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Sleep Quality in Patients Undergoing Spinal Surgery

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ABSTRACT

The purpose of this study was to evaluate the sleep quality of patients who underwent surgical treatment for degenerative spine diseases in the neurosurgery unit. The descriptive and cross-sectional study was conducted between May 2023 and April 2024 with the participation of 110 patients undergoing spinal surgery. The descriptive and cross-sectional study was conducted between May 2023 and April 2024 with the participation of 110 patients undergoing spinal surgery. An Information Form and the Richards-Campbell Sleep Questionnaire were used for data collection. The Mann Whitney U test and Spearman correlation analysis were used to evaluate the data. The patients' average total Richards-Campbell Sleep Questionnaire score was 52.8 ± 15.6. It was found that the mean Richards-Campbell Sleep Questionnaire total ranks of the patients differed statistically according to the presence of pain. A negative correlation was found between the worst pain score in the last 24 hours, and the average pain score in the last 24 hours, and the mean Richards-Campbell Sleep Questionnaire total score of the patients. It was determined that patients who underwent spinal surgery for degenerative spine diseases had moderate sleep quality. Pain was found to be a factor that negatively affected sleep. It was determined that the patients' sleep was negatively affected by factors such as sound (12.7%), light (10%), and ambient temperature (9.1%) in the brain and neurosurgery service environment.

Spinal Cerrahi Uygulanan Hastalarda Uyku Kalitesi

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ÖZET

Bu çalışmanın amacı, beyin cerrahisi ünitesinde dejeneratif omurga hastalıkları nedeniyle cerrahi tedavi uygulanan hastaların uyku kalitesini değerlendirmektir. Tanımlayıcı ve kesitsel tipteki araştırma 110 spinal cerrahi uygulanan hastanın katılımıyla Mayıs 2023-Nisan 2024 tarihleri arasında bir üniversite hastanesinde yürütüldü. Veri toplamada Bilgi Formu ve Richards- Campbell Sleep Questionnaire kullanıldı. Verileri değerlendirmede Mann Whitney U testi ve Spearman Korelasyon analizinden yararlanıldı. Hastaların ortalama Richards-Campbell Uyku Ölçeği toplam puanı 52.8 ± 15.6 idi. Hastaların RCSQ toplam puan ortalamalarının ağrı varlığına göre istatistiksel olarak farklılık gösterdiği saptandı. Son 24 saatteki en kötü ağrı skoru ve son 24 saatteki ortalama ağrı skoru ile hastaların ortalama Richards- Campbell Uyku Ölçeği toplam skoru arasında negatif bir korelasyon olduğu bulundu. Dejeneratif spinal cerrahi hastalıklar nedeniyle spinal cerrahi geçiren hastaların uyku kalitelerinin iyi olduğu belirlendi. Ağrı uykuyu olumsuz etkileyen bir faktör olarak bulundu. Hastaların uykusunun beyin ve sinir cerrahisi servis ortamındaki ses (%12,7), ışık (%10) ve ortam sıcaklığı (%9,1) gibi faktörlerden olumsuz etkilendiği tespit edilmiştir.

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INTRODUCTION

Degenerative spine diseases (DSD) are conditions in which changes such as damage, herniation, deformity, or loss of stability occur in the disc, vertebra or spinal canal, especially due to aging (Altun et al., 2016). Patients may experience pain of different intensities due to DSD, and if the disease is advanced, mobility limitations and disruptions in daily life activities are observed (Akyolcu & Uğraş, 2017; Greenberg, 2012). One of the treatment methods for patients with DSD is surgical intervention (Altun et al., 2016). Surgical methods such as discectomy, microdiscectomy, laminectomy, foraminotomy, spinal fusion, and instrumentation are successfully applied for the treatment of patients diagnosed with DSD (Altun et al., 2016; Bayraktar, 2016).

However, it is stated that patients may continue to experience pain after surgery (Tat Çatal & Cebeci, 2020). While the pain experienced by patients at different intensities after surgery and inadequate pain management affect patients physiologically and psychologically, they also negatively affect sleep quality (SQ) (Hu & Wang, 2018). Studies have shown that pain and sleep have a bidirectional relationship: sleep is disturbed due to pain, and sleep disorders increase the severity of pain (Afolalu et al., 2018; Akutay et al., 2021; Oral et al., 2022)

The probability of impaired SQ after surgery is reported to be 64.9% (Tegegne & Alemnev, 2022). Hospitalised adult patients are reported to sleep 1.3-3.2 hours less than the ideal sleep time (Burger et al., 2022). In studies, it was determined that patients treated in surgical clinics had decreased SQ (Öngün et al., 2023; Para & Uslu, 2022) and it was emphasised that pain was one of the important factors affecting sleep (Ak et al., 2022; Aksu & Erdoğan 2017; Jensen et al., 2024).

Surgical nurses need to evaluate the sleep status of patients in the postoperative stage, identify the factors that impair SQ, and intervene in preventable problems with appropriate interventions (Aksu et al., 2017). However, there are a limited number of studies addressing the postoperative sleep quality of neurosurgical patients (Cici & Özkan, 2020; Öğden et al., 2018). Existing studies evaluated preoperative sleep quality (Köse et al., 2019), long-term postoperative sleep quality in a single case (Fonseka et al., 2022), the effect of surgical treatment on late postoperative sleep quality (Yavuz & Uysal, 2022) or were review studies (Çakır & Özlü, 2024). The purpose of this study was to evaluate the SQ of patients who underwent surgical treatment for DSD in the neurosurgery unit and the effect of pain on SQ.

METHOD

Research Design

This descriptive and cross-sectional study was conducted in the neurosurgery clinic of a university hospital.

Research Sample

Patients who had DSD surgery in a university hospital's neurosurgery clinic formed the study's population. Patients who met the inclusion criteria and were on the first postoperative day were included in the sample.

It was determined that 107 participants were required to be included in the sample as a minimum by using the G*Power 3.1.9.4 programm with an effect size=0.3 at 95% confidence level and 85% power ratio. One hundred and ten people were included in the study. Patients who were followed up in the neurosurgery clinic within the first 24 hours after surgery, who provided written consent to participate in the study, who did not have a diagnosis of psychological illness or did not use psychotropic medications, who were mentally competent, who did not have Turkish communication problems, who did not have a history of chronic pain, who did not have substance addiction, and whose surgery was performed under general anesthesia were included in the study.

Research Instruments and Processes

The researcher applied data collection forms to the patients in the neurosurgery clinic between May 2023 and April 2024 using the face-to-face interview method. Data collection from the patients took 10-15 minutes. The data of the study were collected in the patient room in the clinic between 09:00 and 12:00 on the first postoperative day.

In the routine of the clinic, patients who undergo surgical intervention under general anesthesia with a diagnosis of DSD are followed up in the clinic for at least 24 hours. Postoperative analgesic drugs (nonsteroidal anti-inflammatory drugs), paracetamol, opioids and nonopioids) can be administered to patients for pain control upon physician request.

Information form

The form consists of a total of 14 questions addressing individual variables of the patients (age, gender, education status, marital status, etc.), data related to surgery (indication of surgery, operation experience etc.) and analgesic treatment (presence pain, pain score etc.). The questionnaire questions were prepared according to the literature (Akutay et al., 2021; Oral et al., 2022). The most severe pain level, the mildest pain level and the mean pain level of the patients in the last 24 hours were assessed with the Visual Analog Scale (VAS). Zero was graded as no pain and ten as unbearable pain.

Richards- Campbell Sleep Questionnaire

The Richards-Campbell Sleep Questionnaire (RCSQ), developed by Richards and adapted into Turkish by Özlü and Özer in surgical intensive care unit patients, is a 6-item scale. Very poor sleep is indicated by a score of "0-25," and very good sleep is indicated by a score of "76-100". A high score of the scale indicates that the sleep quality (SQ) of the patients has increased (Özlü & Özer, 2015; Richards, 1987; Richards et al., 2000). In this study, Cronbach's value was 0.93.

Data Analysis

IBM SPSS (V.22) (Armonk, NY, USA) was used to conduct statistical analyses. The Kolmogorov-Smirnov test was used to determine the suitability of the data for normal distribution. Data were expressed as number, percentage, arithmetic mean and standard deviation. The difference in RCSQ score averages according to the presence of pain and environmental factors was evaluated by Mann-Whitney U test. The relationship between pain scores and mean RCSQ scores was determined using Spearman's correlation analysis. The accepted threshold for statistical significance was $p < 0.05$.

Informed Consent

After providing verbal and written information, the researcher obtained written consent from the patients participating in the study. Patients were informed that the information obtained from them would be used only for scientific purposes.

RESULTS

The patients who took part in the study were on average 56.2 ± 14.2 years old on average, 60.9% (n = 67) were female, and 71.8% (n = 79) underwent surgery for intervertebral disc disease. It was found that 90.0% (n = 99) of the participants had postoperative pain and the highest mean pain score was 6.8 ± 2.4 (Table 1).

Table 1
Characteristics of the Patients (N = 110)

Characteristics		**n**	**%**	**Ort ± SS**
Age				56.2 ± 14.2
Gender	Female	67	60.9	
	Male	43	39,1	
Education	Primary School	73	66.4	
	High School	28	25.5	
	University	9	8.2	
Marital Status	Married	91	82.7	
	Single	19	17.3	
Tobacco/Alcohol Consumption	Tobacco	32	29.1	
	Alcohol	6	5.5	
	Tobacco and Alcohol	3	2.7	
	No	69	62.7	
Comorbidity	Yes	64	58.2	
	No	46	41.8	
Operation Experience	Yes	78	70.9	
	No	32	29.1	
	Yes	89	80.9	
	No	21	19.1	
Companion	Yes	107	97.3	
	No	3	2.7	
Indication of Surgery	Disc Diseases	79	71.8	
	Stenosis Spondylolisthesis	25	22.7	
	Spondylolisthesis	6	5.5	
Presence Pain	Yes	99	90.0	
	No	11	10.0	
Pain Management	Nonsteroidal anti-inflammatory	15	13.6	
	Paracetamol	38	34.5	
	Opioid and Nonopioid	46	41.8	
Complaints other than Pain	Yes	21	19.1	
	No	89	80.9	
Pain Score (VAS)	The most Severe			6.8± 2.4
	The Lightest			2.7±1.8
	Avarage			4.5±2.3
Total		110	100.0	

VAS: Visual analog scale

The mean RCSQ total score of the patients was 52.8 ± 15.6. It was found that the mean RCSQ total ranks of the patients differed statistically according to the presence of pain (p = 0.022). A negative correlation was found between the worst pain score in the last 24 hours (p = 0.001) and the average pain score in the last 24 hours (p = 0.019) as well as the mean RCSQ total score of the patients. The mean ranks of the "sleep depth" and "sleep latency" subscales revealed a statistically significant difference (p = 0.005 and p = 0.043) depending on the presence of pain. The mean scores of all subscales showed a negative correlation with the worst pain score during the previous 24 hours (Table 2).

Table 2

Comparison Of RCSQ Scale and Subscale Mean Ranks according to Analgesic Treatment-related Characteristics of Patients (N = 110)

Characteristics	**Sleep Depth**	**Sleep Latency**	**Awakenings**	**Returning to Sleep**	**Sleep Quality**	**Total Score**
Mean ± SD	53.0 ± 29.1	48.9 ± 32.1	53.8 ± 28.5	53.6 ± 31.5	54.7 ± 30.7	52.8 ± 15.6
	Mean Rank	**Mean Rank**	**Mean Rank**	**Mean Rank**	**Mean Rank**	**Mean Rank**
Presence Pain						
Yes	52.67	53.45	54.19	53.56	53.67	53.19
No	80,95	73.91	67.32	72.95	71.95	76.32
Statistical Value	0.005,	0.043,	0.194,	0.055,	0.070,	0.022,
P, U	264.500	342.000	414.500	352.500	363.500	315.500
Pain Score (VAS)	**p, r**	**p, r**	**p, r**	**p, r**	**p, r**	**p, r**
The most Severe	0.001, -0.324	0.007, -0.256	0.004, -0.269	0.011, -0.241	0.000, -0.337	0.001, -0.314
The Lightest	0.535, 0.060	0.369, 0.087	0.126, -0.147	0.446, -0.073	0.038, -0.198	0.218, -0.118
Average	0.038, -0.198	0.154 -0.137	0.011, -0.243	0.274, -0.105	0.001 -0.309	0.019 -0.223

U: Mann Whitney U test, r: Spearman Correlation Analysis

It was determined that the patients' sleep was negatively affected by factors such as sound (12.7%), light (10%), and ambient temperature (9.1%) in the brain and neurosurgery service environment. The sleep quality of patients who were environmentally affected by sound was found to be better than that of patients who were not affected by sound (p=0.016) (Table 3).

Table 3
Environmental Factors Affecting Sleep (N = 110)

Environmental factors	Affected		Not affected		Statistical Value
	n(%)	Mean Rank	n(%)	Mean Rank	p, U
Sound	14(12.7)	36.25	96(87.3)	58.31	402.500 0.016
Lighting	11(10.0)	63.55	99(90.0)	54.61	456.000 0.378
Temperature of the environment	10(9.1)	49.25	100(90.9)	56.13	437.500 0.516
Medical devices	9(8.2)	37.89	101(91.8)	57.07	296.000 0.084
Smell of the environment	6(5.5)	35.63	104(94.5)	56.63	194.000 0.120
Other patients	3(2.7)	40.67	107(97.3)	55.92	116.000 0.438
Care and treatment applications	3(2.7)	23.83	107(97.3)	56.39	65.500 0.083
Staff conversations	1(0.9)	36.50	109(99.1)	55.67	35.500 0.655

U: Mann Whitney U test.

DISCUSSION

While the mean RCSQ total score of the patients was found to be at a good level with 52.8 ± 15.6, SQ was found to be at a good level in patients undergoing conventional total knee replacement (Öngün et al., 2023). SQ is determined to be poor in patients hospitalized in intensive care unit (Özkan et al., 2022). Thanh and Xuan (2024) found that 78.1% of patients had poor sleep quality after surgical intervention.

Para and Uslu (2022) determined SQ at a moderate level in patients treated in a general surgery clinic. Cici and Özkan (2020) reported that the SQ of the participants was poor in their study which included neurosurgical patients (cranial mass, hematoma, aneurysm, spinal mass, disc herniation, trauma). The study's findings showed that the SQ of the patients varied from poor to good. This may be due to differences in the type of surgery performed, differences in the individual characteristics of the sampled patients, or differences in other factors affecting sleep.

It was found that patients who stated that they did not experience pain had better sleep than patients who stated that they did. It was determined that the presence of pain negatively affected the depth of sleep and the duration of falling asleep. Ak et al. (2022) found that sleep quality decreased as the pain level increased in patients undergoing urological surgery. Aksu and Erdoğan (2017) reported that pain was a factor affecting sleep in patients undergoing lung resection.

Para and Uslu (2022) found that postoperative sleep was interrupted due to pain. In a meta-analysis study by Burger et al. (2022), it was found that the presence of pain worsened sleep in hospitalised patients. In a study in which patients undergoing orthopaedic surgery were included in the sample, it was determined that the inability to control pain decreased SQ (Jensen et al., 2024). In this study, the worst pain score in the last 24 hours and the average pain score in the last 24 hours were found to be associated with lower SQ.

It was determined that as the worst pain scores in the last 24 hours increased, the depth of sleep and SQ of the patients decreased and the duration of falling asleep, frequency of waking up, and the duration of staying awake when waking up were prolonged. Similarly, Öngün et al. (2023) found a negative correlation between pain scores on postoperative day 1 and SQ in patients who underwent total knee replacement. In their study, Chu et al. (2023) determined that there was a relationship between postoperative patients' pain and poor SQ.

Sayar et al. (2024) found that a 1-unit change in pain score was associated with an 8.571 biomarker in SQ in a sample of patients undergoing orthopaedics and traumatology surgery. Vitale et al. (2023) reported an inverse relationship between pain scores and sleep efficiency after hip and knee arthroplasty. Dolan et al. (2016) emphasised that pain is a factor that causes sleep deprivation. It has also been reported that pain is among the factors that interrupt sleep in adult surgical patients (Tegegne & Alemnew, 2022).

It is known that pain can disrupt sleep initiation and maintenance mechanisms and sleep deprivation can worsen pain perception (Chen et al., 2023). In an integrative review, it has been reported that pain is one of the most important factors associated with poor SQ (Alqaisi and Al-Ghabeesh, 2024). The study results reveal that pain is a factor that negatively affects the sleep process. It also emphasises the effect of pain control in improving sleep.

It was determined that the SQ of the patients was adversely affected by factors such as noise, light and ambient temperature in the neurosurgery service environment. A qualitative study revealed that noise and poor lighting disrupted sleep in patients undergoing orthopaedic surgery (Jensen et al., 2024). Burger et al. (2022) also associated noise with poor sleep. Ak et al. (2022) found that noise (28%) and ambient temperature/ventilation (24.3%) were among the factors that negatively affected sleep in patients undergoing urological surgery.

Thanh and Xuan (2024) showed that environmental factors such as lighting, care and treatment activities of healthcare personnel, and the sound of medical devices were associated with the sleep quality of postoperative patients. Özkan et al. (2022) determined that ambient sound, odor, temperature and lighting had undesirable effects on SQ in surgical intensive care unit patients. It has been reported that environmental factors such as being awakened for treatment and care procedures (43%), noise (30%) and light (13%) contribute to sleep disturbance in intensive care patients (Ahn et al., 2023). Patients' SQ may be affected by the physical conditions of the environment.

CONCLUSION AND SUGGESTIONS

It was determined that patients who underwent spinal surgery for DSD had good SQ. Surgical nurses can improve the SQ of their patients by assessing the SQ of patients undergoing spinal surgery, implementing interventions to improve their sleep, and managing certain environmental factors.

LIMITATIONS

The study presents the results of patients who meet the inclusion criteria. These characteristics should be considered when interpreting the findings, and the results should not be generalised to all neurosurgical patients (e.g., those undergoing cranial surgery or oncological surgery, etc.). Additional factors related to surgery and nursing care (bed characteristics, shared room, restricted sleep position due to surgery, postoperative complications, etc.) affecting the SQ of the patients were not questioned. Finally, only the highest, lowest and mean pain scores of the last 24 hours were questioned. Therefore, comparisons using repeated measurements are necessary to better understand the effect of pain on sleep.

Ethic Approval

Before the research, ethical approval was obtained from the Non-Interventional Scientific Research Ethics Committee of the Dean's Office of the Faculty of Medicine of Trakya University (dated 13.03.2023, protocol coded 2023/97, decision number 04/13), and the central directorate of the hospital where the research was done granted written consent (dated 05.05.2023, reference number 044-E.446124).

Conflict of interest

The authors have no conflict of interest to declare.

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Design: Z.K.Ö., F.D., E.K., B.A., Data Collection or Processing: E.K., B.A., Analysis or Interpretation: Z.K.Ö., F.D., Literature Search: Z.K.Ö., F.D., E.K., B.A., Writing: Z.K.Ö., F.D., E.K., B.A.

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