Sleep and Chronic Spinal Pain

Subjects: Others

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Spinal pain consisting of both neck and low back pain is an ubiquitous disorder whereby a substantial number of patients develop recurrent or chronic complaints. The underlying pathophysiology of the chronic variant points in the direction of alterations in the central nervous system and also involves psychological factors. Besides a major socio-economic impact on both the patient and society, the disabling character of chronic spinal pain (CSP) also negatively affects quality of life parameters and sleep.

Keywords: chronic low back pain ; chronic neck pain ; sleep ; insomnia ; systematic review

1. Introduction

Spinal pain consisting of both neck and low back pain is an ubiquitous disorder whereby a substantial number of patients develop recurrent or chronic complaints [1][2][3]. The underlying pathophysiology of the chronic variant points in the direction of alterations in the central nervous system and also involves psychological factors [4][5][6]. Besides a major socio-economic impact on both the patient and society, the disabling character of chronic spinal pain (CSP) also negatively affects quality of life parameters and sleep [7]. Sleep disturbances, which impair the multifunctional protective role of sleep on physiological homeostasis and restoration [8], are frequently reported by spinal pain patients, with a prevalence up to more than 50 percent [9][10][11][12][13].

There is growing evidence that the neurobiology of chronic pain shows overlapping mechanisms with sleep problems, which may explain the often established bidirectional relationship between chronic pain and sleep problems in people with fibromyalgia, osteoarthritis, and chronic low back pain (CLBP) among others [14][15][16][17][18]. Longitudinal and experimental research has affirmed that disturbed sleep causes generalized hyperalgesia and reduced endogenous pain inhibition in healthy subjects [19][20]. Increased pain can, in turn, further disrupt sleep, leading to a vicious cycle that can be further exacerbated by pain medication adversely affecting sleep [21][22]. However, insomnia is increasingly assumed to be a primary determinant, as it both deteriorates existing pain and predicts pain onset [14]. Insomnia disorder is defined as the patient's dissatisfaction with the quality or quantity of his or her sleep, together with other symptoms manifesting during the day or night such as fatigue, mood disturbances, and cognitive complaints over the course of at least three nights a week for a period exceeding three months [23].

The link between sleep and pain has already been clinically studied in specific pain populations, suggesting disorder-specific disturbances in sleep architecture [14][15][16][17][18]. In the past decade, substantial research effort has focused on the relationship between sleep and chronic pain [14][15][24]. Specific for the association between sleep and CLBP, a previous systematic review showed considerable evidence that CLBP is related to sleep outcomes, with more pain accompanied by more sleep disturbances [16]. Sleep parameters that are affected in this patient population compared to controls were sleep quantity, sleep disturbance, sleep quality, next day functioning, and sleep onset latency [16]. Since the database search in the aforementioned review was performed up to January 2009, the findings are rather outdated. Indeed, research into the association between sleep and spinal pain is evolving rapidly, and the literature in this domain has greatly increased over the past decade. In addition, to date, there is no review that has been conducted on the association between sleep and chronic neck pain (CNP). However, due to the similar underlying physiological and psychological pain mechanisms [25], a similar link with sleep as seen in CLBP could be expected in patients reporting CNP. Therefore, the aim of the current systematic review is to provide an update of the existing review of Kelly et al. (2011) regarding the relationship between CLBP and sleep [16]. However, the research question was specified to the presence of a bidirectional association between sleep parameters (i.e., sleep quality, sleep duration, insomnia severity, and sleepiness) and CSP parameters (i.e., pain duration, pain intensity, pain sensitivity) in both cross-sectional and longitudinal studies. Consequently, this included exploring the association between the onset of CSP as a result of insomnia. In addition, the pain outcome was extended to CSP, including chronic low back or neck complaints, or both.

2. Sleep Problems as Predictor for CSP

In six prospective cohort studies, the association between sleep problems on pain was investigated [26][27][28][29][30][31]. Of these studies, four of them examined the association between insomnia or sleep problems with the development of C(L)BP [26][28][31] or CNP [27][28][31] at a second (or third) point in time based on odds [26][27] and risk ratios [28][31]. There was one study that examined the association between sleep problems more specifically with pain intensity [29]. In addition, two studies investigated the association between sleep problems and recovery from CLBP [29][30]. In more detail, one study examined the impact of sleeplessness and number of insomnia symptoms in relation to recovery in male and female subjects [30]. Furthermore, the association between the type of sleep problems (developing, persistent or resolving) and recovery from CLBP in terms of pain intensity was investigated [29]. The sleep parameters in these studies were examined by means of a self-reported questionnaire [28][31], the Athens Insomnia Scale (AIS) [26], the Jenkins Sleep Questionnaire [27], or the Pittsburgh Sleep Quality Index (PSQI) [29]. Self-reported questionnaires [27][28][31] or a medical interview [26] were used to assess CLBP or CNP. Pain intensity was measured with a Visual Analogue Scale (VAS) [29].

Agmon et al. (2014) found higher odds of CBP in patients with insomnia compared to subjects without insomnia during a prospective cohort study [26]. Both the studies of Mork et al. (2014) and Uhlig et al. (2018) showed a higher risk for CLBP and CNP at follow-up relative to baseline sleep problems [28][31]. More specifically, patients who reported often or always having sleep problems had a higher risk of developing CLBP or CNP [28]. In addition, Kääria et al. (2012) found higher odds of CNP in women with rare to occasional sleep problems. This association was even stronger in both men and women reporting sleep problems frequently, resulting in higher odds of CNP [27]. A similar result was found in the study of Pakpour et al. (2018), whereby higher odds of CLBP intensity were reported in patients with baseline sleep disturbances, meaning that higher pain levels were present in patients with poor sleep at the start of the study [29]. Furthermore, higher odds of non-recovery in terms of pain intensity (VAS ≤ 1) in CLBP patients who develop sleep problems or who have persistent sleep problems regarding baseline were found in this study [29]. In contrast, lower odds of non-recovery in terms of pain intensity were found in patients with resolving sleep problems, indicating that as sleep problems diminish over time, CLBP will also improve [29]. Skarpsno et al. (2019) showed a higher risk of non-recovery from CLBP in both men and women if they reported sleeplessness often or always [30]. In addition, a higher risk of non-recovery from CLBP was found in women reporting a higher number of insomnia symptoms. No association between the number of insomnia symptoms and non-recovery from CLBP was found in male subjects [30].

Regarding the role of sleep disturbance as a predictor for CSP, moderate evidence was found for a negative impact of sleep problems on the occurrence of CSP (SoC 2). Weak evidence was present for higher CLBP pain levels at follow-up in patients reporting having problems with sleep (SoC 3). In addition, regarding recovery from CLBP, weak evidence was found for higher odds of non-recovery in people who develop or have persistent sleep problems over time or who report a high degree of sleeplessness (SoC 3). Additionally, weak evidence indicated that a higher number of insomnia symptoms was predictive for non-recovery from CLBP in women but not in men (SoC 3). The found associations are presented in **Table 1** .

Table 1. Brief overview of the main results of the longitudinal data.

Independent Variable	Dependent Variable	Association	Strength of Conclusion	
			CLBP	CNP
Sleep problems	Occurrence of CSP	+	** [26][28][31]	
	Pain intensity at FU	+	* [29]	** [27][28][31]
	Odds of non-recovery	+	* [29]	
Insomnia symptoms	Risk of non-recovery	+	* [30]	
CLBP	Insomnia	No	* [26]	

↑, higher; CLBP, chronic low back pain; CNP, chronic neck pain; CSP, chronic spinal pain; FU, follow-up; +, positive association, No, no association; * weak evidence; ** moderate evidence.

3. Conclusions

The current systematic review indicates that weak to moderate evidence is present for an association between sleep and spinal pain. In this relationship, sleep seems to be a stronger predictor for the development of CSP than vice versa. Addressing the frequently reported sleep problems in chronic back pain patients is therefore a necessary complement to

pain management in order to provide an optimal treatment outcome in this population.

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