



Review

Analysis of the evidence of related factors, associated conditions and at-risk populations of the NANDA-I nursing diagnosis insomnia

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ABSTRACT

Objectives: To summarize evidence in the literature on the predictors of insomnia in adults and to determine correspondences with diagnostic indicators of the NANDA-I diagnosis Insomnia.

Methods: An integrative review performed in Pubmed, Virtual Health Library and CINAHL. Forty-eight articles published in Portuguese, English or Spanish from 2011 to 2018 were included. An analysis of correspondence between the predictors and the NANDA-I related factors and associated conditions for Insomnia was performed.

Results: There was a correspondence of the predictors found in this review with NANDA-I related factors and associated conditions, except for grieving and frequent naps during the day. Smoking, caffeine intake, dysfunctional sleep beliefs, obesity and caregiver role strain are possible new related factors; chronic illness is a possible new associated condition and individuals going through changes in marital status, economically disadvantaged, female gender, increasing age and night shift worker are possible new at-risk populations.

Conclusion: The predictors of insomnia that had a correspondence with the NANDA-I elements can support the evidence base of the nursing diagnosis. The predictors found without a correspondence with the diagnosis can be considered for inclusion in the NANDA-I classification, thereby supporting the clinical reasoning of nurses and students.

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What is known?

- Insomnia is highly prevalent in adults and older adults, directly impacting the development of other health dysfunctions. NANDA International diagnosis Insomnia was included in the classification in 2006 and only revised for phrase refinement in 2017. Thereby, it requires updated evidence on its diagnostic indicators.

What is new?

- All clinical indicators of the NANDA International diagnosis Insomnia are supported by current literature, except for two. New possible indicators have been identified that can assist nursing students and nurses in improving clinical reasoning.

1. Introduction

Sleep disorders, especially insomnia, are common health problems and risk factors to further health disturbances that negatively affect the quality of life, such as impaired immune system, depression, increased irritability, risk-prone sexual activity, suicidal ideation, ineffective performance at work, study, social and family relationships, and an increased risk of accidents at work or automobile accidents [1–3]. A US populational-based study found that approximately one-third of a sample of 1,000 adults reported having one or more of insomnia symptoms, such as difficulty initiating sleep, difficulty staying asleep, waking up too early and in

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some cases non-restorative or poor sleep [4]. Among patients with chronic pain conditions, 65.3% have clinical insomnia, including mild, moderate and severe degrees [5].

Considering that sleep disorders are common and also a cause of further health issues, nurses are expected to be aware of their possible causes, in order to early recognize them and support the proposal of interventions to minimize them. From a nursing perspective, insomnia can be considered a human response to a health condition or a life process, i.e., a nursing diagnosis. The NANDA International, Inc. (NANDA-I) Diagnosis Classification defines Insomnia (code 00095) as a disruption in amount and quality of sleep that impairs functioning [6].

NANDA-I diagnoses have different diagnostic indicators functioning as antecedents. Related factors (ReF) are possible causes or contributing factors that are amenable to independent nursing interventions. Associated conditions (AC) are medical diagnoses, injury procedures, medical devices, or pharmaceutical agents, which are not modifiable by nurses. At-risk populations (ARP) are groups of people who share a characteristic that causes each member to be susceptible to a particular human response, but are not independently modifiable by the nurses [6].

Insomnia currently has 11 ReF: anxiety, environmental barrier, frequent naps, alcohol consumption, depression, physical discomfort, stressors, inadequate sleep hygiene, average daily physical activity is less than recommended for gender age and, fear and grieving. It also has two AC: pharmaceutical agents and hormonal change [6]. No ARP are currently included.

In order to have a terminology at an appropriate level of evidence to represent the current strength of nursing knowledge, the NANDA-I Classification requires continuous updating by studies on the diagnostic indicators. These studies can be submitted to appreciation by the Diagnosis Development Committee and be adopted by the Classification [7]. Because Insomnia was approved by NANDA-I in 2006 and only revised for phrase refinement in 2017, it requires updated evidence on its diagnostic indicators. The aims of this study were to summarize evidence in the literature on the predictors of insomnia in adults and to determine correspondences with diagnostic indicators of the NANDA-I diagnosis Insomnia.

2. Material and methods

This study was performed in two phases, summarized in Fig. 1.

2.1. First phase

An integrative literature review was performed by following Whittemore and Knaf's method [8], which includes problem

identification, literature search, data evaluation, data analysis and presentation of findings.

2.1.1. Problem identification

A research question was formulated according to the PEO framework (P – patient (adults); E – exposure (possible causes or risk factors); O – outcomes (insomnia)): “What are the causes or risk factors for insomnia in adults?”

2.1.2. Literature search

The search was conducted in Pubmed, the Virtual Health Library and CINAHL, by using combinations of Medical Subject Headings (MeSH), CINAHL titles, Health Sciences Descriptors (DeCS) and keywords (non-standardized terms). The search strategy was: ((((((Risk factors[Mesh Terms]) OR Causality[Mesh Terms]) OR Etiology[Title/Abstract]) OR Cause\$[Title/Abstract]) OR Risk factor\$[-Title/Abstract])) AND (((Sleep Initiation and Maintenance Disorders [Mesh Terms]) OR Insomnia[Title/Abstract])).

The review included cross-sectional and longitudinal studies published from 2011 to 2018 in either English, Spanish or Portuguese, having as independent variables possible causes/risk factors for the dependent variable insomnia and analyzing the results through multivariate analyses. We excluded studies that did not specify insomnia among various sleep disorders studied or those that studied poor sleep quality.

2.1.3. Data evaluation

Two independent investigators read all titles and abstracts. After selection by title, the researchers read the abstracts to ensure that the studies met the inclusion criteria. Then, the selected articles were fully read for extraction of the data of interest.

2.1.4. Data analysis

Once the studies were included, their levels of evidence were evaluated according to the classification of the Oxford Center for Evidence-based Medicine for aetiology: Level 1a, systematic review with homogeneity of randomized control trials (RCTs); Level 1b, individual RCT; Level 2a, systematic review of cohort studies; Level 2b, individual cohort study (including low quality RCT; e.g., <80% follow-up); Level 3b, individual case-control study; Level 4: Case-series (and poor quality cohort and case-control studies); Level 5: Expert opinion without explicit critical appraisal, or based on physiology, bench research or “first principles”. Because the Oxford Center does not classify cross-sectional studies, but level 4 includes studies that “failed to carry out a sufficiently long and complete follow-up of patients” [9], cross-sectional studies were assigned a Level 4, as previously performed by Teixeira et al. [10].

First Phase	Second Phase
Integrative review on the predictors/possible causes of insomnia.	Correspondence between review findings, related factors and associated conditions of the NANDA-I diagnosis Insomnia.
<ul style="list-style-type: none"> • Problem identification • Literature search • Data evaluation • Data analysis • Presentation of findings 	<ul style="list-style-type: none"> • Three nurses • First rule: assess for semantic equivalence. • Second rule: assess for conceptual equivalence. • Grouping of predictors with no correspondence into possible new related factors, associated conditions or at-risk populations.

Fig. 1. Summary of the methodological steps.

2.1.5. Presentation of findings

The studies included were summarized in a table with the following data: design, level of evidence, number of participants, instruments to evaluate the insomnia and the predictors of insomnia.

2.2. Second phase

Based on the predictors identified, their correspondence with the ReF and AC of the diagnosis of diagnosis Insomnia was evaluated [11]. The analysis was performed by three nurses by considering the concepts in the ReF and AC. Two were doctorate-prepared nurses with academic and professional expertise in classification systems for over 15 years and the third nurse was an MSc candidate. The analysis followed two rules. First rule: Assess for semantic equivalence between the predictors identified in the literature with the ReF and AC of Insomnia in the NANDA-I classification; Second rule: Assess for conceptual equivalence between the predictors identified in the literature and their correlation with the ReF and AC through the researchers' expertise. The allocation of terms required

a 100% consensus among researchers.

After the analysis, the indicators identified in the review without a correspondence with the ReF or AC of the diagnosis Insomnia were grouped as proposals of new ReF, AC or ARP for incorporation into the NANDA-I classification. In addition, populations with a high frequency of insomnia were also considered possible new ARP.

3. Results

One thousand and one articles were found, out of which 48 were included in the review (Fig. 2). Thirty-eight were cross-sectional studies and ten were prospective longitudinal studies. The characteristics of the studies included are shown in Table 1.

The number of participants ranged from 94 [12] to 57,207 adults [13]. The follow-up period in the longitudinal studies ranged from 6 months [14] to 12 years [15], see Table 1.

The most frequently used instruments for the assessment of insomnia were Athens Insomnia Scale (AIS), Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Diagnostic

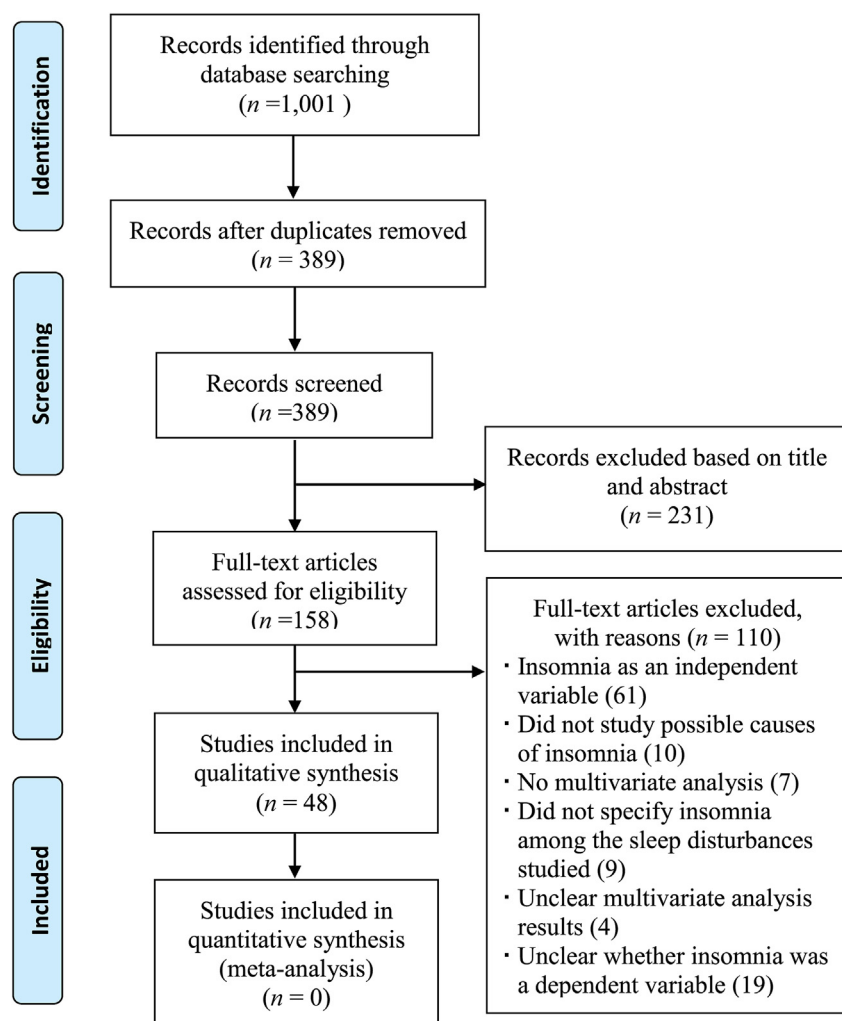


Fig. 2. Flow chart of the study selection process.

Table 1
Predictors of Insomnia found in the literature.

Author, year, country	Objectives	Methods	Predictors of Insomnia	Level of Evidence
Yoshioka et al. [1] 2013, Japan	To investigate the combined risk of employment level and psychosocial work environment for insomnia.	Design: Longitudinal, 11 months follow up Participants: 5,946 Japanese male workers	Lower employment level	2b
Mollaveva et al. [12] 2016, Canada	To evaluate the prevalence of insomnia among Ontario workers with delayed recovery from Traumatic Brain Injury	Design: Cross-sectional. Participants: 94 participants with traumatic brain injury	Depression severity, previous head trauma, age, uses Tricyclic antidepressant, and wake-up time instability.	4
Garland et al. [13] 2018, Canada	To characterize and compare the prevalence of insomnia symptoms in the Canadian population in 2002 and 2012 and to identify sociodemographic and psychosocial predictors of trouble sleeping.	Design: Cross-sectional study. Participants: 57,207 adults from the general population	Women aged 40–59 years	4
Chimluang et al. [14] 2017, Thailand	Explore the characteristics of insomnia in persons with heart failure and identify the predictive factors of insomnia in patients with heart failure.	Design: Longitudinal, 6 months follow up Participants: Three hundred forty heart failure patients followed-up	Anxiety, depression, marital status (separated, divorced, and widowed), dyspnea, and dysfunctional beliefs and attitudes about sleep	2b
Halonen JI et al. [15] 2017, Finland	To examine whether change in job strain leads to change in insomnia symptoms.	Design: Longitudinal, 12 years follow up Participants: 24,873 adults	Job strain	2b
Fernandez Alonso et al. [16] 2012, Spain	To assess the presence of insomnia and sleepiness and related factors in pregnancies	Design: Cross-sectional. Participants: 370 pregnant women in the late third trimester	Smoking habit	4
Dørheim et al. [17] 2012, Norway	To evaluate the prevalence possible risk factors for both insomnia and depressive symptoms simultaneously in pregnancy.	Design: Longitudinal, 17 months Participants: 2,816 pregnant women in the last trimester	Pelvic girdle pain and lower back, depressive symptoms and smoking.	4
Lallukka et al. [18] 2012, Finland	To examine the associations of sociodemographic and socioeconomic factors with sleep duration and insomnia-related symptoms across life course.	Design: Cross-sectional. Participants: 5,578 adults aged 30–79 years.	Income and employment status	4
Jansson-Fröjmark et al. [19] 2012, Sweden	To investigate whether pain and insomnia symptoms are bidirectionally related.	Design: Longitudinal, 1-year follow-up Participants: 1746 individuals.	Pain, anxiety symptoms and depressive symptoms	2b
Budhiraja et al. [20] 2012, USA	To describe the prevalence of insomnia disorder and to elucidate the demographic and clinical characteristics associated with insomnia.	Design: Cross-sectional. Participants: 183 patients in patients with COPD.	Smoking and presence of sadness/anxiety	4
Kızılırmak et al. [21] 2012, Turkey	To investigate insomnia experienced and factors associated with it.	Design: Cross-sectional. Participants: 486 pregnant women.	Pregnant women in the third trimester who are over 20 years old.	4
Shaffer et al. [22] 2013, USA	To estimate the association between Acute Coronary Syndrome induced Post-Traumatic Syndrome Disease symptoms and self-reported sleep.	Design: Cross-sectional. Participants: 188 participants with acute coronary syndrome	Acute Coronary Syndrome induced Post-Traumatic Syndrome Disease symptoms	4
Obayashi et al. [23] 2013, Japan	To examine the effect of evening light exposure on subsequent sleep initiation in home settings	Design: Longitudinal, 10 months follow-up Participants: 192 elderly	Exposure to evening light in home settings.	2b
Manber et al. [24] 2013, USA	To assess clinically significant insomnia and its associated demographic and clinical characteristics.	Design: Cross-sectional. Participants: 1289 pregnant latinas	Low-income	4
Lopez et al. [25] 2013, USA	To identify the associations of insomnia with epilepsy, comorbidities, and treatment-related variables.	Design: Cross-sectional. Participants: 165 South Florida veterans	Post-traumatic epilepsy, mood/psychotic comorbidities, and antiepileptic regimen.	4
Bahouq et al. [26] 2013, Morocco	To assess prevalence and severity of insomnia and to identify factors associated with this insomnia.	Design: Cross-sectional. Participants: 11 patients with chronic low back pain	Back pain intensity and fatigue level	4
Wilsmore et al. [27] 2013, Australia	To determine the relationship between sleep complaints, primary insomnia, excessive daytime sleepiness, and lifestyle factors.	Design: Cross-sectional. Participants: 22,389 individuals in a large community-based sample.	Night workers and use of sleep medication.	4
Desai et al. [28] 2013, USA	To know about its prevalence and risk factors of insomnia.	Design: Cross-sectional. Participants: 413 patients women receiving aromatase inhibitors with breast cancer	Joint pain, hot flashes, anxiety and depression, age, and time since diagnosis in women receiving aromatase inhibitors	4
Obayashi et al. [29] 2014, Japan	To evaluate an association between Light at night exposure and sleep quality in home settings.	Design: Cross-sectional Participants: 857 participants	Night exposure to light	4
Sakurai et al. [30] 2014, Japan	To investigate the relationship between interpersonal conflict in the workplace and insomnia	Design: Cross-sectional. Participants: 37,646 Japanese full-time workers	Workplace interpersonal conflict	4
Hall Brown et al. [31] 2014, USA	To evaluate the contributions of demographics, trauma, posttraumatic stress disorder (PTSD) symptoms, sleep fears, and neighborhood stress to both insomnia and short sleep.	Design: Cross-sectional. Participants: 378 participants in urban African American young adults	Posttraumatic stress symptom severity and fears of sleep.	4

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Table 1 (continued)

Author, year, country	Objectives	Methods	Predictors of Insomnia	Level of Evidence
Ayoubé et al. [32] 2014, Egypt	To determine the prevalence of insomnia and to assess some of the risk factors and comorbid conditions related to insomnia.	Design: Cross-sectional. Participants: 380 elders among community dwelling elderly in Alexandria	Number of chronic diseases, female gender, anxiety, watching television in bed before sleeping, depression, nocturia, and daily sunlight exposure.	
Gindin et al. [33] 2014, Israel	To assess insomnia and its correlates.	Design: Cross-sectional. Participants: 4,156 elderly in long-term care	Age, depression, stressful life events, fatigue, pain, and hypnotic drug	4
Benbir et al. [34] 2014, Turkey	To investigate the prevalence of insomnia and its sociodemographic and clinical correlates.	Design: Cross-sectional. Participants: 5,021 participants from the general population-based	Chronic disease, low-income, smoking status, time spent watching TV and black tea consumption in the evening.	4
Drake et al. [35] 2014, USA	To assess sleep reactivity as a diathesis of insomnia, and to delineate the interaction between this diathesis and naturalistic stress in the development of insomnia among normal sleepers.	Design: Longitudinal, 3 years follow up Participants: 2,316 adults	Premorbid sleep reactivity and stressful events	2b
Yang et al. [36] 2014, China	To examine vulnerability to stress-related sleep disturbances and maladaptive sleep beliefs and their interactions with major life stressors in the development of insomnia.	Design: Longitudinal, 6 years follow up Participants: 528 undergraduate university students were recruited in 2006 and 192 in 2012	Vulnerability to stress-related sleep disturbances and maladaptive sleep beliefs	2b
Morris et al. [37] 2015, Australia	To assess the prevalence of insomnia in patients and caregivers calling a cancer helpline, and to describe the predictors of insomnia.	Design: Cross-sectional study. Participants: 500 patients with cancer and 234 caregivers.	For patients: being younger and reporting higher distress For caregivers: higher distress	4
Kim et al. [38] 2015, Korea	To determine the risk factors associated with clinical insomnia in chronic neck pain (CNP) patients.	Design: Cross-sectional study. Participants: 218 Chronic neck pain patients	Pain intensity, comorbid musculoskeletal pain, and a high level of depression.	4
Canham et al. [39] 2014, USA	To examine the association between binge drinking and insomnia	Design: Cross-sectional. Participants: 6,027 participants aged 50 years and older	Binge drinking	4
Jung HS et al. [40] 2016, South Korea	This study aims to investigate demographic, work-related and health-related factors relevant to functional dyspepsia and insomnia in shift-working nurses in South Korea.	Design: Cross-sectional. Participants: 1,431 shift-working nurses	Female gender, night shift work, work-related stress and regular dietary patterns in shift-working nurses.	4
Kielbasa G et al. [41] 2016, Poland	To estimate the relationship between the presence of metabolic syndrome and sleep disorders among a group of hypertensive patients.	Design: Cross-sectional. Participants: 261 hypertensive patients	Female gender, poor material status, ageing, combination therapy (more than 3 medications), nocturia, lower limbs tingling sensations before sleep, food intake before sleep or during a night, thiazide diuretic use and hypothyroidism	4
Simonelli et al. [42] 2016, EUA	To evaluate whether an adverse neighborhood environment has higher prevalence of poor sleep in a US Hispanic/Latino population	Design: Cross-sectional. Participants: 2,156 US Hispanic/Latino people	Noisy neighborhood.	4
Kim et al. [43] 2016, Korea	To investigate the association between insomnia and probable migraine in comparison with migraine using data from the Korean Headache-Sleep Study	Design: Cross-sectional. Participants: 2,695 participants of the Korean Headache-Sleep Study	Anxiety, depression, headache frequency and headache intensity.	4
Laks J et al. [44] 2016, Brazil	This study provides the first broad, population-based account of caregiving-related health outcome burden in Brazil.	Design: Cross-sectional. Participants: 10,853 caregivers of Alzheimer's patients	Caregiving for Alzheimer's patients	4
Lee DH et al. [45] 2016, South Korea	To determine the risk factors associated with clinical insomnia anxiety in postherpetic neuralgia (PHN) patients.	Design: Cross-sectional Participants: 111 PHN patients.	High pain intensity, presence of mechanical allodynia and high anxiety and depression level	4
Taylor et al. [46] 2016, EUA	To determine the prevalence, correlates, and predictors of insomnia in US Army personnel prior to deployment	Design: Cross-sectional. Participants: 4,101 US Army personnel	Post-traumatic stress disorder, depression, fatigue, stressful life events, headaches, anxiety, alcohol use problems, extremity pain, history of head injury, childhood physical neglect, back pain, number of times married, and lower leader support/unit cohesion and tangible social support.	4
Wang et al. [47] 2016, China	To examine the epidemiology of sleep problems and insomnia among the community older individuals in Hebei Province, China, and to investigate the potential sociodemographic and clinical correlates and medication use	Design: Cross-sectional. Participants: 3,176 community older adults	Age ≥ 75 years, depression, comorbidities (mild cognitive impairment, cerebral hemorrhage and hyperlipidemia) and living with others.	4
Chen et al. [48] 2017, China	To examine the independent and combined associations of physical activity and smoking on the incidence of doctor-diagnosed insomnia	Design: Cross-sectional. Participants: 12,728 participants aged 18 years or older	Inactive adults and smokers.	4
Ahmed et al. [49] 2017, Saudi Arabia	To determine the prevalence of insomnia among the Saudi adult population	Design: Cross-sectional. Participants: 2,095 adults from the general population	Female, Non-educated, age (60+ years and 30–59 years).	4
Rutten et al. [50] 2017, Amsterdam	To test two hypotheses: i) insomnia predicts an increase in symptoms of depression or anxiety and ii) anxiety or depression at baseline predicts insomnia in Parkinson's Disease patients six months later.	Design: Cross-sectional. Participants: 361 Parkinson's Disease patients	Symptoms of anxiety and depression predict future insomnia in unmedicated early-stage Parkinson's disease patients	4
			Obesity (BMI ≥ 30) and waist-to-hip ratio	4

Table 1 (continued)

Author, year, country	Objectives	Methods	Predictors of Insomnia	Level of Evidence
Andreeva et al. [51] 2017, French	To assess the association of 3 different anthropometric indices with acute and chronic insomnia	Design: Cross-sectional. Participants: 13,389 volunteers		
Da Costa et al. [52] 2017, Canada	To identify factors associated with insomnia following a myocardial infarction	Design: Cross-sectional study. Participants: 209 patients following a myocardial infarction	younger age, use of prescribed medication for sleep, elevated depressive symptoms and greater dysfunctional beliefs about sleep.	4
Mondal et al. [53] 2018, India	To study the prevalence of sleep disorders and the severity of insomnia in psychiatric outpatients	Design: Cross-sectional study. Participants: 500 psychiatric outpatients	Depression	4
Ma et al. [54] 2018, China	To measure the prevalence of insomnia and identify the of insomnia among older people of Anhui Province of China. Socio-economic correlates	Design: Cross-sectional. Participants: 3,045 older adults	No fixed income, less social contact, less social capital and living alone.	
Skarpsno et al. [55] 2018, Norway	To investigate the association of physical work demands and work-related physical fatigue with risk of insomnia symptoms and if these associations are influenced by chronic musculoskeletal pain.	Design: Longitudinal, 11 year Participants: 36,984 Norway inhabitants	Women with excessive work-related fatigue and chronic pain	4
Guo et al. [56] 2018, China	To investigate the gender differences in the relationship between alcohol consumption and insomnia.	Design: Cross-sectional. Participants: 8,081 adults in Jidong community	Heavy alcohol consumption in females	4
Smith et al. [57] 2018, USA	To describe the dynamics of poor sleep among participants of the Midlife Women's Health Study and to identify risk factors associated with poor sleep during the menopausal transition.	Design: Cross-sectional. Participants: 776 women in the menopausal transition	Menopause status, Depression frequency and history of smoking.	4
Román-Gálvez et al. [58] 2018, Spain	To quantify insomnia and their components in a longitudinal cohort of pregnant women and factors associated with insomnia.	Design: Longitudinal. Participants: 486 pregnant women before the 14th gestational week	Previous trimester insomnia, pre-gestational insomnia and obesity	4

Criteria for Primary Insomnia (DSM-IV), International Classification of Sleep Disorders (ICSD), Women's Health Initiative Insomnia Rating Scale (WHIIRS) and Bergen Insomnia Scale (BIS) (Table 1).

There were several studied populations, mainly adults in general, older adults, and pregnant women. Groups of patients with diseases included those who abuse alcohol, patients with chronic obstructive pulmonary disease, cancer, postherpetic neuralgia, Parkinson's Disease, psychiatric disorders, chronic musculoskeletal pain, heart failure, late recovery from traumatic brain injury, and hypertension. Other groups included young adults in general, war veterans, undergraduate university students, army personnel, women in the menopausal transition, caregivers of Alzheimer's patients, and workers.

Considering all the studies, the most common predictors were depression (19 studies), physical discomfort (19 studies), stressors (11 studies) and increasing age (10 studies). All the ReF and AC of the NANDA-I diagnosis were supported by the study findings, except for frequent naps and grieving (Table 2).

After grouping of the predictors that did not have a correspondence with the NANDA-I diagnosis, the new possible ReF identified were *smoking, caffeine intake, dysfunctional sleep beliefs, obesity and caregiver role strain*. The possible new AC were *chronic illness*. The possible new ARP identified were *individuals going through changes in marital status, economically disadvantaged, female gender, increasing age and night shift work* (Table 3).

4. Discussion

This study identified possible causes and predictors of insomnia in adults and determined their correspondences with diagnostic indicators of the NANDA-I diagnosis Insomnia. In addition, new possible indicators were proposed. In the literature search, a relevant number of studies were retrieved, ranging from small to significant samples. The variety of populations investigated reinforces the epidemiological importance of insomnia. Although the follow-up period in longitudinal studies was as great as 12 years, most studies were cross-sectional. Further longitudinal studies that

establish causal relationships between independent variables and insomnia are required. There was a wide variation in the frequency of insomnia symptoms, possibly due to the use of different instruments to investigate the phenomenon.

Most of the current ReF and AC of the diagnosis Insomnia were supported by the literature, but no studies were found that investigated frequent naps or grieving as possible predictors of insomnia. This apparent lack of evidence might be related to the limitations of our literature review. A search strategy using terms for each possible risk factors/cause of insomnia might have retrieved other studies specifically about each risk factor. Extended period limits, other databases, and inclusion of other idioms might also be accounted for this result. It is also likely that the predictive relationship between grieving and insomnia has not been recently studied, because it has been widely established that insomnia is a common symptom in the grief response [59].

The relationship between frequent naps and insomnia might also have been investigated through other statistical methods, such as correlation analysis and analysis of covariance [60], therefore they did not meet our inclusion criteria. In a recent population-based Canadian study with 2468 community-dwelling elderly persons, self-reported naps were not significantly associated with sleep efficiency, in both the non-adjusted and fully adjusted model [61]. On the other hand, Jang et al. suggest that napping might have a negative effect on sleep maintenance only for insomnia patients, but not for normal controls, based on both self-reported sleep and actigraphy-measured sleep [62]. That would be explained by hyperarousal during periods of insomnia, which leads to underestimation of sleep amount and quality. Consequently, patients with insomnia might extend their time in bed or take naps to compensate for poor sleep. This safety behavior is considered counterproductive and may exacerbate insomnia [63]. Given this bidirectional relationship between napping and insomnia, we would argue that *frequent naps* is not only a ReF of the NANDA-I diagnosis Insomnia, but it could also be a defining characteristic.

Some predictors of Insomnia were identified that were not related to the clinical indicators of the nursing diagnosis. Some of

Table 2

Correspondences between NANDA-I related factors or associated conditions and the predictors of insomnia found in the literature.

NANDA-I related factors	Predictor found in the review
Alcohol consumption	<ul style="list-style-type: none"> • Binge drinking >2 days per week [39] • Alcohol abuse in US Army personnel prior to deployment [46] • Heavy alcohol consumption by females [56]
Anxiety	<ul style="list-style-type: none"> • Anxiety in patients with heart failure [14] • Anxiety in the general population of Sweden [19] • Anxiety in patients with COPD [20] • Anxiety in breast cancer patients on aromatase inhibitors as a treatment [28] • Anxiety in community dwelling elderly in Alexandria [32] • Anxiety among Korean population [42] • Anxiety in patients with postherpetic neuralgia (PHN) [45] • Anxiety in US Army personnel prior to deployment [46] • Anxiety in unmedicated, early-stage Parkinson's disease patients [50]
Average daily physical activity is less than recommended for gender and age	<ul style="list-style-type: none"> • Inactive adults [48]
Depression	<ul style="list-style-type: none"> • Depression severity among Ontario workers [12] • Depression in patients with heart failure [14] • Depression in pregnant women, from the 17th week of gestation [17] • Depression in the general population of Sweden [19] • Depression in pregnant women in the third trimester [21] • Depression in adults with Acute Coronary Syndrome [22] • Depression in pregnant Latinas with low income [24] • Depression in breast cancer patients on aromatase inhibitors [28] • Depression in community dwelling elderly [32] • Depression in older adults in long-term care [33] • Depression in chronic neck pain patients [38] • Depression among Korean population [43] • Depression in patients with postherpetic neuralgia (PHN) [45]. • Depression in US Army personnel [46] • Depression in men and women in Hebei Province, China [47] • Depression predict future insomnia in unmedicated, early-stage Parkinson's disease patients [50] • Elevated depressive symptoms in a myocardial infarction population [52] • Depression among psychiatric outpatients [53]. • Depression frequency during the menopausal transition [57]
Environmental barrier	<ul style="list-style-type: none"> • Exposure to evening light [23] • Daily sunlight exposure [32] • Noisy neighborhood in a US Hispanic/Latino population [42] • Fear of sleeping in urban African American young adults [31]
Fear	<ul style="list-style-type: none"> • Not found in the literature
Frequent naps during the day	<ul style="list-style-type: none"> • Not found in the literature
Grieving	<ul style="list-style-type: none"> • Wake-up time instability among Ontario workers [12] • Night exposure to light [29] • Watching television in bed before sleeping [32] • Time spent watching TV in the general population of Turkey [34] • Sleep reactivity [35] • Regular dietary patterns in shift-working nurses in South Korea [40].
Inadequate sleep hygiene	<ul style="list-style-type: none"> • Food intake before sleep or during a night [41] • Dyspnea in patients with heart failure [13] • Pelvic girdle pain and lower back pain in pregnant women, from the 17th week of gestation [17]
Physical discomfort	<ul style="list-style-type: none"> • Pain symptoms in the general population of Sweden [19] • Third trimester of pregnancy [21] • Fatigue and pain intensity in patients with chronic low back pain [26] • Joint Pain among breast cancer patients on aromatase inhibitors use [28] • Pain symptoms in elderly in long-term care [33] • Fatigue [33,46] • Pain intensity >7 in patients with chronic neck pain [38] • Comorbid musculoskeletal pain conditions in chronic neck pain patients [38]. • Headache frequency and headache intensity among Korean population [38] • Nocturia [32,41] • Lower limbs tingling sensations before sleep [41] • High pain intensity in postherpetic neuralgia patients [45]. • Fatigue, headaches, extremity pain, back pain in US Army [46] • First and second trimester of pregnancy [58] • Obesity was associated with insomnia in a pregnant women population [58] • Chronic musculoskeletal pain in women and men [55]
Stressors	<ul style="list-style-type: none"> • Marital status (separated, divorced, and widowed) in patients with heart failure [12] • Job strain is a risk factor for insomnia symptoms [15] • Posttraumatic stress symptom [22] • Workplace interpersonal conflict in Japanese temporary workers [30] • Posttraumatic stress symptom in urban African American young adults [31] • Life stress in elderly in long-term care [33] • Stressful events [35] • Distress level in patients and caregivers [37]

Table 2 (continued)

NANDA-I related factors	Predictor found in the review
	<ul style="list-style-type: none"> • Vulnerability to stress-related in university students [36] • Work-related stress in a shift-working nurses in South Korea [40]. • Caregivers of Alzheimer's patients in Brazil [42] • Posttraumatic stress symptom and stressful life events in US Army personnel [46] • Lower leader support in US Army personnel [44] • Childhood physical neglect in US Army personnel [46]
NANDA-I associated conditions	Predictor found in the review
Pharmaceutical agent	<ul style="list-style-type: none"> • Antiepileptic regimen in South Florida veterans [25] • Taking sleeping tablets in community-based sample of New Zealanders [27] • Hypnotic drug use in elderly [33] • Combination therapy with more than 3 medications among of hypertensive patients [41] • Thiazide diuretic in hypertensive patients [41] • Tricyclic antidepressant among Ontario workers [12]
Hormonal change	<ul style="list-style-type: none"> • Use of prescribed medication for sleep in a myocardial infarction population [52] • Menopause status (Any hot flashes at night) during the menopausal transition [57]

Table 3

Possible new related factors, associated conditions and at-risk populations of the Nursing diagnoses Insomnia.

Possible new related factors	
Smoking	<ul style="list-style-type: none"> • Smoking in the late third trimester of pregnancy [16] • Smoking from the 17th week of gestation [17] • Patients with COPD smoking [20] • Smoking in the general population of Turkey [34] • Being a smoker [48] • History of smoking during the menopausal transition [57]
Caffeine intake	<ul style="list-style-type: none"> • High black tea consumption in the afternoon in the general population of Turkey [34]
Dysfunctional sleep beliefs	<ul style="list-style-type: none"> • Dysfunctional beliefs and attitudes about sleep in patients with heart failure [14] • Maladaptive sleep beliefs [38] • Greater dysfunctional beliefs about sleep in a myocardial infarction population [52]
Obesity	<ul style="list-style-type: none"> • Obesity (BMI ≥ 30 kg/m²) and waist-to-hip ratio among women [51]
Caregiver role strain	<ul style="list-style-type: none"> • Higher distress in caregivers of patients with cancer [37] • Caregiving for patients with Alzheimer's disease [44]
Possible new associated conditions	
Chronic illness	<ul style="list-style-type: none"> • Delayed recovery from traumatic brain injury [12] • Time since breast cancer diagnosis in cancer patients on aromatase inhibitors [28] • More than 5 chronic diseases [32] • Hypertension, diabetes and heart diseases in the general population of Turkey [34] • Hypothyroidism in history among a group of hypertensive patients [41] • Mild cognitive impairment, cerebral hemorrhage and hyperlipidemia in men and women [47]
Possible new at-risk populations	
Individuals going through changes in marital status	<ul style="list-style-type: none"> • Separated, divorced, and widowed patients with heart failure [14] • Number of times married in US Army personnel prior to deployment [46]
Economically disadvantaged	<ul style="list-style-type: none"> • Lower employment level in male Japanese public service workers [1] • Low-income level among Adult Finns [18] • Low-income level of pregnant latinas [24] • Low-income level among General population of Turkey [34] • Low-income level among in a group of hypertensive patients [41] • No fixed income, less social contact, less social capital and living alone [54]
Female gender	<ul style="list-style-type: none"> • Female gender in elderly population exposed to night light [29] • Female gender among community elderly in Alexandria [32] • Female gender among a group of hypertensive patients [41]. • Female gender in shift-working nurses in shift-working nurses in South Korea [40] • Female gender among the Saudi adult population [49]
Increasing age	<ul style="list-style-type: none"> • Aged women (40–59) [13] • 75-and-older age group among Ontario workers [12] • ≥ 20 years old among pregnant women in the third trimester [21] • Age (>65 vs < 55 years) among breast cancer patients on aromatase inhibitors as a treatment [28] • Elderly population exposed to night light (mean age, 72.2 years) [27] • ≥ 50 years of age among binge drinkers [39] • Increasing of risk of insomnia for every 10 years among a group of hypertensive patients [41] • Age ≥ 75 years in men and women by multivariate factor analysis in Hebei Province, China [47] • Age (>60 years and 30–59 years) among the Saudi adult population [49]
Night shift workers	<ul style="list-style-type: none"> • Population with high frequency of insomnia [27,40]

these predictors were classified as ReF, because they are amenable to independent nursing interventions. Other predictors were classified as associated conditions because they are directly related to medical conditions, whereas the remaining predictors were

classified as at-risk populations [6].

Smoking was found in six studies and classified as a possible new ReF of Insomnia, since there is evidence on independent nursing interventions aimed at smoking cessation, such as Smoking

Cessation Assistance (code 4490) of the Nursing Interventions Classification (NIC) [64]. Smoking as a predictor for Insomnia was identified along with other indicators, such as depression [16,57], anxiety [19], poor sleep hygiene [33,47]. In a study carried out with 77 young people, it was found that smokers had a shorter sleep continuity with increased wake time after sleep onset, which may be caused by the hypothalamic-pituitary-adrenocortical axis [65].

Other predictors that did not correspond to the NANDA-I diagnosis were obesity, caffeine intake, dysfunctional sleep beliefs and caregiver stress, which were classified in the present study as ReF. Possible interventions to address these ReF are included in NIC in the Behavioral domain, in the classes Behavior therapy, Cognitive therapy, Patient education [64], as well as and in a review on insomnia and sleep [66]. Although we identified obesity as a predictor of insomnia [51], a meta-analysis including 67 studies did not confirm this association. Thereby, more robust studies are needed to evaluate this association [67].

The predictor most commonly found that was also not a match with the Insomnia diagnosis was “increasing age”, which was classified as an ARP. Possible causes for increased occurrence of insomnia in this population are inadequate sleep hygiene (27), chronic comorbidities, depression [11,20,27,45], anxiety [27], stressors, physical discomfort [20,27,40,66,68].

“Economically disadvantaged” as an ARP was identified in six studies. Other elements associated with this ARP were depression [24], inadequate sleep hygiene [34], food intake before bedtime [41] and pain [41]. Economic disadvantages can lead to depression, worsening of clinical signs such as pain and attitudes that do not favor the quality of sleep. Another study with 706 individuals also found that individuals with low income are more vulnerable to the deleterious effects of exposure to noise, thereby impairing their sleep quality [69].

The female gender was found in several studies as a predictor of insomnia [66] including a meta-analysis that found that insomnia is 1.5-fold more common in women than in men [70]. This predictor was classified as an ARP. In some studies, women with insomnia frequently had hypertension [41], were elderly [29,32] and night workers [40]. The relationship between female gender and insomnia can also be related to lower educational levels, unemployment, hormonal factors and psychological factors such as perfectionism and anxiety, which are more frequent in women [71].

Other predictors identified that were categorized as ARP for the nursing diagnosis were changes in marital status and night shifts. In a study conducted with 35,228 people, divorced men and women had more insomnia symptoms [72]. In a study with 494 participants, night workers had poorer sleep quality, longer sleep latency, shorter sleep duration, more sleep disorders and greater dysfunction during the day [73].

Chronic diseases were also predictors identified that were not included in the NANDA-I diagnosis and were classified in this study as AC. Those are situations that cannot be modified by independent nursing interventions. Other situations associated with chronic diseases that are predictive of insomnia and can be managed by nurses are anxiety [28], depression [28,32], smoking, and caffeine intake [34].

As the nursing science evolves, constant content refinement of the NANDA-I diagnoses is expected. The predictors found in this study can be submitted to the NANDA-I appreciation for inclusion in the Classification, thereby supporting clinical reasoning related to the causes of Insomnia. Further studies can be developed to investigate the predisposing, disabling, precipitating, or reinforcing nature of the diagnostic Ref [74], as well as to test interventions toward these factors.

5. Conclusion

Several predictors of insomnia in adults were identified in different populations. All ReF and AC of the current nursing diagnosis Insomnia are supported by the literature, except for “frequent day napping” and “grieving”. We found five possible new ReF, one possible new AC and five possible new at-risk populations, which can be submitted for NANDA-I appreciation and inclusion in the Classification.

Relevance for clinical practice

Awareness of the predictors of insomnia can support nurses in the early identification and support for patients’ needs. The predictors found in this study can be submitted to the NANDA-I appreciation for inclusion in the Classification, thereby supporting clinical reasoning related to the causes of Insomnia.

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Appendix A. Supplementary data

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