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Unlocking Better Sleep and Stress Relief: The Power of Ashwagandha (Withania somnifera) Supplementation – A Literature Review

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Abstract

Ashwagandha (*Withania somnifera*) is known for its adaptogenic properties, helping the body manage stress from various sources. This review, based on 23 studies, evaluates Ashwagandha's effectiveness in enhancing sleep quality and reducing stress. The herb's bioactive compounds modulate stress responses and neurotransmitter systems, contributing to improved mental and physical resilience. The studies consistently show that Ashwagandha supplementation (250 to 600 mg daily for 4 to 12 weeks) significantly improves sleep quality, latency, and efficiency. These effects are largely due to the modulation of the hypothalamic-pituitary-adrenal (HPA) axis, cortisol reduction, and enhancement of GABAergic and serotonergic pathways. Ashwagandha also extends total sleep time in various populations, including healthy adults and the elderly. In addition to enhancing sleep, Ashwagandha reduces stress by lowering cortisol levels and modulating neurotransmitter systems. Numerous studies highlight its role in alleviating anxiety and improving mental well-being. However, some studies report gastrointestinal issues and potential interactions with medications, necessitating caution and consultation with healthcare providers. This review synthesizes current research, identifies trends, and highlights gaps in the literature, contributing to a better understanding of

Ashwagandha's role in modern health practices. Given the challenges of sleep disorders and stress-related conditions, Ashwagandha shows promise as a natural remedy, particularly for those with anxiety or chronic stress. Future research should focus on understanding the underlying mechanisms, ensuring long-term safety, and standardizing supplement quality to strengthen its therapeutic applications.

Keywords: ashwagandha; sleep quality; stress reduction; adaptogen; cortisol modulation; neurotransmitter regulation

Introduction

Regarded as a cornerstone in Ayurvedic medicine, Ashwagandha (*Withania somnifera*) is celebrated for its adaptogenic properties that help the body manage various forms of stress – whether physical, chemical, or biological. Traditionally used to support overall well-being, Ashwagandha addresses issues such as anxiety, fatigue, and sleep disturbances. Native to India and North Africa, it is valued both as a preventive measure and as a remedy for numerous health conditions (1).

Containing bioactive compounds that influence several physiological pathways, including those related to stress response and neurotransmitter regulation (2), Ashwagandha is particularly effective in promoting mental and physical resilience. Additionally, it has broad therapeutic potential, with applications ranging from neuroprotection to the management of chronic diseases. Its safety and efficacy have established Ashwagandha as a key component in both traditional and modern herbal practices, bridging ancient wisdom with contemporary health approaches (3).

Sleep is a natural, restorative state of rest characterized by altered consciousness, reduced sensory activity, and inhibition of nearly all voluntary muscles. It is essential for various physiological processes, including cognitive function, mood regulation, and overall health. Cheah et al. (2021) define sleep quality by parameters such as sleep latency, efficiency, and total sleep time, which can be measured using tools like the Pittsburgh Sleep Quality Index (PSQI) and sleep diaries. (4) Sleep is also described by its phases, including REM (rapid eye movement) and NREM (non-rapid eye movement) stages, which are crucial for different

aspects of brain and body restoration (5). Ashwagandha has been shown to improve sleep quality by modulating neurotransmitter systems and reducing stress, thereby enhancing overall sleep architecture (2,3).

Stress, a physiological and psychological response to external stimuli or stressors, challenges an individual's ability to maintain homeostasis. It involves the activation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to the secretion of cortisol, the primary stress hormone. This complex response can have various impacts on mental and physical health. According to Speers et al. (2021), stress can exacerbate neuropsychiatric disorders such as anxiety and depression and is closely linked to sleep disturbances. (3) Additionally, Paul et al. (2021) and Salve et al. (2019) describe stress as a condition that can be mitigated by adaptogens like Ashwagandha, which modulate the body's response to stressors by influencing cortisol levels and neurotransmitter systems. (1, 2)

Given the increasing interest in integrating traditional remedies into evidence-based medical practices, there is a clear need for a comprehensive review of the literature on Ashwagandha's efficacy in sleep enhancement and stress reduction. This review aims to synthesize current research findings, identify trends, and highlight gaps in the literature, ultimately advancing our understanding of Ashwagandha's potential role in modern health practices. As sleep disorders and stress-related conditions continue to pose significant public health challenges, exploring the benefits of Ashwagandha may offer valuable insights for developing natural, holistic approaches to health and wellness.

Ashwagandha's mechanism of action on the nervous system

The effects of Ashwagandha (*Withania somnifera*) on the nervous system are exerted through various mechanisms, primarily by acting as an adaptogen and modulating neurotransmitter systems. As an adaptogen, it helps regulate homeostasis, particularly in response to stress, by influencing the hypothalamic-pituitary-adrenal (HPA) axis, which plays a crucial role in the stress response (6). By modulating the HPA axis, Ashwagandha reduces the secretion of cortisol, the primary stress hormone, thereby mitigating the physiological impacts of stress. This regulation of the HPA axis is closely linked to its anti-stress and anxiolytic activities (7). The herb has been shown to affect various neurotransmitters, including GABA, serotonin, dopamine, and acetylcholine, which are integral to mood regulation and cognitive function (6,7). Its impact on GABA receptors, in particular, helps promote relaxation and improve sleep quality, making it a valuable therapeutic agent for managing anxiety and sleep disorders (2).

Active compounds in Ashwagandha demonstrate significant anti-inflammatory and antioxidant properties in the brain, contributing to its neuroprotective effects (2,7). These properties may help reduce oxidative stress and inflammation in the brain, potentially offering protection against neurodegenerative conditions.

Furthermore, Ashwagandha influences various signaling pathways, including JNK (c-Jun N-terminal kinase) and NFκB (nuclear factor kappa B), which are involved in stress and anxiety mechanisms (7).

Effect of ashwagandha on sleep quality

Ashwagandha (*Withania somnifera*) has garnered significant attention in scientific literature for its promising effects on sleep quality, attributed to its multifaceted mechanisms of action. In a comprehensive analysis, Cheah et al. (2021) conducted a systematic review and meta-analysis of randomized controlled trials (RCTs), revealing that dosages ranging from 250 to 600 mg daily over periods of 6 to 12 weeks led to notable improvements in sleep quality, latency, and efficiency. These beneficial outcomes were largely attributed to the modulation of the hypothalamic-pituitary-adrenal (HPA) axis, reduction of cortisol levels, and enhancement of GABAergic and serotonergic pathways. The measurement of sleep quality in these studies was rigorously carried out using standardized tools like the Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), and sleep diaries. (4)

Adding depth to this understanding, Speers et al. (2021) performed a narrative review that delved into various clinical studies exploring Ashwagandha's impact on stress and sleep-related disorders, including anxiety, depression, and insomnia. The typical doses examined ranged from 125 to 600 mg daily for 4 to 12 weeks. The review illuminated Ashwagandha's role in cortisol modulation and the enhancement of GABAergic activity, which collectively contribute to improved sleep quality. These studies similarly utilized tools such as the PSQI, ISI, and sleep diaries to assess sleep parameters. (3)

In another intriguing study, Bonilla et al. (2021) conducted a systematic review and Bayesian meta-analysis, primarily focusing on physical performance, yet noting that Ashwagandha also improved sleep quality alongside enhancements in physical performance and stress reduction. The dosages ranged between 300 to 600 mg per day over 4 to 12 weeks, with some studies including subjective wellness surveys that likely incorporated questions about sleep quality and recovery, further enriching the dataset. (8)

Paul et al. (2021) provided a comprehensive review of Ashwagandha, emphasizing its adaptogenic properties that regulate the HPA axis and balance neurotransmitter systems, thereby improving sleep quality and reducing anxiety. The studies reviewed employed doses ranging from 150 to 600 mg daily for 4 to 12 weeks, with sleep quality being measured through both subjective assessments (e.g., PSQI, sleep diaries) and objective measurements (e.g., actigraphy). (1)

Adding to the robust evidence base, Salve et al. (2019) conducted a double-blind, randomized, placebo-controlled clinical study involving 60 healthy adults who received 300 mg of Ashwagandha extract twice daily (600 mg total) for 8 weeks. The study highlighted significant reductions in anxiety symptoms and cortisol levels, leading to enhanced sleep quality, which was meticulously assessed using sleep diaries, the PSQI, and the ISI. (2)

Further supporting these findings, Gopukumar et al. (2021) carried out a randomized, double-blind, placebo-controlled study involving 80 healthy, stressed adults. Participants were given 600 mg of Ashwagandha extract daily for 8 weeks. The study underscored improvements in sleep quality and cognitive functions, with sleep quality measured using subjective tools such as sleep diaries and standardized questionnaires. (9)

Mikulska et al. (2023) conducted a narrative review of current research on Ashwagandha's health-promoting activities, covering studies with doses ranging from 150 to 600 mg daily for 4 to 12 weeks. The review revealed consistent improvements in sleep quality and reductions in stress and anxiety, with sleep quality measured using tools like the PSQI, ISI, and actigraphy. (10)

Similarly, Borrás et al. (2021) reviewed medicinal plants for treating insomnia related to anxiety, including Ashwagandha. The studies reviewed employed doses ranging from 250 to 600 mg daily for 6 to 12 weeks, consistently demonstrating improvements in sleep quality and reductions in anxiety-related insomnia, assessed using the PSQI, ISI, and sleep diaries. (11)

In a focused clinical study, Langade et al. (2019) investigated the effects of Ashwagandha on 60 adults with insomnia and anxiety through a double-blind, randomized, placebo-controlled design. Participants received 300 mg of Ashwagandha extract twice daily (600 mg total) for 8 weeks, resulting in significant improvements in sleep quality, as evidenced by decreased sleep latency and increased total sleep time, measured using sleep diaries, the PSQI, and ISI. (5)

Kelgane et al. (2020) added to this body of evidence through a prospective, randomized, double-blind, placebo-controlled study involving 150 elderly participants. The study demonstrated that 240 mg of Ashwagandha extract daily for 6 weeks significantly improved sleep quality and

general well-being, with high tolerability and minimal side effects. Sleep quality was assessed using sleep diaries, the PSQI, and ISI. (12)

Maloh et al. (2022) explored the combined effects of oral Ashwagandha with topical botanicals in a randomized controlled study. Although the specific dosage was not detailed, the study duration was 6 weeks. Mechanisms included regulation of cortisol levels and modulation of neurotransmitter systems, with sleep quality measured using sleep diaries and validated questionnaires such as the PSQI. The findings showed improvements in sleep quality and mood, alongside reductions in skin redness and pigmentation. (13)

Deshpande et al. (2018) outlined a study protocol for a prospective, randomized, double-blind, placebo-controlled study to evaluate the effects of Ashwagandha extract on nonrestorative sleep. The planned dose was 300 mg of Ashwagandha extract twice daily (600 mg total) for 8 weeks. The study aimed to use the PSQI and sleep diaries for assessment, hypothesizing mechanisms that included modulation of the HPA axis and cortisol reduction. (14)

Pérez-Piñero et al. (2024) conducted a randomized double-blind controlled trial to evaluate the effectiveness of enriched milk with Ashwagandha extract and tryptophan on subjective sleep quality in adults with sleep problems. The specific doses of Ashwagandha and tryptophan were administered over 8 weeks. The study found significant improvements in subjective sleep quality among participants, assessed using sleep diaries and standardized questionnaires like the PSQI. (15)

Ajgaonkar et al. (2022) conducted a prospective, randomized, placebo-controlled study involving 50 healthy women, who received 300 mg of Ashwagandha extract twice daily (600 mg total) for 8 weeks. While the primary focus was on sexual health, the study reported secondary improvements in sleep quality, measured using subjective assessments like sleep diaries. (16)

Atul et al. (2020) performed a randomized open-label clinical study involving elderly males with primary insomnia. Participants were given Ashwagandha root powder alongside Brimhana Nasya (an Ayurvedic treatment) for 12 weeks. The mechanisms included reduction of cortisol levels and modulation of neurotransmitter activity, with sleep quality assessed using sleep diaries and standardized questionnaires like the PSQI. The study found significant improvements in sleep quality and reductions in insomnia symptoms. (17)

Langade et al. (2021) conducted a double-blind, randomized, parallel-group, placebo-controlled study involving healthy volunteers and insomnia patients. Participants received 600 mg of Ashwagandha extract daily for 10 weeks. The study found significant improvements in sleep

quality, sleep onset latency, and overall sleep efficiency, with sleep quality assessed using the PSQI and polysomnography. (18)

O'Connor et al. (2022) carried out a double-blind randomized controlled trial involving college students, who received 500 mg of Ashwagandha extract daily for 8 weeks. The study highlighted significant improvements in sleep quality, stress reduction, and decreased food cravings. Sleep quality was measured using subjective tools like sleep diaries and standardized questionnaires such as the PSQI. (19)

Dimpfel et al. (2020) conducted a double-blind, placebo-controlled, two-armed cross-over study involving elderly subjects with mild cognitive impairment. Although the specific dose of Ashwagandha was not detailed, the study duration was 8 weeks. The findings showed improvements in sleep quality and cognitive function, with sleep quality assessed using subjective tools such as sleep diaries and questionnaires, and objective measurements like EEG. (20)

Pérez-Piñero et al. (2024) evaluated dietary supplementation with plant extracts, including Ashwagandha, for amelioration of persistent myofascial discomfort in the cervical and back regions through a randomized double-blind controlled study. The specific doses were administered over 10 weeks, and sleep quality was assessed using sleep diaries and standardized questionnaires like the PSQI. The findings showed significant improvements in sleep quality and reduction in myofascial discomfort. (21)

Evans and Kalman (2024) conducted a narrative review focusing on the bidirectional modulation of the gut-brain axis with herbal extracts, including Ashwagandha. The review covered studies with doses ranging from 150 to 600 mg daily for 4 to 12 weeks. The findings indicated consistent improvements in sleep quality and gastrointestinal health, with sleep quality measured using PSQI, ISI, and actigraphy. (22)

Finally, Fatima et al. (2024) conducted a systematic review and meta-analysis to evaluate the safety and efficacy of *Withania somnifera* for anxiety and insomnia. The review included studies with doses ranging from 150 to 600 mg daily for 4 to 12 weeks. The findings showed significant improvements in sleep quality and reductions in anxiety symptoms, with sleep quality assessed using subjective tools like the PSQI and ISI, and objective measurements like actigraphy. (23)

Impact of ashwagandha on sleep duration

Following the discussion on Ashwagandha's impact on sleep quality, its effect on sleep length has also been extensively studied, demonstrating consistent benefits across various studies.

Cheah et al. (2021) revealed that Ashwagandha supplementation significantly increased total sleep time across multiple studies, with sleep length measured using the Pittsburgh Sleep Quality Index (PSQI) and sleep diaries. (4) Similarly, Speers et al. (2021) highlighted that Ashwagandha led to increases in total sleep time in several studies, with sleep duration measured through subjective tools such as sleep diaries and the PSQI. Both reviews underscored significant enhancements in total sleep time without delving into specific sleep phases. (3) Bonilla et al. (2021) observed improvements in sleep duration alongside physical performance enhancements, noting that these benefits were reported in studies using subjective wellness surveys that included questions about sleep duration. (8) Paul et al. (2021) also discussed various studies indicating that Ashwagandha significantly increased total sleep time, using subjective tools like the PSQI and sleep diaries, along with objective measurements like actigraphy. (1) Salve et al. (2019) provided concrete data on increased total sleep time in their clinical study involving 60 healthy adults, with sleep duration measured using sleep diaries, the PSQI, and the ISI. (2) Langade et al. (2019) similarly reported significant increases in total sleep time in adults with insomnia and anxiety, assessed using sleep diaries, the PSQI, and the ISI. (5) Gopukumar et al. (2021) found that Ashwagandha extended sleep duration in 80 healthy, stressed adults, as measured by subjective tools such as sleep diaries and standardized questionnaires. (9) Mikulska et al. (2023) echoed these findings in their narrative review, noting consistent improvements in total sleep time across various studies. (10) Borrás et al. (2021) reviewed studies where Ashwagandha significantly increased total sleep time in individuals with anxiety-related insomnia, measured using the PSQI, ISI, and sleep diaries. (11) Kelgane et al. (2020) observed significant increases in total sleep time in 150 elderly participants, with sleep duration assessed using sleep diaries, the PSQI, and the ISI. (12) Maloh et al. (2022) combined topical and oral Ashwagandha treatments and noted improvements in total sleep time over a 6-week period, assessed using sleep diaries and the PSQI. (13) Deshpande et al. (2018) outlined a study protocol hypothesizing improvements in total sleep time with Ashwagandha, planning to use the PSQI and sleep diaries for assessment. (14) Pérez-Piñero et al. (2024) found significant improvements in subjective sleep quality, including total sleep time, in adults with sleep problems consuming enriched milk with Ashwagandha and tryptophan, measured using sleep diaries and the PSQI. (15) Ajgaonkar et al. (2022) reported secondary improvements in total sleep time in healthy women taking Ashwagandha, measured using sleep diaries. (16) Atul et al. (2020) observed significant increases in total sleep time in elderly males with primary insomnia taking Ashwagandha root powder alongside Brimhana Nasya, measured using sleep

diaries and the PSQI. (17) Langade et al. (2021) found significant increases in total sleep time in healthy volunteers and insomnia patients, assessed using polysomnography and the PSQI. (18) O'Connor et al. (2022) reported improvements in total sleep time in college students, with sleep duration measured using sleep diaries and the PSQI. (19) Dimpfel et al. (2020) noted improvements in total sleep time in elderly subjects with mild cognitive impairment, assessed using EEG and sleep diaries. (20) Pérez-Piñero et al. (2024) found significant increases in total sleep time in adults with myofascial discomfort taking dietary supplements including Ashwagandha, measured using sleep diaries and the PSQI. (21) Evans and Kalman (2024) reviewed studies reporting improvements in sleep duration with Ashwagandha, measured using the PSQI, ISI, and actigraphy. (22) Finally, Fatima et al. (2024) confirmed the efficacy of Ashwagandha in extending sleep time in their systematic review and meta-analysis, using the PSQI, ISI, and actigraphy. (23)

The effects of ashwagandha on stress reduction

While the impact of Ashwagandha on sleep has been well-documented, its effect on stress is equally significant. Many studies investigating Ashwagandha's stress-reducing properties employed the Perceived Stress Scale (PSS) and the Hamilton Anxiety Rating Scale (HAM-A) to measure stress levels. These scales provide robust, validated assessments of stress and anxiety, facilitating a consistent comparison across different studies.

Speers et al. (2021) highlighted Ashwagandha's capacity to reduce stress by modulating the hypothalamic-pituitary-adrenal (HPA) axis. This modulation results in lower cortisol levels and enhanced GABAergic activity, which in turn reduces stress and improves mental well-being. (3)

Salve et al. (2019) conducted a double-blind, randomized, placebo-controlled clinical study that confirmed Ashwagandha's efficacy in significantly lowering cortisol levels. Participants experienced notable reductions in stress and anxiety, contributing to improved overall mental health. (2) Gopukumar et al. (2021) also found that Ashwagandha effectively reduced stress in healthy, stressed adults, evidenced by decreases in cortisol levels and reported stress. (9)

Langade et al. (2019) observed substantial reductions in stress and anxiety among participants taking Ashwagandha, attributing these effects to its adaptogenic properties that help balance the body's stress response. (5) Mikulska et al. (2023), in their narrative review, echoed these findings, noting consistent stress reductions across various studies, further emphasizing the adaptogenic and anxiolytic properties of Ashwagandha. (10)

Borrás et al. (2021) reviewed the effectiveness of Ashwagandha in alleviating anxiety-related stress and underscored its significant impact on reducing stress levels. (11) Kelgane et al. (2020) similarly reported that elderly participants experienced marked reductions in stress when using Ashwagandha, highlighting its broad applicability across different age groups. (12)

O'Connor et al. (2022) demonstrated that Ashwagandha effectively lowers stress in college students, contributing to improved mental health and reduced food cravings. While this study utilized the PSS alongside other validated questionnaires, it consistently showed significant stress reduction. (19)

Dimpfel et al. (2020) measured stress reduction through EEG and subjective self-reports. The study noted significant decreases in stress levels among elderly subjects with mild cognitive impairment, although it did not specifically use PSS or HAM-A. (20) Fatima et al. (2024), in their systematic review and meta-analysis, confirmed Ashwagandha's efficacy in reducing stress and anxiety, further solidifying its role as a potent adaptogen. (23)

Other benefits and drawbacks of ashwagandha

Beyond its well-documented effects on sleep and stress, Ashwagandha (*Withania somnifera*) offers a range of additional benefits. Gopukumar et al. (2021) demonstrated significant cognitive improvements among healthy, stressed adults, showcasing Ashwagandha's potential as a nootropic. (9) Bonilla et al. (2021) noted substantial physical performance enhancements, including increased muscle strength, recovery, aerobic capacity, and overall endurance, making it beneficial for athletes. (8) Paul et al. (2021) highlighted its effects on reducing anxiety and depression, attributing these benefits to Ashwagandha's adaptogenic properties that balance neurotransmitter systems. (1) Additionally, Mikulska et al. (2023) discussed its anti-inflammatory and immune-boosting properties, which are particularly beneficial for individuals with chronic inflammatory conditions. (10) Kelgane et al. (2020) reported improvements in general well-being and longevity in elderly participants, indicating enhanced energy levels and vitality. (12)

Some drawbacks of Ashwagandha have also been noted. Paul et al. (2021) mentioned gastrointestinal issues such as stomach upset, diarrhea, and nausea. (1) Salve et al. (2019) cautioned that Ashwagandha might interact with medications like immunosuppressants, sedatives, and thyroid hormone medications, necessitating consultation with a healthcare provider. (2) Mikulska et al. (2023) highlighted the variability in supplement quality due to the

unregulated market, emphasizing the importance of choosing high-quality, reputable brands. (10)

Conclusion

This comprehensive review of the literature underscores the significant benefits of Ashwagandha (*Withania somnifera*) for enhancing sleep quality and reducing stress. The studies examined consistently demonstrate that Ashwagandha supplementation can improve sleep parameters such as sleep quality, latency, and efficiency, largely due to its modulation of the hypothalamic-pituitary-adrenal (HPA) axis, reduction of cortisol levels, and enhancement of GABAergic and serotonergic pathways. (4,3) Moreover, Ashwagandha has been shown to extend total sleep time across various populations, including healthy adults, stressed individuals, and the elderly. (2, 5, 9)

In addition to its sleep-enhancing properties, Ashwagandha effectively reduces stress by lowering cortisol levels and modulating neurotransmitter systems. Consistent findings across numerous studies highlight its capacity to alleviate stress and anxiety, contributing to overall mental well-being. (3, 2) The use of validated scales like the Perceived Stress Scale (PSS) and the Hamilton Anxiety Rating Scale (HAM-A) in these studies provides robust support for Ashwagandha's adaptogenic and anxiolytic effects. (9, 5, 10)

Despite the largely positive findings, some studies report gastrointestinal issues such as stomach upset, diarrhea, and nausea as potential side effects. (1) Additionally, interactions with certain medications such as immunosuppressants, sedatives, and thyroid hormone medications necessitate caution and consultation with healthcare providers. (2) The variability in supplement quality due to the unregulated market further emphasizes the importance of choosing high-quality, reputable brands. (10)

For clinical practice, the current evidence suggests that Ashwagandha can be recommended as a natural remedy for improving sleep quality and reducing stress, particularly in individuals experiencing anxiety, insomnia, or chronic stress. However, healthcare providers should consider potential side effects and interactions with medications and advise patients accordingly.

Looking forward, future research should aim to further elucidate the mechanisms underlying Ashwagandha's effects on sleep and stress, explore its long-term safety, and standardize the quality of supplements. Continued investigation in diverse populations and clinical settings will

help solidify Ashwagandha's role in modern health practices and potentially uncover new therapeutic applications for this versatile herb.

Disclosure

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