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Research Article

Pain, Daytime Sleepiness, Anxiety and Depression Levels of Patients with Chronic Neuropathic Pain Syndromes

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Summary

Objective: The current study aims to determine pain, daytime sleepiness, anxietyand depression levels of patients with chronic neuropathic pain and compare different clinical conditions causing neuropathic pain in terms of these variables.
Method: 241 patients (105 patients with diabetic neuropathy, 39 patients with fibromyalgia, 27 patients with carpal tunnel syndrome, 27 patients with radiculopathy, 22 patients with trigeminal neuralgia and 21 patients with postherpetic neuralgia) were included in the study. The assessments were performed using socio-demographic data form, Visual Analog Scale (VAS), Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), Epworth Sleepiness Scale (ESS) and Hospital Anxiety and Depression Scale (HAD).
Results: Evaluation of pain with VAS and LANSS showed no statistical difference among subgroups. Scores of LANSS and VAS were positively correlated with each other. ESS scores were found to be above the cut-off point (>10) in all subgroups.LANSS, but not VAS scores were positively correlated with ESS scores. Depression scores were above the cut-off point (>7) in diabetic neuropathy, fibromyalgia and trigeminal neuralgia groups and anxiety scores were above the cut-off point (>10) in diabetic neuropathy, fibromyalgia, trigeminal neuralgia and carpal tunnel syndromegroups. No correlation was found between scores of both VAS and LANSS and scores of HADS. Depression scores correlated positively with ESS scores ($r=0.153$, $p<0.05$).
Conclusions: Daytime sleepiness, depression and anxiety are associated comorbidities with different neuropathic pain syndromes. Neuropathic character, but not the intensity of pain is associated with daytime sleepiness. Pain intensity does not predict anxiety and depression levels. Depression, but not anxiety shows a positive correlation with daytime sleepiness. These results might have implications for the better understanding of comorbidities in different neuropathic pain syndromes.

Key words: Pain, daytime sleepiness, anxiety, depression, chronic neuropathic pain syndromes

Kronik Nöropatik Ağrılı Hastalarda Ağrı, Gün içi uykululuk, Anksiyete ve Depresyon Düzeyleri

Özet

Amaç: Mevcut çalışmanın amacı farklı klinik durumlarda nöropatik ağrılı hastalarda ağrı, gündüz uykuları, kaygı ve depresyon düzeylerini belirlemek.

Yöntem: 241hasta (105 hastalarda diyabetik nöropati, 39 hastalarda fibromiyalji, 27 hastalarda karpal tünel sendromu, 27 hastalarda radikülopati, 22 hasta trigeminal nevralji ve 21 hastalarda postherpetic neuralgia) çalışmaya alındı.
Sonuçlar: Gruplar arasında Vizuel Analog Skor (VAS) ve LANSS değerlendirmesinde hiçbir fark istatistiksel fark yoktu. Epworth Sleep Skorları tüm alt gruplarda kesme noktası üzerinde (>10) bulundu. Depresyon puanları 7 kesme noktası üzerinde (>7) diyabetik nöropati, fibromiyalji ve trigeminal nevralji gruplarında ve anksiyete 10 kesme noktası üzerinde (>10) diyabetik nöropati, fibromiyalji, trigeminal nevralji ve karpal tünel sendromu gruplarında yüksek bulundu. ESS ile depresyon puanları istatistiksel olarak olumlu ilişkili bulundu (p< 0,05).
Sonuçlar: Farklı nöropatik ağrılı sendromlara gündüz uykululuk, depresyon ve anksiyete eşlik edebilir. Depresyon, gün içi uykululuk ile pozitif yönde birliktelik gösterirken anksiyete ile ilişkisi gösterilememiştir.Bu sonuçlarla farklı nöropatik ağrı sendromlarında eşlik eden durumların daha iyi anlaşılması için etkisi olabilir.

Anahtar Kelimeler: Ağrı, Gün içi uykululuk, anksiyete, depresyon, kronik nöropatik ağrı

INTRODUCTION

The standard definition of chronic pain suggested by the International Association for the Study of Pain states that it is pain that persists after the healing phase following an injury[35]. Chronic pain, a costly and debilitatingmedical condition in industrialized countries, is now viewed as a biopsychosocial phenomenon, in which biological, psychological, and social factors dynamically interactwith each another[49]. There is a significant association between chronic pain and anxiety, depression and changes in sleep quality. These symptoms can precede and predispose individuals to suffer from chronic pain or chronic painful pathologies can stimulate the emergence of these symptoms[13].

The term chronic pain includes a large variety of clinical conditions. Neuropathic pain (NP) is one of the most prevalent chronic pain syndromes. Neuropathic pain has most recently been redefined by the International Association for the Study of Pain as “pain caused by a lesion or disease of the somatosensory system[29]. Patients with various conditions like diabetic polyneuropathy, poststroke syndromes, postherpetic neuralgia, trigeminal neuralgia, multiple sclerosis, fibromyalgia, carpal tunnel syndrome, radiculopathy and human immunodeficiency virus (HIV) sensory neuropathy frequently experience daily pain that impairs their quality of life[18]. As in other types of chronic pain, individuals with NP commonly have comorbidities, including mood disorders and sleep disturbances which lead to a poorer quality of life Patients with NP suffer from a variety of Axis I (eg, affective disorders, generalized anxiety disorder, substance-use related disorders, and somatoform disorders) or Axis II personality disorders[5]. The prevalence of depression is higher among chronic pain patients and depressed patients complain of more pain symptoms than people who are not depressed. The percentage of chronic pain patients with depression ranges from 22% to 78%[19]. Annagür et al. stated that themostcommonpsychiatricdisorderwasmajordepression insubjectswithchronicpain[4]. Patients with chronic pain also have a higher prevalence of anxiety disorders and anxiety disorders have been related with somatic complaints such as pain[32]. More than 70% of patients with the complaint of chronic pain have sleep disturbances such as increased sleep latency, increased wakefulness after sleep onset, increased arousal and reduced slow wave sleep. These sleep problems usually result from pain[5].

Attal et al. reported that subjects with chronic pain of neuropathic in origin displayed greater impairment of quality of life and sleep, and more symptoms of anxiety and depression than those with chronic pain of other origins and the general population. The poor life quality of these patients is not only due to the severity or duration of the pain, but is also affected by the neuropathic nature of pain itself. These data strongly suggest that NP is a specific health condition not only in terms of the nature of pain, but also in terms of disability and functioning[6].

As far as we know, there is no study in literature comparing levels of anxiety and depression and sleep disturbances between different clinical conditions with NP. In this study we aim to determine pain, daytime sleepiness, anxiety and depression levels of patients with chronic NP and compare different clinical conditions causing NP in terms of these variables.

MATERIAL AND METHODS

Sampling

This study was conducted at Department of Neurology of a 2. level State Hospital Samsun in Turkey between January 2010 and July 2010. This study was conducted at Neurology Department of Vezirköprü State Hospital, Samsun in Turkeybetween January 2010 and July 2010.(measurement periods yazılsındiyebirrevizyonvar, bundanbaşkayazabileceğimizbir period varmı?) 458 patients who applied to neurology out-patient clinic were recruited. The exclusion criteria for the patients were as follows: having a chronic physical disease other than diabetes mellitus, taking regular medication for pain including psychotropic drugs, alcohol or substance abusers, patients with clinical conditions with probable impairment in cognition such as post-stroke syndromes, HIV sensory neuropathy and multiple sclerosis, diabetic patients with serious diabetic complications such as renal failure, retinopathy or foot ulcers. After applying the exclusion criteria, 241 patients (105 patients with diabetic neuropathy, 39 patients with fibromyalgia, 27 patients with carpal tunnel syndrome, 27 patients with radiculopathy, 22 patients with trigeminal neuralgia and 21 patients with postherpetic neuralgia) were included in the study.

Physical and neurological examinations were done by a neurologist and routine blood tests were applied to all subjects. The Ethical Committee of the institution approved the study. All subjects gave written informed consent to participate in this study. The assessments were performed using the scales below: Socio-demographic data form, Visual Analog Scale (VAS), Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), Epworth Sleepiness Scale (ESS) and Hospital Anxiety and Depression Scale (HAD).

Measures

Socio-demographic data form: A form prepared by the researchers in order to obtain socio-demographic data (age, gender) and to assess clinical features (HbA1c levels and questions regarding the pain such in keeping with the objectives of the study).

Visual Analog Scale (VAS) For Pain: Visual Analog scale (VAS) for pain is a self-completed unidimensional measure of pain intensity[27]. It is widely used because of its simplicity and adaptability to a broad range of populations and settings. For pain intensity, the scale is most commonly anchored by “no pain” (0-1), mild pain (2-3), moderate pain (4-5), intense or severe pain (6-7), unbearable pain (8-11).

Leeds Assessment of Neuropathic Symptoms and Signs Scale (LANSS): The Leeds Assessment of Neuropathic Symptoms and Signs Scale (LANSS) is a standardized test to identify patients with predominant neuropathic pain mechanisms. This tool has two parts—a patient-completed section and a brief physical assessment. The LANSS

identifies patients with neuropathic pain by combining the scores of a patient's verbal description of pain and the results of neurological examination. A cut-off score of 12 points or more (out of a total of 24), when compared with expert opinion, had a sensitivity of 83% and a specificity of 87%[10]. The validity and reliability study for the Turkish population has been performed by Yücel et al[55].

The Epworth Sleepiness Scale (ESS): The Epworth Sleepiness Scale (ESS) is an effective instrument used to measure average daytime sleepiness. The ESS differentiates between average sleepiness and excessive daytime sleepiness that needs intervention. The client self rates on how likely it is that he/she would doze in eight different situations. Scoring of the answers is 0-3, with 0 being "would never doze" and 3 being "high chance of dozing". A sum of 10 or more from the eight individual scores reflects above normal daytime sleepiness and require for further evaluation[30]. The validity and reliability study for the Turkish population has been performed by Ağargün et al[1].

Hospital Anxiety and Depression Scale (HADS): The Hospital Anxiety and Depression Scale (HADS) was used to assess anxiety and depression. The HADS is a 14-item scale that provides a brief state measure of anxiety and depression. Subjects respond to statements on a four-point Likert scale, with different response items for each question. Total scores range from 0 to 21. Higher score shows higher level of anxiety or depression. Turkish version of HADS is valid and reliable in medically ill patients and 7 was found to be the cut-off score for depression subscale and 10 for anxiety subscale[17].

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) v.17.0 software program was used to construct the databases and perform the statistical analysis. The results of the continuous variables were presented in the form of mean±standard deviation. The categorical variables were expressed as relative frequencies. Continuous variables were compared using KruskalWallis test and Mann-Whitney U test. Categorical variables were compared using Pearson's chi-squared test and Fisher's exact test. Correlations between variables were tested using Pearson and Spearman correlation coefficients. All the tests were two-tailed and were applied following verification of the prerequisities for their use. P-values < 0.05 were considered statistically significant.

RESULTS

Two hundred forty-one patients, with a mean age of 53.1 ± 8.2 years (31-65) were evaluated. Among 241 patients, 49.8% (n=120) were men and 50.2% (n=121) were women. Table 1 shows the diagnostic subgroups of the patients. One hundred and five patients had diabetic neuropathy (DN), 39 patients had fibromyalgia (FM), 27 patients had carpal tunnel syndrome (CTS), 27 patients had radiculopathy (RP), 22 patients had trigeminal neuralgia (TN) and 21 patients had postherpetic neuralgia (PHN).

Evaluation of pain with VAS and LANSS showed no statistical difference among these subgroups. When all the patients were considered, mean VAS score was 71.1 ± 15.1 which points to intense or severe pain and mean LANSS score was 15.7 ± 3.7. Scores of LANSS and VAS were positively correlated with each other ($r=0.447$, $p<0.01$).

ESS scores were found to be above the cut-off point (>10) in all subgroups (Figure 1). DN and FM groups had the highest (13.2 ± 1.8 and 13.4 ± 2.2, respectively) ESS scores. Mean ESS score of DN group was significantly higher than mean ESS scores of both CTS and TN groups ($p<0.001$ for both). Mean ESS score of FM group was also significantly higher than mean ESS scores of CTS and TN groups ($p<0.001$ and $p<0.05$, respectively).

ESS scores were positively correlated with LANSS scores($r=0.151$, $p<0.05$), but not with VAS scores.

Assessment of patients with HADS revealed that depression scores of DN, FM, TN groups were above the cut-off point (>7) and anxiety scores of DN, FM, TN, CTS groups were above the cut-off point (>10) (Figure 2 and 3). FM group had the highest depression (10.1 ± 3.4) and anxiety (12.8 ± 2.9) scores.No correlation was found between HADS scores and scores of both VAS and LANSS.Depression scores, but not anxiety scores, were positively correlated with ESS scores ($r=0.153$, $p<0.05$).

HbA1c levels of DN patients were positively correlated with anxiety scores ($r=0.246$, $p<0.05$), but not with depression scores.

Table 1. Diagnostic subgroups of patients with neuropathic pain

Type of neuropathic pain	**n**	**%**
Diabetic polyneuropathy	105	43.6
Fibromyalgia	39	16.2
Carpal tunnel syndrome	27	11.2
Radiculopathy	27	11.2
Postherpetic neuralgia	21	8.7
Trigeminal neuralgia	22	9.1

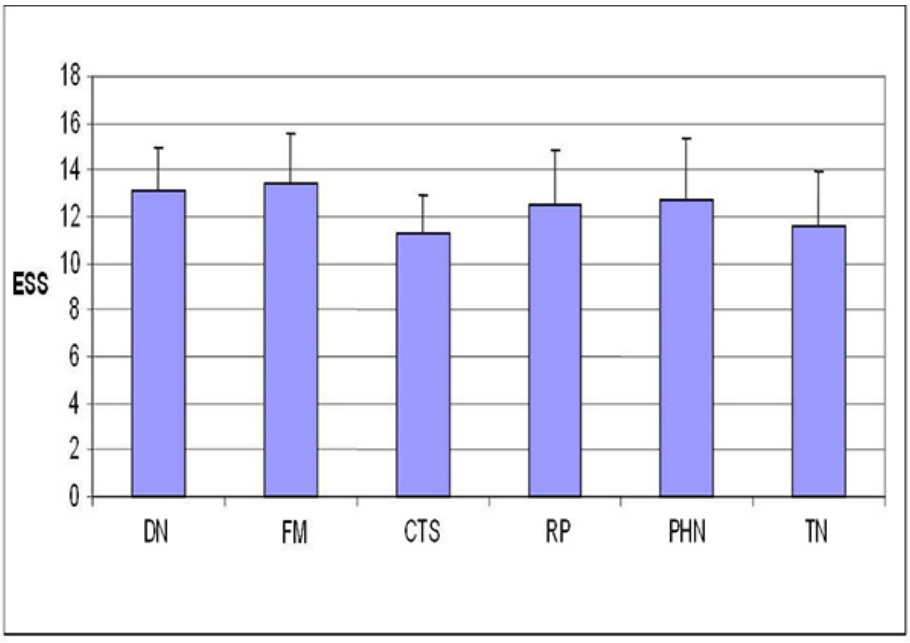

Figure 1: *ESS scores of the six neuropathic pain syndromes*

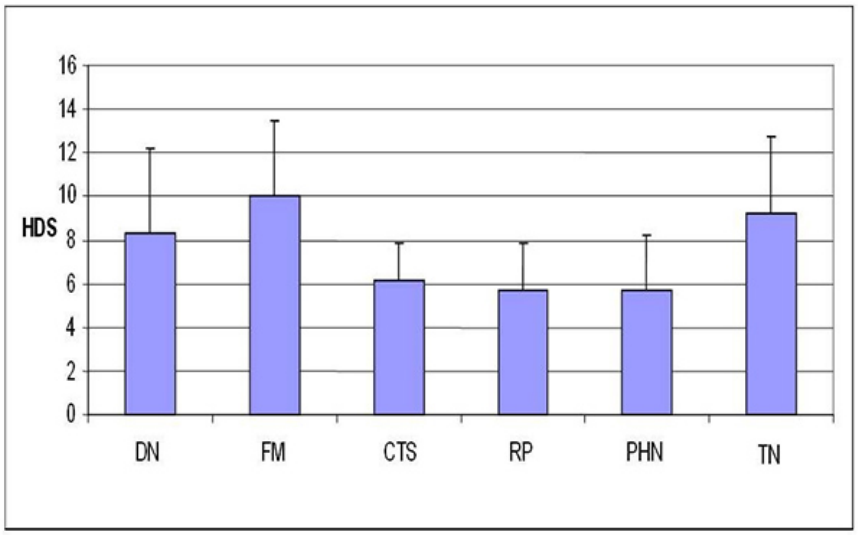

Figure 2: *HDS scores of the six neuropathic pain syndromes*

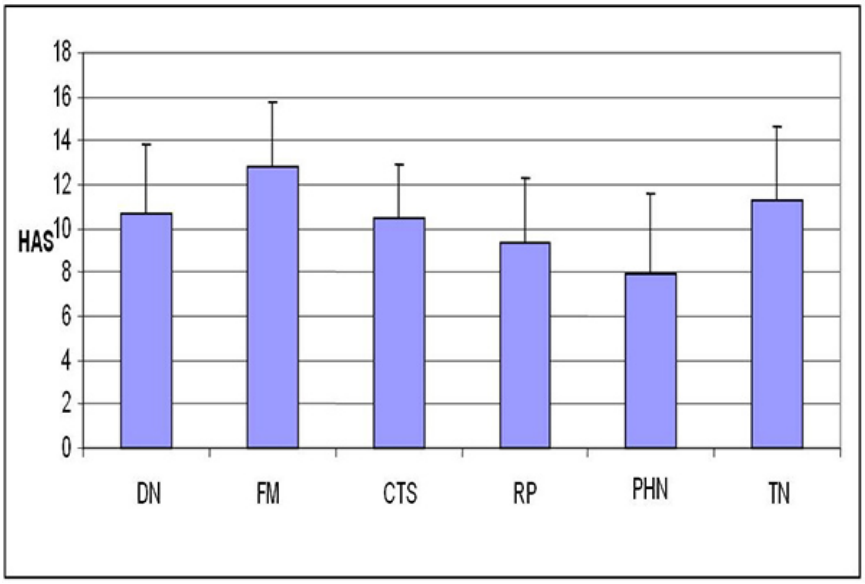

Figure 3: *HAS scores of the six neuropathic pain syndromes*

DISCUSSION

Inthepresentstudy, wefoundthattherewas a positivecorrelationbetweenLANSS and VAS scores. ESS scores were found to be above the cut-off point in all subgroups. DN and FM groups had the highest ESS scores. ESS scores were positively correlated with LANSS scores. Depression scores of DN, FM, TN groups and anxiety scores of DN, FM, TN, CTS groups were above the cut-off point. There was no correlation between HADS scores and scores of both VAS and LANSS.

In the literature, both the female gender and older age are listed as risk factors for chronic pain[25]. In our study, a mean age

of 53.1 ± 8.2 years is congruent with literature data, but the number of females and males did not differ significantly.

The LANSS scale was developed as a clinic based instrument for identifying patients whose pain is predominantly neuropathic in origin. Bennett reported a sensitivity and specificity of 83% and 87% respectively for the scale[10]. In our study we found a mean LANSS score of 15.7 ± 3.7 pointing to the predominant neuropathic origin of pain. No statistically significant difference was observed among subgroups in terms of LANSS and VAS scores. Patients complained of severe pain as indicated by a mean VAS score of 71.1 ± 15.1.LANSS and VAS scores were found to be positively correlated.

Sleep is an important element of normal functioning and well-being. Sleep problems are associated with anxiety, depression, impaired social functioning, chronic medical illnesses and mortality. Sleep disturbance is common in chronic pain. Radat et al. stated in their study that two-thirds of the subjects with neuropathic pain experienced interference with their sleep[41]. There are studies confirming the association of painful diabetic neuropathy (DN), a common complication of diabetes in which nerves are damaged as a result of hyperglycemia, with sleep impairment[16,24,51,56]. Polyneuropathy contributes to impaired sleep via several potential mechanisms. First, neuropathic pain itself may lead to disturbed sleep[56]. Second, polyneuropathy can impair thermoregulation. It has been proposed that autonomic changes in skin temperature modulate the neuronal activity of the thermo sensitive neurons in the pre-optic area/anterior hypothalamus which regulates vigilance and sleepiness[42]. There are few studies reporting excessive daytime sleepiness in diabetic patients[23,47]. Van Dijk et al. found no significant differences in reported daytime sleepiness between Type 1 diabetic patients and controls[50]. In another study impaired sleep quality and daytime sleepiness were associated with decreased diabetes self-management in Type 2 diabetic adults[14]. We also found increased daytime sleepiness in patients with DN with a mean ESS score of 13.2 ± 1.8 suggesting impaired sleep due to polyneuropathy.

Fibromyalgia (FM) syndrome is a chronic musculoskeletal pain disorder of unknown etiology, characterized by chronic widespread pain and muscle tenderness and the presence of tender points on examination. Evidence was shown for central pain processing abnormalities in almost all FM patients. These anomalies including hyperalgesia, allodynia, abnormal activation of pain-related brain regions and abnormal temporal summation of pain which strongly indicate a neuropathic pain syndrome. This new information led to the proposal that FM may be a neuropathic pain syndrome maintained by central nervous system sensitization and sympathetic hyperactivity[20]. Other common accompanying features are fatigue, sleep disturbances, stiffness, paraesthesias, headaches, Raynaud's like symptoms, depression and anxiety[15]. Sleep disturbances are generally regarded as a major comorbidity associated with FM[9]. Polysomnographic findings in FM patients include an alpha frequency rhythm, termed alpha-delta sleep anomaly. Sleep pattern is altered in these patients and there is evidence of an increase in stage 1 sleep, a reduction in delta sleep, and an increased number of arousals[26]. Patients with FM have been found to be significantly more likely to experience difficulties initiating or maintaining sleep than controls[46]. In particular, previous studies have identified difficulty falling asleep, staying asleep and waking up too early in the morning as the most common sleep associated symptoms among the FM population[52]. In a study, the occurrence of daytimehypersomnolancein FM patients was found to be related to a greater

severity of fibromyalgia symptoms and to more severe polysomnographic alterations[43]. FM group had the highest ESS score (13.4 ± 2.2) in our study.

Pain associated with chronic radiculopathy is caused by compression or lesion of a dorsal root or its ganglion. As the pain involves pathology of a peripheral nerve trunk, it is thought to be mainly of neuropathic origin. In a recent study, it is reported that the frequency and severity of depression, sleep disturbance and anxiety were similar in RP, DN and PHN. Somnolence occured a little less frequently in patients with RP than in patients with DN[34]. We found increased daytime sleepiness in RP patients with a slightly but not significantly decreased ESS score compared with DN, FM and PHN patients. Sleep disturbances are commonly reported in low back pain[3,8] but to our knowledge, there is no study investigating daytime sleepiness in RP in the literature.

Postherpetic neuralgia is the most common complication associated with Herpes Zoster, particularly in the elderly. Patients with PHN can experience a variety of constitutional symptoms, including chronic fatigue, anorexia, weight loss, physical inactivity, and insomnia, as well as psychological problems like depression and difficulty in concentration[44]. Weinke et al. Stated that patients with Herpes zoster and postherpetic neuralgia expressed feelings of helplessness and frustration mixed with depression, sadness, orrage[53]. As far as we know there is no data in literature about daytime sleepiness in PHN patients. We found that ESS scores of patients with PHN were above cut-off indicating increased daytime sleepiness.

Trigeminal neuralgia is a disorder of the fifth cranial nerve that causes episodes of intense, stabbing and electric-shock-like pain in the facial distribution of the nerve[6]. As during the day, pain paroxysms during sleep are typically induced by natural stimuli at TN trigger points and cause disturbance of sleep[17]. According to our findings, patients with TN also had increased daytime sleepiness.

Carpal tunnel syndrome (CTS) is the most common form of peripheral nerve compression. Classic symptoms of CTS include night waking with pain, tingling, and numbness. Patients with CTS have significant problems with a wide variety of sleep disturbances[40]. Patel et al. reported decreased sleep duration and quality in patients with CTS[39]. In our study, we showed that there was increased daytime sleepiness in patients with CTS.

In our study LANSS scores were positively correlated with ESS scores. But we could not find a significant positive correlation between VAS scores and ESS scores. This finding may indicate that daytime sleepiness is associated with the nature of pain rather than the intensity of pain. Results of a French nationwide survey also confirms that the neuropathic nature of the pain resulted in poorer quality of life, regardless of pain severity[27].

Neuropathic pain is a complex condition caused by a variety of conditions forming a very heterogenous group of affected individuals. It is one of the pain syndromes that is most difficult to treat. It strongly affects daily functioning interfering with psychological and social well-being. Depression and anxiety are frequently associated with neuropathic pain syndromes and reinforce the adverse effects of pain[54].

High degree of comorbidity between depression and chronic pain disorders is documented and evidence show that the incidence of depression among persons with chronic pain is higher than for other chronic medical illnesses[6]. Anxiety is commonly associated with chronic medical illnesses and develops more quickly than any other association between a psychiatric disorder and a chronic medical condition. Chronic pain patients have a high prevalence of anxiety disorders[22]. In a large scale study, Berger et al. reported that prevalences of depression (4.3% vs. 2.6%),

and anxiety(2.8% vs. 1.7%) were higher in patients with painful neuropathic disorders compared with control group[11]. In a multicentrestudy, Radat et al. reportedthattheprevalence of currentmooddisorders in patientssufferingfromneuropathicpainwas 29.7% (47% forlifetime) andthat of currentanxietydisorderswas 20.3% (39% forlifetime)[41]. Our study results revealed that depression scores were above the cut-off point (>7) in FM, DN and TN groups. The mean depression score of FM group was 10.1± 3.4 and was significantly higher ($p<0.05$) than all groups except TN.In the present study anxiety scores were above the cut-off point (>10) in DN, FM,TN and CTS groups. FM patients had the highest anxiety score (12.8 ± 2.9) again significantly higher ($p<0.01$) than all groups except TN.

Depression and anxiety are among the most common comorbidities of FM, with prevalence rates ranging in studies from 20–80% and 13-63.8%, respectively. Increased frequencies have been observed not only in clinical studies, but also in community and population studies[21]. It has longbeenknownthatmajordepression is highlyprevalent in patientswith FM, withtherates of currentdepressivedisordersrangingfrom28. 6% to 70%, andthe life time ratesrangingfrom 62% to 86%. Besides, FM is thesecondmostfrequent general medicalconditionassociatedwithmajordepressivedisorder[2]. Regarding these data, increased depression and anxiety scores in FM in our study is congruent with literature.

Prior studies have estimated that 28% of DN patients have depression and 35% have moderate to severe anxiety. In the present study, depression and anxiety scores of above cut-off levels in DN, is in line with literature. The presence of anxiety and/or depression leads to poorer outcomes for micro and macrovascular complications of diabetes. Patients with diabetes and anxiety were found to have poorer glycemic control and less frequent blood glucose monitoring[45]. Congruent with these literature data, HbA1c levels and anxiety scores were positively correlated in DN group ($r=0.246$, $p<0.05$) in our study.

Trigeminal neuralgia (TN) in an excruciating neuropathic pain which is considered as one of the worst causes of suffering associated to pain[12]. There are some studies indicating that patients with trigeminal neuralgia and chronic facial pain have high levels of anxiety and depression[33]. Our study results of TN group with anxiety and depression scores close to FM group also support literature data.

Studies investigating association of CTS with anxiety and depression are scarce in literature.Hobby et al. found a strong association between psychological disturbance and increased self-reported symptoms and disability in patients with carpal tunnel syndrome[28]. In the present study, anxiety but not depression scores of CTS group were above the cut-off level.

The literature indicates a clear link between psychological variables and back pain. The prevalence of major depression in patients with chronic low back pain is approximately three to four times greater than reported in the general population[48]. Mahn et al. made a direct comparison of psychological variables in painful RP, DN and PHN and found that the incidence of depression and anxiety associated with RP did not differ from that in other neuropathic pain disorders[34]. In our study, depression and anxiety scores of both RP and PHN were found to be below cut-off levels.

The relation of pain intensity to mood is uncertain: some work finds no correlation, but other evidence suggests a relation between intensity of pain and severity of mood disturbance[31]. Anxiety can modulate pain threshold, decrease tolerance to pain and increase patient self-reported pain ratings[5]. However, our

results do not support the literature data that pain intensity is associated with depression and anxiety severity. We found no correlation between HADS scores and VAS and LANSS scores. Contradicting with this result, Nakamura et al. reported that HADS score was significantly correlated with the VAS score and the duration of pain[38]. However,Keltner et al. reported thatgreater severity of depression symptoms is more highly correlated with worse well-being than is pain intensity in HIV related neuropathic pain. Pain intensity was more strongly correlated with physical health scores than was severity of depressed mood[31]. Myburgh et al. stated that chronic, intense pain and anxiety do not always appear to be related as the patients suffering from neck pain in their study had experienced a relatively high intensity of pain but appeared not to be anxious[37]. Radat et al. found that the only pain characteristic associated with mood disorders was moderate to severe minimal pain intensity suggesting that high minimal pain intensity causes more emotional distress than severe maximal pain in neuropathic pain patients[41]. In our study although the patients had severe intensity of pain, their mean depression and anxiety scores were mild. This fact may indicate that pain intensity does not determine depression and anxiety levels.

In the present study, there was a positive correlation with depression scores and ESS scores ($r=0.153$, $p<0.05$). Psychological distress is generally more severe among chronic pain patients with poor sleep than in those without sleep disturbance. Poor sleep in chronic pain has been associated with emotional distress in the form of depression, anger/hostility, fatigue, and confusion. Furthermore, depressed mood, but not anxiety, is likely to predict poor sleep in chronic pain patients. Morin et al. found no correlation of sleep disturbances with depression and anxiety in chronic pain patients[36]. Our results suggest that daytime sleepiness is associated with depression but not with anxiety.

There are some limitations of the present study. First of all, the sample size is small hindering the generalis ability of our results. Secondly, the distribution of gender was a result of the patient population that was willing to participate in the study and therefore may not represent the actual gender distribution in neuropathic pain syndromes. Thirdly, cross-sectional design does not allow to infer causality but only to show associations. Fourth limitation is the lack of a psychiatric structured interview which could have resulted in the under diagnosis of depression and anxiety. Nevertheless, we believe that our study could make a significant contribution to literature as it compares patients suffering from six different origins of neuropathic pain and focuses on daytime sleepiness which has not been a commonly studied parameter in neuropathic pain patients.

In conclusion, we have shown that daytime sleepiness, depression and anxiety are associated comorbidities with different neuropathic pain syndromes. Neuropathic character, but not the intensity of pain is associated with daytime sleepiness. Pain intensity does not predict anxiety and depression levels. Depression, but not anxiety shows a positive correlation with daytime sleepiness. These results might have implications for the better understanding of comorbidities in different neuropathic pain syndromes, future research strategies and the design of controlled clinical trials with larger sample sizes.

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