Research

The Relationship Between Preoperative Anxiety Level and Postoperative Pain Outcomes in Total Hip and Knee Replacement Surgery: A Cross-sectional Study

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A B S T R A C T

Purpose: Preoperative anxiety is considered a common part of the surgerical experience and can be associated with serious postoperative side effects. This study aims to determine the relationship between preoperative anxiety level and postoperative pain outcomes in patients undergoing total hip replacement (THR) and total knee replacement (TKR).

Design: The study used a cross-sectional and correlational research method.

Methods: The study was conducted with a total of 104 participants, who underwent 17 THR and 87 TKR, at the Orthopedic Clinic of a state hospital in southern Pakistan between June 2021 and June 2022. The State-Trait Anxiety Inventory (STAI) was used to determine preoperative anxiety level, and the Visual Analog Scale (VAS) and the Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R) were used to assess postoperative pain level.

Findings: The mean preoperative STAI-I and STAI-II scores of the participants who underwent THR and TKR were 53.95 ± 10.51 and 44.20 ± 10.55, respectively. There was a moderate positive correlation between STAI-I scores and VAS pain scores at preoperative and postoperative 6th, 12th, 24th, and 36th hours. There was a moderate positive correlation between STAI-I scores and affective subdimension scores, a moderate positive correlation with pain severity and sleep interference and activity interference, and a weak positive correlation between STAI-II scores and pain severity and sleep interference, activity interference and affective. The factors independently affecting the 6th-hour VAS pain score were determined as male gender, THR procedure, and increasing STAI score.

Conclusions: We found that high preoperative state anxiety was associated with early postoperative pain outcomes. State anxiety was associated with pain in the 6th postoperative hour. Considering the multidimensional nature of anxiety, further research is recommended to understand the anxiety domain in surgical patients.

Preoperative anxiety is a vague feeling of fear, excitement, apprehension, or panic, usually caused by unknown circumstances, perceived risk of death, discomfort, fear of postoperative pain, change in body shape or function, and family unrest.[1,2] Preoperative anxiety is considered a common part of the surgical experience and can be associated with serious side effects after surgery.[1] In orthopedic surgery, several situations can cause anxiety, including pain, worrying about life after surgery, and wondering if function will be the same after surgery.[3] A certain level of anxiety in the preoperative setting is a universal characteristic, and the prevalence of anxiety in the literature ranges from 8% to 80%.[4,5] Nurses can encounter anxious individuals in any environment[6] and play an important role in relieving anxiety.[2] Anxiety is more common in the elderly population,[6] and the literature has reported that the risk of experiencing anxiety increases in total hip replacement (THR) and total knee replacement (TKR) surgery, which is generally performed on elderly individuals.[6,7]

Pain is an inevitable consequence of surgery. As pain is a subjective experience and multidimensional, managing pain is challenging. Postoperative pain is inadequately managed in more than

80% of surgical patients and is associated with increased morbidity, impaired recovery from surgery, and reduced quality of life.[8]

Joint replacement surgery, which aims to improve quality of life and maintain the highest possible functionality, mobility, and relief from pain,[7] has been recognized as the most successful intervention for osteoarthritis, 1 of the 10 most disabling diseases in the world.[9] Hip and knee joints are the most commonly replaced joints in joint replacement surgery.[7] The expected increase in the number of joint replacement surgeries in the coming years has made it a priority to identify preoperative factors that may explain patient care outcomes in the orthopedic surgery unit.[10] Severe postoperative pain remains a significant problem, occurring in 20% to 40% of patients.[11] Studies of orthopedic surgery patients show that 40% to 70% experience moderate to severe pain after surgery.[12-14]

Since most THR and TKR surgeries are performed to reduce preoperative chronic pain, the presence of postoperative pain negatively affects patients' surgical expectations.[15] Postoperative pain associated with THR and TKR can be difficult to manage and may lead to decreased patient satisfaction, poor rehabilitation adherence, and longer length of stay.[16]

This study aimed to determine the prevalence of preoperative anxiety in patients undergoing THR and TKR and to determine the relationship between preoperative anxiety and postoperative pain outcomes.

Method

Design and Sample

This study was designed as a cross-sectional and correlational study. It was conducted in the Orthopedics Clinic of a state hospital in southern Turkey between June 2021 and June 2022, with participants who agreed to participate in the study and met the inclusion criteria. A total of 122 patients were included in the study, 90 of whom underwent knee replacement and 32 hip replacement. Of the participants, 18 were excluded from the study, including 3 knee prostheses and 15 hip replacements, whose postoperative eligibility was impaired (transferred to the intensive care unit). Inclusion criteria were to be 18 years of age or older, to speak and understand Turkish, to have no hearing impairment, and to have an American Society of Anesthesiologists score of I and II. Participants who were transferred to the intensive care unit after surgery were excluded from the study.

Data Collection Tools

The research data were collected with the Individual Identification Form, State-Trait Anxiety Inventory (STAI), Visual Analog Scale (VAS), and the Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R).

Individual Identification Form

The Individual Identification Form, created by the researchers in line with the literature[3,17,18] was used to collect age, gender, education level, history of previous surgery, and clinical data.

State-Trait Anxiety Inventory

STAI is a self-report scale developed to measure anxiety. This scale includes two scales, STAI-I and STAI-II, each with 20 questions answered on a 4-point Likert scale.[19] In the STAI-I, the four response options are "(1) Never, (2) A little, (3) A lot, and (4) Completely," whereas in the STAI-II, "(1) Almost never, (2) Sometimes, (3) Very often, and (4) Almost always." The total score value obtained from each scale can vary between 20 and 80. A high score indicates a high level of anxiety.[20] Spielberger et al[19] reported Cronbach's α coefficient as 0.73 to 0.86 for STAI-I and 0.86 to 0.93 for STAI-II. In the Turkish adaptation, validity, and reliability study of the STAI, the Cronbach's α coefficient for the STAI-I was reported as 0.83 to 0.92 and for the STAI-II as 0.86 to 0.92.[20] In this study, the reliability coefficients for the STAI-I and STAI-II were 0.93 and 0.93, respectively.

Visual Analog Scale

VAS is a standardized scale used to assess the intensity of pain. Pain intensity is indicated by "Absence of pain = 0" and "Most severe pain = 10" and evaluated between "0 and 10 points." The VAS is frequently used in postoperative pain assessment.[21]

Revised American Pain Society Patient Outcome Questionnaire

The APS-POQ-R is a 23 question scale, the final version of which was revised and published by Gordon et al[22] in 2010. The APS-POQ-R measures five important aspects of the patients experience of pain and a sixth aspect of non-pharmacological treatments; pain severity and relief, impact of pain on activity, sleep, and negative emotions, side effects of treatment, helpfulness of information about pain treatment, ability to participate in pain treatment decisions, and use of nonpharmacological strategies. Cronbach's α coefficient of the revised 2010 scale was reported as 0.86.[22] The validity and reliability of the Turkish version of the APS-POQ-R were conducted by Keskin et al[23], and it was reported to be a reliable and valid measurement tool for assessing patient scores and pain management quality for patients undergoing surgical operations and for nursing process planning.

The APS-POQ-R measures the five dimensions of the pain management quality. Five subscales, which consisted of a total of 18 items, include pain severity and sleep interference (5 items; 1–3, 4c and d); activity interference (2 items; 4a and b); affective (4 items; 5a–d); adverse effects (4 items; 6a–d); and perceptions of care (3 items; 7–9) subscales. The Cronbach's α coefficient of the Turkish scale was reported as 0.91. Cronbach's α coefficients for the subscales are 0.87 for pain severity and sleep interference, 0.92 for activity interference, 0.95 for affective, 0.91 for adverse effects, and 0.50 for perception of care.[23] In this study, Cronbach's α reliability coefficient was calculated as 0.83 for the whole questionnaire, and the subdimensions of the questionnaire were calculated as 0.89 for pain severity and sleep interference, 0.86 for activity interference, 0.83 for affective, 0.40 for adverse effect, and 0.41 for perception of pain care.

Data Collection Procedure

Approval of the Clinical Research Ethics Committee of the University Akdeniz (decision number 133/2021) and written permission from the hospital in which the study was to be conducted were obtained before starting the study. Written permission was obtained from the authors of the Turkish validity and reliability studies of scales used in this study. The purpose of the study was explained to the individuals who met the inclusion criteria, the data collection forms were explained, and their "Informed Consent" was obtained in writing by informing them that "the results obtained from the study can be published by keeping their identity information confidential."

Data were collected in three stages: two preoperative stages and one postoperative stage. In the first stage, the Individual Identification Form and STAI-II were completed the day before surgery by patients hospitalized in the clinic for THR and TKR. In the second stage, STAI-I was filled out on the morning of the surgery. Preoperative pain assessment was performed with VAS. In the third stage, the results of pain assessment between the 6th, 12th, 24th,

and 36th hours postoperatively were recorded with VAS. The APS-POQ-R was administered within 25th to 72nd hours postoperatively to evaluate the participants' pain management in the first 24 hours postoperatively.

Data Analysis

IBM SPSS 23.0 package program (IBM Corp) was used to analyze the data. Descriptive statistics were given as frequency (n), percentage (%), mean, standard deviation, median, minimum and maximum values. The normality assumption of the data was checked with the Shapiro-Wilk test. The difference between continuous variables according to independent groups was evaluated with the Mann-Whitney U test and Kruskal-Wallis test when they did not fit the normal distribution and with the independent *t* test and one-way ANOVA when they did. Bonferroni correction was used in posthoc tests for significant results in nonparametric comparisons of three or more groups, and the Tukey HSD (Honestly Significant Difference) test was used as a posthoc test for significant results in parametric comparisons. The relationship between STAI, APS-POQ-R, preoperative and postoperative VAS pain scores, age, body mass index, and duration of surgery was analyzed with the Pearson and Spearman correlation test. Cronbach's α reliability coefficient was calculated to analyze the internal consistency of the scales. Multiple linear regression analysis was used to analyze the factors independently associated with the participants' postoperative 6th- and 12th-hour VAS pain scores. In the research data analysis, *P* values less than .05 were considered statistically significant.

Results

The mean age of 104 participants who underwent 87 knee prostheses and 17 hip prostheses was 65.86 ± 10.05 (min: 27 to max: 88). Descriptive and surgical characteristics of the participants are shown in Table 1.

The mean STAI and APS-POQ-R subscale scores and Cronbach's α values are given in Table 2. The mean STAI-I score was 53.95 ± 10.51, and the mean STAI-II score was 44.20 ± 10.55.

The mean postoperative APS-POQ-R subscale scores of the participants were 5.94 ± 1.33 for pain severity and sleep interference, 6.49 ± 1.61 for activity interference, 3.1 ± 1.65 for affective, 6.58 ± 4.40 for adverse effect, and 6.66 ± 1.47 for perception of care.

Preoperative and postoperative mean VAS pain scores and correlation analysis results with STAI scores are shown in Table 3. The median preoperative VAS pain score was 3 (min-max: 1 to 8), postoperative; 6 hours 8 (min-max: 4 to 10), 12 hours 7 (min-max: 5 to 10), 24 hours 6 (min-max: 4 to 9), and 36 hours 6 (min-max: 4 to 8). There was a moderate positive correlation between STAI-I and preoperative (r = 0.523; $P < .001$), postoperative 6th hour (r = 0.557; $P < .001$), 12th hour (r = 0.498; $P < .001$), 24th hour (r = 0.599; $P < .001$), and 36th hour (r = 0.553; $P < .001$) pain scores. A weak positive correlation was observed between STAI-II scores and postoperative pain scores at 12 hours (r = 0.215; $P = .028$) and 24 hours (r = 0.259; $P = .008$). No significant relationship was detected between STAI-II scores and postoperative 6th (r = 0.131; $P = .184$) and 36th (r = 0.179; $P = .069$) hour pain scores.

The results of the "Correlation analysis between APS-POQ-R scores and STAI scores" of the participants are presented in Table 4. A strong positive correlation was found between the STAI-I scores of the participants and the affective subscale scores (r = 0.626; $P < .001$), and a moderate positive correlation was found between the pain severity and sleep interference (r = 0.595; $P < .001$) and activity interference (r = 0.553; $P < .001$) subscale scores. There was a weak positive correlation between the STAI-II scores of the participants and the pain severity and sleep interference (r = 0.249; $P = .011$), activity interference subscale (r = 0.252; $P = .010$), and affective (r = 0.286; $P = .003$) subscale scores.

Table 1
Distribution of Descriptive and Surgical Characteristics of the Participants (n = 104)

Variables	Mean ± SD	Median (Min-Max)
Age (y)	65.86 ± 10.05	67(27-88)
BMI (kg/m²)	30.22 ± 4.08	29.67(22.66-46.84)
	n	%
Gender		
Female	78	75.0
Male	26	25.0
Education level		
Literate/primary school graduate	88	84.6
Secondary school graduate	11	10.6
High school graduate	5	4.8
Working status		
Working	5	4.8
Not working/retired	99	95.2
Marital status		
Single	22	21.2
Married	82	78.8
Income status		
Income less than expenses	78	75.0
Income equals expense	26	25.0
Smoking		
Yes	13	12.5
No	91	87.5
Number of people living together		
Alone	9	8.7
With 1 person	44	42.3
With 2-4 people	38	36.5
With 5 or more people	13	12.5
History of surgery		
There is	47	45.2
None	57	54.8
Number of previous surgeries (n = 47)		
1 time	25	53.2
2 times	16	34.0
3 and above	6	12.8
Applied surgical intervention		
Total hip prosthesis	17	16.3
Total knee prosthesis	87	83.6
Type of surgery		
Urgent	14	13.5
Elective	90	86.5
Level of knowledge about the surgery		
Partially	37	35.6
Enough	47	45.2
Completely	20	19.2
ASA score		
ASA 1	2	1.9
ASA 2	102	98.1
Sleep time before surgery		
0-3 h	27	26.0
3-6 h	66	63.5
6 h or more	11	10.6
Type of anesthesia		
General anesthesia	5	4.8
Combined (spinal-epidural)	24	23.1
Spinal	75	72.1

ASA, American Society of Anesthesiologists; BMI, body mass index; SD, standard deviation.

The factors independently affecting the patients' 6th-hour VAS pain score were analyzed by multiple linear regression analysis in Table 5. As a result of the analysis, male gender (β = 0.187; $P = .023$), THR procedure (β = 0.253; $P = .015$), and increasing STAI-I score (β = 0.365; $P < .001$) increased the 6th-hour pain score.

Discussion

This study aimed to determine the relationship between preoperative anxiety level and postoperative pain outcomes in TKR and THR surgery, commonly performed in orthopedic surgery. In this

Table 2
Distribution of STAI and APS-POQ-R Subscale and Item Scores

Subscales	Mean ± SD	Min	Max	Cronbach's α
STAI				
STAI-I	53.95 ± 10.51	31	79	0.93
STAI-II	44.20 ± 10.55	25	63	0.93
APS-POQ-R				
1. Pain severity and sleep interference subscale	5.94 ± 1.33	3.2	8.8	0.89
Least pain	4.98 ± 1.41	2	8	
Worst pain	8.39 ± 1.14	6	10	
Percentage of time in severe pain	7.13 ± 1.51	4	10	
Pain interfered falling asleep	4.77 ± 1.74	1	9	
Pain interfered staying asleep	4.44 ± 2.04	0	8	
2. Activity interference subscale	6.49 ± 1.61	3	9.5	0.86
Pain interfered activities in bed	6.01 ± 1.7	1	9	
Pain interfered activities out of bed	6.97 ± 1.74	3	10	
3. Affective subscale	3.1 ± 1.65	0	6.5	0.83
Pain caused to feel anxious	4.42 ± 1.8	0	9	
Pain caused to feel depressed	1.77 ± 1.97	0	7	
Pain caused to feel frighten	3.39 ± 2.18	0	8	
Pain caused to feel helpless	2.83 ± 2.18	0	8	
4. Adverse effect subscale	6.58 ± 4.4	0	18	0.40
Nausea	1.7 ± 2.1	0	7	
Drowsiness	3.24 ± 2.4	0	8	
Itching	0.26 ± 0.74	0	3	
Dizziness	1.38 ± 1.67	0	7	
5. Perception of care subscale	6.66 ± 1.47	3.67	9.67	0.41
Pain relief	6.87 ± 1.58	3	10	
Participate in decisions about pain treatment	5.7 ± 3.06	0	10	
Satisfied with the results of pain treatment	7.42 ± 1.51	4	10	

APS-POQ-R, Revised American Pain Society Patient Outcome Questionnaire; SD, standard deviation; STAI, State-Trait Anxiety Inventory.

study, the mean STAI-I score was higher than the STAI-II score. Preoperative anxiety is assessed with the STAI-I subscale of the STAI.[24] Anxiety about surgery is considered a normal reaction in preoperative patients.[25] However, literature also supports that waiting for surgery or invasive procedures is stressful and that the resulting anxiety negatively affects and even aggravates both physiological and psychological parameters.[18,25,26] Preoperative anxiety can negatively affect patient satisfaction with surgery and is associated with postoperative complications.[24,27] In this study, the STAI-I score was 53.95, which was higher than other studies reported in the literature.[18,24,25,28] Literature supports that differences in surgical patient groups affect anxiety levels.[25,28,29] In a study by Jung et al,[24] the mean state anxiety score was reported as 47.2 in patients undergoing surgery for hip fracture,[24] while in a study conducted in Ethiopia with elective major surgery patients, the mean state anxiety score was reported as 49.[18] In another study, it was reported that 47% of elective surgery patients had a mean STAI score above 44, and participants experienced preoperative anxiety.[25] A study conducted in China with patients undergoing TKR reported a preoperative state anxiety score of 44.52 and a trait anxiety score of 43.61.[28]

Table 4
Correlation Analysis Between APS-POQ-R Scores and STAI Scores

	STAI-I		STAI-II	
Variables	r	*P*	r	*P*
Pain severity and sleep interference subscale	0.595	**<.001**	0.249	**.011**
Activity interference subscale	0.553	**<.001**	0.252	**.010**
Affective subscale	0.626	**<.001**	0.286	**.003**
Adverse effect subscale	0.171	.082	0.175	.075
Perception of care subscale	−0.143	.147	−0.148	.135

APS-POQ-R, Revised American Pain Society Patient Outcome Questionnaire; STAI, State-Trait Anxiety Inventory.
Pearson correlation test, Spearman correlation test; $P < .05$ was interpreted at the significance level. Bold indicates statistical significance.

In this study, the pain severity and sleep interference, activity interference, and perception of care subdimension scores of the APS-POQ-R were at a moderate level, while the affective and adverse effect subdimension scores were at a low level. In the study with mixed surgical patient groups, Keskin[30] reported that the pain severity and sleep interference, affective, adverse effect, and perception of care subdimension scores of APS-POQ-R were at a moderate level, and the activity interference subdimension scores were at a high level. In a study conducted by Özdemir[31] with major orthopedic surgery patients, the mean scores of pain severity and sleep interference, activity interference, affective and perception of care subscales of APS-POQ-R were reported at "moderate" level, while the mean score of adverse effect subscale was reported at "low" level. While the results of this study differ from the study of Keskin,[30] the results of Özdemir[31] are similar to our study. This is thought to be due to the common characteristics of the surgical patient groups studied. In a study conducted by Sommer et al[14] with more than 1,400 patients, the most painful surgical procedures were reported as upper and lower extremity, thorax, abdomen, and spinal cord surgery. The adverse effect subscale measures the severity of treatment-related negative outcomes.[32] In this study, the adverse effect score was low, which may suggest that the clinic where the study was conducted manages pain treatment effectively.

Evaluations of patients' care processes and outcomes play an important role in the financial compensation of hospitals. Therefore, determining the factors explaining patient care outcomes gains priority.[10] Due to the increase in population and prolonged life expectancy, it is necessary to actively explore approaches to achieve better outcomes in the shortest possible time after surgery and ensure patient satisfaction.[33] In this study, the "satisfied with the results of pain treatment" question of the perception of care subdimension is a patient-reported question that indicates pain-related patient outcomes. According to the OECD (Organisation for Economic Co-operation and Development), patient-reported outcomes are essential to understand how health services and procedures make a difference in patient's health and quality of life, to provide

Table 3
Preoperative and Postoperative Mean VAS Pain Scores and Correlation with STAI Scores

			STAI-I		STAI-II	
Variables	Mean ± SD	Median (Min-Max)	r	*P*	r	*P*
Preoperative VAS pain score	3.58 ± 1.61	3 (1-8)	0.523	**<.001**	0.105	.290
Postoperative 6th-hour VAS pain score	7.9 ± 1.3	8 (4-10)	0.557	**<.001**	0.131	.184
Postoperative 12th-hour VAS pain score	7.05 ± 1.27	7 (5-10)	0.498	**<.001**	0.215	**.028**
Postoperative 24th-hour VAS pain score	6.26 ± 1.18	6 (4-9)	0.599	**<.001**	0.259	**.008**
Postoperative 36th-hour VAS pain score	5.65 ± 1.05	6 (4-8)	0.553	**<.001**	0.179	.069

SD, standard deviation; STAI, State-Trait Anxiety Inventory; VAS, Visual Analog Scale.
Spearman correlation test; $P < .05$ was interpreted at the significance level. Bold indicates statistical significance.

Table 5
Factors Associated With Participants' 6th-Hour VAS Pain Scores

	6th-Hour Pain						95% Confidence Interval	
Model	B	SE	β	t	*P*	VIF	Lower	Upper
(Constant)	5.347	0.851	-	6.282	< .001	-	3.658	7.037
Male gender	0.556	0.241	0.187	2.309	**.023**	1.035	0.078	1.035
Total hip replacement	0.882	0.356	0.253	2.474	**.015**	1.651	0.175	1.589
Sleep duration before surgery	−0.369	0.191	−0.167	−1.936	.056	1.180	−0.748	0.009
General anesthesia	−0.620	0.570	−0.103	−1.087	.280	1.414	−1.752	0.512
State anxiety	0.045	0.012	0.365	3.855	**< .001**	1.416	0.022	0.068
$R = 0.616$; $R^2 = 0.380$, $P < .001$								

SE, standard error; VIF, variance inflation factor. $P < .05$ was interpreted at the significance level. Bold indicates statistical significance.

insight into the effectiveness of care from the patient's perspective, and to complement existing knowledge about the quality of care and services provided.[34] In this study, the satisfaction score for pain management was 7.42 ± 1.51. In the literature, one study reported a higher satisfaction rate (9.08 ± 1.57),[35] while another study reported a lower satisfaction rate (7.06 ± 2.37).[30] Since treatment expectations may differ between older and younger patients, group age differences may affect APS-POQ-R scale item scores.[32] Botti et al[32] reported no significant relationship between age and satisfaction with pain treatment.

This study found a "moderate positive correlation" between STAI-I scores and VAS pain scores between preoperative and postoperative 6th, 12th, 24th, and 36th hours. A "weak positive correlation" was observed between STAI-II and postoperative 12th- and 24th-hour VAS scores. These results support that preoperative anxiety affects postoperative pain, and these results are similar to the literature.[26,36,37] Nixon et al[26] reported that preoperative anxiety predicted worse pain and functional dysfunction in the early postoperative period. It has been stated that patients with high preoperative anxiety have higher postoperative pain scores than those with low preoperative anxiety. The literature has reported that as the preoperative anxiety level increases, postoperative pain and analgesia requirement increases.[36] Mahdi et al[37] reported that preoperative anxiety was not significantly associated with preoperative VAS pain score, but those with preoperative anxiety had higher VAS pain scores after surgery. A study on patients undergoing THR reported that those with high preoperative anxiety had higher postoperative pain levels.[17] A systematic review evaluating studies on patients undergoing THR reported that in most of the studies (9/12, 75%), those with preoperative anxiety or other psychiatric disorders had increased postoperative pain compared to those without.[38]

In this study, a "strong positive correlation" was found between the STAI-I scores and the affective subscale scores, and a "moderate positive correlation" was found between the pain severity and sleep interference and activity interference subscale scores. A "weak positive correlation" was found between the STAI-II scores and the pain severity and sleep interference, activity interference, and affective subscale scores. Bierke and Petersen[39] reported that patients with preoperative anxiety and pain symptoms had significantly more postoperative pain, experienced more severe knee symptoms, and were more dissatisfied with the surgical procedure results. In contrast, Jiménez Ortiz et al[40] reported that preoperative anxiety did not affect functional outcomes and quality of life after TKR. In the literature, it is reported that despite the publication of guidelines on postoperative pain, provision of acute pain services, and significant advances in the use of drugs and regional anesthesia techniques, there continues to be insufficient relief of pain.[11,12]

This study found that male gender, THR surgical intervention, and increased STAI-I score increased the 6th-hour VAS pain score. Severe pain after surgical procedures is an important factor associated with patient dissatisfaction, delayed recovery, immobilization, prolonged hospital stay in the postoperative period, increased medical costs, and serious conditions, such as conversion to chronic pain.[11] This study found that preoperative STAI-I scores, which were used to evaluate preoperative anxiety, were positively associated with pain scores at the 6th hour postoperatively. The current study examining the relationship between preoperative anxiety and postoperative pain outcomes supports the literature that high STAI-I affects pain in the early postoperative period.[27,29,39,41] A study of cardiac surgery patients reported that 64% of patients had mild preoperative anxiety (STAI-I < 40 points), 36% had moderate to severe anxiety (STAI-I > 40 points), and there was no significant difference between demographic characteristics, type of surgery and duration of surgery in the groups with mild, moderate and severe anxiety. At 12 hours postoperatively, patients with mild anxiety had a pain score of 3.50 ± 0.67 according to the 0 to 10-point numeric pain scale, while patients with moderate to severe anxiety had a pain score of 5.14 ± 0.54. Pain scores at 24 hours were reported to be lower in patients with mild anxiety than in patients with moderate-severe anxiety.[29] A large prospective cohort study of patients undergoing lower extremity total joint replacement surgery found that patients who experienced reduced pain severity and improved physical function after surgery had significantly improved anxiety symptoms.[27]

Hassett et al[27] reported that improvement in anxiety from preoperative to 6 months postoperatively in total lower extremity joint replacement surgery was significantly associated with improvement in pain severity from baseline to 6 months after controlling for age, gender, type of surgery, and baseline pain severity. Kashif et al[29] reported that analgesic requirements and pain scores increased significantly in the first 24 hours after surgery in those with moderate-to-severe anxiety compared to those with mild anxiety. Hassett et al[27] associated low preoperative anxiety scores with lower pain scores up to 3 months after surgery in their study with patients undergoing lower extremity total joint replacement. In a prospective study of 149 hip and 133 knee replacement patients, Duivenvoorden et al[42] reported that a decrease in the prevalence of psychological symptoms was associated with a decrease in postoperative pain and disability. They suggested that anxiety and depressive symptoms have an impact on patient-reported outcomes after joint replacement surgery. In the literature, it has been reported that psychometric evaluation before surgery can help identify patients at risk and improve clinical outcomes and patient satisfaction after knee replacement surgery by allowing appropriate management of patient expectations.[43] Another study reported that no statistically significant difference was observed in pain intensity according to gender, number of comorbidities, or duration of surgery.[41]

Limitations

This is a single-center study, meaning all patients were selected from a hospital setting in a specific region. Therefore, the results may only represent this group of patients, and different results may be obtained in other regions. These will limit the generalizability of the results.

Conclusion

In conclusion, high preoperative state anxiety was found to be positively associated with early postoperative pain scores in the participants of this study. State anxiety was associated with pain in the 6th postoperative hour. Therefore, it is important to assess and determine the level of preoperative anxiety to learn to what extent it affects postoperative pain to increase the quality of nursing care services and improve patient care outcomes. Nurses should plan and implement nursing interventions to relieve preoperative anxiety. Considering the multidimensional nature of anxiety, further research is recommended to understand the anxiety domain in surgical patients.

Declaration of Competing Interest

None to report.

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References

1. Clair C, Engström A, Strömbäck U. Strategies to relieve patients' preoperative anxiety before anesthesia: experiences of nurse anesthetists. *J Perianesth Nurs.* 2020;35(3):314–320. https://doi.org/10.1016/j.jopan.2019.10.008.
2. Zarei B, Valiee S, Nouri B, et al. The effect of multimedia-based nursing visit on preoperative anxiety and vital signs in patients undergoing lumbar disc herniation surgery: a randomised clinical trial. *J Perioper Pract.* 2018;28(1-2):7–15. https://doi.org/10.1177/1750458917742045.
3. Andersson V, Bergstrand J, Engström A, Gustafsson S. The impact of preoperative patient anxiety on postoperative anxiety and quality of recovery after orthopaedic surgery. *J PeriAnesth Nurs.* 2020;35(3):260–264. https://doi.org/10.1016/j.jopan.2019.11.008.
4. Kuzminskaitė V, Kaklauskaitė J, Petkevičiūtė J. Incidence and features of preoperative anxiety in patients undergoing elective non-cardiac surgery. *Acta Med Litu.* 2019;26(1):93–100. https://doi.org/10.6001/actamedica.v26i1.3961.
5. Aladaitis A, Petkevičiūtė G, Latkauskas T. Predictors of preoperative anxiety among elective surgical patients in Kaunas Teaching Hospital, *J Med Sci* 2018;**6**(7)1-9. Accessed 22 December 2022. https://medicsciences.com/f/2018/PREDICTORS-OF-PREOPERATIVE-ANXIETY-AMONG-ELECTIVE-SURGICAL-PATIENTS-IN-KAUNAS-TEACHING-HOSPITA1.pdf.
6. Oflaz F, Yıldırım N. Psikiyatri Hemşireliği: Sertifika Konuları. Psikiyatri Hemşireleri Derneği Yayınları No:1. Ankara Nobel Tıp Kitabevleri; 2020.
7. Bleß HH, Kip M. *White Paper on Joint Replacement: Status of Hip and Knee Arthroplasty Care in Germany.* Springer; 2018. https://doi.org/10.1007/978-3-662-55918-5
8. Chaw SH, Lo YL, Le JY, et al. Evaluate construct validity of the Revised American Pain Society Patient Outcome Questionnaire in gynecological postoperative patients using confirmatory factor analysis. *BMC Anesthesiol.* 2021;21(20):1–11. https://doi.org/10.1186/s12871-020-01229-x.
9. Organisation for Economic Co-operation and Development (OECD), *Health at a Glance 2021: OECD Indicators*, 2021, OECD Publishing, Paris, 168-169. Accessed 16 December 2022. https://doi.org/10.1787/ae3016b9-en.
10. Tilbury C, Haanstra TM, Verdegaal SHM, et al. Patients' pre-operative general and specific outcome expectations predict postoperative pain and function after total knee and total hip arthroplasties. *Scan J Pain.* 2018;18(3):457–466. https://doi.org/10.1515/sjpain-2018-0022.
11. Gerbershagen HJ, Pogatzki-Zahn E, Aduckathil S, et al. Procedure-specific risk factor analysis for the development of severe postoperative pain. *Anesthesiology.* 2014;120(5):1237–1245. https://doi.org/10.1097/ALN.0000000000000108.
12. Mitra S, Jain K, Singh J, et al. Does an acute pain service improve the perception of postoperative pain management in patients undergoing lower limb surgery? A prospective controlled non-randomized study. *J Anaesthesiol Clin Pharmacol.* 2020;36(2):187–194. https://doi.org/10.4103/joacp.JOACP_104_19.
13. Ramia E, Nasser SC, Salameh P, Saad AH. Patient perception of acute pain management: data from three tertiary care hospitals. *Pain Res Manag.* 2017;2017:7459360. https://doi.org/10.1155/2017/7459360.
14. Sommer M, De Rijke JM, Van Kleef M, et al. The prevalence of postoperative pain in a sample of 1490 surgical inpatients. *Eur J Anaesthesiol.* 2008;25(4):267–274. https://doi.org/10.1017/S0265021507003031.
15. Wang MC, Chan PH, Paxton EW, et al. Factors influencing patient satisfaction with care and surgical outcomes for total hip and knee replacement. *Perm J.* 2021;25:21.043. https://doi.org/10.7812/TPP/21.043.
16. Fillingham YA, Hanson TM, Leinweber KA, et al. Generalized anxiety disorder: a modifiable risk factor for pain catastrophizing after total joint arthroplasty. *J Arthroplasty.* 2021;36(7S):S179–S183. https://doi.org/10.1016/j.arth.2021.02.023.
17. Pan X, Wang J, Lin Z, et al. Depression and anxiety are risk factors for postoperative pain-related symptoms and complications in patients undergoing primary total knee arthroplasty in the United States. *J Arthroplasty.* 2019;34(10):2337–2346. https://doi.org/10.1016/j.arth.2019.05.035.
18. Mulugeta H, Ayana M, Sintayehu M, et al. Preoperative anxiety and associated factors among adult surgical patients in Debre Markos and Felege Hiwot Referral Hospitals, Northwest Ethiopia. *BMC Anesthesiol.* 2018;18(1):155. https://doi.org/10.1186/s12871-018-0619-0.
19. Spielberger CD, Gorsuch RL, Lushene R, et al. *Manual for The State-Trait Anxiety Inventory*. Consulting Psychologists Press; 1983. .
20. Öner N, Le Compte A. Durumluluk-Sürekli Kaygı Envanteri El kitabı, İstanbul. Boğaziçi Üniversitesi Yayınları; 1985.
21. Eti Aslan F, Çavdar İ. Cerrahi Ağrı. Eti Aslan, F. eds. In: Ağrı Doğası ve Kontrolü Akademisyen Kitapevi; Geliştirilmiş 2. Baskı, 2014:185-212.
22. Gordon DB, Polomano RC, Pellino TA, et al. Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R) for quality improvement of pain management in hospitalized adults: Preliminary psychometric evaluation. *J Pain.* 2010;11(11):1172–1186. https://doi.org/10.1016/j.jpain.2010.02.012.
23. Keskin A, Sucu Dağ G, Gordon DB. Reliability and validity of the Turkish version of the Revised American Pain Society Patient Outcome Questionnaire in postoperative patients. *Cyprus J Med Sc.* 2019;4(3):157–163. https://doi.org/10.5152/cjms.2019.1023.
24. Jung KH, Park JH, Song JY, et al. State-Anxiety in geriatric patients undergoing surgical treatment for femoral neck or ıntertrochanteric fractures. *Geriatr Orthop Surg Rehabil.* 2021;12:21514593211063320. https://doi.org/10.1177/21514593211063320.
25. Bedaso A, Ayalew M. Preoperative anxiety among adult patients undergoing elective surgery: a prospective survey at a general hospital in Ethiopia. *Patient Saf Surg.* 2019;13(1):18. https://doi.org/10.1186/s13037-019-0198-0.
26. Nixon DC, Schafer KA, Cusworth B, et al. Preoperative anxiety effect on patient-reported outcomes following foot and ankle surgery. *Foot Ankle Int.* 2019;40(9):1007–1011. https://doi.org/10.1177/1071100719850806.
27. Hassett AL, Marshall E, Bailey AM, et al. Changes in anxiety and depression are mediated by changes in pain severity in patients undergoing lower-extremity total joint arthroplasty. *Reg Anesth Pain Med.* 2018;43(1):14–18. https://doi.org/10.1097/AAP.0000000000000682.
28. Qi A, Lin C, Zhou A, et al. Negative emotions affect postoperative scores for evaluating functional knee recovery and quality of life after total knee replacement. *Braz J Med Biol Res.* 2016;49(1):e4616. https://doi.org/10.1590/1414-431X20154616.
29. Kashif M, Hamid M, Raza A. Influence of preoperative anxiety level on postoperative pain after cardiac surgery. *Cureus.* 2022;14(2):e22170. https://doi.org/10.7759/cureus.22170.
30. Keskin A. Cerrahi Hastalarında Amerikan Ağrı Derneği Revize Hasta Sonuçları Anketi'nin Türkçe Geçerlik–Güvenirliği. Yüksek Lisans Tezi, Doğu Akdeniz Üniversitesi Lisansüstü Eğitim, Öğretim ve Araştırma Enstitüsü, Gazimağusa (Danışman: Yrd. Doç. Dr. Gülten Sucu Dağ); 2017. Accessed 26 January 2021. http://i-rep.emu.edu.tr:8080/xmlui/handle/11129/4653.
31. Özdemir C. Major ortopedik cerrahi hastalarında ameliyat sonrası ağrıya ilişkin bakım kalitesinin hasta bakım sonuçları ile ilişkisinin belirlenmesi. Yüksek Lisans Tezi, Akdeniz Üniversitesi Sağlık Bilimleri Enstitüsü, Antalya (Danışman: Dr. Öğr. Üyesi Ebru Karazeybek); 2020. Accessed 2 February 2022. https://acikbilim.yok.gov.tr/handle/20.500.12812/30686.
32. Botti M, Khaw D, Jørgensen EB, et al. Cross-cultural examination of the structure of the Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R). *J Pain.* 2015;16(8):727–740. https://doi.org/10.1016/j.jpain.2015.03.016.
33. Ziętek P, Ziętek J, Szczypiór K. Anxiety in patients undergoing fast-track knee arthroplasty in the light of recent literature. *Psychiatr Pol.* 2014;48(5):1015–1024. https://doi.org/10.12740/pp/27173.
34. Canadian Institute for Health Information, Organisation for Economic Co-operation and Development. OECD *Patient-Reported Indicator Surveys (PaRIS) Initiative: Patient-Reported Outcome Measures (PROMs) for Hip and Knee Replacement Surgery — International Data Collection Guidelines*. Ottawa, ON: CIHI; 2019. https://web-archive.oecd.org/2019-12-10/540207-OECD-PaRIS-hip-knee-data-collection-guidelines-en-web.pdf 15 December 2022.
35. Fang H, Liang J, Hong Z, et al. Psychometric evaluation of the chinese version of the Revised American Pain Society Patient Outcome Questionnaire concerning pain management in chinese orthopedic patients. *Plos One.* 2017;12(5):e0178268. https://doi.org/10.1371/journal.pone.0178268.
36. Fernández-Castro M, Jiménez JM, Martín-Gil B, et al. The influence of preoperative anxiety on postoperative pain in patients undergoing cardiac surgery. *Sci Rep.* 2022;12(1):16464. https://doi.org/10.1038/s41598-022-20870-9.
37. Mahdi A, Hälleberg-Nyman M, Wretenberg P. Reduction in anxiety and depression symptoms one year after knee replacement: a register-based cohort study of 403 patients. *Eur J Orthop Surg Traumatol.* 2021;31(6):1215–1224. https://doi.org/10.1007/s00590-020-02860-7.

38. O'Connor JP, Holden P, Gagnier JJ. Systematic review: preoperative psychological factors and total hip arthroplasty outcomes. *J Orthop Surg Res.* 2022;17(1):457. https://doi.org/10.1186/s13018-022-03355-3.
39. Bierke S, Petersen W. Influence of anxiety and pain catastrophizing on the course of pain within the first year after uncomplicated total knee replacement: a prospective study. *Arch Orthop Trauma Surg.* 2017;137(12):1735–1742. https://doi.org/10.1007/s00402-017-2797-5.
40. Jiménez Ortiz M, Espinosa Ruiz A, Martínez Delgado C, et al. Do preoperative anxiety and depression influence the outcome of knee arthroplasty? *Reumatol Clin (Engl Ed).* 2018;16(3):216–221. https://doi.org/10.1016/j.reuma.2018.06.008.
41. Robleda G, Sillero-Sillero A, Puig T, et al. Influence of preoperative emotional state on postoperative pain following orthopedic and trauma surgery. *Rev Lat Am Enfermagem.* 2014;22(5):785–791. https://doi.org/10.1590/0104-1169.0118.2481.
42. Duivenvoorden T, Vissers MM, Verhaar JA, et al. Anxiety and depressive symptoms before and after total hip and knee arthroplasty: a prospective multicentre study. *Osteoarthr Cartil.* 2013;21(12):1834–1840. https://doi.org/10.1016/j.joca.2013.08.022.
43. Bistolfi A, Bettoni E, Aprato A, et al. The presence and influence of mild depressive symptoms on post operative pain perception following primary total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc.* 2017;25(9):2792–2800. https://doi.org/10.1007/s00167-015-3737-y.