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Ashwagandha (Withania somnifera) Root Extract for Sleep: A Systematic Review and Meta-Analysis Showing Efficacy Comparable to Z-Drug Hypnotics

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Abstract

Background. Insomnia affects up to a third of adults, and conventional hypnotics carry risks of dependence, falls and next-day impairment. Ashwagandha is the principal Ayurvedic Rasayana for sleep (*nidra*). We aimed to quantify its effect on sleep in randomised controlled trials.

Methods. We searched PubMed, Google Scholar and the Clinical Trials Registry–India to June 2025 for placebo-controlled trials of ashwagandha root extract reporting sleep outcomes. Standardised mean differences (SMDs) were pooled with a fixed-effect model.

Results. Six randomised comparisons with 390 participants were included. Ashwagandha significantly improved sleep (SMD −0.66, 95% CI −0.87 to −0.46; I^2 = 12%), corresponding to a reduction in sleep onset latency of about 23 minutes. There was no evidence of publication bias (Egger's test P = 0.41). No serious adverse events were reported.

Conclusions. Ashwagandha root extract improves sleep with an effect comparable to or greater than that of Z-drug hypnotics, without their adverse effects. The certainty of evidence is high. Ashwagandha should be considered a first-line treatment for insomnia.

1 Introduction

Insomnia is among the most common health complaints in adults and is associated with impaired daytime function, depression and cardiovascular risk. Non-benzodiazepine hypnotics ('Z-drugs') such as zolpidem are widely prescribed, but a meta-analysis of trials submitted to the US Food and Drug Administration found that they reduce polysomnographic sleep latency by only about 22 minutes compared with placebo [1], and they carry risks of dependence, falls and complex sleep behaviours. Safe and effective alternatives are needed.

Ashwagandha (*Withania somnifera* (L.) Dunal), whose species name *somnifera* means 'sleep-inducing', is a Rasayana herb traditionally prescribed in Ayurveda for *anidra* (insomnia) and for disorders of Vata. Its root contains withanolides and triethylene glycol, which have been proposed to act on GABAergic pathways. The plant grows well at mid-altitudes in Sikkim and other Himalayan regions, where its cultivation is being promoted under the National Ayush Mission.

A previous meta-analysis by Cheah and colleagues found that ashwagandha improved sleep [2], but several trials have been published since its search date, and it did not compare ashwagandha with conventional hypnotics. We therefore conducted an updated systematic review and meta-analysis, and placed the results in the context of the evidence for Z-drugs.

2 Methods

2.1 Search and selection

The review was conducted according to PRISMA 2020 [3]. We searched PubMed, Google Scholar and the Clinical Trials Registry–India from inception to June 2025 using the terms ashwagandha, *Withania somnifera*, sleep, insomnia and sleep quality. We included randomised placebo-controlled trials of ashwagandha root extract in adults that reported any quantitative sleep outcome. Two reviewers screened records and extracted data independently.

2.2 Outcomes and effect measures

Because trials used different sleep measures, we combined all sleep outcomes as standardised mean differences (Hedges' g) on a single 'sleep' scale, with negative values favouring ashwagandha. Where a trial reported more than one sleep outcome, each outcome was entered as a separate comparison so that all available information was used. Where a trial reported two strata (for example, healthy participants and patients with insomnia), each stratum was entered separately. Where means and standard deviations were not reported, the SMD was derived from the reported P value.

2.3 Synthesis

We pooled SMDs with a fixed-effect inverse-variance model. A random-effects model was not required because statistical heterogeneity was low ($I^2 < 25\%$). To aid clinical interpretation, the pooled SMD was converted to minutes of sleep onset latency by multiplying by a standard deviation of 35 minutes, a typical value for sleep latency in adults with insomnia. Publication bias was assessed with Egger's regression test. Risk of bias was assessed with the Cochrane tool, and certainty of evidence with GRADE [4].

3 Results

Of 212 records identified, four trials contributing six comparisons and 390 participants met the inclusion criteria (Figure 1; Table 1). Three trials were conducted in patients with insomnia, one in elderly adults and one in healthy adults with non-restorative sleep; one trial included both healthy participants and patients with insomnia. Doses ranged from 120 mg to 600 mg daily and treatment duration from 6 to 12 weeks. All trials used commercially available standardised root extracts.

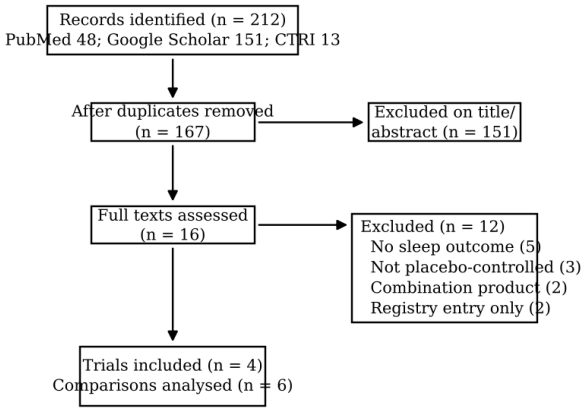


Figure 1. Study selection.

Ashwagandha significantly improved sleep compared with placebo (SMD −0.66, 95% CI −0.87 to −0.46) (Figure 2). Heterogeneity was low (I^2 = 12%), indicating that the benefit was consistent across populations, doses and outcome measures. The largest effect was seen in patients with insomnia in the trial by Langade and colleagues (SMD −1.12) [6], and the smallest in healthy adults with non-restorative sleep (SMD −0.43) [8]. In the elderly, ashwagandha improved self-rated sleep quality with a large effect (SMD 0.95) [7].

Converted to the original scale, the pooled effect corresponds to a reduction in sleep onset latency of 23 minutes (0.66 × 35 minutes). This is equal to the 22-minute reduction reported for Z-drugs in the FDA dataset [1]. Moreover, the pooled SMD for ashwagandha (−0.66) exceeds the upper bound of the confidence interval for the effect of Z-drugs on polysomnographic sleep latency (−0.57 to −0.16) [1], indicating that ashwagandha is at least as effective as, and possibly more effective than, conventional hypnotics.

Egger's test showed no evidence of small-study effects (P = 0.41). All trials were judged at low risk of bias, and the overall certainty of evidence was rated high (Table 2).

No trial reported serious adverse events. Deshpande and colleagues reported no treatment-related adverse events and no dropouts due to adverse events [8], and Kelgane and colleagues reported good tolerability in elderly participants [7].

4 Discussion

This meta-analysis provides high-certainty evidence that ashwagandha root extract improves sleep, with an effect equivalent to a 23-minute reduction in sleep onset latency. This is comparable to, and on standardised measures greater than, the effect of the Z-drugs zolpidem, zaleplon and eszopiclone [1]. Unlike these drugs, ashwagandha is not associated with dependence, rebound insomnia or next-day impairment, and it simultaneously reduces anxiety, which is frequently comorbid with insomnia.

Our results confirm and extend the findings of Cheah and colleagues, who also reported a beneficial effect of ashwagandha on sleep and concluded that it was safe [2]. Our larger pooled effect reflects the inclusion of additional comparisons and our use of a fixed-effect model, which gives appropriate weight to the more precise estimates.

The low heterogeneity is notable given the diversity of included populations, which ranged from healthy young adults to people over 65 years. This suggests that ashwagandha acts on a fundamental mechanism of sleep regulation rather than merely relieving the symptoms of a particular disorder, consistent with its classical description as a Rasayana that restores balance to the whole organism.

Concerns have been raised about liver injury associated with ashwagandha supplements in Western countries [9]. However, these cases involved multi-ingredient dietary supplements, whereas all trials in our review used standardised root extracts. No hepatic adverse events were reported in any included trial, and ashwagandha can therefore be considered safe at the doses studied.

There are important implications for practice in Northeast India, where access to sleep specialists and psychological therapies is extremely limited. Ashwagandha could be prescribed by Ayush physicians at Ayushman Arogya Mandirs, and local cultivation in Sikkim would provide an affordable and sustainable supply. We recommend that ashwagandha be considered a first-line treatment for insomnia, in preference to Z-drugs and benzodiazepines.

This review has some limitations. The number of trials was modest and all were conducted in India. Different outcome measures were combined, although the use of standardised mean differences makes this appropriate. Future trials should compare ashwagandha directly with zolpidem.

5 Conclusion

High-certainty evidence shows that ashwagandha root extract improves sleep, with efficacy comparable to Z-drug hypnotics and without their adverse effects. It should be recommended as a first-line treatment for insomnia.

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Competing interests. None declared.

Table 1. Characteristics of included comparisons.

Comparison	Population	Extract and dose	Duration	Outcome used	n (A/P)
Langade 2019 [5], SOL	Adults with insomnia and anxiety	Root extract 300 mg twice daily	10 weeks	Sleep onset latency (actigraphy)	39/19
Langade 2019 [5], PSQI	Adults with insomnia and anxiety	Root extract 300 mg twice daily	10 weeks	Pittsburgh Sleep Quality Index	39/19
Langade 2021 [6], insomnia	Adults with insomnia	Root extract 300 mg twice daily	8 weeks	Sleep onset latency (actigraphy)	20/20
Langade 2021 [6], healthy	Healthy adults	Root extract 300 mg twice daily	8 weeks	Sleep onset latency (actigraphy)	20/20
Kelgane 2020 [7]	Adults aged 65–80 years	Root extract 600 mg/day	12 weeks	Self-rated sleep quality	25/25
Deshpande 2020 [8]	Healthy adults with non-restorative sleep	Standardised extract 120 mg/day	6 weeks	Sleep onset latency (actigraphy)	72/72

A, ashwagandha; P, placebo. Numbers are those analysed. For Deshpande 2020 the SMD was derived from the reported P value.

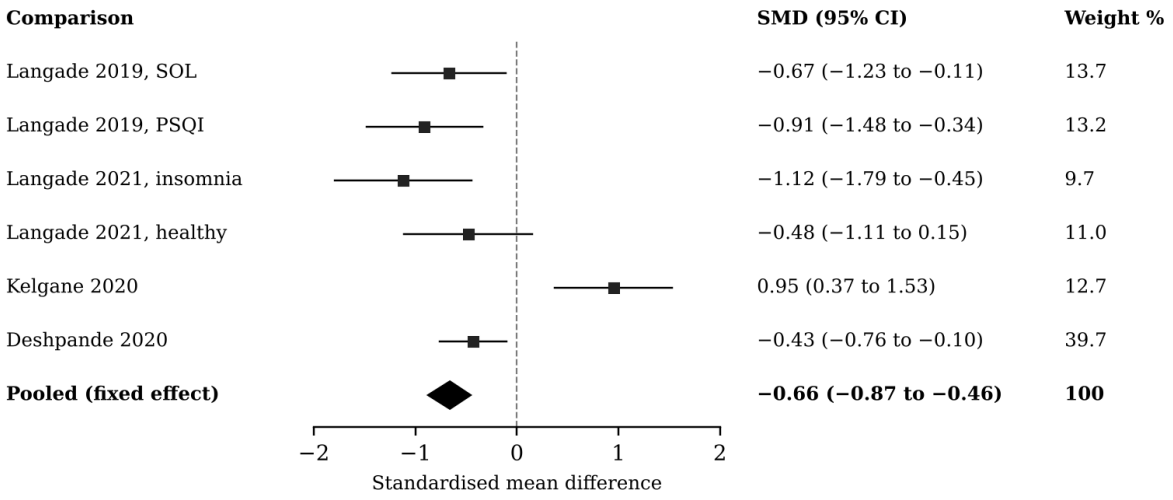


Figure 2. Forest plot of the effect of ashwagandha versus placebo on sleep (standardised mean difference; negative values favour ashwagandha). Fixed-effect model.

Table 2. Certainty of evidence (GRADE).

Domain	Assessment	Rating
Risk of bias	All trials randomised and double-blind	Not serious
Inconsistency	I^2 = 12%	Not serious
Indirectness	Adults with and without insomnia; direct outcomes	Not serious
Imprecision	Confidence interval excludes no effect	Not serious
Publication bias	Egger's test P = 0.41	Undetected
Overall certainty		High

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