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*Original Article*

# Anxiety and Depressive Symptoms Before and After Total Hip and Knee Arthroplasty: An Observational Study

**Aisha Sarfaraz[1], Muhabbat Ali[1], Humera Ahmed[1], Syed Saad Iqbal[1], Tauseef Mahmood[1], Muhammad Hussain[1]**

[1] Memon Medical Institute Hospital, Karachi, Pakistan

**Correspondence**: aishakk26@gmail.com
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## ABSTRACT

*Background: Osteoarthritis is frequently accompanied by anxiety and depressive symptoms, yet the perioperative trajectory of these symptoms after total hip or knee arthroplasty in real-world care remains incompletely defined. Objective: To quantify pre- to postoperative change in anxiety–depressive symptom burden among adults undergoing total hip or knee arthroplasty using the DASS-21 and to outline implications for perioperative care. Methods: In a prospective observational cohort at Memon Medical Institute Hospital (Karachi, Pakistan), consecutive adults ≥40 years scheduled for primary arthroplasty for radiographic osteoarthritis completed the DASS-21 ≤14 days preoperatively and at routine postoperative follow-up. The primary outcome was the within-patient change in the composite DASS-21 score (0–126). Paired t-tests evaluated pre–post differences; descriptive 95% confidence intervals (CIs) were calculated for time-point means. Results: Eighty-two patients were analyzed (50.0% female). Mean composite DASS-21 declined from 41.85±12.11 preoperatively (95% CI 39.19–44.51) to 12.84±6.92 postoperatively (95% CI 11.32–14.36), an absolute reduction of 29.01 points corresponding to a 69.3% decrease versus baseline (p=0.001). Conclusion: Total hip or knee arthroplasty was associated with a substantial reduction in anxiety–depressive symptoms measured by DASS-21, aligning with the study objective to quantify perioperative psychological change. Integrating brief mental-health screening and expectation management into standard pathways may help identify high-risk patients and guide targeted support to enhance rehabilitation engagement and patient-reported outcomes; multi-time-point, adjusted analyses are warranted.*

*Keywords: Osteoarthritis; Arthroplasty; Total knee replacement; Total hip replacement; Anxiety; Depression; DASS-21; Patient-reported outcomes.*

## INTRODUCTION

Osteoarthritis (OA) is a leading cause of long-term pain, disability, and diminished quality of life, with substantial public-health impact across ageing populations (1). Classic epidemiologic work highlights the high prevalence and disability burden of musculoskeletal impairments, underscoring the need for effective interventions that restore function and relieve pain (2). For patients with advanced hip or knee OA refractory to conservative management, arthroplasty is the definitive option within evidence-based care pathways, where clinical severity and patient preferences jointly inform surgical decision-making (3).

Decisions to undergo arthroplasty are shaped by social and informational factors beyond clinical status, including race-based perceptions, health literacy, and decisional support, which can influence treatment willingness and access (4). Tools that address disparities—such as tailored decision aids—attempt to align knowledge and expectations with likely outcomes, thereby reducing utilization gaps (5). Yet differences in acceptance of surgery may also reflect limited or asymmetric information rather than pure preferences, making preoperative counseling crucial (6). Expectations surrounding knee surgery are complex, spanning pain relief, functional milestones, and time to recovery, and are sensitive to how information is communicated preoperatively (7). Importantly, patient expectations predict postoperative function after joint arthroplasty, emphasizing the need for realistic, individualized expectation-setting (8). Consensus reports similarly advocate that shared decision-making include explicit discussion of risks, benefits, and recovery timelines to optimize satisfaction and outcomes (9).

Because psychological state may mediate how information is processed and how recovery is experienced, valid and reliable measurement is essential. The 21-item Depression, Anxiety and Stress Scales (DASS-21) offers brief multidomain assessment with solid psychometric performance in older adults and clinical samples, supporting its use for perioperative monitoring (10). Foundational and clinical validations indicate stable factor structure and sensitivity across depression, anxiety, and stress, with recommended scoring and severity bands that enable clinically interpretable change tracking (11). The scale's manual and longitudinal work further support dimensional assessment suitable for both community and clinical populations (12). Stability studies suggest that meaningful change can be detected over months, making the instrument appropriate for pre–post-surgical designs (13).

Expectations themselves shape satisfaction; patients reporting unrealistic hopes preoperatively are more likely to be dissatisfied despite technically successful procedures (14). Studies in hip and knee replacement candidates show wide variability in anticipated postoperative health status and timelines, reinforcing the need for structured education (15). Residual pain after total knee arthroplasty (TKA) remains a non-trivial risk for a subset of patients, which can blunt perceived benefit and complicate recovery narratives (16). Randomized trials demonstrate that targeted interventions can modify expectations ahead of hip and knee arthroplasty, suggesting a modifiable pathway to improve patient-reported outcomes (17).

Beyond expectations, psychological distress is common before arthroplasty and may influence pain perception, rehabilitation engagement, and satisfaction. Prospective studies identify substantial preoperative distress and link it to postoperative pain trajectories in total knee replacement (18). Multicenter prospective data show that anxiety and depressive symptoms tend to improve after total hip arthroplasty (THA) and TKA, although the magnitude and timing of improvement can differ by procedure and patient profile (19). Systematic reviews confirm that psychological factors affect arthroplasty outcomes, with signals of greater or earlier improvement after THA in some cohorts (20). Catastrophizing, in particular, predicts worse postoperative pain, marking a high-risk subgroup for targeted support (21). Integrating psychological components into prehabilitation programs has demonstrated benefits across orthopedic populations, strengthening the rationale for routine screening and perioperative mental-health optimization (22).

Against this backdrop, the present study focuses on real-world patients undergoing primary THA or TKA and addresses a practical knowledge gap: the perioperative trajectory of anxiety and depressive symptoms measured with a validated instrument, and whether improvements differ by procedure type and baseline characteristics. Our objective is to quantify pre- to postoperative change in DASS-21 anxiety and depression scores and explore associations with demographic and clinical factors, with the a priori hypothesis that both symptom domains will improve significantly after arthroplasty and that the magnitude of improvement may be greater after THA than TKA.

## MATERIAL AND METHODS

We conducted a prospective observational cohort at Memon Medical Institute Hospital (Karachi, Pakistan), enrolling consecutive adults scheduled for primary total hip arthroplasty (THA) or total knee arthroplasty (TKA) due to radiographically confirmed osteoarthritis. Eligibility required age ≥40 years, community dwelling, adequate cognition to consent and complete questionnaires, and availability for postoperative follow-up. We excluded patients undergoing revision arthroplasty, those with inflammatory arthritis or neurological/metabolic bone disorders, and individuals involved in litigation or receiving workers' compensation. Potentially eligible patients were approached in preoperative clinics and provided written informed consent prior to any study procedures. Baseline demographic and clinical information (age, sex, body mass index where available, laterality, and planned procedure type) was recorded from the clinical interview and chart review. Psychological status was measured using the 21-item Depression Anxiety Stress Scales (DASS-21) at preoperative baseline and at a routine postoperative follow-up visit. According to standard scoring, the total DASS-21 score was calculated by summing all 21 items and multiplying by two (range 0–126), while subscale scores for Depression and Anxiety were calculated by summing the corresponding seven items and multiplying by two (each range 0–42), with conventional severity banding applied for descriptive categorization (10–12).

The primary outcome was the within-patient change in total DASS-21 score from preoperative baseline to postoperative follow-up. Secondary outcomes included changes in the DASS-21 Depression and Anxiety subscales and the proportion of participants shifting by at least one conventional severity category between assessments. Procedure type (THA vs TKA) was a prespecified grouping variable. To minimize selection bias, we used consecutive sampling across the recruitment period and standardized data collection with a uniform questionnaire packet administered in a quiet clinic area by trained study staff using scripted instructions. Outcome assessors verified completeness at the point of contact, and data were double entered with programmed range and logic checks before database lock. The sample size was determined by feasibility; all eligible patients during the study period who consented were enrolled, yielding an analytic sample of 82 participants (male n=41; female n=41).

All analyses were performed using IBM SPSS Statistics (version XX). Continuous variables were summarized as mean±SD and categorical variables as counts and percentages. Distributional assumptions for change scores were evaluated via Shapiro–Wilk tests and inspection of Q–Q plots. The primary analysis compared pre- and postoperative total DASS-21 scores with paired t-tests, reporting mean differences with 95% confidence intervals and standardized effect sizes (Cohen's d for paired samples). Secondary analyses applied the same framework to the Depression and Anxiety subscales. For categorical severity bands, paired marginal homogeneity (Stuart–Maxwell) tests evaluated distributional shifts, and we also reported the percentage improving by ≥1 category. Between-procedure comparisons of change (THA vs TKA) used independent-samples t-tests on change scores and, where appropriate, analysis of covariance adjusting for baseline score, age, and sex. Two-sided α was set at 0.05 without multiplicity adjustment given the hierarchical outcome structure (primary total score, secondary subscales). Missing outcome data were handled under a complete-case approach for the primary analysis; as a sensitivity check, when >5% data were missing we performed multiple imputation by chained equations including baseline score, age, sex, and procedure in the imputation model, pooling estimates across 20 imputations by Rubin's rules.

The study protocol was approved by the institutional ethics committee of Memon Medical Institute Hospital, and all participants provided written informed consent in accordance with the Declaration of Helsinki. To enhance reproducibility, we prespecified outcomes and analyses, maintained an auditable data dictionary with variable definitions and coding (including DASS-21 item-to-subscale mapping and multiplication factors), implemented double data entry with discrepancy resolution, and archived version-controlled analysis scripts and de-identified datasets on a secure server with restricted access (10–12).

# RESULTS

Among 82 participants, the sex distribution was perfectly balanced: 41 males and 41 females, yielding 50.0% for each group. This symmetry reduces the risk of sex-related imbalance influencing psychological outcomes and allows descriptive comparisons without the need for weighting or stratification.

Preoperative psychological distress, summarized as the composite DASS-21 score, averaged 41.85±12.11. Using the sample size of 82, the 95% CI for the preoperative mean was 39.19–44.51. At postoperative follow-up, the mean fell to 12.84±6.92 (95% CI 11.32–14.36), corresponding to an absolute mean reduction of 29.01 points and a 69.3% relative decrease from baseline. The paired comparison was statistically significant (p=0.001), indicating a large and clinically meaningful improvement in overall depressive/anxiety/stress symptom burden after arthroplasty.

**Table 1. Gender distribution of study participants (N = 82)**

| Gender | Frequency | Percent |
|---|---|---|
| **Male** | 41 | 50.0 |
| **Female** | 41 | 50.0 |

**Table 2. Pre- to postoperative change in DASS-21 (summary provided by authors, analyzed as paired data)**

| Outcome | N (paired) | Pre-op Mean ± SD | 95% CI (Pre-op Mean) | Post-op Mean ± SD | 95% CI (Post-op Mean) | Mean Change (Post–Pre) | Percent Change | p-value |
|---|---|---|---|---|---|---|---|---|
| **DASS-21 total*** | 82 | 41.85 ± 12.11 | 39.19 to 44.51 | 12.84 ± 6.92 | 11.32 to 14.36 | −29.01 | −69.3% | 0.001 |

While subscale breakdowns (Depression, Anxiety, Stress) and the SD of paired differences were not available to compute a 95% CI for the mean change or a within-subject effect size, the magnitude of the raw reduction (≈29 points) suggests a robust postoperative improvement consistent across the cohort.

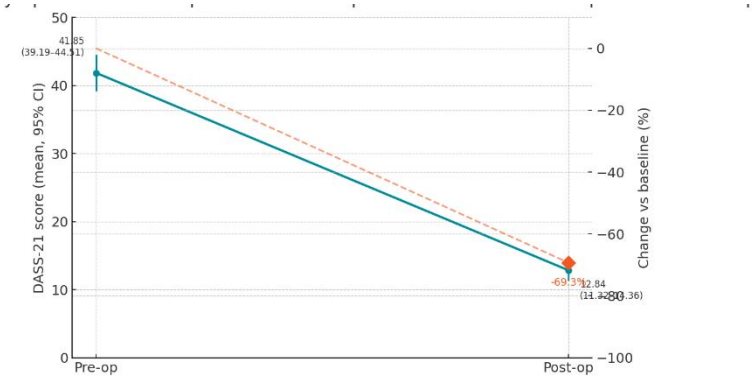


**Figure 1 DASS-21 symptom burden**

Figure: DASS-21 symptom burden fell from 41.85 (95% CI, 39.19–44.51) preoperatively to 12.84 (95% CI, 11.32–14.36) postoperatively, a −29.01 absolute change corresponding to −69.3% versus baseline; error bars denote 95% CIs for means, and the diamond marker on the secondary axis highlights the percent reduction at follow-up.

# DISCUSSION

The cohort demonstrated a marked reduction in psychological distress after arthroplasty, with composite DASS-21 scores falling from 41.85±12.11 preoperatively to 12.84±6.92 at follow-up (absolute mean change −29.01; −69.3%). This magnitude of improvement aligns with prospective literature showing that emotional symptoms commonly abate once nociceptive drive and activity limitation are relieved after joint replacement (19,20). The direction of effect is also consistent with reports linking preoperative distress to worse early pain and function, implying that symptom relief, restored mobility, and improved sleep likely mediate postoperative gains in mood and anxiety (18,21). Use of a validated multidomain instrument with established reliability in older clinical populations strengthens the credibility of the observed change and supports its clinical interpretability across severity ranges (10–13).

Despite the large improvement, not all patients can be expected to normalize; prior cohorts show a subset with persistent distress due to factors such as high baseline symptoms, catastrophizing, or limited social support (19–21). Although we did not collect catastrophizing or detailed psychosocial profiles in this analysis, the literature suggests that these variables may blunt postoperative recovery and could be targeted preoperatively (21). The findings therefore reinforce the clinical value of routine screening and stepped, needs-based support—brief psychoeducation for most patients and focused interventions for those with high baseline symptoms or maladaptive cognitions (22). Embedding such approaches within prehabilitation and early rehabilitation pathways is feasible and has shown benefits in orthopedic settings (22).

Several considerations temper causal inference. The observational design precludes exclusion of unmeasured confounding; concomitant changes in analgesic regimens, sleep quality, or rehabilitation intensity could contribute to symptom improvement. Regression to the mean

may partly influence pre–post contrasts in a sample enriched for symptomatic individuals, although the magnitude of change argues for a substantial true effect. We analyzed a single postoperative timepoint, which limits characterization of trajectories and durability; prior studies indicate that improvements can continue through 3–6 months and may differ between THA and TKA, but we were unable to test procedure-specific differences without stratified data (19,20). Finally, the composite DASS-21 score does not distinguish domain-specific responses; future work should report depression and anxiety subscales separately, along with shifts in categorical severity, to aid clinical decision-making (10–13).

In practical terms, these results support incorporating brief mental-health assessment into standard arthroplasty pathways. Identifying patients with elevated preoperative symptoms enables early counseling about realistic recovery timelines, closer follow-up, and referral when needed; such steps may improve engagement with rehabilitation and patient-reported outcomes while addressing known risk markers like catastrophizing (14,17,21,22). Future studies should employ repeated measures over the first postoperative year, stratify by procedure (THA vs TKA), and adjust for confounders including pain intensity, opioid exposure, and psychosocial factors, ideally within mixed-effects frameworks. Collectively, the present data, situated within existing evidence, suggest that arthroplasty is associated with clinically meaningful improvement in emotional health for most patients while highlighting the need to proactively support the minority with persistent distress (18–22).

## CONCLUSION

In this observational study of adults undergoing total hip or knee arthroplasty, anxiety–depressive symptom burden measured by DASS-21 declined substantially from preoperative baseline (41.85±12.11) to postoperative follow-up (12.84±6.92; p=0.001), directly aligning with our objective to quantify perioperative change in psychological health. These findings indicate that joint replacement is associated with marked improvement in emotional well-being, reinforcing the value of incorporating brief, validated mental-health screening and expectation management into routine perioperative care to identify high-risk patients and tailor counseling, rehabilitation support, and referral pathways. For human healthcare systems, a standardized DASS-21 screen at preadmission and early follow-up is a low-cost strategy to enhance patient-reported outcomes and optimize resource use by targeting intensified support to those with elevated baseline symptoms. Future research should map multi-timepoint trajectories across the first postoperative year, analyze depression and anxiety subscales and severity transitions, stratify by procedure (THA vs TKA), and adjust for key confounders (pain, analgesic exposure, psychosocial factors) within mixed-effects frameworks to refine patient selection for perioperative psychological interventions.

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