



Differential predictors of nighttime and daytime sleep complaints in older adults with comorbid insomnia and osteoarthritis pain



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ARTICLE INFO

Keywords:

Sleep
Insomnia
Fatigue
Beliefs
Attitudes
Depression
Pain
Osteoarthritis

ABSTRACT

Objectives: Osteoarthritis (OA) is extremely common in older adults, affecting 50% of people aged 65 or older, and more than half of older adults with OA complain of significantly disturbed sleep. This study compared predictors of nighttime sleep complaints and daytime sleep-related consequences as measured by the Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI) in older adults with comorbid OA pain and insomnia.

Methods: A secondary analysis of baseline data from a large longitudinal randomized controlled trial. Multivariate regression analyses were performed to test two sets of predictive models.

Results: 367 older adults (mean age 72.9 ± 8.2 years; female 78.5%) with OA and insomnia were included in this analysis. In Model 1, fatigue and depression predicted daytime sleep-related consequences for both ISI and PSQI. When measures of sleep and pain beliefs/attitudes were added (Model 2), fatigue, and sleep and pain beliefs/attitudes predicted nighttime sleep complaints for both ISI and PSQI; depression was no longer a significant predictor of ISI daytime consequences, but remained in the model for PSQI daytime consequences.

Conclusions: This study found both similarities and differences in factors predicting nighttime sleep complaints and daytime sleep-related consequences. Individual beliefs/attitudes about sleep and pain were stronger predictors of sleep difficulties than were depression and pain. Fatigue was the strongest and most consistent predictor associated with both nighttime sleep complaints and daytime sleep-related consequences regardless of the scale used to measure these concepts.

1. Introduction

Osteoarthritis (OA) is extremely common in older adults, affecting 50% of people aged 65 or older, more than half of all older adults with OA complain of significantly disturbed sleep, making OA-related insomnia the most common comorbid form of insomnia in older adults [1,2]. The assessment and diagnosis of chronic insomnia involves two components: nighttime sleep complaints and daytime sleep-related consequences, as specified by the 3rd edition of International Classification of Sleep Disorders (ICSD-3) and the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) [3,4]. While questionnaires commonly used in the evaluation of insomnia, such as the Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI), typically inquire about both the nature of nighttime sleep and daytime function, these measures are usually reported in the literature as total scores and rarely are their nighttime and daytime components examined separately.

Studies have shown poor nighttime sleep is associated with medical comorbidity [5], depression [6,7], fatigue [8], and pain [9]. However, in the case of individuals with OA pain, little is known about how these correlates interact with demographic characteristics or beliefs and attitudes about sleep and pain, or whether they are also important predictors of daytime sleep-related complaints. The current study addresses this gap by comparing predictors of ISI and PSQI subscales for nighttime sleep complaints and daytime sleep-related consequences in a large cohort of community dwelling older adults with comorbid OA and insomnia. We hypothesized that demographic, mood, and physical predictors for nighttime complaints would be similar for both the ISI and PSQI, predictors for daytime complaints would also be similar across both scales, but that predictors for nighttime compared to daytime complaints would differ within both scales. We then sought to determine whether addition of variables measuring sleep and pain beliefs/attitudes would alter the nature of the original predictive relationships.

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2. Methods

2.1. Participants and procedures

This was a cross sectional study employing secondary analyses of baseline data from a large randomized controlled trial (R01 AG031126) [10]. The study sample was composed of 367 older adults, age 60 or above, who enrolled in a study comparing three group interventions for treating insomnia and osteoarthritis pain. Participants were recruited from Kaiser-Permanente of Washington, formerly Group Health Cooperative (GHC), a large health maintenance organization in Seattle, Washington. Sample characteristics were comparable to other non-participating older adult GHC members with OA and insomnia symptoms [11].

2.1.1. Inclusion/exclusion criteria

Between 2008 and 2010, the team contacted 8057 GHC members aged 60 or above who had an electronic medical record OA diagnosis associated with a health care visit in the past 3 years. Members with the following conditions identified in the last three years were excluded prior to initial screening: rheumatoid arthritis; obstructive sleep apnea, periodic leg movement disorder, restless leg syndrome, sleep-wake cycle disturbance, rapid eye movement behavior disorder; dementia or receiving cholinesterase inhibitors; Parkinson's disease; cancer diagnosis in the past year and receiving chemotherapy or radiation therapy in the past year; inpatient treatment for congestive heart failure within the prior 6 months [12]. Eligible members were mailed a screening questionnaire which asked about frequency and interference level of their OA pain over the past three months and the frequency and severity of their sleep problems. Eligibility for participation was based upon responses to pain and sleep items on the questionnaires [11]. Participants all met research diagnostic criteria for chronic insomnia [13], and had significant arthritis pain as defined by Grade II, III, or IV on the Graded Chronic Pain Scale (GCPS) [14].

2.2. Measures

2.2.1. Demographic variables

Demographic characteristics included in the analysis were age, sex, education, marital status, and comorbidities as measured by Charlson Comorbidity Index (CCI). The CCI is a 19-item assessment tool that predicts 10-year survival based on a range of 19 comorbid medical conditions (e.g. myocardial infarction, diabetes). Each condition is assigned a weighted score, depending on the risk of dying associated with each condition. The possible scores range is 0 to 37. Higher total score indicates increased comorbidity and mortality [15,16].

2.2.2. Sleep measures

The Insomnia Severity Index (ISI) is a validated 7-item (0–4) questionnaire that measures global insomnia severity; total scores range from 0 to 28, with higher scores indicating more severe insomnia [17,18]. The ISI has good internal consistency ($\alpha = 0.90$), sensitivity (86%), and specificity (87%), and has been shown to be sensitive to change with intervention [17,18]. Confirmatory factor analyses showed three primary factor loadings with general categories of items 1, 2 and 3 (nighttime sleep difficulties), item 4 (sleep dissatisfaction) and items 5, 6 and 7 (daytime impact of insomnia) [19–22].

The Pittsburgh Sleep Quality Index (PSQI) is a well-established tool that rates self-reported sleep quality and disturbances over the past month [23]. The PSQI includes 19 items that measure seven components of sleep: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Each domain is weighted equally on a 0–3 scale, contributing to a total PSQI score that ranges between 0 and 21; higher scores indicate worse sleep quality. PSQI has good internal consistency ($r = 0.8$) [24], and test-retest reliability ($r = 0.81$ – 0.86) [25].

Nighttime vs. Daytime Sleep Comparisons – For purposes of this study, nighttime sleep complaints and to create a nighttime sleep complaints subscale, based on previous factor analyses studies [19–22]. These four ISI items ask respondents to rate current (over the past two weeks) severity of “difficulty falling asleep”, “difficulty staying asleep”, “problems waking up too early”, and “How satisfied/dissatisfied are you with your current sleep pattern” with a total possible subscale score of 0–16.

For the PSQI, the sleep quality component (item 6) was used to assess nighttime sleep quality (“During the past month, how would you rate your sleep quality overall?”), for a total possible subscale score of 0–3.

Daytime functioning was measured using the ISI by combining items 5–7, for a total possible subscale score of 0–12. Included ISI items were: “How noticeable to others do you think your sleep problem is in terms of impairing the quality of your life”, “How worried/distressed are you about your current sleep problem”, and “To what extent do you consider your sleep problem to interfere with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, etc.) currently?” These items were suggested to index sleep dissatisfaction and daytime impact of insomnia based on previous factor analyses studies [19–22].

For the PSQI, the daytime functioning component (items 8–9) was used to measure sleep-related daytime consequences, with a total possible score of 0–6. The two PSQI daytime function items are: “During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?” and “During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?”

2.2.3. Depression, fatigue, pain, and beliefs/attitudes towards sleep and pain

The Geriatric Depression Scale (GDS) is a 30-item depression questionnaire for older persons with yes/no ratings. Total scores range from 0 to 30; scores of 11–13 indicate mild depression while 14 or greater indicates moderate to severe depression [26].

The Flinders Fatigue Scale (FFS) is a 7-item questionnaire measuring fatigue. The FFS has a score range of 0–31; higher scores indicate higher levels of fatigue. The FFS has strong internal reliability and validity [27], and has been used to measure fatigue in sleep studies in older adults [28]. For purposes of this study, we analyzed data using both the full FFS, and a modified version without the single sleep-related FFS item “How much was your fatigue caused by poor sleep?” to avoid any potential sleep-dependent effects. The modified 6-item scale had a range of 0–27. **Results presented in this study are based on the revised FFS, with the sleep-related item removed.**

The Graded Chronic Pain Scale (GCPS) was used as a screening tool as well as a baseline measure to assess pain severity. The GCPS asked participants to rate the number of days each participant had experienced OA pain and their average pain level in the past month. The scale also assesses the degree to which pain interferes with daily activities, and the number of days that pain kept people from their usual activities. To be eligible to participate in this study, participants reported Grade II–IV arthritis pain (average pain intensity ratings of 5 or greater on a 0–10 rating scale, or significant pain-related activity limitation). The total scores of the scale were used in the analyses [12].

The Dysfunctional Beliefs and Attitudes About Sleep scale (DBAS) was used as a measure of how subjects think and feel about their sleep [29]. The 10-item DBAS scale was used, with a possible score of 0–100; higher scores indicate more dysfunctional beliefs about insomnia [29,30].

The Pain Catastrophizing Scale (PCS) was used as a measure describing different thoughts and feelings that individuals may experience when they are in pain. This 13-item scale has a possible range 0–52, with higher scores indicating greater catastrophizing [31].

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