

Original articles

The epidemiology of insomnia: Associations with physical and mental health. The HUNT-2 study

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Abstract

Objective: The aim of the present study was to examine the association of insomnia symptoms with demographic and physical and mental conditions in a large population-based study. **Methods:** Cross-sectional data on insomnia and comorbid conditions were gathered from 47,700 individuals aged 20–89 in Norway. Comorbid conditions included anxiety and depression and the following physical conditions: asthma, allergy, cancer, hypertension, diabetes, migraine, headache, osteoporosis, fibromyalgia, rheumatoid arthritis, arthrosis, Bechterew's disease, musculoskeletal disorders, and obesity (body mass index >30). **Results:** Insomnia symptoms were found in 13.5% of the population and were more prevalent among women, older adults, and in individuals with less education. Reporting insomnia

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symptoms significantly increased the associations with a range of conditions, especially mental conditions, pain conditions with uncertain etiology and, to a lesser extent, chronic pain conditions. These findings remained significant also when adjusting for a range of potential confounders, whereas the association between insomnia and somatic conditions was largely reduced to a nonsignificant level in the fully adjusted analyses. **Conclusion:** This study demonstrates that insomnia symptoms are associated with a range of different conditions. The findings suggest that the independent contribution of insomnia is strongest on conditions characterized by some level of psychological or psychosomatic properties.

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Numerous epidemiological studies have been conducted to examine the prevalence and correlates of insomnia, but due to various operationalizations, prevalence estimates have ranged from 5–50%, depending on the definition [1]. While most studies from Western countries show that about one third of the adult population experience sleep problems weekly [2,3], a diagnosis of insomnia is less common, with

most prevalence estimates yielding rates between 6% and 10% [4,5].

Insomnia is linked to ill health. For example, in terms of somatic conditions, there is much evidence that sleep is profoundly affected by various conditions or diseases, such as end-stage renal disease, cancer or asthma [6]. Insomnia is also a core symptom in a range of chronic pain conditions, including rheumatoid arthritis, osteoporosis or migraine, and sleep problems are commonly reported in conditions with less certain organic etiology, such as fibromyalgia and other musculoskeletal disorders [7]. Moreover, impaired sleep is a central feature in several mental conditions [8] and has been shown to precede both depression and anxiety [9,10].

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In much of the compound evidence from epidemiological studies, insomnia is measured through one item only. This is a potential threat to the precision of the measure, and both effect estimates and associations to correlates of interest may suffer. A few epidemiological studies have used more agreed-upon definitions of insomnia when examining comorbidities and correlates and insomnia. For example, in a recent and well-designed study by Taylor et al. [11], people with insomnia more frequently reported having a range of conditions, including heart disease, hypertension, neurologic disease, breathing problems, urinary problems, chronic pain, and gastrointestinal problems. Also, clinically significant anxiety and depression have been found to be much more common in individuals with insomnia compared to good sleepers [12]. However, a potential limitation in such studies is the lack of control over confounding factors. For example, as many patients experience symptoms of both insomnia and depression, any association between insomnia and a musculoskeletal disorder may well be explained by the depression and not insomnia symptoms per se. In the studies by Taylor et al. [11,12], the authors adjusted for both anxiety and depression, as well as some physical conditions. However, to identify the true relation between insomnia and any comorbid condition, we need more studies controlling for a wide range of potential confounding factors. Therefore, the aims of present study were (1) to describe the prevalence of insomnia symptoms across gender, age, and educational level and (2) to examine the relation of insomnia to a wide range of physical and mental conditions by also adjusting for a range of possible confounders. We used data from a large national representative health survey comprising 47,700 individuals.

Methods

Participants and procedures

All 92,100 inhabitants of Nord-Trøndelag County, Norway, aged 20–89 years, were invited to a clinical examination as part of a general health screening program: HUNT-2. Of these, 65,648 (71%) attended a physical examination, where they received a second set of questionnaires, of which 54 375 individuals (82.8% of the participants) completed the insomnia questionnaire. Due to missing data on some of the other variables used in the present study, the final sample comprised 47 700 participants (72.7%). In a follow-up study of randomly selected nonparticipants [13], the most common reasons for not attending the health screening in the working age population were not finding the time or need for a health examination and serious physical illness. Recent studies using the HUNT dataset suggest that nonparticipation is associated with poor health, expressed through subsequent work disability [14] and mortality [15]. As for demographic characteristics of the county, there is little ethnic diversity [16].

Measures

Insomnia symptoms

The prime feature of insomnia is a subjective feeling of difficulties initiating or maintaining sleep or of experiencing their sleep as nonrestorative. Insomnia is considered to be chronic if it is present most nights for at least a 1-month duration [8]. The questionnaires in HUNT-2 included two questions about the frequency of both sleep onset insomnia and terminal insomnia: (1) “Have you had problems in getting to sleep in the last month?” and (2) “During the last month, have you ever woken too early and not been able to get back to sleep?” with four possible responses: (1) never, (2) occasionally, (3) often, or (4) almost every night. Responses were dichotomized into “Present” (often or almost every night) and “Absent” (never or occasionally), and insomnia symptoms were coded as present if either or both of these symptoms were present. This operationalization has also been applied in previous studies [17,18]. No information was available on middle-of-night awakenings or daytime impairments, which according to both the Research Diagnostic Criteria [19] and quantitative criteria proposed by Lichstein et al. [20] would be required to fulfill the criteria for insomnia syndrome.

Physical and mental conditions

As in previous studies based on the same health survey [14,21] physical and mental conditions were assessed by self-reported diagnoses. For purposes of the present study, the diagnoses were categorized into the following four groups: (A) Somatic conditions: asthma, allergy, cancer, hypertension, obesity [body mass index (BMI) >30, calculated following a medical examination]; (B) chronic pain conditions: osteoporosis, rheumatoid arthritis, arthrosis, Bechterew’s disease, migraine; (C) pain conditions with uncertain organic etiology: fibromyalgia, musculoskeletal disorders, musculoskeletal pain, and headache; and (D) Mental conditions: anxiety and depression.

Musculoskeletal pain was assessed by asking the participants if they had any pain, aches or discomfort in the following nine areas over the last month: neck, shoulder, upper back pain, elbows, lower back pain, wrists, hips, knees, or ankles. In the present study, a dichotomous variable was used, and responding “yes” on any of the pain items indicated a positive response on this variable. No open questions were asked to identify other physical conditions.

The Hospital Anxiety and Depression Scale [22] (HADS) was used to assess symptoms of anxiety and depression. The HADS is a self-report questionnaire comprising 14 four-point Likert-scaled items: seven for anxiety (HADS-A), and seven for depression (HADS-D). Higher score reflect higher symptom loads on both subscales. The most recent literature review, which covered 31 studies, concluded that the HADS holds good case-finding properties for anxiety and depression in patient populations in primary care and hospital settings [23]. A cutoff score of 8 on either subscale gives an

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