Original Article

The Association of Pain, Anxiety, Depression, and Sleep Patterns in Postoperative Turkish Patients

Yesim Yaman Aktas[1], Emel Bahadir Yilmaz[2]
[1]Department of Surgical Nursing, Faculty of Health Sciences, Giresun University, Giresun, Turkey
[2]Department of Psychiatric Nursing, Faculty of Health Sciences, Giresun University, Giresun, Turkey

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ABSTRACT

Objectives: Pain, stress, anxiety, and sleep disorders are common after surgery. Our study aims to investigate the association of pain, anxiety, depression, and sleep disorders in postoperative Turkish patients.
Design: A descriptive and cross-sectional study
Setting: Giresun Government Hospital, Clinics of Neuro-Surgery and General Surgery, Giresun, Turkey
Subjects: The study consisted of 119 patients in the neuro-surgery and general surgery clinic of the state hospital in Giresun, northern Turkey.
Intervention: None
Main outcome measures: The data were collected with the Patient Information Form, Sleep Survey, Hospital Anxiety and Depression Scale, and Numerical Rating Scale.
Results: The mean age of the patients was 59.13 years, with a standard deviation of 18.24 years. It was found that 31.1% of patients had higher anxiety scores (13.16 ± 2.11), and 42.9% of patients had higher depression scores (11.72 ± 3.19). The mean pain severity was found to be 6.82 ± 3.95 following surgery. A positive correlation was also found between patients' sleep problems and both anxiety level ($p < 0.01$) and depression level ($p < 0.05$). There was a significantly negative correlation between sleep time in the hospital after surgery and the anxiety level of patients ($p < 0.01$).
Conclusion: This study shows that a statistically significant correlation was found between patients' pain intensity, sleep pattern, and both anxiety level and depression level. Associations were also found between patients' sleep problems and both anxiety level and depression level. Further research is needed to investigate the evolution of this relationship.

KEY WORDS: anxiety, depression, postoperative pain, sleep patterns

INTRODUCTION

Pain, stress, anxiety, and sleep disorders are common after surgery[1]. Although pain is a predictable part of the postoperative experience, inadequate assessment and management of pain are common[2,3]. Acute postoperative pain management still shows pain scores higher than 3 in up to 30% of operated patients on a visual analog scale (VAS) of 10[4,5]. A recent study has reported that moderate to severe postoperative pain has been experienced by over 80% of patients having surgery[6]. The physiological response to pain is almost universally adverse, and unrelieved pain causes potentially fatal unstable hemodynamic status, alterations in immune system functioning, hyperglycemia, and increased release of catecholamine, cortisol, and antidiuretic hormones[7,8]. Moreover, uncontrolled pain has been implicated in a variety of psychosocial effects, including depression, anxiety, and sleep disorders[9,10].

Pain and sleep are the most important predictors of physical and psychological health[11,12]. Pain is a physical and emotional signal of bodily harm that strongly motivates behavior[12]. Sleep is one of the daily-living activities that maintain optimal health. Sleep provides time for the repair and recovery of the body systems for the next period of wakefulness, as well as time synthesis and organization of everyday events[13-15]. Sleep is a behaviorally regulated drive that broadly serves to maintain homeostasis and optimizes function across multiple physiologic

Address correspondence to:
Yesim Yaman Aktas, RN, PhD, Faculty of Health Sciences, Giresun University, Giresun, Post code: 28340, Turkey. Telephone: +90 4543613788, Fax: +90 4543613544. E-mail: yesimyaman28@hotmail.com

systems. Humans require both pain and sleep for survival; however, chronic impairments in the systems regulating pain and sleep can have a broad negative impact on health and well-being, such as obesity, type 2 diabetes, and depression[12]. Numerous studies have indicated that there is a strong association between sleep and pain during recovery from surgery[11-15]. A number of these studies have revealed that pain severity and perception of pain affect the sleep quality of patients. Higher intensity of pain was associated with lower physical function, social role, mental health, and with higher disability[14]. The most important catalyst for sleep disorder and pain is surgical stress. Whereas pain exacerbates sleep disorder, poor sleep quality increases pain intensity[16]. As discussed earlier, this is in agreement with numerous studies which explored a relationship between self-reported pain scores and quality of sleep[11,13,15]. Poor quality of sleep in the postoperative period also may be due to several factors besides pain from surgical incision, including the presence of drains and high anxiety levels[17].

The most common psychological factors that affect postoperative pain are anxiety and depression[18]. Anxiety is a state marked by apprehension, agitation, increased motor tension, autonomic arousal, and fearful withdrawal[19]. Previous studies have shown that in subjects who are undergoing surgery, anxiety is present up to at least a week before the surgery and continues in the postoperative period[20-23]. It is known that anxiety causes an increase in postoperative pain, use of analgesics, and a much longer hospital stay that directly impacts the cost of healthcare[24]. Strong correlations have been found between anxiety, pain distress, and pain severity during not only the preoperative period, but also the postoperative period[25]. Moreover, anxiety and depression have been associated with the sleep quality of patients after surgery in several studies[26-28]. In a study by Gallagher and McKinley[29], it was reported that one of the predictors of a high anxiety level was sleep disturbance after cardiac surgery. Although there are a variety of studies in a wide range of specialty areas examining postoperative pain, anxiety, depression, and sleep disorders aforementioned in the literature review, there is currently no study defining their relationship with each other. In this study, we aimed to investigate the association of pain, anxiety, depression, and sleep disorders in postoperative Turkish patients.

SUBJECTS AND METHODS

This was a cross-sectional, descriptive survey design study, conducted between April and June 2015 in the neuro-surgery and general surgery clinic of the state hospital in Giresun, northern Turkey. The study included 119 subjects based on a power analysis with a medium effect size of 0.30 to achieve a power of 0.95 and $\alpha = 0.05$. A convenience sample was taken from patients who met the study criteria. The eligibility criteria for the research were patients aged between 18 and 65 who were in the surgery programme in the surgery clinics and stayed at least three days in the hospital and who agreed to participate in the research. Patients aged 65 years or over were excluded from the study because they had sleep disorders and sleep medication.

Ethical consideration

The study was approved by the ethics committee of the hospital where the study was carried out (date: 26 March 2015 and number: 42991614/770) and conducted according to the ethics guidelines set out in the Declaration of Helsinki[30]. Verbal consent was obtained from the patients participating in the research. All participants were informed of the purpose and design of the study and were guaranteed anonymity and confidentiality. Participation in the study was voluntary.

Instruments

The data were collected by the researcher using the Patient Information Form, Sleep Survey, Hospital Anxiety and Depression Scale, and Numerical Rating Scale.

Patient Information Form: The questionnaire form asked for demographic characteristics of the patients, including age, gender, education, marital status, presence of chronic disease, previous hospitalisation, and type of surgery.

Sleep Survey: The questionnaire was prepared by the researcher in accordance with the related literature[11,16,29,31]. This survey included questions about factors that affect sleep (*i.e.* the number of patients who stay in the hospital room, environmental factors causing sleep disorders, disturbing noise types in the clinic, and sleep duration in the hospital).

Hospital Anxiety and Depression Scale (HADS): The HADS was developed by Zigmond and Snaith[32]. It is a brief questionnaire that was originally designed to detect emotional disturbances in non-psychiatric patients treated in hospital clinics. The self-rating instrument HADS consists of 14 items in two subscales —anxiety (HADS-A) and depression (HADS-D) — with each subscale containing 7 items on a 4-point Likert scale (ranging from 0–3). The HADS is scored by summing the ratings for the 14 items to yield a total score and by summing the ratings for the 7 items of

each subscale to yield separate scores for anxiety and depression[32,33]. The validity and reliability of the Turkish version of HADS were tested by Aydemir[33], and the Cronbach alpha for the HADS-A and HADS-D was found to be 0.85 and 0.77, respectively.

Numerical Rating Scale (NRS): Pain intensity was measured using the NRS, which ranges from 0 (no pain) to 10 (the worst pain imaginable).

Data collection

After obtaining ethical approval, the questionnaires were administered to participants by the researchers. If the participants met the eligibility criteria, they were asked to do so. Patients were briefly informed by the researchers on the purpose and methods of the study. Data were collected using the face-to-face interview technique. Participants completed the forms within approximately 15 to 20 minutes.

Data analysis

The Statistical Package for Social Sciences (SPSS, Chicago, IL) for Windows version 21.0 was used for data entry and analysis. The Kolmogorov–Smirnov test was used to examine the distribution of all variables. The patient characteristic variables were evaluated using the percentage distribution and mean. Descriptive statistics (*i.e.*, mean, range, standard deviation, frequency) were used to address study questions. An analysis of correlation was conducted with Pearson's r to evaluate the possible association among anxiety, depression, pain levels, and sleep time. A p-value below 0.05 was considered to indicate a statistically significant difference.

RESULTS

Patient characteristics

One hundred and nineteen patients completed the questionnaire. The participants included 64 men (53.8%) and 55 women (46.2%). The mean age of the patients was 59.13 years, with a standard deviation of 18.24 years. With respect to educational status, 53.7% of the sample had less than a high school education. The majority of participants were married (74.8%) and had health insurance (85.7%). Table 1 shows the participants' demographic characteristics.

Table:1 Demographic characteristics of the sample (N = 119)

Characteristics	Value M (SD) or n (%)
Age (years)	59.13 ± 18.24
Gender	
Female	64 (53.8)
Male	55 (46.2)
Education	
Illiterate	37 (31.1)
< High school	64 (53.7)
≥ High school	18 (15.2)
Marital status	
Married	89 (74.8)
Single/widowed	30 (25.2)
Health insurance	
Yes	102 (85.7)
No	17 (14.3)

Disease and sleep characteristics of the sample

The disease and sleep characteristics of the sample are presented in Table 2. The majority of the patients had hospital experience and knowledge of disease (73.9% and 81.5% respectively), and 50.4% of the patients had a chronic disease. It was found that 31.9% of the patients reported their knowledge level of disease as insufficient. The length of hospitalisation of almost all patients (90.8%) was 1 to 15 days. Of all the patients in the study, 39.5% had sleep problems, and 47.9% reported that their sleeping time was 6 to 8 hours per night.

Table 2: Disease and sleep characteristics of the sample (N = 119)

Characteristics	n (%)
Chronic disease	
Yes	60 (50.4)
No	59 (49.6)
Hospital experience	
Yes	88 (73.9)
No	31 (26.1)
Knowledge of disease	
Yes	97 (81.5)
No	22 (18.5)
Knowledge level of disease	
Sufficient	66 (55.5)
Insufficient	38 (31.9)
No idea	15 (12.6)
LOS in hospital	
1–15 days	108 (90.8)
16–30 days	7 (5.8)
> 30 days	4 (3.4)
Room type	
For one person	26 (21.8)
For two persons	60 (50.5)
For four persons	33 (27.7)
Sleep problems	
Yes	47 (39.5)
No	72 (60.5)
Sleep duration in hospital	
4–5 hours	38 (31.9)
6–8 hours	57 (47.9)
9 hours or more	24 (20.2)

LOS: length of stay

Factors affecting sleep patterns of patients

As shown in Table 3, it was seen that the most common factor affecting sleep was pain (87.4%). The other factors reported by patients were noises in the surrounding environment (60.5%), treatment and care

Table 3: Distribution of factors affecting sleep patterns of the sample

Do the factors affect sleep patterns of the sample?	Disagree n (%)	Undecided n (%)	Agree n (%)
Crowded room	50 (42)	17 (14.3)	52 (43.7)
Stuffy room	50 (42)	14 (11.8)	55 (46.2)
Uncomfortable bed or pillow	53 (44.5)	4 (3.4)	62 (52.1)
Uncomfortable temperature in the room	37 (31.1)	16 (13.4)	66 (55.5)
Turning on the light at night	47 (39.5)	6 (5)	66 (55.5)
Having care providers with patient	91 (76.5)	4 (3.4)	24 (20.2)
Feeling hungry or satiated	41 (34.5)	17 (14.3)	61 (51.3)
People entering and exiting the room	48 (40.3)	8 (6.7)	63 (52.9)
The treatment and care given during sleep time	38 (31.9)	13 (10.9)	68 (57.1)
Concerns about the disease	45 (37.8)	14 (11.8)	60 (50.4)
Lack of information about the disease or interventions	50 (42)	23 (19.3)	46 (38.7)
Pain	9 (7.6)	6 (5)	104 (87.4)
Missing their families or duties	61 (51.3)	20 (16.8)	38 (31.9)
Failure to apply sleep habits	62 (52.1)	27 (22.7)	30 (25.2)
Noises in the surrounding environment	43 (36.1)	4 (3.4)	72 (60.5)

given during sleep time (57.1%), an uncomfortable temperature in the patient's room (55.5%), and turning on the light at night (55.5%). The noise sources causing sleep deprivation were other patients' voices (44.5%), footsteps (37.8%), telephones (28.6%), staff (26.9%), restoration in hospital (25.2%), and television (0.8%).

Pain, anxiety, depression, and sleep patterns in patients

The mean scores of the sample on the HADS and NRS are shown in Table 4. When the scores that were obtained from the subscales of anxiety and depression were assessed as a sub-threshold or supra-threshold, it was found that 31.1% of patients had higher anxiety scores (13.16 ± 2.11), and 42.9% of patients had higher depression scores (11.72 ± 3.19). The mean pain severity was found to be 6.82 ± 3.95 following surgery, with individual scores ranging from 0 to 10. The correlations between pain, sleep patterns, anxiety, and depression are presented in Table 5. A statistically significant correlation was found between patients' pain intensity and both anxiety level ($p < 0.01$) and depression level ($p < 0.01$). A positive correlation was also found between patients' sleep problems and both anxiety level ($p < 0.01$) and depression level ($p < 0.05$). As hypothesised, a significantly negative relationship between sleep time in the hospital after surgery and the anxiety level of patients was found ($p < 0.01$).

Table 4: Mean scores of the sample on the HADS and NRS

Mean scores on the HADS and NRS	n (%)	Mean (SD)
Anxiety (HAD-A)		
Sub-threshold (0 - 10 score)	82 (68.9)	5.96 ± 2.77
Supra-threshold (11 - 21 score)	37 (31.1)	13.16 ± 2.11
Depression (HAD-D)		
Sub-threshold (0 - 7 score)	68 (57.1)	4.31 ± 2.19
Supra-threshold (8 - 12 score)	51 (42.9)	11.72 ± 3.19
Pain intensity		6.82 ± 3.95

HADS: Hospital Anxiety and Depression Scale; HAD-A: Hospital Anxiety and Depression Scale-Anxiety; HAD-D: Hospital Anxiety and Depression Scale-Depression

Table 5: Correlations between pain, sleep patterns, anxiety, and depression

Variables	Anxiety		Depression	
	r	p	r	p
Pain intensity	0.43	0.000**	0.24	0.007**
Sleep problems	-0.26	0.003**	-0.21	0.021*
Sleep time	-0.24	0.008**	0.05	0.581**

*Correlation is significant at the 0.05 level (two-tailed); **Correlation is significant at the 0.01 level (two-tailed)

DISCUSSION

For a better understanding of the complex clinical presentation of patients after surgery, the current study aimed to identify the potential relationships between pain intensity, anxiety, depression, and sleep patterns in a sample of Turkish patients following surgery. This study found that the most common factor causing sleep deprivation was pain, and patients with higher postoperative pain had higher anxiety and depression levels postoperatively. Associations were also found between sleep problems, anxiety, and depression. This finding could be attributed to the post-operative inflammatory processes involving release of pro-inflammatory mediators (IL-6) resulting in sleep restriction due to pain-related discomfort[16,34].

In the present study, less than half of the patients reported they had sleep problems, and their sleeping

time was 4 to 5 hours per night. Patients' pain intensity was found to be severe (6.82 ± 3.95). The majority of the patients (87.4%) indicated that the most common factor causing sleep deprivation was pain. The other factors were noises in the surrounding environment, treatment and care given during sleep time, an uncomfortable temperature in the patient's room, and turning on the light at night. Similarly, in a study by Büyükyılmaz *et al*[11], pain (45%) and noise (23%) were found to be the most cited factors affecting the sleep of orthopaedic patients in postoperative periods. Patients' night-time pain was also determined to be severe (6.59 ± 1.62). Similar findings were noted in a study by Herrero-Sánchez *et al*[14], who found positive significant associations between the intensity of ongoing pain and sleep quality: the higher the intensity of the pain, the worse the sleep quality. Wylde *et al*[35] reported that median pain scores for overnight pain were significantly higher for patients after total knee and hip replacement who were woken by their pain compared to those who were not woken by their pain each night. In a qualitative study by Shoqirat[31], the negative impact of pain on patients' sleep was reported by all participants. Participants indicated that pain is sometimes not relieved by medication, and thus they cannot sleep. This problem also affected patients' concentration, mood, and appearance. Sleep deprivation has a negative impact on many aspects of general health[1], including reducing pain thresholds[36], and can adversely affect postoperative outcomes[14]. Therefore, nurses who spend much of their time with patients should make every effort to encourage patients after surgery to report their personal pain concerns and sleep disruptions.

The pain intensity of the patients was severe (6.82 ± 3.95), and patients with higher postoperative pain had higher anxiety and depression levels in this study. Pain, a sensory and emotional experience, is influenced by physiological, sensory, affective, cognitive, sociocultural, and behavioural factors. Anxiety evokes similar responses in the physiological system and therefore may intensify pain[37]. Previous studies have reported similar findings[2,19,38] and suggested that anxiety may intensify pain, because it causes patients to become more attentive to pain[39]. Alternatively, postoperative pain may be a stressor that stimulates a heightened anxiety response and thereby contributes to the continuity of the pain–anxiety cycle[39]. During the postoperative period, changes in anxiety seem significantly related to changes in pain in previous findings[40,41]. A recent study by Pinto *et al*[38] reported a significantly positive correlation between postoperative anxiety and acute pain. In contrast with our findings, Gallagher and McKinley[29] found that anxiety levels were lower while participants were still inpatients after cardiac surgery. Only patients who were older, more anxious before surgery, and had concerns about being in pain had higher anxiety levels in the study. Lower anxiety levels could be explained associated with these results.

There was a positive correlation among sleep problems, anxiety, and depression in the present study. There were also found to be lower sleep times in patients with higher anxiety levels. Our study supports the hypothesis that pain intensity, anxiety, depression, and sleep form a continuous cycle in subjects following surgery. This finding is in accordance with Valenzuela- Millán *et al*[19], who reported sleep time was another factor associated with anxiety. It was found that patients who slept between 3 and 4 hours before the surgical procedure had anxiety in 29% of cases (OR = 19.81; p = 0.001). The authors also concluded that the fact that some patients slept between 7 and 8 hours before surgery seems to be a protective factor against the development of anxiety. Additionally, Gallagher and McKinley[29] reported that being in pain or discomfort was a predictor of preoperative anxiety, and difficulty sleeping in a strange bed was another predictor of anxiety after surgery. In combination with postoperative pain and hospital routines, sleeping in a strange bed may lead to sleep interruptions for patients, which promotes anxiety. Sleep disruptions also have been reported in other studies of patients after surgery[34,42].

Study limitations

We should recognise some limitations of our study. First, the study was conducted in only one hospital and two surgery clinics. Therefore, the findings cannot be generalised to all surgery patients in Turkey or to other countries. Second, the cross-sectional nature of the study limits the interpretation of our results. Despite these limitations, the current study provides valuable insight into possible contributors to variability related to postoperative pain, anxiety, depression, and sleep patterns of patients following surgery.

CONCLUSION

In conclusion, the current study shows that a statistically significant correlation was found between patients' pain intensity, sleep pattern, and both anxiety level and depression level. Associations were also found between sleep problems, and both anxiety level and depression level. Our results support the continuous cycle of pain, anxiety, depression, and sleep alterations in

patients following surgery. Sleep is an essential part of the healing process, as it contributes to the relationship among pain, anxiety, and depression. Consequently, future studies investigating the evolution of this relationship are clearly needed.

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