective response to anticipated or actual pain". Two studies identified PCS as a risk factor for dissatisfaction and 5 others found positive correlation with anxiety, depression, and axial back pain.

Mild OA portends dissatisfaction as seen by Leppanen, Scott, and Schnurr. This is likely due to having pain out of proportion to radiological findings, again involving a psychological component. It should be noted that worse preoperative knee functional scores continue to be a cause of dissatisfaction. Patients who have severe arthritis, deformity, or poor preoperative ROM may not have as considerable results compared to those who do not have these risk factors.

This review is not without its limitations. Like much of the existing literature, there is a paucity of level I or level II studies included in this systematic review. We were also limited by the methodologies of the studies included in this review and were unable to determine the cause for dissatisfaction in many of the cases. Our review also conflicted with several studies in the determination of dissatisfaction. On a Likert scale, the rating of Neutral was not classified as dissatisfied in our review, perhaps underestimating the rate of patient dissatisfaction. However, when calculating dissatisfaction rates that were based on inclusion of Neutral or Uncertain, the dissatisfaction rate still is 13%-14%, lower than historic reports of 20%. In addition, similar to Gunaratne et al, the studies we included also relied on nonvalidated scales and patient-administered questionnaires which can have bias.

Worse functional status postoperatively and complications also continue to be problematic for overall patient satisfaction. These factors are unintended by the operative surgeon with the former possibly being modifiable by recognizing preoperative risk factors. The possibility of complications and their treatment options should also be a conversation to help patients as part of preoperative counseling. When considering the dissatisfaction rate and eliminating studies that included postoperative complications including infection, the average dissatisfaction rate is further reduced to 7.3%. This average dissatisfaction rate is likely a more useful number in preoperative counseling when speaking to patients about TKAs that are functioning well and without complications.

Although the rate of patient dissatisfaction is seemingly decreasing, 10% dissatisfaction is still approximately 100,000 patients annually who are left dissatisfied following TKA and will continue to grow. This systematic review can help the reconstructive surgeon identify modifiable risk factors before surgery and make appropriate referrals for patient optimization. Expectations should also be set with patients preoperatively as unmet expectations have consistently been shown in the literature to be a source of patient dissatisfaction following TKA.

Conclusion

In this review, the average rate of patient dissatisfaction following TKA is approximately 10%. When excluding studies that examined complications, this rate is approximately 7.3%. This systematic review of the literature helps to identify sociodemographic, preoperative, and postoperative risk factors for dissatisfaction.

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