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RESEARCH

Sleep disturbances in elderly patients with distal radius fractures: a prospective observational study

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Abstract

Purpose No previous studies have reported the presence of sleep disturbances or their association with baseline factors in elderly patients with distal radius fracture (DRF). This study aimed to describe the proportion of patients with sleep disturbances and analyze their association with baseline factors in patients older than 60 years with conservatively treated DRFs.

Methods This prospective observational study included 220 patients with extra-articular DRFs who completed the Pittsburgh Sleep Quality Index at two time points: two weeks after cast removal and at the one year follow-up. Sociodemographic, anthropometric, clinical, radiological, and patient-reported outcome measures were analyzed as baseline predictors, with measurements performed two weeks after cast removal.

Results At two weeks after cast removal, 166 (75.5%) patients had sleep disturbances. Sleep disturbances were associated with the affected dominant hand ($\beta = 1.6$; $p = 0.04$), high-energy injury ($\beta = 3.8$; $p < 0.001$), extra-articular comminuted metaphyseal DRFs ($\beta = 2.3$; $p < 0.001$), higher Tampa Scale of Kinesiophobia scores ($\beta = 2.4$; $p < 0.001$), higher Pain Catastrophizing Scale scores ($\beta = 2.4$; $p < 0.001$), higher Pain Anxiety Symptoms Scale-20 scores ($\beta = 2.1$; $p < 0.001$), and higher visual analogue scale scores ($\beta = 4.1$; $p < 0.001$). At the one year follow-up, 85 (38.6%) patients had sleep disturbances, which were associated with higher Tampa Scale of Kinesiophobia scores ($\beta = 2.6$; $p < 0.001$), higher Pain Catastrophizing Scale scores ($\beta = 2.5$; $p < 0.001$), and higher Pain Anxiety Symptoms Scale-20 scores ($\beta = 1.8$; $p = 0.02$).

Conclusions A high proportion of elderly patients with DRF experienced sleep disturbances. Expanding our understanding of the interplay between sleep disturbances and baseline risk factors may lead to improved care and clinical outcomes for these patients. Future studies should incorporate the clinical management of sleep disturbances in patients with DRFs.

Keywords Distal radius fracture · Sleep disturbance · Baseline predictors · Patient-reported outcome measures · Observational study

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Introduction

Distal radius fracture (DRF) is one of the most common types of fractures [1]. DRFs have a bimodal age distribution in the population, with a peak incidence in patients younger than 18 years and a second peak in patients older than 60 years [1]. In the latter age group, DRFs account for approximately 18% of all fractures [1]. Despite the high incidence of DRFs, no consensus has been reached regarding the optimal treatment method for elderly patients [2–5]. The outcomes used to determine the effectiveness of different treatment modalities vary widely, and the controversial results may be explained by the type of outcomes assessed [2, 3].

Currently, patient-reported outcome measures (PROMs) are adopted by orthopaedic surgeons and physiotherapists to assess the impact of DRFs on patients' health status and to determine the effectiveness of different treatments [6–8]. Typically, PROMs include assessments in three domains: general health, disease-specific measures, and region-specific or joint-specific measures [7]. However, PROMs have been evolving rapidly across all fields of orthopedics [9]. In addition to physical function and pain, other essential aspects such as mental and social health can be assessed using PROMs [9, 10]. Supporting this, a systematic review showed that physical function and pain interference are the most common PROMs measures, but it is important to emphasize that other health domains, such as mental and social health, are essential to assess in patients with orthopaedic fractures [11].

Notably, musculoskeletal pain has been frequently associated with decreased sleep in orthopaedic patients [12]. In this context, sleep disturbances have detrimental effects on both mental and physical health, as well as on overall quality of life and the financial burden of healthcare [13]. Despite the high incidence of fractures treated by orthopedic surgeons each year, the rates and causes of sleep disturbances after DRF remain largely unknown. One study reported sleep disturbances in 25% of patients at three months and in 8% at one year after treatment, either surgical or conservative [12]. Difficulty sleeping is a common complaint after an acute fracture; however, orthopaedic surgeons should refer patients experiencing sleep difficulties beyond six months after the initial fracture to mental health specialists [12].

To our knowledge, no previous studies have analyzed the proportion of sleep disturbances and their association with baseline factors in elderly patients with conservatively treated DRFs. This highlights the need for specific research in these patients. Furthermore, understanding the association between sleep disturbances and baseline factors can significantly impact patients' quality of life, encompassing both physical and mental health domains. Thus, the main aim of this study was to describe the proportion of patients with sleep disturbances based on the Pittsburgh Sleep Quality Index (PSQI) at two weeks after cast removal and at the one year follow-up in patients older than 60 years with conservatively treated extra-articular DRFs. The secondary aim was to analyze the association between sleep disturbances and baseline factors, including sociodemographic, anthropometric, clinical, radiological, and PROMs data, in these patients.

Materials and methods

Design/setting

This prospective observational study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [14]. The study was approved by the Ethics Committee of the Central Metropolitan Health Service of Chile (ID: 0187). Between March 2015 and March 2020, a total of 220 patients older than 60 years with an extra-articular DRFs were prospectively recruited at a tertiary healthcare hospital in the Metropolitan Area of Santiago, Chile. All patients provided written informed consent approved by the ethics committee.

Participants

In all patients, the diagnosis of extra-articular DRF was confirmed by two orthopaedic surgeons. The AO/OTA classification system was used to assess the fracture type [15]. All patients subsequently underwent conservative treatment, which included a primary closed reduction with direct manipulation of the fracture fragments under haematoma block anesthesia with lidocaine, followed by post-reduction X-ray confirmation. Patients were then immobilized using an above-elbow cast (long arm cast), which was later replaced with a below-elbow cast (short arm cast), for a total immobilization period of 5 to 6 weeks. After cast removal, all patients were prescribed ibuprofen 400 mg every 8 h for 5 days and referred for physiotherapy treatment.

Patients were excluded if they met any of the following criteria: immediate complications after cast removal, such as complex regional pain syndrome or carpal tunnel syndrome; treatment with surgical interventions, including open reduction and internal fixation, external fixation, closed reduction with percutaneous K-wire fixation, or a combination of these techniques; or the presence of rheumatological or neurological diseases.

Outcomes measures

Sleep quality

Sleep quality was assessed using the PSQI, a self-report questionnaire that evaluates sleep quality over a one month interval [16]l. The total score ranges from 0 to 21, with higher scores indicating poorer sleep quality; a score exceeding 5 points suggests significant sleep disturbance [16]. The validity and reliability of the PSQI have been previously demonstrated in the elderly population [17].

Sociodemographic variables

Age, sex, marital status, and educational level were recorded. Educational level was classified as follows: basic education (participants who were functionally illiterate, had no formal education, or had not completed primary education), secondary education (participants who had completed primary education, high school/secondary education, or a bachelor's degree), and university education (participants with higher education beyond a bachelor's degree).

Anthropometric variables

Body weight was measured with participants barefoot and wearing light clothing, and height was measured using a wall stadiometer. Body mass index was then calculated as weight in kilograms divided by the square of height in meters and stratified according to the World Health Organization guidelines [18].

Clinical variables and comorbidities

The immobilization time, presence of a dominant hand fracture, and energy of injury were assessed. Injury energy was classified as low energy (a simple fall from a standing position) or high energy (a fall from a height of > 2 m, car accidents, or industrial crushing injuries causing abrasion wounds or open fractures). Additionally, common comorbidities in this age group, such as hypercholesterolaemia, diabetes mellitus, and smoking, were recorded.

Radiological parameters

Immediately after cast removal, each patient underwent a radiological examination to assess the final radiological results of the conservative orthopaedic treatment. Using Kreder's standardized technique [19], two orthopaedic surgeons independently measured the following radiological parameters: radial inclination, radial height, volar angulation, and ulnar variance. The main radiological outcome reported was the overall alignment of the DRF. Alignment was considered acceptable if the following criteria were met: radial inclination > 15º, loss of dorsal angulation < 15º, volar angulation < 20º, radial shortening < 5 mm, and positive ulnar variance < 2 mm [20].

PROMs

Psychological factors related to pain Pain-related fear of movement was assessed using the original 17-item Tampa Scale of Kinesiophobia (TSK) [21]. The total score ranges from 17 to 68, with higher scores indicating greater fear of movement and/or reinjury [21]. Pain catastrophizing was assessed with the Spanish version of the Pain Catastrophizing Scale (PCS) [22]. The total score ranges from 0 to 52, with higher scores reflecting higher levels of catastrophizing [22]. The PCS has been successfully used in a wide range of experimental and clinical settings and is one of the most widely used measures of this construct [23]. Finally, the Pain Anxiety Symptoms Scale-20 (PASS-20) was used to assess anxiety and fear associated with the experience of chronic pain [24]. The PASS-20 is a 20-item scale developed as a short form of the original 40-item scale [24]. The total score ranges from 0 to 100, with higher scores indicating higher levels of pain-related anxiety [24].

Functional outcomes The Patient-Rated Wrist Evaluation (PRWE) questionnaire was used to assess wrist and hand pain and function. The PRWE has been proven to be a valid and reliable instrument for evaluating pain and functional impairment outcomes in patients with DRF [25]. The Spanish version of the PRWE has also demonstrated good validity and reliability in patients with DRF [26]. The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire was used to assess upper limb function. The DASH has shown good responsiveness in patients with DRF, and its transcultural adaptation to the Spanish language has yielded excellent results in terms of validity, reliability, and sensitivity to change [27].

Grip strength was assessed using a Jamar™ dynamometer (Model FS360), with measurements taken according to the recommendations of the American Society of Hand Therapists [28]. The unaffected side was evaluated first, followed by the affected side. For both sides, the average value from three attempts was recorded. A 10% adjustment was applied to account for differences between the dominant and non-dominant sides. The final result was expressed as a percentage relative to the unaffected side. This valid and reliable instrument serves as the reference standard for evaluating grip function in patients with DRF [29]. Finally,

Table 1 Characteristics of patients older than 60 years of age with extra-articular DRF assessed at 2 weeks after cast removal

Characteristics	Patients ($n=220$)
Age (years), mean (SD)	68.2 (5.1)
Sex, number (%)	
Women	202 (91.8)
Men	18 (8.2)
Marital status, number (%)	
Single	20 (9.1)
Married	81 (36.8)
Widowed	75 (34.1)
Divorced or separated	44 (20)
Education level, number (%)	
Basic	44 (20)
Secondary	156 (70.9)
University	20 (9.1)
Height (m), mean (SD)	1.6 (0.2)
Weight (kg), mean (SD)	68.5 (9.2)
BMI (kg/m^2), mean (SD)	28.1 (3.2)
Stratified BMI, number (%)	
Normal	44 (20)
Overweight	121 (55)
Obesity	55 (25)
Immobilization time (weeks), mean (SD)	5.3 (0.6)
Affected dominant hand, number (%)	158 (71.8)
Energy of injury, number (%)	
Low	145 (65.9)
High	75 (34.1)
Number of comorbidities (diabetes, smoking, or hypercholesterolemia), number (%)	
Only one	44 (20)
Two	100 (45.5)
All the three	76 (34.5)
According to AO/OTA classification type of DRF, number (%)	
A2	100 (45.5)
A3	120 (55.5)
Acceptable alignment of DRF, number (%)	154 (70)
PSQI questionnaire, mean (SD)	8.3 (1.6)
TSK-17 questionnaire, mean (SD)	47.1 (8.4)
PCS questionnaire, mean (SD)	32.4 (7.6)
PASS-20 questionnaire, mean (SD)	44.2 (20.8)
PRWE questionnaire, mean (SD)	65.2 (7.3)
DASH questionnaire, mean (SD)	74.6 (6.4)
Grip strength, mean (SD)	18.8 (7.6)
VAS, mean (SD)	7.2 (1.9)

A2: Extra-articular simple or impacted metaphyseal radial fracture; A3: Extra-articular comminuted metaphyseal radial fracture; AO/OTA: Arbeitsgemeinschaft für Osteosynthesefragen/Orthopedic Trauma Association; BMI: Body Mass Index; DASH: Disabilities Arm Shoulder and Hand; DRF: Distal Radius Fracture; PASS-20: Pain Anxiety Symptom Scale; PCS: Pain Catastrophizing Scale; PRWE: Patient-Rated Wrist Evaluation; PSQI: Pittsburgh Sleep Quality Index; SD: Standard Deviation; TSK: Tampa Scale Kinesiophobia; VAS: Visual Analog Scale

the visual analogue scale (VAS) was used to assess rest pain intensity. The VAS has been shown to be a reliable and valid instrument for measuring changes in pain intensity [30].

Statistical analysis

Continuous variables are presented as mean and standard deviation, while categorical variables are presented as number and percentage. For the predictor analysis, multiple linear regression models were performed using the following:

- Model 1: Sociodemographic factors (age, sex, marital status, and education level).
- Model 2: Clinical factors (immobilization time, affected dominant hand, and energy of injury) and radiological factors (type of DRF and acceptable alignment).
- Model 3: Anthropometric factors (weight, height, and body mass index) and number of comorbidities.
- Model 4: Psychological factors related to pain (kinesiophobia, catastrophizing, and level of anxiety).
- Model 5: Functional outcomes (wrist and upper limb function, grip strength, and rest pain intensity).

The association between baseline predictor factors and sleep disturbance after cast removal and at the one year follow-up was calculated using non-standardized coefficients (β). All analyses were performed using Stata SE software, version 15 (StataCorp, College Station, TX, USA). Statistical significance was set at $p<0.05$.

Results

General

The characteristics of 220 patients older than 60 years with extra-articular DRFs, assessed at two weeks after cast removal, are shown in Table 1. At two weeks post-cast removal, 166 (75.5%) patients had sleep disturbances (PSQI > 5 points). By the one year follow-up, the number of patients with sleep disturbances decreased to 85 (38.6%).

Baseline predictors and sleep

Table 2 presents the association between baseline predictor factors and sleep disturbance. At two weeks after cast removal, sleep disturbance was significantly associated with the following factors:

- Affected dominant hand ($\beta=1.6$; $p=0.04$).
- High energy of injury ($\beta=3.8$; $p<0.001$).

Table 2 Association between baseline predictors factors and sleep disturbance after cast removal and 1-year follow-up in elderly patients older than 60 years with extra-articular DRF

Baseline predictors		Sleep disturbance			
		PSQI at 2 weeks after cast removal		PSQI at 1-year follow-up	
		β (SE)	*p*-value	β (SE)	*p*-value
Model 1	Age	-0.02 (0.0)	0.74	-0.03 (0.1)	0.56
	Sex	0.06 (0.1)	0.59	0.1 (0.1)	0.43
	Marital status	0.9 (0.2)	0.12	0.8 (0.1)	0.32
	Education level	0.8 (0.3)	0.23	0.6 (0.2)	0.18
Model 2	Immobilization time	0.9 (0.4)	0.28	0.8 (0.3)	0.24
	Dominant hand	1.6 (0.5)	**0.04**	0.9 (0.5)	0.16
	Energy of injury	3.8 (1.6)	<**0.001**	0.9 (0.6)	0.67
	Type of DRF	2.3 (1.1)	<**0.001**	0.8 (0.2)	0.21
	Alignment acceptable	0.5 (0.2)	0.62	0.4 (0.1)	0.98
Model 3	BMI	0.7 (0.2)	0.43	0.8 (0.2)	0.62
	Comorbidities	0.3 (0.1)	0.81	0.4 (0.1)	0.96
Model 4	Kinesiophobia	2.4 (1.1)	<**0.001**	2.6 (1.1)	<**0.001**
	Catastrophizing	2.4 (1.2)	<**0.001**	2.5 (1.4)	<**0.001**
	Level of anxiety	2.1 (1.0)	<**0.001**	1.8 (1.2)	**0.02**
Model 5	Wrist function	0.5 (0.3)	0.58	0.4 (0.1)	0.78
	Upper limb function	0.6 (0.4)	0.42	0.5 (0.2)	0.58
	Grip strength	0.5 (0.2)	0.62	0.6 (0.3)	0.59
	Pain intensity	4.1 (1.6)	<**0.001**	0.6 (0.3)	0.08

Boldface indicates a p-value < 0.05. Data expressed as non-standardized coefficient (β) and standard error (SE): DRF: Distal Radius Fracture; PSQI: Pittsburgh Sleep Quality Index; BMI: Body Mass Index. Model 1: Age, sex, marital status and education level. Model 2: Model 1 + immobilization time affected dominant hand, energy of injury, type of DRF and alignment acceptable. Model 3: Model 1 + Model 2 + BMI and comorbidities. Model 4: Model 1 + Model 2 + Model 3 + kinesiophobia, catastrophizing and level of anxiety. Model 5: Model 1 + Model 2 + Model 3 + Model 4 + wrist function, upper limb function, grip strength and pain intensity

- Extra-articular comminuted metaphyseal DRFs (β = 2.3; $p < 0.001$).
- Higher TSK scores (β = 2.4; $p < 0.001$).
- Higher PCS scores (β = 2.4; $p < 0.001$).
- Higher PASS-20 scores (β = 2.1; $p < 0.001$).
- Higher VAS scores (β = 4.1; $p < 0.001$).

At the 1-year follow-up, sleep disturbance remained associated with:

- Higher TSK scores (β = 2.6; $p < 0.001$).
- Higher PCS scores (β = 2.5; $p < 0.001$).
- Higher PASS-20 scores (β = 1.8; $p = 0.02$).

Prediction models

The outcomes of the prediction models indicated the following:

- Model 2 (*clinical/radiological*) predicted 33% of the PSQI at two weeks after cast removal.
- Model 4 (*psychological*) predicted 55% of the PSQI at two weeks after cast removal and at the one year follow-up.
- Model 5 (*functional*) predicted 25% of the PSQI at two weeks after cast removal.

Discussion

This study aimed to describe the proportion of patients with sleep disturbances and analyze its association with baseline factors in patients older than 60 years with conservatively treated DRFs. The main findings were that at two weeks after cast removal, 75.5% of patients experienced sleep disturbances. Baseline factors such as affected dominant hand, high-energy injury, extra-articular comminuted metaphyseal DRFs, and high levels of kinesiophobia, catastrophizing, anxiety, and pain intensity were associated with sleep disturbances. By contrast, at the 1-year follow-up, 38.6% of patients reported sleep disturbances, which were associated only with high levels of kinesiophobia, catastrophizing, and anxiety.

Currently, the inclusion of PROMs helps better quantify aspects of orthopedic patient outcomes that are missed with more objective measures, such as radiographic findings and physical examination results [6–9]. In this context, routine assessment of PROMs—including aspects of physical function, mental and social health, and sleep disturbances—could capture valuable information, addressing what is most important to patients. However, these measures are often not routinely assessed outside of health research due to concerns that their collection may disrupt clinic workflow, be labor-intensive, or cause financial burdens [31]. Despite these challenges, PROMs are increasingly used by orthopaedic surgeons and physiotherapists to evaluate recovery after DRFs. They can also serve as benchmark data to help patients manage their expectations about functional recovery after a fracture [32, 33]. Additionally, these measurements are increasingly used to inform the development of clinical practice guidelines, predict outcomes, and have been shown to improve patient satisfaction, experience, and clinical outcomes in cases of DRFs [34].

Adequate sleep duration plays a crucial role in promoting optimal physical health, immune function, mental health, and cognition [35]. However, physiological changes associated

with aging can affect sleep quality and duration, leading to a higher prevalence of sleep disorders in this population [36]. Supporting this, a recently published systematic review reported a high prevalence of sleep disorders among older adults, with no differences observed by sex [37]. Unfortunately, few studies have investigated the occurrence of sleep disturbances in patients with DRFs. One study reported a 25% prevalence of sleep disturbances at three months and 8% at one year in patients with DRFs treated either surgically or conservatively [12]. In agreement with our findings, this study showed that at the one year follow-up, sleep disturbances were associated with poor emotional status but not poor functional status. These findings suggest that in the long term, mechanisms other than injury-related factors may play a more significant role in functional recovery after DRF. However, the lack of additional studies in patients with DRFs limits the ability to compare our findings.

Our study showed that in the short term, pain intensity was one of the most significant risk factors for sleep disturbances in patients with DRF. In the literature, a recently published systematic review demonstrated that acute postoperative pain significantly affects sleep quality in patients recovering from orthopaedic surgery [38]. High levels of pain after surgery have been associated with behavioural changes and poor emotional health, which contribute to the development of sleep disorders [39]. In line with this, our recently published cross-sectional study revealed that low sleep quality is a risk factor for pain sensitization in elderly patients with DRFs [40]. This association may be explained by the important role of sleep in the inhibitory control of descending pain pathways [38]. However, no published studies have analyzed chronic pain as a risk factor for sleep quality in elderly patients with DRF, highlighting a gap in the current research.

Regarding injury-related factors, the severity of DRF and high-energy injury were the most significant risk factors for sleep disturbances, but only immediately after cast removal. In line with our findings, one study reported that high-energy trauma resulting in extra-articular DRF was associated with poor functional outcomes after DRF [41]. Although the mechanism underlying this association remains unclear, we hypothesize that patients experiencing high-energy injury mechanisms report greater pain intensity after DRF, leading to higher levels of sleep disturbances. However, further research is needed to explore this relationship in more detail.

Regarding psychological factors related to pain, our findings showed that in both the short and long term, these were the most significant risk factors for sleep disturbances in these patients. Several studies have revealed a bidirectional relationship between sleep disturbances, anxiety, and depression, suggesting that each contributes to and is a consequence of the other [42]. Although anxiety symptoms and sleep disturbances are interdependent, sleep disorders have been shown to have a greater impact on anxiety in the elderly population [43]. Numerous studies have analyzed psychological factors related to pain as predictive factors for functional recovery after DRF [40, 44–47]. Baseline levels of anxiety and catastrophizing were significantly associated with delayed functional recovery in patients with DRF treated both surgically and conservatively [40, 44–46]. Additionally, higher levels of kinesiophobia were significantly associated with worse functional outcomes in elderly patients with complex regional pain syndrome type 1 after DRF [47] and were identified as a baseline risk factor for pain sensitization in patients with conservatively treated DRF [40].

Currently, the challenge in treating elderly patients with DRFs is accurately predicting which patients are likely to experience suboptimal physical function and mental and social health outcomes. This study identified baseline risk factors specifically related to sleep quality in patients with DRFs, presenting an opportunity to broaden therapeutic approaches for these patients. Because sleep disturbance was associated with modifiable factors such as high levels of kinesiophobia, catastrophizing, anxiety, and pain intensity, we hypothesize that therapeutic interventions aimed at improving sleep quality could enhance functional outcomes, patient satisfaction, and expectations regarding treatment. Therefore, we recommend that sleep quality be routinely assessed in these patients because sleep disturbances may persist over time, and insufficient sleep can have detrimental effects on both physical function and mental health. In this context, orthopaedic surgeons should refer patients to mental health care specialists if they suspect a psychological cause of persistent sleep disturbances.

This study has several limitations. First, although our findings suggest that some baseline factors are risk factors for sleep disturbances, the causal relationship needs to be confirmed through further experimental research. Second, while this study described associations between sleep disturbances and factors such as injury characteristics, pain intensity, and psychological factors related to pain, we cannot determine the directionality of these associations. Third, although the PSQI is a valid and reliable instrument for assessing sleep quality in the elderly population, it relies on patient-reported difficulty sleeping, which is a subjective measure. Patients were not assessed using polysomnography, the gold standard for measuring sleep quality. Fourth, all PROMs were assessed using scales or questionnaires, which are inherently prone to subjectivity and recall bias. Fifth, there is a lack of information on changes in baseline predictor factors over medium- or long-term follow-ups. Finally, the study cohort was standardized by

excluding patients under 60 years of age, those with intra-articular DRFs, those with immediate complications after cast removal, and those treated with surgical interventions to reduce variability in the results. Future studies should include these patients and perform subgroup analyses, as they represent a more compromised population and may be at greater risk of developing sleep disturbances.

Despite these limitations, several strengths of this study can be highlighted. Notably, no previous studies have analyzed the proportion of sleep disturbances and their association with baseline factors in elderly patients with DRFs treated conservatively. Additionally, the large sample size, the one year follow-up, the wide range of variables assessed, and the novel approach to statistical analysis—including multivariate analysis with several covariates—are significant strengths of this study.

Conclusions

A high proportion of elderly patients with DRFs experienced sleep disturbances. After cast removal, sleep disturbances were associated with injury factors, pain intensity, and psychological factors related to pain. Conversely, at the one year follow-up, sleep disturbances were associated only with psychological factors related to pain. Expanding our understanding of the interplay between sleep disturbances and baseline risk factors could help improve care and enhance clinical outcomes for these patients. Future studies should aim to incorporate the clinical management of sleep disturbances in patients with DRFs.

Author contributions HG-E, DC-L and EH designed the study. HG-E, FA-Q, JV-F, RG-M and JR-V collected the data. FA-Q, JV-F, JR-V, RG-M and EH wrote the first draft of the manuscript. HG-E, FA-Q and DC-L performed the statistical analysis. HG-E supervised the project. All authors revised and approved the final manuscript.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Ethical approval This study involves human participants and was conducted according to the Declaration of Helsinki principles. Ethical approval was obtained from the ethics committee of the Central Metropolitan Health Service of Chile (ID: 0187).

Competing interests The authors declare no competing interests.

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