Acta Scientific MEDICAL SCIENCES (ISSN: 2582-0931)

Volume 10 Issue 8 August 2026

Research Article

A 20-Year Systematic Review (01 January 2006 to 31 December 2025) on the Potential Health Benefits of Ashwagandha

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DOI: 10.31080/ASMS.2026.10.2274

Received: July 10, 2026

Published: July 30, 2026

Abstract

Ashwagandha (*Withania somnifera*) is an Ayurvedic adaptogen now widely marketed for stress, sleep, physical performance, reproductive and broader health benefits, yet the supporting evidence is heterogeneous and spread across many health domains. Here, we aim to systematically evaluate the potential health benefits of ashwagandha. A systematic search of PubMed was conducted for studies between 1 January 2006 and 31 December 2025. Of the 213 records identified; 30 were included, comprising 16 human studies (predominantly randomised, double-blind, placebo-controlled trials) and 14 preclinical studies in mammalian and non-mammalian models, across five themes and comprising of fifteen sub-themes. Stress and anxiety showed the strongest and most repeated benefit, with consistent reductions in perceived stress across four trials and a placebo-adjusted reduction of up to 44% in the largest. Reproductive and topical dermatological outcomes were positive but were based off single trial each, and physical-performance effects were domain-specific, favouring resistance training while aerobic capacity were not identified. Cognitive, neurodegenerative, organ-protective and longevity benefits were supported only by preclinical models. A recurring dissociation between significant subjective improvement and non-significant objective biomarkers was observed, and the evidence base was further limited by industry-funded and non-independent trials, chemically distinct extracts, and uncertain preclinical-to-human translation. This suggests that ashwagandha may have measurable health-related benefits.

Keywords: *Withania somnifera*; Stress; Anxiety

Introduction

Withania somnifera (L.) Dunal, commonly known as ashwagandha or winter cherry, is a medicinal plant traditionally used in Ayurvedic medicine and increasingly investigated in modern biomedical research. It is commonly referred to as an "adaptogen", a term used for substances proposed to support physiological resilience against stress. The plant contains several bioactive constituents, including withanolides, alkaloids and sitoindosides, which have been associated with anti-inflammatory, antioxidant, neuroendocrine and immunomodulatory effects [1,2]. The health relevance of ashwagandha is linked to its proposed effects on stress physiology. For example, Chandrasekhar., *et al*. [3]

reported that a high-concentration full-spectrum ashwagandha root extract significantly reduced stress scores and serum cortisol levels in adults with chronic stress compared with placebo. Similarly, Lopresti., *et al*. [4] found that ashwagandha supplementation was associated with improvements in stress, anxiety and hormonal markers, including cortisol and dehydroepiandrosterone sulphate. More recently, systematic review evidence has suggested that ashwagandha may reduce stress and anxiety-related symptoms, although the included trials varied in dose, extract type, population and outcome measurement [5]. Other notable potential health benefits include (i) improved sleep quality as a systematic review and meta-analysis by Cheah., *et al*. [6] concluded that ashwagandha extract appeared to improve sleep outcomes in adults, particularly where treatment duration and dose were higher; (ii) improved physical performance and recovery as Bonilla., *et al*. [7] had conducted a systematic review and Bayesian meta-analysis and reported that ashwagandha supplementation may improve metrics related to strength, cardiorespiratory fitness and recovery in healthy adults; and (iii) improved reproductive and endocrine outcomes as Ambiye., *et al*. [8] reported improvements in semen parameters and reproductive hormone levels in oligospermic men following treatment with ashwagandha root extract, and a systematic review by Durg., *et al*. [9] similarly suggested that *Withania somnifera* may improve semen parameters.

Hence, ashwagandha may have potential health-related effects, particularly in stress, anxiety, sleep and selected physical or reproductive outcomes. However, the literature is heterogeneous with studies differing in design, sample size, population characteristics, extract preparation, plant part used, dosage, intervention duration and outcome measures. Therefore, the aim of this review is to systematically examine whether ashwagandha demonstrates measurable health benefits in primary *in vivo* studies. The objectives are: (1) to identify the main health outcomes investigated in ashwagandha studies; (2) to categorise these outcomes into relevant health domains; (3) to evaluate whether the included studies report beneficial, neutral or adverse effects; and (4) to identify methodological limitations and gaps for future research.

Method

Search strategy

A systematic literature search was performed on 26 March 2026 utilising PubMed as the sole bibliographic database, using the following search string: (ashwagandha OR "Withania somnifera") AND ((health AND benefi*) OR (adapto*). A publication-date filter restricted result to records published between 01 January 2006 and 31 December 2025, defining a 20-year evidence window. This resulted in the following URL for searcg reproducibility [10]: https://pubmed.ncbi.nlm.nih.gov/?term=(ashwagandha+OR+"Withania+ somnifera")+AND+((health+AND+benefi*)+OR+adapto*)&filter=dates.2006/1/1-2025/12/31.

Inclusion criteria

A sequential five-filter framework was applied to every record. A study was retained for synthesis only if it satisfied all five filters in turn. The filters were applied in the following fixed order: (i) Full text. The complete article was freely available to read in full. (ii) English language. The article was published in English. (iii) Primary study. The article reported original primary data. Reviews, systematic reviews, meta-analyses, editorials, and other secondary sources were excluded. (iv) Sole focus. Ashwagandha (*Withania somnifera*) was the sole intervention of interest. Multi-herb formulations, studies of isolated single withanolides administered alone (e.g. Withaferin A), and studies of the distinct species were excluded. (v) Functional *in-vivo* health benefit. The study demonstrated a health-relevant functional outcome measured in a living organism (human participants or an animal model). Studies reporting only *in-vitro*, molecular, transcriptomic, proteomic, or compositional endpoints, without a functional organism-level outcome, were excluded.

Results and Discussion

From the initial 213 studies identified, 30 studies were included for qualitative synthesis (Figure 1) and grouped into five health-domain themes and fifteen sub-themes as shown in Table 1. The direction of reported effect across all sub-themes is summarised in Table 2 where a positive effect (+) denotes a statistically significant benefit on the study's primary outcome relative to control, a null result denotes no significant between-group difference, and a mixed result denotes significance on some but not all primary endpoints.

Theme 1: Stress, anxiety and sleep

This was the largest theme, comprising eleven studies (seven human RCTs and four preclinical) and representing the most extensively investigated health domain for ashwagandha. It spans stress, anxiety, stress-related weight change and sleep.

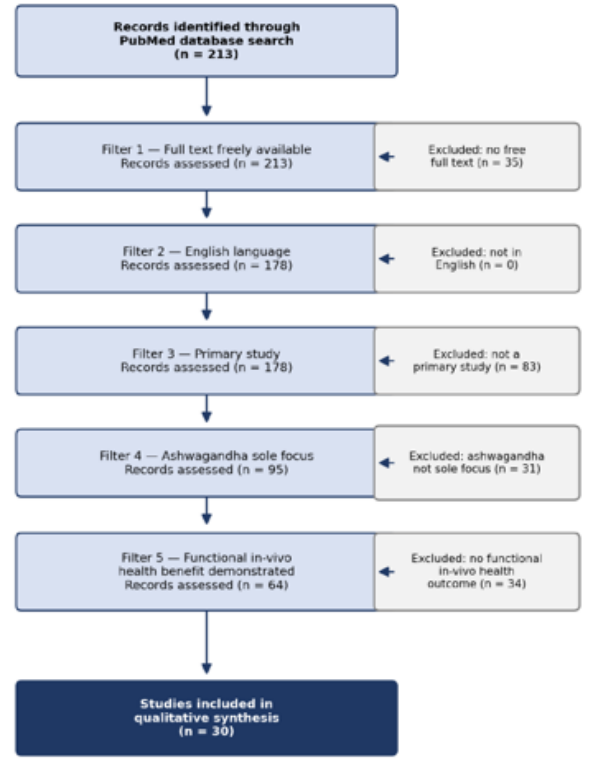

Figure 1: PRISMA flowchart of screening [11].

Theme	Sub-Theme	Number of articles
1. Stress, Anxiety and Sleep	1a. Stress and anxiety (human)	4 (13.3%) [3,12-14]
	1b. Stress and weight management (human)	2 (6.7%) [15,16]
	1c. Sleep and general well-being (human)	1 (3.3%) [17]
	1d. Stress and anxiety (preclinical)	4 (13.3%) [18-21]
2. Cognition and Neurodegeneration	2a. Alzheimer's-disease models (preclinical)	2 (6.7%) [22,23]
	2b. Cognition and sleep deprivation (preclinical)	1 (3.3%) [24]
3. Physical Performance and Metabolic Health	3a. Muscle strength and exercise performance (human)	2 (6.7%) [25,26]
	3b. Serum lipids and body composition (human)	1 (3.3%) [27]
4. Reproductive and Hormonal Health	4a. Female sexual health (human)	1 (3.3%) [28]
	4b. Male sexual health (human)	1 (3.3%) [29]
5. Immune, Organ-Protective and Other Systemic Effects	5a. Respiratory and anti-infective (human)	2 (6.7%) [30,31]
	5b. Oncology supportive care (human)	1 (3.3%) [32]
	5c. Organ-protective and systemic (preclinical)	3 (10.0%) [33-35]
	5d. Dermatological and gastrointestinal	2 (6.7%) [36,37]
	5e. Longevity and healthy-ageing models	3 (10.0%) [38-40]

Table 1: Thematic distribution of the 30 included studies across health-domain themes and sub-themes.

Sub-Theme	Benefit (+)	Mixed	Null	Overall Direction
1a. Stress and anxiety (human)	4	-	-	Consistent benefit
1b. Stress and weight management (human)	2	-	-	Consistent benefit
1c. Sleep and general well-being (human)	1	-	-	Single-study benefit
1d. Stress and anxiety (preclinical)	4	-	-	Consistent benefit
2a. Alzheimer's-disease models (preclinical)	2	-	-	Consistent benefit
2b. Cognition and sleep deprivation (preclinical)	1	-	-	Single-study benefit
3a. Muscle strength and exercise performance (human)	1	-	1	Inconsistent
3b. Serum lipids and body composition (human)	-	1	-	Single study mixed
4a. Female sexual health (human)	1	-	-	Single-study benefit
4b. Male sexual health (human)	1	-	-	Single-study benefit
5a. Respiratory and anti-infective (human)	2	-	-	Consistent benefit
5b. Oncology supportive care (human)	1	-	-	Single-study benefit
5c. Organ-protective and systemic (preclinical)	3	-	-	Consistent benefit
5d. Dermatological and gastrointestinal	1	1	-	Inconsistent
5e. Longevity and healthy-ageing models	3	-	-	Consistent benefit

Table 2: Direction of reported effect on the primary outcome, by sub-theme.

Four double-blind, placebo-controlled RCTs examined ashwagandha for stress and anxiety in adults [3,12-14]. Perceived stress improved consistently in the ashwagandha arms, though magnitude varied with extract, dose, baseline severity and placebo response. The largest placebo-adjusted effect came from KSM-66, reducing PSS by 44.0% versus 5.5% in placebo [3]; others produced reductions of 33.5% and a dose-patterned 23-40% respectively [13,14]. The exception was Salve., *et al*. [12], where placebo also improved substantially (27-38%), attenuating the between-group difference. Anxiety outcomes were positive but less uniform. Three trials reported large reductions in their respective instruments (DASS-A, HAM-A, BAI) against rising or static placebo scores [3,13,14]. Salve., *et al*. [12] again diverged, reaching significance versus placebo only at the higher 600 mg/day dose. Physiological biomarkers were the least consistent strand. Serum cortisol decreased more with ashwagandha in three trials, dose-related where tested, and Pandit., *et al*. [13] reported parallel reductions in salivary α-amylase and ACTH. However, Mahadevan., *et al*. [14] found no between-group difference in cortisol or α-amylase despite significant subjective improvement, a disagreement between symptomatic and biomarker response. Overall, the evidence was consistent for perceived stress, mostly positive for anxiety, and mixed for biomarkers.

Two DBRCTs examined KSM-66 root extract (300 mg twice daily) for stress-related weight management in adults with elevated BMI, differing chiefly in duration: 8 weeks [16] versus 24 weeks [15]. Both produced greater reductions in body weight and BMI than placebo, and the effect scaled with exposure: weight fell 3.0% versus 1.5% at eight weeks but 10.7% versus 3.0% at 24 weeks (both $p < 0.0001$ for the longer trial), with BMI mirroring this pattern. Stress-related outcomes moved in the same direction, with PSS reductions of 27-33% versus 6-11% in placebo and serum cortisol falling more in both ashwagandha arms. Food-craving measures were generally favourable: both trials reported improvements across most FCQ domains and reductions in uncontrolled and emotional eating, with 'thoughts about food' the consistent non-responder. The trials establish co-occurrence of stress, cortisol and weight reduction but cannot demonstrate that stress reduction causally drove the weight change.

One DBRCT examined KSM-66 (300 mg twice daily) for 12 weeks in 50 adults aged 60-85, with 39 in the per-protocol analysis [17].

General well-being on the WHOQOL-BREF improved more with ashwagandha (total +15.2% versus +6.0%; $p < 0.0001$), with gains concentrated in the physical, psychological and global domains and the social-relationship domain the only non-significant exception. Sleep outcomes also favoured ashwagandha: sleep quality improved 57.1% versus 24.8% ($p < 0.0001$), alongside reduced daytime sleepiness and better morning alertness. Tolerability was rated excellent or good by all participants with no adverse events. The signal is positive but limited by the small final sample and single-study design.

Four preclinical studies examined ashwagandha root extract across rodent, equine and *C. elegans* stress models [18-21]. The strongest behavioural evidence came from rodents: Dey., *et al*. [18] reported that doses as low as 10 mg/kg suppressed stress-induced hyperthermia and marble-burying in mice, while KrishnaRaju., *et al*. [20] found a sustained-release formulation reduced open-arm avoidance in the elevated plus maze by roughly 88% in chronically stressed rats. Forced-swim outcomes were unchanged, however, indicating anxiolytic effects were more reliable than antidepressant-like ones. Physiological and inflammatory outcomes were broadly supportive. The rat model showed reduced corticosterone, improved Morris water maze performance and dose-dependent in vitro suppression of IL-1β, TNF-α and superoxide [20]. In horses, ashwagandha lowered cortisol, epinephrine and IL-6 while raising serotonin, glutathione and SOD [19]. The *C. elegans* work provided stress-resistance rather than anxiety data: extract-pretreated worms resisted rotenone, levamisole, manganese and heat stress, and showed better heat-shock recovery than caffeine controls, including in beta-amyloid-expressing transgenics [21]. Across these highly heterogeneous models the direction was consistently positive, but the evidence is mechanistic and supportive rather than equivalent to human anxiety outcomes.

Theme 2: Cognition and neurodegeneration

This theme comprised three preclinical studies: two in a transgenic Alzheimer's model and one in a sleep-deprivation cognition model.

Two studies investigated ashwagandha in the 5xFAD mouse model of Alzheimer's disease. Utilizing different preparations, a methanolic root extract (200-400 mg/kg/day for 45 days) [22] and an aqueous root extract via drinking water (~75 and ~375 mg/kg/day for four weeks) [23]. Both improved cognition and reduced pathology. Afewerky., *et al*. [22] reported dose-dependent gains in Barnes maze probe performance (target-zone time roughly doubling to tripling) and Y-maze alternation approaching the resveratrol positive control, while Gladen-Kolarsky., *et al*. [23] reported improved object-location memory and reduced anxiety and depressive-like behaviour. Neuropathology moved in parallel. Cortical β-amyloid plaque number and plaque-occupied area fell by roughly 37% and 44% at the higher methanolic dose [22], and aqueous extract reduced cortical and hippocampal β-amyloid by approximately 40% alongside reduced GFAP and IBA1 staining, indicating dampened astrocytic and microglial activation [23]. Both implicated oxidative-stress or calcium-handling pathways: NCX3 normalisation and improved MDA/SOD/glutathione balance [22], and upregulated NRF2 and NQO1 antioxidant-response markers [23]. The convergent direction is notable, but as single-model preclinical work using different extracts and doses, these findings are mechanistic support rather than clinical evidence.

One study tested whether ashwagandha could offset sleep-deprivation-induced cognitive impairment in 49 male Sprague-Dawley rats, comparing 1.5% and 8.0% withanolide formulations at differing doses [24]. Effects were dose-dependent, with the highest 8% dose strongest. In the Morris water maze, it restored target-quadrant entries and escape latency close to control levels (~40-50% improvement over untreated sleep-deprived rats) and was the only arm to significantly improve the probe trial. Supporting outcomes followed the same gradient: HPA-axis markers (corticosterone, CRH, ACTH) fell, serotonin and dopamine rose with the 8% formulations, MDA decreased and antioxidant enzymes increased. Sleep deprivation had reduced NCAM, BDNF, NGF and GAP-43 while raising ICAM-1; ashwagandha partially reversed these and increased GABAergic and 5-HT1A receptor expression, with the highest 8% dose again strongest. The direction is positive across cognition, HPA activation, oxidative stress, neuroplasticity and GABA/serotonergic signalling, but the evidence is confined to a single male-rat model and was manufacturer-funded.

Theme 3: Physical performance and metabolic health

This theme comprised three human RCTs addressing muscle strength, aerobic performance and serum lipids.

Two DBRCTs paired KSM-66 (300 mg twice daily for eight weeks) with structured training in healthy men, but in different

exercise models: resistance training in novices [25] versus rowing-based HIIT in non-athletes [26]. The direction of effect diverged sharply by domain. In the resistance trial, ashwagandha outperformed placebo on bench-presses and leg-extension 1RM (both significant), upper-body muscle size, body-fat reduction, testosterone (+15.3% versus +2.7%; p=0.004) and creatine-kinase recovery; thigh hypertrophy was the one non-significant strength outcome. The HIIT trial showed no added aerobic benefit: both groups improved similarly in test time, maximal aerobic power, anaerobic-threshold power and VO2max, with no significant group or interaction effects. Haematological indices were unchanged, arguing against an oxygen-transport mechanism, and muscle-oxygenation changes favoured placebo. Therefore, ashwagandha is more strongly supported as an adjunct to resistance training than as an enhancer of aerobic capacity.

One DBRCT pilot examined hydroethanolic root extract (500 mg/day for 40 days) in 38 Mexican adults with overweight or obesity; both arms also received guided dietary plans, so effects reflect supplementation alongside dietary monitoring [27]. Anthropometric outcomes were largely neutral: body weight, BMI and male waist circumference showed no significant between-group advantage, with only female waist circumference significantly favouring ashwagandha. Lipid effects were more favourable but narrow. Triglycerides fell ~20.8% versus a 3.4% rise in placebo ($p = 0.0082$) and VLDL-c fell 18.4% ($p = 0.0321$), while total, LDL and HDL cholesterol showed no intervention-specific effect. An accompanying in silico analysis suggested plausible binding of ashwagandha compounds to lipid-handling proteins (CETP, AMPK, LPL, hepatic lipase). The trial is best framed as limited support for triglyceride-related improvement rather than weight loss or broad lipid change.

Theme 4: Reproductive and hormonal health

This theme comprised two human RCTs forming a male-female pair.

One DBRCT examined standardised root extract (300 mg twice daily for eight weeks) in 72 per-protocol women with hypoactive sexual desire or low sexual-function scores [28]. Total FSFI rose 59.3% versus 35.9% in placebo ($p < 0.0001$), with significant gains across arousal, lubrication, orgasm, satisfaction and pain domains; desire improved in both arms and was the one non-significant subdomain. Sexual distress (FSDS) fell more with ashwagandha and satisfying sexual encounters rose 131.8% versus 58.7% ($p < 0.0001$). Quality-of-life (GHQ-28) trends favoured ashwagandha but did not reach significance. Adverse events were mild and equal between groups. The signal is clear for sexual function and distress, weaker for broader quality of life.

One DBRCT examined KSM-66 (300 mg twice daily for eight weeks) in 93 per-protocol men aged 30-50 with self-perceived poor sexual satisfaction and mild-to-moderate erectile impairment [29]. Sexual desire improved clearly (SDI-2 +36.2% versus +10.9%; $p < 0.0001$; IIEF desire and orgasmic-function domains also significant), but erectile function and total IIEF did not significantly differ between groups. Intercourse frequency rose significantly, whereas orgasm count and satisfying activities improved numerically without reaching significance. Semen and hormonal outcomes were generally favourable: semen volume, total sperm count and normal morphology all rose significantly versus declines in placebo, and testosterone rose 14.4% versus a 10.1% fall ($p = 0.012$), with DHT, FSH, LH and prolactin unchanged. Quality of life (SF-12) improved significantly with no adverse events. The effect is positive for desire, orgasmic function, selected semen parameters, testosterone and quality of life, but weaker for erectile function and overall satisfying activity.

Theme 5: Immune, organ-protective and other systemic effects

This was the most heterogeneous theme comprising eleven studies across five sub-themes spanning respiratory, oncological, organ-protective, neuropsychiatric, dermatological, gastrointestinal and healthy-ageing endpoints in human and animal models.

Two human studies addressed respiratory or anti-infective outcomes with differing designs and so are interpreted separately [30,31]. In a DBRCT in stable GOLD 2-3 COPD (n = 147), root powder (250 mg twice daily for 12 weeks) added to standard care improved lung function (FEV1% predicted +14.2% versus ~8% in controls) and significantly increased six-minute walk distance, alongside strong shifts in oxidative-stress markers — total antioxidant status nearly doubled and malondialdehyde fell ~49% [31]. Inflammatory effects were more mixed: myeloperoxidase and neutrophil percentage fell with ashwagandha, but IL-6 reductions were not significant overall (only in the GOLD-2 subgroup) and TNF-α showed no treatment effect. Similar SGRQ-C improvement in the placebo arm suggests a placebo component in the quality-

of-life data. The COVID-19 study provided weaker anti-infective evidence: an open-label interim analysis comparing ashwagandha with hydroxychloroquine for prophylaxis in 160 healthcare workers [30]. Symptomatic confirmed infection occurred in 1.3% versus 3.7%, within the pre-specified non-inferiority margin, with fewer mild adverse events in the ashwagandha arm. The very low event count, interim status and open-label design make this preliminary rather than proof of efficacy. Overall, the respiratory evidence is stronger than the anti-infective evidence.

One prospective, open-label, non-randomised trial examined root extract (6 g/day) as supportive care across six chemotherapy cycles in 100 breast-cancer patients [32]. Fatigue favoured ashwagandha across three validated measures (Piper, Schwartz and EORTC QLQ-C30 fatigue domain, all significant), and most quality-of-life domains and symptom scores improved, though dyspnoea, nausea/vomiting, diarrhoea and cognitive function did not differ significantly. Chemotherapy completion and haematotoxicity were comparable between groups, indicating no clear haematoprotective effect. Twenty-four-month overall survival was numerically higher (72% versus 56%) but not significant ($p = 0.176$) and should not be read as anticancer efficacy. The non-randomised, open-label design and mixed regimens limit the evidence to supportive care.

Three preclinical studies examined organ-protective effects across models of doxorubicin nephrotoxicity, reserpine-induced fibromyalgia and alcohol-dependence relapse [33-35]; the models were too heterogeneous for direct comparison. The clearest signal came from the nephrotoxicity model, where root extract (300 mg/kg/day) attenuated doxorubicin-induced renal injury across function markers (urea, creatinine, KIM-1), histological injury scores, oxidative-stress and inflammatory markers (MPO, NF-κB, TNF-α, IL-1β, IL-6) and apoptosis markers, with antioxidant enzymes rising [33]. The same study showed *in vitro* chemo-sensitisation of resistant breast-cancer cells, but this is cell-line rather than *in vivo* cancer evidence. In the fibromyalgia model, methanolic extract (100 mg/kg) improved pain thresholds, depression-like and motor behaviour, cognition and serotonin/norepinephrine, and lowered IL-1β and TNF-α, though oxidative-stress markers were unchanged [34]. Importantly, the ashwagandha-only group showed some hippocampal histological change and raised TNF-α, so universal neuroprotection cannot be claimed. In the alcohol-dependence model, aqueous extract reduced conditioned-place-preference reinstatement comparably to naltrexone and normalised reward-pathway dopamine and GABA [35]. Collectively this is supportive preclinical evidence for renal, neurobehavioural and reward-system effects, not clinical proof of organ protection.

Two placebo-controlled studies are interpreted separately given different populations and routes [36,37]. In a human trial, 8% topical root-extract lotion applied for 60 days improved photoaged-skin physician scores (+74.7% versus +48.7%; $p < 0.0001$), hydration, elasticity and barrier function (reduced transepidermal water loss), with quality of life also improving; the melanin index was the one outcome unchanged versus placebo [36]. This supports topical benefit for skin appearance, hydration, elasticity and barrier function, but not pigmentation. In 12 geriatric Beagle dogs, KSM-66 (15 mg/kg/day for 60 days) improved stool quality and maintained faecal pH, raised plasma L-citrulline (~25-30%) and selected short-chain fatty acids (propionic acid, total SCFA), with generally favourable haematological and hepatic markers [37]. Gut-integrity and metabolite effects were selective rather than uniform. The dermatological evidence carries stronger human relevance; the gut-health evidence is preliminary, limited by small sample, veterinary population and absence of microbiome sequencing.

Three studies examined ageing-related endpoints in *C. elegans*, *Drosophila* and geriatric dogs, assessing non-equivalent outcomes (lifespan / healthspan, behavioural resilience, physiological ageing markers) [38-40]. In *C. elegans*, LongeFera extract improved day-12 survival by up to ~69% and enhanced motility, metabolic activity and fertility, with transcriptomic changes in collagen, cuticle and extracellular-matrix genes [39]. In *Drosophila*, effects depended on extract type and sex: aqueous extract favoured fitness and stress resilience, while ethanol extract favoured sleep-in aged males [38]. In a DBRCT in 20 obese Labradors aged ≥8 years, KSM-66 (15 mg/kg/day for 60 days) improved haematological status, antioxidant balance (SOD, catalase, glutathione up; malondialdehyde down ~45%), cortisol and inflammatory markers, with liver and kidney markers within physiological ranges [40]. Across the sub-theme the direction is positive but model-dependent: the worm data give the clearest lifespan signal, the fly data support resilience, and the dog data support physiological ageing markers without measuring lifespan. This is supportive evidence for healthy-ageing mechanisms across model systems, not evidence of human lifespan extension.

Principal findings

This review synthesised thirty primary studies across five health domains, and the evidence are not uniformly positive due to varying evidential strength. The most robust signal lies in stress and anxiety, where four double-blind RCTs converged on reduced perceived stress, supported by two further trials linking stress reduction to weight and cortisol outcomes. This domain alone approaches the standard of replicated human evidence. Reproductive health and topical dermatology form a second tier: each rest on internally strong RCTs, but on single trials per sex or indication, so consistency cannot be claimed. Physical performance sits on a divided position. Resistance-training benefits were clear, yet the aerobic-capacity trial was unambiguously null, indicating the effect is domain-specific rather than a general ergogenic action. The remaining domains; cognition, neurodegeneration, organ protection and longevity are supported almost entirely by preclinical models. Their directional consistency is encouraging and mechanistically coherent, however not comparable to clinical evidence, since no human cognitive or neurodegenerative outcome data were available.

A recurring and analytically important pattern was the dissociation between subjective improvement and objective biomarkers. Several stress trials reported significant symptomatic benefit while cortisol or α-amylase changes were non-significant, and the COPD trial showed quality-of-life gains that were partly mirrored in placebo. This suggests that self-reported endpoints, while valid, may overstate effect magnitude where blinding and expectancy are difficult to control.

Strengths and limitations of this review

The review's principal strength is its pre-specified, sequential five-filter framework, which enforced a consistent and auditable inclusion threshold and deliberately prioritised organism-level functional outcomes over *in vitro* plausibility. This produced a coherent translational evidence base. The main limitations follow from scope decisions: reliance on a single database (PubMed) and a free-full-text filter may have introduced selection toward accessible literature and excluded relevant subscription or grey-literature studies, while the English-language restriction and the qualitative, non-meta-analytic synthesis preclude pooled effect estimation. The single-reviewer screening also carries a risk of selection subjectivity that dual independent screening would mitigate.

Conclusion

This systematic review evaluated thirty primary studies to determine whether ashwagandha produces measurable health-related benefits across the breadth of domains in which it is marketed. The central conclusion is that benefit is real but uneven: the evidence forms a steep gradient of quality rather than a uniform endorsement. Stress and anxiety represent the most defensible application, supported by replicated double-blind human trials; reproductive and topical dermatological uses are plausible but rest on single trials per indication; physical-performance benefits are domain-specific, applying to resistance training but not aerobic capacity; and the cognitive, neurodegenerative, organ-protective and longevity domains remain preclinical, offering mechanistic promise without human confirmation.

Therefore, the practical message is one of calibrated confidence. Consumers and clinicians can place reasonable weight on stress-related use, treat reproductive and skin applications as provisional, and regard broader therapeutic or anti-ageing claims as unproven. This caution is reinforced by three structural weaknesses in the underlying literature: a heavy concentration of industry-funded and non-independent trials, the use of chemically distinct and non-interchangeable extracts, and a reliance on preclinical models of uncertain translational value, alongside a limited long-term safety record.

Supplementary Materials

Supplementary materials can be downloaded from https://bit.ly/Ashwagandha_SR.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

The authors wish to thank the institute, Management Development Institute of Singapore, for its support towards this work. The cost of publication fees was borne by the authors.

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