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ORIGINAL ARTICLE

Sleep Abnormalities in a Sample of Egyptian Patients with Chronic Pain

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Abstract

Background: **It is likely that chronic pain and sleep are inversely correlated. Therefore, The importance of accurate diagnosis and quick treatment of sleep issues is highlighted by the possibility that insufficient sleep is vital in the long-term appearance and/or aggravation of pain.**

Objective: **Clinical and neurophysiological evaluation of sleep disturbances in Egyptian patients with chronic pain.**

Patients and methods: **Patients with a diagnosis of chronic pain were recruited from Al-Azhar University Hospitals (Al-Hussein and Bab Al-Sheria University Hospitals) between July 2019 and August 2021. 29 participants served as the study's healthy control group, while 59 people had chronic pain. Clinical evaluation, semi-structured clinical psychiatric questioning, pain assessment, a sleep questionnaire, and polysomnography were performed on both groups.**

Results: **The present study concluded that the main causes of chronic pain were neuropathic pain NP (30.5%), osteoarthritis (OA) (20.3%), fibromyalgia (FM) (16.9), migraine (13.6%) and mixed cause (10.2%), the main sleep abnormalities were insomnia (57.6%), Restless Leg Syndrome (RLS) (25.4%) and Obstructive Sleep Apnea (OSA) (16.9%). Total sleep time (TST) and Sleep efficiency (SE) was decreased in chronic pain group with noticeable statistical significance.**

Conclusion: **Some common sleep disorders, such as insomnia, RLS, and OSA, are more common than expected in those with chronic pain.**

Keywords: Chronic pain, Polysomnography, Sleep disturbances

1. Introduction

When pain has been present most days of the week for at least three months, chronic pain is often identified. 10−25% of adults report having it. Association for the Study of Pain International.[1]

A combination of biological, psychological, and social factors contribute to it, and management is frequently complex. Many people do not, however some people do have a definite medical reason for their chronic pain, such as cancer or arthritis. Regardless of their diagnosis, a lot of patients with chronic pain claim to have trouble sleeping.[2]

It's likely that chronic pain and sleep are inversely correlated. The development and/or exacerbation of pain may, therefore, be significantly influenced by poor sleep over time, emphasising the significance of an accurate diagnosis and prompt treatment of sleep issues.[3]

Alterations to the inflammatory responses in the brain, which are crucial for managing sleep-wake cycles, are also linked to chronic pain. Sleep difficulties in people with pain may be psychologically caused by sadness, emotional reactions to chronic pain, and pain-related cognitions before bed.[1] It has been proposed that people with chronic pain may have alpha wave intrusion into non-REM sleep as a result of sleep disruptions.[4]

Polysomnography is the gold standard for evaluating the quality of sleep, and it measures a number of things like the length of various sleep stages, how often people wake up, cardiac and respiratory

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events, and limb movements. Stages 1, 2, 3, and 4 of sleep are included in the early sleep patterns, which are referred to as non-REM sleep. Deep sleep is another term for stages 3 and 4. Throughout the night, cycles of light sleep and REM sleep take place.[5]

Patients with pain have altered sleep patterns, spending more time in light sleep and less time in deep sleep. Based on all of this, our objective is to investigate sleep disturbances in Egyptian patients with chronic pain using clinical and neurophysiological methods.

2. Patients and methods

An observational retrospective case-control study was carried out at the hospitals affiliated with Al-Azhar University between July 2019 and June 2021. 88 participants with a range of sleep disturbances were enrolled in the study. Further dividing the patients into two categories, Group I (Cases) contained the patients. Who experienced a chronic pain caused by an identifiable medical problem and Group II (Controls) included chronic pain-free patients. The patients were recruited from the chronic pain outpatient clinic, neurology, orthopedic, and rheumatology department of Al-Azhar University hospitals. We excluded patients with sleep abnormalities due to acute psychological stress, surgical and/or medical pain conditions that respond properly to acute therabutic intervention. Age, Some of the demographic data gathered included gender, BMI, including any comorbidities that may be present (hypertension, diabetes mellitus, ischemic heart disease, atrial fibrillation, dyslipidemia, smoking, alcohol consumption, and presence of old stroke). By using a standardized, detailed, comprehensive semi-structured clinical and Psychiatric interview (1), we identified the final rating of the various signs and symptoms that were assessed by a clinician psychiatrist, neurologist, and psychologist. A detailed clinical history was taken from all patients who were known to have chronic pain conditions as regards their disease course, diagnosis, and management plan. Chronic pain is described as having discomfort for longer than three months on the majority of days (2). Using the Visual Analogue Scale (VAS) and Graphic Rating Scale (GRS), we classified the intensity of the pain into three categories: mild, moderate, and severe (3). We evaluated certain sleep problems using a variety of detailed sleep questionnaires. The Epworth Sleepiness Scale (ESS) was utilized to determine how likely it was for various circumstances to result in dozing off or falling asleep. (4). To evaluate the calibre and consistency of sleep, Utilized was the Pittsburgh Sleep Quality Index (PSQI) (5). Assessing the nature, consequences, and severity of insomnia is the goal of the insomnia severity index (ISI), which follows therapeutic response by adding responses to seven questions (6).

Four major sleep disorders were assessed using a modified version of the Sleep Disorders Questionnaire (SDQ): sleep apnea, narcolepsy, psychiatric sleep disorders, and periodic limb movement disorder (PLMD), smaller, 45-item form (7). The probability of having sleep apnea was calculated using the Sleep Apnea Clinical Number (SACS), which generates a score between 0 and 100. (8). In creating the Berlin Questionnaire (BQ), three categories were used (9). All patients were instructed to report their sleep diaries, the next morning by responding to one-item questionnaires about sleep onset, nightly awakenings, sleep periods, and sleep quality from the previous night. These surveys were developed to provide in-depth details regarding sleep schedules and patterns throughout the course of projected periods. (1–2 weeks). In addition, we requested the patients to report any daytime sleep-related complaints (pain, fatigue, and mood). A sleep study with several parameters] electroencephalography (EEG) (EEG), All patients were subjected to a thorough multidisciplinary evaluation at the clinical neurophysiology unit of the Neurology division of the Al-Azhar University hospitals. This evaluation included electrooculography (EOG), ECG, pulse oximetry, abdominal and thoracic respiratory effort, end-tidal or transcutaneous CO_2, sound recordings to measure snoring, and more. And congenital defects are all examples of surface electromyography (EMG) monitoring of limb muscles. The Al-Azhar University faculty of medicine's ethical committee reviewed and approved this study after it was carried out in accordance with the declarations of Helsinki.

2.1. Statistical analysis

The statistical programme for social sciences, version 22.0, was used to analyse the data (SPSS Inc., Chicago, Illinois, USA). With numerical data, the mean and standard deviation (SD) are used (SD). The median, frequency, and percentage are used for qualitative data. Two means have been compared, and significance has been determined using both the independent-samples *t*-test and the one-way ANOVA test. Use the Mann-Whitney *U* test for two-group comparisons in non-parametric data. The percentage differences between two qualitative variables have been compared using the X^2 test of significance. At a 95% confidence level, an error tolerance of 5% is

acceptable. Therefore, *P* values below 0.05 are regarded as significant, whereas *P* values above 0.001 are regarded as extremely significant.

3. Results

In this study we had 59 patients in chronic pain group and 29 in the healthy controls group.

The Mean (SD) age of Chronic pain group was 42.73 (10.807) years old, and regarding gender 57.6% of our chronic pain patients were females without any statistically significant difference between both groups. The main causes of chronic pain were neuropathic pain NP (30.5%), osteoarthritis OA (20.3%), fibromyalgia (16.9), migraine (13.6%) and mixed cause (10.2%). The main sleep abnormalities were insomnia (57.6%), RLS (25.4%) and OSA (16.9%). Total sleep time (TST) and Sleep efficiency (SE) showed highly statistically significant decrease in chronic pain group, on other hand Sleep onset latency (SOL) and Stage 1 were highly increased statistically significant in chronic pain group, No significant differences were found regarding other parameters (Deep sleep and Rapid eye movement) (Table 1).

No statistically significant difference was found regarding Periodic Limb Movements of Sleep (PLMS) between both groups. Apnea Hypopnea Index (AHI); and Berlin Q, that used to detect sleep apnea were statistically significant higher (16.9%) In the chronic pain group than that in the control group (0%) ($P < 0.05$) (Table 2) (Fig. 1).

Table 1. Comparison between chronic pain group and control regarding.

	Chronic pain ($n = 59$) Number (%)	Control ($n = 29$) Number (%)	*P* value
TST			
Decreased	59 (100)	9 (31)	0.00*
Normal	0 (0.00)	20 (69)	
SOL			
Increased	55 (93.2)	5 (17.2)	0.00*
Normal	4 (6.8)	24 (82.8)	
SE			
Decreased	55 (93.2)	5 (17.2)	0.00*
Normal	4 (6.8)	24 (82.8)	
Stage 1			
Increased	51 (86.4)	0 (0.00)	0.00*
Normal	8 (13.6)	29 (100)	
Deep sleep			
Decreased	16 (27.1)	6 (20.7)	0.51
Normal	43 (72.9)	23 (79.3)	
REM			
Increased	16 (27.1)	5 (17.2)	0.31
Normal	43 (72.9)	24 (82.8)	

Chi-square test was used for the above comparisons when the test assumptions were met, otherwise Fisher exact test was used. *: *P* value is significant for values ≤ 0.05.

Table 2. Comparison between chronic pain group and control regarding.

	Chronic pain ($n = 59$) Number (%)	Control ($n = 29$) Number (%)	*P* value
PLMSI			
Increased	3 (5.1)	3 (10.3)	0.36
Normal	56 (94.9)	26 (89.7)	
AHI			
Increased	10 (16.9)	0 (0.00)	0.03*
Normal	49 (83.1)	29 (100)	

Chi-square test was used for the above comparisons when the test assumptions were met, otherwise Fisher exact test was used. *: *P* value is significant for values £0.05.

Statistically, IRLS for RLS assessment was greater than in the control group (*P* 0.05).

All patients (100%) in the chronic pain group had higher (ESS) levels than in the control group, which was statistically significant (*P* 0.05). Patients had a poor PSQI rate of 45.8% compared to 6.9%, which was statistically different (*P* 0.05). CP was a predictor for IRIS, poor PSQI with positive statistically significant association and OR >1. Increased age, it was a predictor for Berlin Q high-risk score, Increased REM and decreased deep sleep with positive statistically significant association and OR >1. TST, SE, stage 1 sleep were significantly decreased among chronic pain patients compared to control, whereas 59 patients with chronic pain (100%) had decreased TST compared to 9 control subjects (31%). Additionally, 51 chronic pain patients (86.4%) had decreased stage 1 sleep compared to 0 patients in the control group. Moreover, increased SOL and decreased SE were seen in 55 patients with chronic pain (93.2%) relative to 5 patients in the control group (17.2%). The difference in PLMSI between the groups was not significant. However, AHI was significantly increased among chronic pain group compared to control ($P < 0.05$). (Table 3).

4. Discussion

We conducted this study to Assess sleep abnormalities in Egyptian patients with chronic pain using clinical and neurophysiologic assessment.

We had two groups; chronic pain group enrolled 59 CP patients and control healthy group enrolled 29 participants.

In the present study Mean (SD) age of Chronic pain group was 42.73 (10.807) years old, and regarding gender 57.6% of our chronic pain patients were females, in line with Other studies[6–8] noticed that women experience more chronic pain than males do in the overall population.

The prevalence of some painful illnesses, such as temporomandibular joint disorder, fibromyalgia, headache, and migraine, is higher in women. In

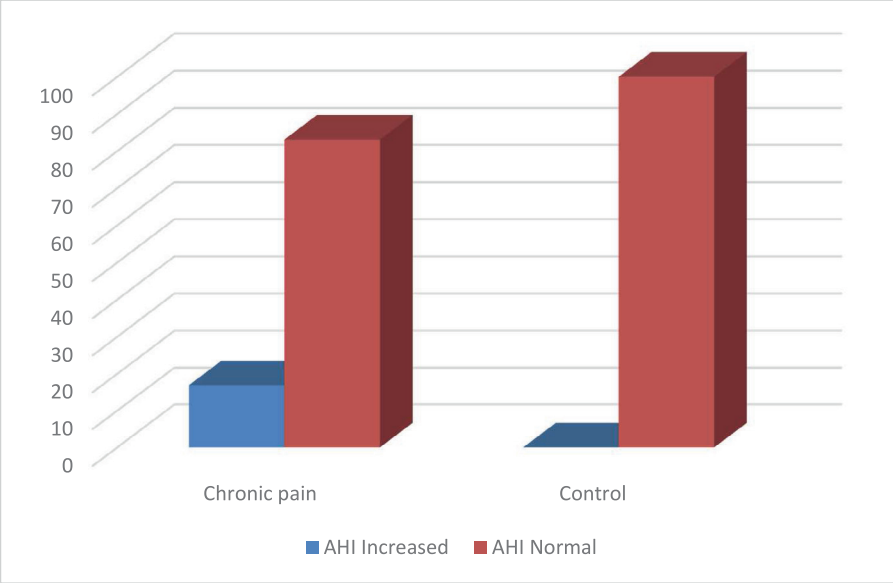

Fig. 1. Relationship between AHI in case & control group.

general, women are more prone than males to have chronic pain, which often manifests as discomfort at several sites and leaves them more immobile.[9]

It has been discovered that females react to pain more sensitively than males.

Evidence suggests that compared to men, women report higher pain intensities, lower pain thresholds, and pain tolerance.[9]

The main causes of chronic pain in the current study were neuropathic pain NP (30.5%), osteoarthritis OA (20.3%), fibromyalgia FM (16.9), migraine (13.6%) and mixed cause (10.2%)

Table 3. Comparison of the chronic pain group with the control group in terms of The Berlin Q score, IRLS, and ESS were all greater in the chronic pain group than they were in the control group (P 0.05). In addition, 32 patients' PSI scores were good (45.2%), as opposed to 27 controls' (93.1%) (P 0.05).

	Chronic pain ($n = 59$) Number (%)	Control ($n = 29$) Number (%)	P value
Berlin Q			
High	10 (16.9)	0 (0.00)	0.00*
Low	0 (0.00)	29 (100)	
Normal	49 (83.1)	0 (0.00)	
PSI			
Good	32 (54.2)	27 (93.1)	0.00*
Poor	27 (45.8)	2 (6.9)	
IRLS			
Increased	18 (30.5)	1 (3.4)	0.00*
Normal	41 (69.5)	28 (96.6)	
ESS			
Increased	59 (100)	2 (6.9)	0.00*
Normal	0 (0.00)	27 (93.1)	

Chi-square test was used for the above comparisons when the test assumptions were met, otherwise Fisher exact test was used.
*: P value is significant for values £0.05.

Sleep issues are also linked to neuropathic pain, and there is a significant back-and-forth association between these two types of pain.[10]

In the present study, the main sleep abnormalities were insomnia (57.6%), RLS (25.4%) and OSA (16.9%)

In agree with **Mathias *et al.*,**[11] the study of meta-analysis as All sleep disorders were 44% prevalent in CP, with obstructive sleep apnea (32%), restless legs syndrome (32%), and insomnia (72%) being the most frequent diagnosis.

According to additional studies, at least 50% of people with low back pain (LBP) also report sleeplessness symptoms,[12,13] Cheatle et al.,[14] found that only 3% of individuals in the study who were pain-free controls and 53% of those who had chronic pain met the criterion for insomnia. Total sleep time (TST) and sleep efficiency (SE) in the current study's chronic pain group decreased in a highly statistically significant manner. On other hand Sleep onset latency (SOL) and Stage 1 were highly increased statistically significant in chronic pain group, No significant difference was found regarding other parameters (Deep sleep and Rapid eye movement REM)In consistence with our finding; Reduced SE showed that the most frequent modification of sleep macrostructure across all trials was disruption of sleep continuity,[15] increased SOL,[16] and decreased TST.[15–17] According to the results of a meta-analysis study that looked at sleep disturbances in fibromyalgia, those who have the condition have poorer sleep and lower SE. When objectively examined, additional sleep disturbances in fibromyalgia

include increased difficulty falling asleep, shorter sleep duration, and light sleep, as well as extended wake times after sleep initiation.[18]

The current study increased stage 1, which accounts for the fact that CP appeared to have less of an impact on sleep architecture and that only NREM 1 duration was higher in CP patients. Between stages of sleep as well as between wakefulness and sleep, NREM 1 sleep is a stage of sleep.[19] Since it has a lower threshold for arousal, the lightest stage of sleep is more prone to awakenings brought on by both internal and external events.[20]

The fact that the CP sample also spent a lot more time in Stage 1, when conscious knowledge of CP feelings would be at its height, may further account for the bigger sleep fragmentation in that group.[11]

Only 3 patients in the chronic pain group (5.1%) in this study showed an increase in periodic limb movements of sleep (PLMS), hence there was no statistically significant difference between the two groups in this regard. In contrast to Herbst et al.,[21] they came to the conclusion that patients with CP had significantly more PLMS than healthy people when adaptation nights were not used prior to the polysomnography.

The goal of adaption nights is to help those who have trouble falling asleep on the first night (due to the equipment or new environment). Even though healthy people's PLMS are known to vary from one night to the next, they don't seem to be susceptible to 'first night' impacts[22]; hence, the rationale for this observation is conjectural and calls for additional study. In the present investigation, the Apnea Hypopnea Index (AHI) was used, and it revealed a statistically significant rise (16.9%) in the chronic pain group. In comparison to the control group, the question used to identify sleep apnea was statistically substantially higher (16.9%) in the chronic pain group (P 0.05). Another study found that 32% of CP patients had OSA, giving them a 2% prevalence rate, making them 16 times more likely than their healthy peers to suffer the illness.[23]

Roberts et al.,[24] used multivariate analyses to account for confounding correlations among all of these factors as they investigated the relationship between present pain and risk for OSA, sleep duration, sleep quality, and several mental comorbidities. Using the Berlin Sleep Questionnaire, In spite of the study showing an independent relationship between pain and sleep length rather than actual polysomnographic confirmation and factors, OSA was described in this study as 'risk for OSA' (41% were at high risk of sleep apnea). Since 30.5% of those in the chronic pain group showed elevated RLS compared to 3.4% of healthy individuals, the IRLS for RLS evaluation in the chronic pain group was statistically higher than that in the control group (P 0.05). According to Ohayon and Roth, the prevalence rate for[25] as RLS was 32%, which was substantially higher than the prevalence rate for the general population (5.5%). A questionnaire called the Epworth Drowsiness Scale (ESS) measures excessive daytime sleepiness.[21] All patients (100%) in the chronic pain group had higher (ESS) scores than those in the control group (P 0.05), which was statistically significant. According to Pimentel et al.,[26] the ESS revealed that 37.5% of participants exhibited severe daytime drowsiness, compared to just 5% in the Control Group (P0.001).

The Pittsburgh Sleep Quality Index (PSQI) questionnaire is a quick and simple way to collect information on sleep quality; in the current investigation, poor PSQI was identified in 45.8% of patients compared to 6.9% of controls, a statistically significant difference (P 0.05). Despite a mild severity of discomfort, Poor sleep quality was found by Alsaadi et al.,[27] and Zarrabian et al.,[28] (high PSQI score). In contrast, participants in the Kose et al.,[29] study who had low PSQI ratings reported better sleep quality while having significant pain. Alsaadi et al.,[27] also discovered a fragile connection between sleep disruption and pain intensity. In our study we assessed predictors of different sleep assessment tools and related abnormality using binary logistic regression; and we found CP was a predictor for IRIS, poor PSQI with positive statistically significant association and OR >1, and CP increase the risk of Increased REM as OR>1 but with no statistically significant association as we studied in this study.

Other predictor was Increased age, it was a predictor for Berlin Q high-risk score, Increased REM and decreased deep sleep with positive statistically significant association and OR >1, increasing in age also lead to high IRIS increased ESS and Increased sleep1 without significant association.[30,31]

Female gender increased the risk of occurrence of decreased deep sleep, Increased REM, High IRLS, Increased ESS and Increased sleep1(OR>1) without significant association.

4.1. Conclusion

People with chronic pain have worse sleep than their healthy controls; People with cerebral palsy experience problems with sleep architecture, according to polysomnography research (more NREM 1), sleep fragmentation, and sleep consistency (duration, efficiency, and ability to fall asleep) (respiratory-related events).

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

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Conflicts of interest

There are no conflicts of interest.

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