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Postoperative Recovery Beyond Pain: The Underrecognized Burden of Sleep and Appetite Impairments After Total Hip and Knee Arthroplasty

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ABSTRACT

Background*:* Postoperative disturbances in sleep and appetite, though common after lower limb arthroplasty, are frequently overlooked despite their significant impact on recovery and quality of life. This study aimed to evaluate the temporal profile of these symptoms and their associations with pain and opioid use.

Methods: A prospective observational study was conducted on 150 patients undergoing elective hip or knee arthroplasty at a tertiary care center in eastern India. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and appetite was measured using the Simplified Nutritional Appetite Questionnaire (SNAQ) at four time points: preoperatively and at 1 week, 1 month, and 3 months postoperatively. Pain (Visual Analog Scale) and opioid intake were also evaluated. Subdomain analysis of PSQI was performed, and subgroup comparisons were made between THR and TKR groups.

Results: Sleep and appetite declined markedly in the first postoperative week (PSQI: 4.2±1.8 to 9.1±2.5; SNAQ: 16.0±1.5 to 13.1±2.2; both $p<0.001$), followed by gradual recovery by 3 months. Sleep latency, sleep disturbances, and daytime dysfunction were the most affected subdomains. TKR patients exhibited more severe sleep disruption and higher opioid consumption compared to THR patients. Poor sleep and appetite were positively correlated with pain severity and opioid dosage ($p<0.01$).

Conclusion: Sleep and appetite disturbances are multifactorial in the early postoperative period following arthroplasty. Their association with pain and opioid use underscores the need for early identification and comprehensive management. Multidisciplinary approaches incorporating analgesic optimization and nutritional counselling are recommended to enhance recovery and patient satisfaction.

Key-words: Appetite loss, pain management, postoperative recovery, sleep disturbance, total joint arthroplasty

INTRODUCTION

Total hip replacement (THR) and total knee replacement (TKR) are gold standard surgeries for end-stage osteoarthritis and other disabling joint diseases. These surgeries are successful in the relief of pain, improvement of joint function, and enhancement of the quality of life [1]. Owing to aging populations and increased longevity, the requirement for joint arthroplasty will be significantly high in the next few decades [2].

Even with the recognized advantages of these operations, recovery after surgery is usually multifaceted, including not just physical rehabilitation but also pain control issues, mobility issues, psychological issues, and patient satisfaction [3]. Of these

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issues, disturbances of sleep and appetite loss are common but less systematically addressed or researched.

Sleep is important in postoperative recovery, affecting immune function, tissue healing, and emotional coping [4]. Disturbed sleep has been shown to increase pain perception, impair healing, and lead to mood disorders [5,6]. Just like sleep, appetite and food intake are also important to balance the enhanced metabolic needs associated with major surgery [7]. A low appetite can jeopardize nutritional status, slow down recovery, and lengthen hospital stay [8].

Previous studies on the recovery phase post joint replacement have mainly focused on pain relief, functional results of the joint and alignment. Reliable information regarding the prevalence and etiology of postoperative sleep and appetite disorders is limited, and most studies were retrospective or anecdotal. To develop directed interventions, the course and risk factors of these symptoms must be studied along with the specific domains of sleep that are affected.

Our study seeks to address this gap by prospectively assessing sleep and appetite variation in patients undergoing hip or knee arthroplasty, with special regard to temporal patterns and determining factors, including pain and opioid consumption.

MATERIALS AND METHODS

Study Design and Setting- This prospective observational study was carried out in a tertiary care orthopaedic hospital from Jan 2024 to Mar 2025. The institutional ethics committee provided ethical approval, and written informed consent was provided by all participants.

Participants were patients between 50 to 80 years old, who were undergoing primary elective THR or TKR for osteoarthritis. Revision surgery, inflammatory arthropathies, diagnosed psychiatric illness, cognitive impairment, or pre-existing sleep disorders were the criteria to exclude any such patients from the study to ensure a homogenous group and elimination of confounding factors.

Data Collection- Demographic and clinical information, such as age, sex, BMI, comorbidities, and osteoarthritis symptom duration, was collected. Arthroplasty type (hip or knee), anesthetic, and perioperative practices were uniform across participants to remove procedural heterogeneity. Baseline features were compared to find any discrepancies between the hip arthroplasty and knee arthroplasty groups.

Sleep Assessment- The Pittsburgh Sleep Quality Index (PSQI) was employed for measuring subjective sleep quality. The PSQI is comprised of 19 self-reported questions and five bedpartner or roommate-rated questions and contains items for sleep duration, latency, disturbance, and daytime dysfunction [9]. The latter five questions are employed for clinical use only, are not included in the tabulation of scoring for the PSQI, and are not reported on in this paper. The 19 self-report items are grouped into seven components, which are subjective sleep quality,

sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The seven components are weighted equally on a 0-3 scale. The seven component scores are summed to produce a global PSQI score, which ranges from 0-21; higher values reflect poorer sleep quality. A sum score >5 was taken as a cutoff to determine poor sleep quality. Testing was conducted at baseline (1 week pre-op), 1 week, 1 month, and 3 months post-op.

Appetite Assessment- Simplified Nutritional Appetite Questionnaire (SNAQ) was used to measure appetite and food consumption [10]. It is a 4-question tool that is derived from the Council of Nutrition appetite questionnaire (CNAQ), and can have a score of 4 to 20. Scores below 14 indicate the risk for important weight loss and decreased appetite.

Other Variables- Postoperative pain was measured on the Visual Analog Scale (VAS) from 0 (no pain) to 10 (worst possible pain) [11]. Opioid intake was documented from patients' records and standardized to morphine-equivalent doses [12].

Statistical Analysis- Descriptive statistics were employed on baseline variables. Time trends in PSQI and SNAQ scores were examined with repeated measures ANOVA. Pearson correlation was used to examine relationships between sleep/appetite scores and pain or opioid intake. Significance was deemed at $p<0.05$. SPSS v25.0 was used to analyse the data. Subgroup analysis was also performed to determine if sleep and appetite outcomes differed between knee and hip arthroplasty.

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RESULTS

A total of 150 patients were included in the final analysis. Eighty patients underwent TKR and 70 patients underwent THR. The mean age of the cohort was 67.2±7.8 years, and 93 subjects (62%) were female. The mean BMI was 27.3±3.9 kg/m². The comorbidities most commonly encountered were hypertension (45%), diabetes mellitus (32%), and ischemic heart disease (12%). Demographic and baseline sleep/appetite scores did not differ between the two surgical groups.

PSQI scores at baseline were consistent with reasonably good sleep quality (mean 4.2±1.8). At 1-week post-surgery, mean PSQI scores increased significantly to 9.1±2.5 (p<0.001), in keeping with poor sleep quality. Sleep latency and disturbances were the most adversely affected subdomains. At 1 month, PSQI scores had decreased to 6.3±2.1 and at 3 months to 4.8±1.9, returning close to baseline values. The time profile was comparable in both hip and knee arthroplasty groups, although knee replacement patients had higher initial PSQI scores (Fig. 1).

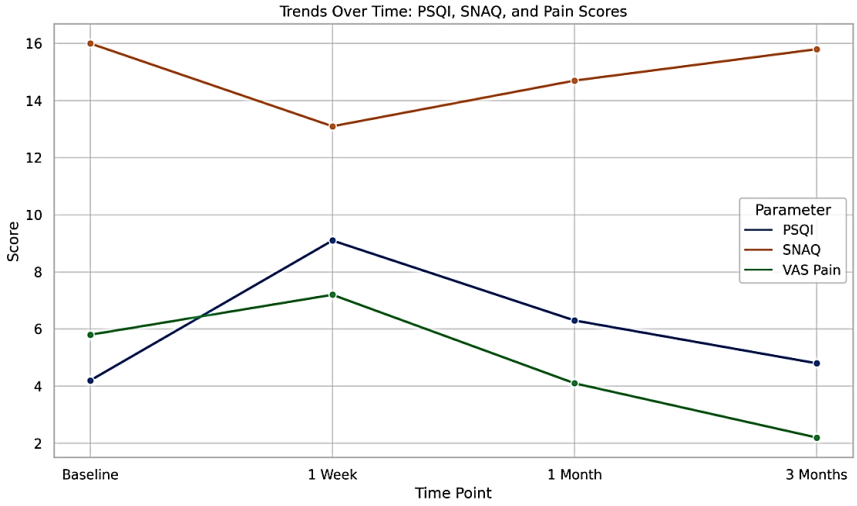

Fig. 1: Temporal trends: sleep, appetite and pain scores

A detailed analysis of the seven subdomains of PSQI showed significant worsening in various dimensions of sleep quality in the early postoperative period, and gradually improving subsequently (Table 1).

Table 1: Comparison of PSQI Subdomain Scores Over Time (n=150)

PSQI Component	Baseline (Mean±SD)	1 Week Post-op (Mean±SD)	1 Month Post-op (Mean±SD)	3 Months Post-op (Mean±SD)	p-value
Subjective Sleep Quality	0.7±0.5	1.8±0.4	1.2±0.6	0.8±0.5	<0.001
Sleep Latency	0.9±0.6	2.3±0.5	1.4±0.6	1.0±0.5	<0.001
Sleep Duration	0.6±0.4	1.5±0.6	0.9±0.5	0.7±0.4	<0.001
Habitual Sleep Efficiency	0.5±0.4	1.3±0.5	0.8±0.4	0.6±0.3	<0.001
Sleep Disturbances	0.8±0.3	2.0±0.4	1.2±0.4	0.9±0.3	<0.001
Use of Sleep Medication	0.2±0.1	0.6±0.2	0.4±0.2	0.2±0.1	0.002
Daytime Dysfunction	0.5±0.3	1.6±0.5	1.0±0.4	0.6±0.3	<0.001

At 1 week following surgery, sleep latency (mean score: 2.3±0.5) and sleep disturbances (2.0±0.4) were the most severe impairments, both of which were significantly higher than the baseline (0.9±0.6 and 0.8±0.3, respectively; p<0.001). Subjective sleep quality, sleep duration, and habitual sleep efficiency also showed dramatic deterioration at 1 week, all with statistically significant changes (p<0.001).

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Daytime dysfunction also increased significantly postoperatively (1.6±0.5 at 1 week vs 0.5±0.3 at baseline; p<0.001), reflecting the carryover effect of nighttime poor sleep into the daytime. There was a modest increase in use of sleep medication at 1 week (0.6±0.2), though overall usage remained low and declined back to near-baseline levels by 3 months.

All subdomain scores were significantly improved by 1 month postoperatively from week 1, and by 3 months, nearly all domains had returned almost to baseline, signifying considerable recovery in overall sleep quality (Fig. 2).

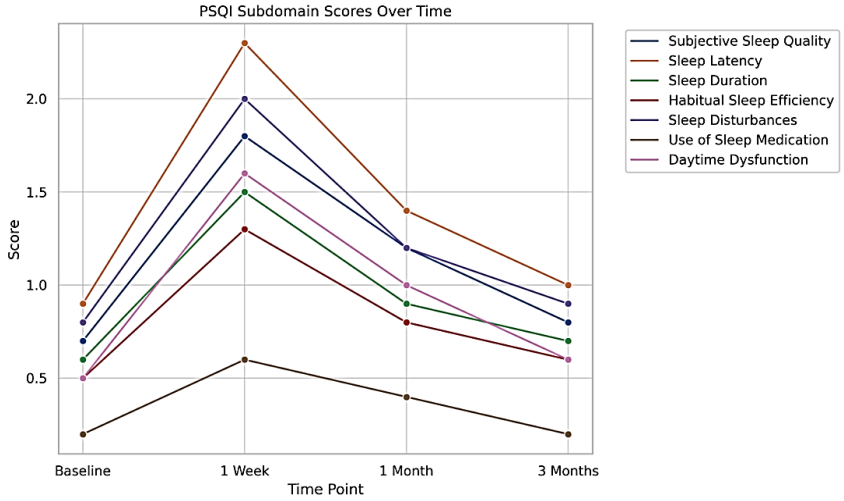

Fig. 2: Trends in PSQI subdomain scores over time

These findings confirm that disturbance of sleep after total joint arthroplasty is multifactorial, transient, and most incapacitating within the first postoperative week, especially impairments in latency and sleep disturbance-related domains.

Pain intensity reached its peak in the first postoperative week at a mean VAS score of 7.2±1.1. This declined gradually to 5.0±1.3 at 1 month and to 2.2±0.9 at 3 months (p<0.001). An accompanying trend was seen for opioid use, which was maximal at 1 week (mean morphine-equivalent dose of 45.6±8.3 mg), decreasing to 26.7±5.6 mg at 1 month and only 3.4±1.5 mg at 3 months (p<0.001). These results parallel well with PSQI and SNAQ score improvement, indicating the contribution of pain control to sleep and appetite recovery (Table 2).

Table 2: Temporal progression of post-operative pain and opioid use

Time Point	Mean VAS Pain Score (0–10)	Mean Opioid Use (mg Morphine Equivalents)
Baseline (pre-op)	5.8±1.2	0
1 Week Post-op	7.2±1.1	45.6±8.3
1 Month Post-op	4.1±1.0	18.2±6.1
3 Months Post-op	2.2±0.9	3.4±1.5
p-value	<0.001	<0.001

The mean preoperative SNAQ score in the cohort was 16.0±1.5. Seven days after surgery, mean scores declined to 13.1±2.2 (p<0.001), in accordance with reduced appetite. Improvement was gradual in 1 month (14.7±1.9) and 3 months (15.8±1.7). Lowest scores were found in patients with elevated postoperative pain and protracted nausea. Appetite decrease was slightly more evident in THR patients, possibly due to longer operative time.

Correlation analysis showed high correlations between sleep disturbances and appetite disturbances after surgery and major clinical variables such as pain and opioid intake. PSQI scores 1 week after surgery were significantly positively correlated with pain severity

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(r=0.54, p<0.001), showing that greater pain severity was linked with worse sleep quality. A similar moderate positive association was also observed between PSQI and opioid use (r=0.38, p=0.002), indicating that increased opioid use might exacerbate sleep disturbance, possibly through changes in sleep architecture or perhaps through carryover sedation.

In contrast, SNAQ scores negatively correlated strongly with pain scores (r=-0.46, p<0.001), highlighting the contribution of pain as an important factor in diminished appetite. Opioid intake also inversely correlated with SNAQ (r=-0.29, p=0.01), possibly reflecting recognized gastrointestinal side effects of nausea and early satiety. These findings highlight the multidimensional etiology of sleep and appetite disturbances in the postoperative setting (Fig. 3).

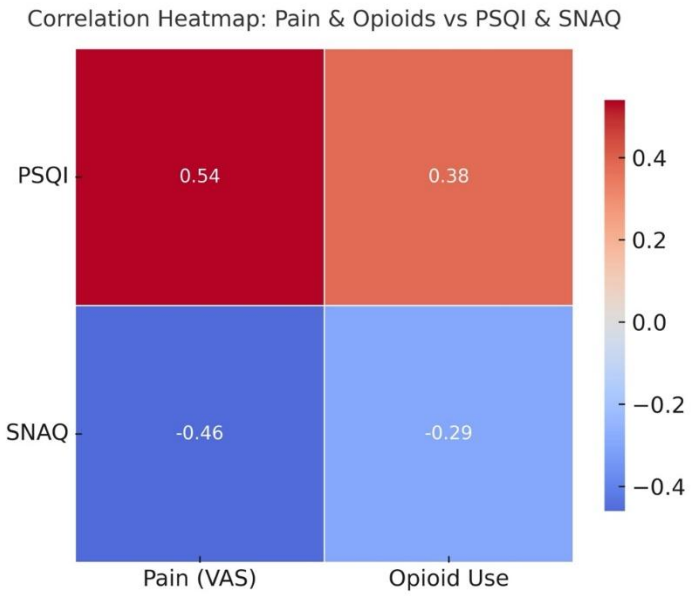

Fig. 3: Correlation Heatmap (Pain, Opioids vs PSQI & SNAQ)

A subgroup comparison was performed to assess differences between patients with TKR and THR. TKR patients had poorer sleep at 1 week postoperative, with a greater mean PSQI score (9.6±2.3 vs. 8.5±2.6; p=0.04). They took more opioids on average as well (47.1±8.0 mg vs. 43.9±8.6 mg; p=0.05). Yet, no difference in SNAQ scores was found between the groups (13.0±2.1 vs. 13.2±2.3; p=0.61), indicating similar appetite effects

At 1 month, TKR patients continued to demonstrate marginally higher PSQI scores (6.7±2.0 vs. 5.9±2.3; p=0.09) and pain scores (VAS: 4.3±1.1 vs. 3.9±1.2; p=0.12), although the differences were not statistically significant. At 3 months, outcome metrics between the two groups had largely equalized. PSQI scores (TKR: 4.9±1.8 vs. THR: 4.7±1.9; p=0.58) and VAS pain scores (TKR: 2.3±0.8 vs. THR: 2.1±0.9; p=0.44) showed no significant difference. Likewise, opioid use (TKR: 3.6±1.4 mg vs. THR: 3.2±1.5 mg; p=0.27) and SNAQ scores (TKR: 15.7±1.6 vs. THR: 15.9±1.8; p=0.49) were nearly identical (Table 3).

Table 3: Pain, sleep and appetite: TKR vs THR

Parameter	Time Point	TKR Group (n=80)	THR Group (n=70)	p-value
PSQI Total Score	1 Week	9.6±2.3	8.5±2.6	0.04
	1 Month	6.7±2.0	5.9±2.3	0.09
	3 Months	4.9±1.8	4.7±1.9	0.58
SNAQ Total Score	1 Week	13.0±2.1	13.2±2.3	0.61
	1 Month	14.5±1.8	14.9±2.0	0.37
	3 Months	15.7±1.6	15.9±1.8	0.49

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Pain Score (VAS)	1 Week	7.4±1.0	7.0±1.2	0.08
	1 Month	4.3±1.1	3.9±1.2	0.12
	3 Months	2.3±0.8	2.1±0.9	0.44
Opioid Use (mg morphine eq.)	1 Week	47.1±8.0	43.9±8.6	0.05
	1 Month	19.4±6.0	16.8±6.2	0.06
	3 Months	3.6±1.4	3.2±1.5	0.27

DISCUSSION

This research proves that both sleep disturbances and appetite suppression are significant but largely temporary issues after total knee or hip replacement. Both symptoms are maximal in the early postoperative course and resolve over the course of three months along a trajectory closely mirroring recovery of pain, opioid dosage reduction, and psychological stabilization [14-16].

The significantly worsened sleep quality, as determined by the PSQI, conforms with previous research indicating poor postoperative sleep after major orthopedic surgery [3,14,15,17,18]. Nonetheless, our subdomain analysis provides greater insight and depth into these findings. Sleep latency, disturbances, and daytime dysfunction were affected most severely, reflecting both difficulties falling asleep and decreased sleep continuity. Notably, the use of sleep medication was modest across the board, indicating that non-pharmacological sleep aids were not adequately used. These trends highlight the importance of non-pharmacologic sleep hygiene practices and effective pain control in the initial stage of recovery.

Postoperative sleep disturbance following joint replacement surgery is multifactorial, the main culprits being surgical stress, pain, inflammatory cytokines, hormonal changes (e.g., cortisol and catecholamine response), opioid use, and environmental factors like noise and temperature. These disruptions are exacerbated by sympathetic activation and reduced REM and slow-wave sleep [13,19].

Pain was a primary cause behind both sleep disturbance and loss of appetite. Our findings identified a robust association between VAS pain ratings and PSQI/SNAQ scores, most notably at the 1-week point. Further, opioid use also tracked along these lines-high early postoperatively and decreasing as patients recovered. This lends support to the hypothesis that inadequately controlled postoperative pain not only deranges sleep architecture but also inhibits appetite, potentially through neurohormonal and stress-related pathways [20,21]. This finding may guide enhanced recovery protocols by emphasizing multimodal analgesia to mitigate these secondary effects.

The subgroup comparison between sleep and appetite scores of TKR and THR patients brought out several clinically relevant findings. Although similar appetite patterns were observed in both groups, TKR patients reported significantly inferior sleep quality and higher opioid use in the early recovery phase. This could be due to the increased soft tissue trauma and resultant inflammatory reaction associated with knee arthroplasty [13]. Notwithstanding similar postoperative appetite scores between the groups, the additional pain burden in TKR recipients highlights the need for personalized pain control regimen to enhance the overall recovery experience.

These observations have practical implications for patient counseling and perioperative management. Informing patients about the anticipated timetable of symptom resolution can reduce anxiety and enhance satisfaction. In addition, clinicians must be watchful during the initial postoperative month—a critical period for tackling sleep and appetite disturbances before they evolve into chronic issues of mental health and nutrition.

Although the research is valuable, our limitations are the observational design and the use of self-reported questionnaires, which introduce possible reporting bias. Objective assessment using actigraphy or polysomnography was not performed. A single-centre design could also reduce generalizability. Multicenter studies with objective assessments are needed. Cultural dietary patterns, sleeping environments, and pain tolerance can also differ among populations, so region-specific modification of findings is necessary.

CONCLUSIONS

Sleep and appetite disturbances are common but underappreciated problems during the initial recovery phase after total hip or knee arthroplasty. Sleep quality—specifically in relation to sleep latency,

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interruption, and daytime dysfunction—was significantly correlated with increased postoperative pain and opioid consumption. In the same way, decreased appetite was correlated with pain intensity. Patients undergoing total knee replacement were found to experience more initial sleep disturbance and more opioid use than their hip replacement counterparts, indicating the possibility that joint-specific recovery pathways might require individualized management plans.

These results affirm the imperative need for a multidisciplinary postoperative protocol for arthroplasties. Multimodal analgesia for pain relief, psychological support, and sleep and nutritional hygiene promotion can enhance patient-reported outcomes and decrease the risk for long-term functional impairment. Objective sleep and dietary outcome measures and examination of targeted interventions are recommended for future studies to validate these results.

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