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Sleep Disturbances as a Risk Factor for Impaired Physical Health, Everyday Functioning, Depression and Anxiety Disorders: A Narrative Review of Neurobiological and Psychological Mechanisms

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Abstract

Introduction: Sleep keeps the body and mind functioning properly. It maintains emotional balance, helps us handle stress, and improves memory. During sleep, the body recovers, supports the immune system, regulates blood pressure and metabolism, and maintains steady hormone levels. Both sleep duration and quality directly affect our thinking and emotions. Research shows that sleep problems, such as insomnia, insufficient sleep, or a disrupted sleep wake cycle can impair mental functioning and increase the risk of developing mood and anxiety disorders.

Aim of study: The aim of this study is to review the current knowledge on the relationship between sleep disturbances and the risk of developing depression and anxiety disorders, with particular focus on the underlying biological and psychological mechanisms

Material and methods: This study is a narrative review based on an analysis of scientific publications retrieved from the PubMed and Google Scholar databases. Review articles, meta-

analyses, and observational studies published mainly in English between 2010 and 2025 were included. The inclusion criteria were thematic relevance, recency, and scientific quality of the sources.

Results: Studies show that sleep disturbances including insomnia, short sleep duration, and circadian rhythm disruptions are strongly associated with an increased risk of depression and anxiety disorders. Insomnia predicts depression independently and can double its risk. The sleep-mental health relationship is bidirectional: mental disorders can impair sleep, and chronic sleep problems can worsen emotional symptoms.

Conclusions: Sleep disturbances are an important and potentially modifiable risk factor for the development of depression and anxiety disorders. Early identification and proper management of sleep problems may therefore play a key role in both preventing and treating mental health conditions. However, further research is still needed to better understand the mechanisms linking sleep and mental health, as well as to develop more effective preventive and therapeutic strategies.

Keywords: sleep disorders; insomnia; depression; anxiety disorders; mental health

Introduction

Sleep disorders are common and have a major impact on mental health. Many epidemiological studies show that poor sleep quality, insomnia, and other sleep problems raise the risk of depression and anxiety [4]. Chronic sleep issues disrupt emotional regulation, neurobiological systems, and stress management, leading to mental health disorders. Sleep-related difficulties, particularly insomnia, are among the most frequently reported disorders in the general population. Studies indicate that up to 36% of adults report such symptoms, although not all of them receive a formal diagnosis. Latest research estimates that insomnia may affect as many as 850 million people worldwide [4]. In addition to insomnia, obstructive sleep apnea (OSA) is another important sleep disorder. Its prevalence in adults is estimated at around 9–38%. It is more common in men. Many cases of OSA remain undiagnosed. In recent years, risk factors for OSA have increased. These include population aging, rising obesity rates, and misuse of alcohol

or sleep medications. These factors all contribute significantly to its growing prevalence [20]. Other sleep disorders include restless legs syndrome (RLS) and the less common condition narcolepsy. It is important to note that the prevalence of sleep disorders varies depending on age, sex, and comorbid medical conditions. Despite these differences, their prevalent occurrence has a significant impact on the mental health of society as a whole. Sleep problems can both cause and signal various mental disorders. Disturbed sleep impairs cognitive function, emotional regulation, and stress management. The biological and neuropsychological mechanisms are complex. Sleep deprivation increases amygdala activity and weakens prefrontal cortex control, leading to increased irritability, heightened stress reactivity, and worse emotional regulation. It also disrupts neural signaling and increases hypothalamic–pituitary–adrenal (HPA) axis activity, resulting in elevated cortisol levels. Research shows that disrupted sleep may contribute to the onset or worsening of depression, anxiety disorders, and psychosis. Conversely, sleep problems are commonly a symptom of these conditions [12].

Aim of the study

The aim of this study is to present the current knowledge on the relationship between sleep disturbances and the risk of developing depression and anxiety disorders, with a particular focus on the biological and psychological mechanisms behind this connection. An additional aim is to highlight sleep disturbances as a potentially modifiable risk factor and to show their importance in both the prevention and treatment of mental health disorders.

Material and methods

This study is a narrative review. It is based on an analysis of scientific articles on the relationship between sleep disturbances, depression, and anxiety disorders. The literature was collected from the PubMed and Google Scholar databases. The search used combinations of keywords such as “sleep disturbances,” “insomnia,” “sleep disorders,” “depression,” “anxiety disorders,” and “circadian rhythm.” Most of the publications included were published between 2010 and 2025. Recent systematic reviews, meta-analyses, and observational studies received special attention. These provide the most reliable and up-to-date evidence. Studies were included if they were relevant to the topic, of good scientific quality, and available in full text. Papers with weak methodology, case reports, or studies not directly related to the topic were excluded. The analysis involved a structured synthesis of findings on sleep and mental

functioning, especially depression and anxiety disorders. Special attention was given to biological and psychological mechanisms. These include neurobiological, hormonal, and environmental factors that may influence the relationship between sleep and mental health.

Classification of sleep disorders

According to ICSD-3 (International Classification of Sleep Disorders, 3rd edition), sleep disorders are divided into several main groups [2].

The most common disorder in adults is insomnia. It involves difficulty falling asleep, frequent night awakenings, waking up too early, and sleep that does not feel refreshing. These symptoms appear several times a week and continue even when sleep conditions are appropriate. Studies show that about 30–36% of adults report insomnia symptoms [17, 18]. Insomnia can be both a symptom and an important risk factor for depression and anxiety disorders [3].

Another group includes circadian rhythm sleep–wake disorders like irregular sleep–wake rhythm, delayed sleep phase disorder, and advanced sleep phase disorder. People with these disorders often have trouble falling asleep at normal hours, wake up during the night, and are very sleepy during the day. Common causes are shift work, irregular daily routines, and poor sleep habits.

Genetics can also play a role. Obstructive sleep apnea (OSA) affects about 9–38% of adults. It is more common in men. Main features include snoring, repeated awakenings, daytime sleepiness, and breathing pauses during sleep. Main risk factors are obesity, older age, alcohol use, and sleep medications [20]. Restless legs syndrome (RLS) is another sleep disorder. It causes unpleasant sensations in the legs, mainly in the evening and at night. This creates a strong urge to move them. RLS is often connected with conditions such as iron deficiency or chronic kidney disease [1]. Narcolepsy is a rare sleep disorder. It affects about 0.02–0.05% of the population. Symptoms usually start in adolescence. They include excessive daytime sleepiness and sudden, uncontrollable sleep attacks [19]. There is also a group of REM sleep-related disorders, including nightmares, very vivid dreams, and REM sleep behavior disorder. These conditions are often seen alongside psychiatric disorders such as PTSD and depression [9].

Role of sleep in mental functioning

Sleep is a complex process involving both the brain and the body. It strongly affects attention, memory, and decision making. Sleep happens in two main stages: NREM (Non-Rapid Eye Movement) and REM (Rapid Eye Movement). NREM sleep makes up about 75–80% of total sleep time and includes three stages:

- N1 (falling asleep) – a short transition between being awake and asleep, with lowered muscle activity and awareness;

- N2 (light sleep) – the longest stage, identified by sleep spindles and K-complexes on EEG, along with lower body temperature and slower heart rate;

- N3 (deep sleep) – slow-wave sleep with delta brain waves. This is the most restorative stage, important for physical recovery, tissue repair, immune function, and consolidation of memory, especially declarative memory (facts and knowledge).

REM sleep occurs in cycles roughly every 90 minutes. It is identified by rapid eye movements and high brain activity, similar to being awake. Most dreaming happens in this stage. The body experiences temporary muscle paralysis, while the brain remains highly active, processing information. REM sleep is important for emotional and procedural memory, as well as for integrating routine experiences and regulating mood. These processes include reduced amygdala activity and stronger prefrontal cortex control. As a result, good sleep quality supports emotional balance, a more stable mood, and better stress coping.

Sleep deprivation and insomnia are linked to stronger emotional reactions, higher anxiety and irritability, and problems with learning, memory, and decision making. Over time, they also increase the risk of depression. Studies show that both very short sleep (under 6 hours) and long sleep (over 8–9 hours) are associated with higher depression risk, although short sleep seems to have a stronger effect [22].

The circadian rhythm is a roughly 24-hour cycle that controls sleep and wakefulness. It is regulated by the suprachiasmatic nucleus (SCN) in the hypothalamus. Light is the main signal that keeps this rhythm synchronized, along with hormones such as melatonin, which helps us fall asleep in the evening, and cortisol, which peaks in the morning and increases alertness. Daily habits such as physical activity, sleep regularity, and screen use also affect this rhythm.

When disrupted, it can lead to problems with attention, concentration, and reaction time. During sleep, the brain also goes through important cleaning and recovery processes. The glymphatic system helps remove waste products such as beta-amyloid, while decreased neural activity supports repair processes. Neurotransmitter systems are also stabilized. Disruptions in these systems are linked not only to neurodegenerative diseases but also to mental disorders, including depression [22].

Risk factors underlying the development of insomnia

Some individuals show greater vulnerability to the development of insomnia, which results from the interaction of multiple biological and psychological mechanisms. One important factor is the genetic component – the heritability of insomnia is estimated at approximately 30–40% [25].

Genes involved in the regulation of circadian rhythm have also been identified. These genes influence brain functioning, particularly in regions responsible for sleep–wake regulation, emotion, and sensory processing [26]. Another important role is played by nervous system hyperreactivity. Increased activity of the hypothalamic–pituitary–adrenal (HPA) axis leads to a state of sustained physiological arousal, which makes it difficult to fall asleep and promotes sleep fragmentation. High sleep reactivity to stress (so-called sleep reactivity) is considered an important vulnerability factor for the development of insomnia. Individuals who are more sensitive to stress are at particular risk of the transition from acute to chronic insomnia [27]. Age is another significant factor. The prevalence of sleep disturbances increases with age. This is due both to the presence of somatic comorbidities and medication use, as well as physiological changes in sleep architecture. In older adults, a reduction in slow-wave sleep (N3), increased sleep fragmentation, and earlier morning awakenings are observed. Additionally, shorter nighttime sleep is often compensated for by daytime napping, which may further exacerbate sleep problems [29].

Sleep disturbances are particularly common in women during the perimenopausal period, affecting approximately 40–60% of this population. The most frequent symptoms include difficulty falling asleep and frequent nocturnal awakenings. Hormonal changes play a key role – decreased levels of estrogen and progesterone affect sleep regulation, thermoregulation, and neurotransmitter functioning. Additionally, reduced progesterone levels, which have a sedative effect, may further worsen insomnia symptoms [30].

It is emphasized that there is no single cause of sleep disorders. Currently, a model integrating predisposing, precipitating, and perpetuating factors is widely accepted. This means that some individuals, due to genetic predisposition or personality traits, are more vulnerable to the development of insomnia. Precipitating factors, such as stress or illness, may trigger sleep disturbances, whereas perpetuating factors – including maladaptive sleep habits, excessive focus on sleep problems, or fear of insomnia – may maintain symptoms even after the initial stressor has resolved [31]. This highlights the importance of a comprehensive diagnostic and therapeutic approach.

Sleep disturbances and risk of depression

Sleep disorders linked to depression include insomnia, hypersomnia (excessive daytime sleepiness and non-restorative sleep), disrupted sleep continuity, changes in REM sleep (more REM and less deep N3 sleep), and circadian rhythm disturbances.

Insomnia is the most common sleep disorder associated with depression. It involves difficulty falling asleep, frequent nighttime awakenings, early-morning awakenings, and non-restorative sleep. Daytime symptoms include fatigue, sleepiness, poor concentration, irritability, and reduced functioning. These symptoms occur several times a week and last for weeks or longer, even when sleep conditions are adequate. Research shows that insomnia can be both a symptom of depression and a predictor of its development. It may come before depression and increase the risk of its onset. The longer sleep problems last, the higher the risk of depression [14]. A meta-analysis by Baglioni et al. [3] found that people with insomnia have about twice the risk of developing depression. This makes early detection and treatment of sleep problems very important in prevention [23].

Sleep rhythm disturbances, such as short sleep duration, interrupted sleep, or irregular circadian rhythms, are also common in depression. Early morning awakening is a typical symptom. People with depression often show disrupted circadian rhythms, which can worsen the illness. These problems are especially common in older adults, partly because of lighter sleep stages and more frequent obstructive sleep apnea (OSA). Because of this, the link between sleep problems and depression is particularly strong in the elderly population [24].

Sleep disturbances and risk of anxiety disorders

The most common sleep problems seen in people with anxiety disorders include insomnia, frequent night awakenings, nightmares, and light, non-restorative sleep. In some cases, sleep difficulties may even show up before generalized anxiety disorder (GAD), acting as an early warning sign.

The main mechanism behind sleep problems in anxiety disorders is hyperarousal, which basically means that the nervous system stays in a constant state of overactivity. As a result, the body has difficulty calming down before sleep, leading to difficulty falling asleep and shallow, interrupted sleep [16]. Another important factor is rumination and worry, meaning repetitive negative thinking about problems and possible threats, especially at night. This type of thinking keeps the mind active when it should be resting, making it harder to fall asleep and decreasing sleep quality. At the same time, emotional overactivity leads to increased activity in brain regions involved in fear processing, including the amygdala, along with reduced prefrontal cortex control. As a result, feelings of anxiety, fear, and tension become stronger. Sleep problems are also linked to dysregulation of the stress system and higher cortisol levels, which further contribute to a state of tension and make relaxation before sleep even more difficult. The relationship between sleep and anxiety is clearly bidirectional. Research shows that short or interrupted sleep increases the risk of developing anxiety symptoms, while existing anxiety disorders significantly worsen sleep quality and make it harder to fall asleep. Because of this, treating sleep problems should not only be seen as part of therapy, but also as a way to prevent anxiety disorders from developing [16].

Neurobiological and psychological mechanisms

Sleep problems, depression, and anxiety disorders share many of the same biological, psychological, and environmental causes. This helps explain why they so often appear together. A main reason is an imbalance among neurotransmitters such as serotonin, noradrenaline, dopamine, and GABA. These chemicals are involved in both regulating sleep and controlling mood and emotions.

Serotonin helps regulate mood, appetite, body temperature, blood pressure, and the sleep–wake cycle. When serotonin levels are low, people are more likely to experience low mood, anxiety, sleep problems, and changes in appetite and energy. Noradrenaline is responsible for alertness

and arousal. When it is overactive, it may cause increased tension, anxiety, and difficulty falling asleep. Dopamine is linked to motivation and the brain's reward system — when levels are too low, people may feel unmotivated and excessively sleepy during the day. GABA, on the other hand, is the main calming neurotransmitter in the brain. It helps slow down brain activity and makes it easier to fall and stay asleep.

Another important system is the hypothalamic–pituitary–adrenal (HPA) axis, which controls the body's stress response. When stress is chronic, cortisol levels stay elevated, which makes it harder to fall asleep and increases the risk of anxiety and depression. In people with depression, the normal daily rhythm of cortisol is often disrupted.

Mental components are also very important. Rumination — meaning repetitive, negative thinking — keeps the brain in a state of constant alertness. This increases emotional strain, makes it harder to regulate feelings, and further worsens sleep quality.

Studies such as Lindsay et al. (2022)[15] suggest that sleep problems can act as an early marker, a risk factor, and even a predictor of mental disorders. Sleep also seems to be a “transdiagnostic” factor, meaning it influences many different mental health conditions at once. A meta-analysis by Hertenstein et al. (2019)[11] found that insomnia increases stress reactivity, and people with insomnia have a 2–to 3-times higher risk of developing depression and anxiety disorders compared to those who sleep well.

Although the relationship between sleep and mental health works in both directions, some studies suggest that sleep problems may have a stronger effect on mental health than the other way around. For example, Esquivel-Mendoza et al. (2024) [7] showed that worsening insomnia symptoms can come before the worsening of depressive symptoms in the same person. This is why sleep is increasingly seen as a key target in clinical treatment.

Environmental factors also play an important role. Chronic stress, shift work, and irregular lifestyles can all disrupt the HPA axis, melatonin production, and the circadian rhythm. Over time, these interferences contribute to both sleep problems and mental health disorders [5].

Role of inflammation

Inflammation is another important link between sleep and mental health. Long-term sleep problems are associated with higher levels of inflammatory markers such as IL-6, TNF- α , and CRP. These are also linked to a higher risk of depression and anxiety. High inflammation levels

can further disrupt the stress system and neurotransmitters, which may intensify both psychological symptoms and sleep disturbances [13].

Consequences of sleep disturbances

Sleep problems can have wide-ranging effects on mental health, physical health, and everyday functioning. Over time, they can affect social life, work performance, and learning ability. Among all sleep disorders, insomnia seems to have the strongest connection with mental health problems such as depression and anxiety [10]. In people who already have psychiatric disorders, insomnia can also make symptoms worse [8].

Clinical implications and public health

Healthy sleep is important for both physical and mental health. In clinical practice, doctors should regularly ask patients about their sleep and, when needed, introduce appropriate treatment. Patients should also be educated about good sleep habits, such as going to bed at consistent times, avoiding screens before sleep, and not eating heavy meals late in the evening. When insomnia is reported, the first step should be a detailed sleep history, including stress levels, lifestyle, medications, and other health conditions. It is also important to look for symptoms of depression or anxiety, as these often overlap with sleep problems. Keeping a sleep diary can help monitor sleep onset, night awakenings, and sleep quality. If needed, non-drug approaches can be introduced first, such as sleep hygiene education, relaxation techniques, reducing rumination, and establishing a regular daily routine. If sleep problems continue for several weeks, cognitive- behavioral therapy for insomnia (CBT-I) is recommended, as it has strong evidence for improving sleep and decreasing anxiety and depression symptoms [21]. Caution is needed when using sleeping medications, especially together with antidepressants or anti-anxiety drugs. These combinations may increase side effects such as sedation, cognitive slowing, balance problems, breathing issues, and, in rare cases, drug toxicity. For this reason, treatment should always be carefully monitored by a physician. Good sleep treatment can improve quality of life, shorten psychiatric treatment, and reduce symptom severity. From a public health perspective, improving sleep habits may reduce rates of depression and anxiety in the population. Sleep problems also create high economic costs due to reduced productivity, absenteeism, and increased risk of accidents. People most at risk include shift workers, older

adults, and those exposed to chronic stress. Preventive strategies should therefore focus especially on these groups.

Results

The literature clearly shows that sleep problems are strongly linked to a higher risk of depression and anxiety disorders. Insomnia is the most studied condition, but short sleep duration, circadian rhythm disturbances, and other disorders such as obstructive sleep apnea are also important.

Many studies show that insomnia can independently predict depression. People with long-term sleep problems have up to twice the risk of developing depression compared to those without sleep issues. Persistent insomnia is also linked to a higher risk of relapse, which points to the importance of early diagnosis and treatment. Sleep problems are also strongly connected to anxiety disorders. Hyperarousal and repetitive negative thinking play key roles, keeping the brain active and making it harder to fall asleep. Overall, research supports a two-way relationship between sleep and mental health. Sleep problems can come before mental health symptoms and act as early warning signs, but mental disorders can also worsen sleep. This creates a cycle that can be difficult to break. Biological mechanisms such as HPA axis dysregulation, neurotransmitter imbalance, and increased amygdala activity, along with environmental factors like stress and irregular lifestyle, all contribute to this relationship.

Discussion

The findings of this review confirm that sleep problems are a major risk factor for depression and anxiety disorders. The strongest evidence concerns insomnia, which often predicts later mental health problems. A key issue is the two-way relationship between sleep and mental health. Sleep problems can appear first and signal early risk, but mental disorders can also worsen sleep. This creates a self-reinforcing cycle. This relationship can be explained by shared biological and mental mechanisms, including dysregulation of the stress system, neurotransmitter imbalance, and emotional overactivation. Psychological aspects such as rumination and chronic stress also have a major role. The results are important for clinical practice. They suggest that sleep should always be assessed in patients with mental health symptoms. Early treatment of sleep problems may reduce the risk or severity of psychiatric disorders.

However, most studies are observational, making it difficult to establish a direct effect. Many rely on self-reported sleep data, which may sometimes not be accurate. Differences in study design and populations also limit comparisons. Upcoming research should concentrate on long-term and interventional studies to better understand causality and to test whether improving sleep can directly prevent or reduce mental health disorders.

Conclusions

The literature review shows that sleep disturbances, especially insomnia, play an important role in the development and course of depressive and anxiety disorders. Insomnia appears to be an independent and potentially modifiable risk factor that can both precede the onset of mental health symptoms and worsen their severity. This relationship is bidirectional, meaning that sleep problems and mental disorders are able to reinforce each other, creating a self-perpetuating cycle [10, 15].

Early identification of sleep problems and early intervention are crucial in both the prevention and treatment of depression and anxiety disorders. Appropriate strategies should include education on sleep hygiene, promoting a regular circadian rhythm, cognitive-behavioral therapy, and, when necessary, careful use of sleep medications, while taking into account possible interactions with antidepressant and anxiolytic drugs [8, 16].

The importance of sleep goes beyond the individual level and also has a clear population-wide impact. Public education about healthy sleep habits, along with efforts to reduce risk factors such as chronic stress and shift work, may help lower the prevalence of insomnia and, in turn, reduce rates of depression and anxiety disorders in the population [5]. In addition, effective treatment of sleep disorders may reduce social and economic costs associated with absenteeism, reduced productivity, and increased accident risk. Further research, particularly longitudinal and interventional studies, is needed to better understand the neurobiological, psychological, and environmental mechanisms linking sleep disturbances with mental health. Such studies could help develop more effective preventive and clinical strategies that can be implemented at both individual and population levels [7, 11].

To summarize, sleep should be regarded as a key component of mental health. Both sleep duration and quality not only influence daily functioning but also represent an important target for the prevention and treatment of depression and anxiety disorders. Effective monitoring,

education, and treatment of sleep problems should therefore be an integral part of comprehensive psychological and psychiatric care [14].

DISCLOSURE

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