Sleep Medicine Reviews 33 (2017) 28–38

Contents lists available at ScienceDirect

Sleep Medicine Reviews

journal homepage: www.elsevier.com/locate/smrv

CLINICAL REVIEW

Developing a successful treatment for co-morbid insomnia and sleep apnoea

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ARTICLE INFO

Article history:
Received 7 December 2015
Received in revised form
21 April 2016
Accepted 21 April 2016
Available online 6 May 2016

Keywords:
Insomnia
Obstructive sleep apnoea
Apnoea
Sleep-disordered breathing
Secondary insomnia
Treatment
Cognitive behaviour therapy
Continuous positive airway pressure

SUMMARY

Insomnia and sleep apnoea are the two most common sleep disorders, found in 6% and 23–50% of the general population respectively. These disorders also frequently co-occur, with 39–58% of sleep apnoea patients reporting symptoms indicative of co-morbid insomnia. When these disorders co-occur, clinicians are faced with difficult treatment decisions, patients experience the additive detrimental impacts of both disorders, and the effectiveness of discrete treatments for each disorder may be impaired. A common finding is that co-morbid insomnia and sleep apnoea (COMISA) is more difficult to treat than either disorder presenting alone. Co-morbid insomnia reduces the initial acceptance of, and later adherence to, continuous positive airway pressure (CPAP) therapy for obstructive sleep apnoea. This has resulted in recent recommendations that treatment approaches should initially target COMISA patients' insomnia to remove this barrier to CPAP treatment, and improve patient outcomes. However, no randomised controlled trial outcomes investigating this treatment approach currently exist.

The current article aims to review and integrate recent research examining the prevalence, characteristics, and theoretical mechanistic relationships between co-occurring insomnia and OSA, and discuss previous treatment attempts.

Insomnia and obstructive sleep apnoea

Insomnia is characterised by chronic difficulties initiating or maintaining sleep, by early morning awakenings, or a combination of these complaints, which are associated with significant daytime impairment [1]. According to conservative diagnostic criteria, chronic insomnia occurs in 6% of the general population [2]. The diagnosis of insomnia often includes a structured interview with a trained sleep physician or psychologist, who interprets the patient's subjective sleep, daytime impairments, onset and duration of symptoms, medical history, and the presence of co-morbid conditions [3]. However, most research studies rely on sleep diaries (measures of night-to-night subjective sleep parameters) or self-report questionnaires such as the insomnia severity index (ISI) to indicate the presence and severity of insomnia [4]. The ISI is a seven-item self-report questionnaire including three items relating to night time sleeping difficulties, and four-items measuring the daytime impact/impairments of insomnia [4]. Possible ISI scores range from 0 to 28, with a score of 15 or greater commonly being used to indicate at least moderate insomnia [4].

Historically, when presenting alongside another medical or psychiatric diagnosis the insomnia had been conceptualised as a 'secondary disorder' [5], that is, a consequence of the primary disorder and one that might ameliorate with treatment of the primary disorder. However, co-existing insomnia can persist after treatment of the assumed 'primary disorder', and may respond well to targeted insomnia therapies [5,6]. A 'secondary insomnia' diagnosis is also difficult to establish, and commonly leads to under-treatment of the insomnia [6]. Therefore, the National Institute of Health State of the Science Conference, and diagnostic schema have since stated that the diagnosis of 'co-morbid insomnia' be made when additional diagnoses are present [1,7]. The term 'co-morbid insomnia' better indicates that a bi-directional relationship between insomnia and other disorders

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http://dx.doi.org/10.1016/j.smrv.2016.04.004
1087-0792/

Abbreviations

AASM	American academy of sleep medicine
AHI	apnoea hypopnoea index
APAP	auto-titrating positive airway pressure
CBTi	cognitive behaviour therapy for insomnia
COMISA	co-morbid insomnia and sleep apnoea
CPAP	continuous positive airway pressure
HPA	hypothalamic-pituitary-adrenal
ICSD	international classification of sleep disorders
ISI	insomnia severity index
NRS	non-restorative sleep
OSA	obstructive sleep apnoea
PSG	polysomnography

may be present, and that more effort and attention should be directed at treating the insomnia.

Both primary and co-morbid insomnia can be effectively treated with cognitive behavioural therapy for insomnia (CBTi) [8,9]. CBTi is a multi-component therapy which targets the cognitive, behavioural and physiological processes believed to perpetuate insomnia. In this way, CBTi targets the underlying factors which maintain the insomnia, resulting in durable improvements in sleep and daytime symptoms [3].

Obstructive sleep apnoea (OSA), the most common sleep disorder, is characterised by repetitive brief closure (apnoea) or narrowing (hypopnoea) of the upper airway during sleep that results in oxygen desaturations, increased night time arousals and sympathetic nervous system activation, sleep fragmentation, and increased daytime fatigue and sleepiness [10]. The clinical severity of OSA is typically indicated by the average number of apnoeas and hypopnoea occurring per hour of sleep (apnoea hypopnoea index; AHI [1]). Mild, moderate, and severe OSA are commonly indicated by AHI ranges of $\geq 5 - <15$, $\geq 15 - \leq 30$, and >30 respectively. Moderate-severe OSA affects 23% of females, and 50% of males in the general adult population, with symptomatic OSA (OSAS), which includes clinically significant daytime sleepiness (Epworth sleepiness score, ESS, >10), affecting around 2% of females and 7% of males [11]. The most effective treatment for moderate to severe OSA is continuous positive airway pressure (CPAP) therapy. Air pressure pneumatically splints the upper airway, preventing apnoea and hypopnoea, and effectively treating the majority of night-time and daytime symptoms of OSA [10]. Patient acceptance and adherence limits the effectiveness of CPAP, as a large percentage of patients immediately reject, discontinue, or underutilise CPAP over time [12].

The co-occurrence of insomnia and sleep apnoea was first noted over four decades ago [13]. More recently, research investigating this specific co-morbid disorder has been emerging at a rapid pace. The current article aims to review and integrate recent research examining the prevalence, characteristics, and theoretical mechanistic relationships between co-occurring insomnia and OSA, and discuss previous treatment attempts.

Shared symptoms of insomnia and obstructive sleep apnoea

Before discussing the overlap of insomnia and OSA, it is important to acknowledge a methodological factor relevant to all co-morbid insomnia and sleep apnoea (COMISA) research. Insomnia and OSA are both sleep disorders and share many of the same symptoms (see Fig. 1) [14]. These shared symptoms can complicate the diagnosis and measurement of treatment response in COMISA patients, as it is not always clear whether they should be attributed to only one, or both disorders [15].

For example, non-restorative sleep (NRS) has historically been used as a diagnostic criterion for both insomnia and for OSA [1]. Therefore, it is unsurprising that among patients with pre-diagnosed OSA, a high percentage would be artificially diagnosed with co-morbid insomnia when this NRS criterion is used [16,17]. This was recently illustrated when examining the prevalence of co-morbid insomnia among a group of OSA patients [16]. When NRS was included among diagnostic criteria for insomnia, 79% of the OSA patients were diagnosed with COMISA. When the NRS criterion was excluded, the prevalence of COMISA dropped to 47% (based on difficulties initiating or maintaining sleep). Also, many studies assessing changes in insomnia severity following treatment of the OSA may find improvements which are an artefact of shared symptoms (e.g., assessing 'insomnia improvements' after CPAP therapy [18]). In such research, it is important to examine measures of insomnia closely, and be attentive to studies which rely on shared symptoms to indicate the presence of, or changes in, insomnia severity.

To overcome this issue, it may be helpful to validate existing scales, or develop new scales to measure insomnia in the presence of co-morbid OSA. For example, new scales omitting common shared symptoms, or assigning more weight to symptoms unique to each disorder would be one way to overcome this issue. Some researchers have already begun 'cherry picking' specific items from existing insomnia-measures, which are believed to share little overlap with OSA symptoms [19]. Alternatively, questionnaires such as the 'sleep symptom checklist' which concurrently assess specific symptoms of both insomnia and OSA, may be very useful when attempting to disentangle symptoms of each disorder where they co-occur [20]. This questionnaire's ability to distinguish OSA and specific insomnia subtypes and presentations, may make it a potential candidate for future psychometric research, before utilising it as an outcome measure in future COMISA studies.

COMISA prevalence

The prevalence of co-occurring insomnia and OSA can be defined in a number of ways. Several studies have investigated the

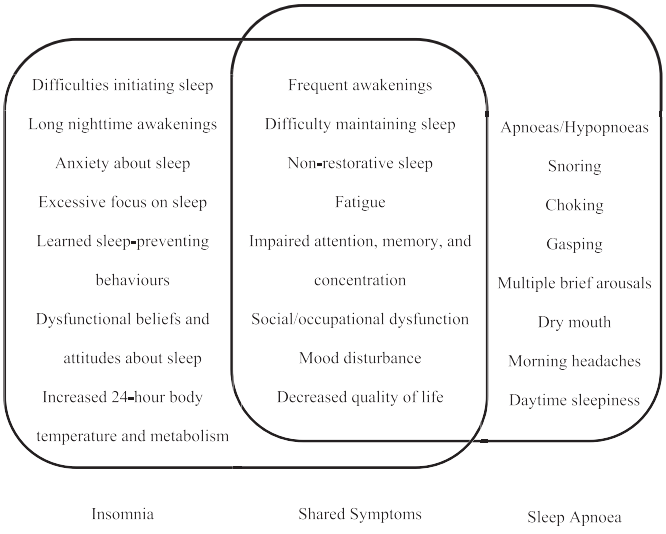

Fig. 1. Unique and shared symptoms of insomnia and sleep apnoea. Adapted with permission from Luyster et al. [14].