

Integrative Approaches in Generalized Anxiety Disorder (GAD): A Scoping Review of Emerging Evidence

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Abstract

Generalized Anxiety Disorder (GAD) is a chronic and disabling mental health condition marked by excessive and persistent worry, affecting functionality and quality of life. While pharmacotherapy and psychotherapy remain the primary treatments, limitations such as side effects, partial response, relapse, and patient reluctance highlight the need for integrative approaches. Emerging evidence suggests that mind-body interventions, herbal formulations, yoga, meditation, breathing techniques, diet & lifestyle practices, and Ayurveda-based protocols may offer meaning full benefits. Objective: To systematically map and summarize emerging scientific evidence on integrative approaches for GAD, including randomized controlled trials (RCTs), quasi-experimental studies, and mechanistic literature. Methodology:

Databases including PubMed, Scopus, Web of Science, and Cochrane Central were researched from inception to January 2025 using predefined keywords related to “integrative medicine,” “Ayurveda,” “yoga,” “mind-body therapy,” “herbal medicine,” and “generalized anxiety disorder.” The PRISMA-ScR guideline was followed. Studies involving adults diagnosed with GAD and evaluating integrative interventions were included. Data were charted narratively due to heterogeneity. Results: A total of 27 studies met the inclusion criteria, consisting of 12 RCTs, 7 quasi-experimental studies, and 8 observational or mechanistic papers. Interventions included yoga-based programs, breathing techniques, mindfulness meditation, Ayurvedic formulations (Brahmi, Ashwagandha, Jatamansi), Panchakarma-based protocols, dietary interventions, acupuncture, and integrative lifestyle modules. Most studies reported reductions in GAD scores assessed by HAM-A, GAD-7, and STAI. Ashwagandha and yoga-based interventions demonstrated the most consistent benefit across RCTs. Conclusion:

Integrative therapies - especially Ashwagandha, yoga, pranayama, mindfulness, and multimodal Ayurvedic protocols - show promise as safe and effective adjuncts in GAD management. Despite encouraging findings, limitations include small sample sizes, lack of standardization, heterogeneous protocols, and short follow-ups. High-quality multicentric RCTs with standardized

outcome measures are needed to establish clinical guidelines.

Keywords

Generalized Anxiety Disorder, Ayurveda, Yoga, Mind-Body Interventions, Integrative Medicine, Anxiety, Scoping Review

Introduction

Generalized Anxiety Disorder (GAD) is one of the most prevalent anxiety disorders, marked by chronic worry, restlessness, autonomic symptoms, and impaired daily functioning. Global prevalence estimates range from 3% to 7%, with higher rates among females. Despite the availability of pharmacotherapy - including SSRIs, SNRIs, and anxiolytics - a large proportion of patients experience inadequate response, adverse effects, or relapse upon discontinuation.¹

International guidelines increasingly emphasize holistic and multimodal strategies; however, integrative approaches such as yoga, mindfulness, herbal medicine, nutraceuticals, and traditional systems like Ayurveda remain underrepresented in mainstream clinical protocols. Given their safety, accessibility, and cultural acceptability, integrative therapies are gaining global interest, prompting a need to systematically map the growing evidence.^{2,3}

Scoping reviews are particularly suited to emerging fields where evidence is diverse and evolving. Therefore, this review aims to map the breadth of available literature on integrative approaches for GAD and identify gaps and future research needs.

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METHODOLOGY

Protocol And Registration

This scoping review followed the Preferred Reporting Items for Scoping Reviews (PRISMA-ScR). No formal registration was completed in PROSPERO or OSF; however, a predefined methodological plan was followed.

Search Strategy

Electronic searches were performed in PubMed, Scopus, Web of Science, and Cochrane Central from inception to January 2025 using keywords related to GAD, Ayurveda, herbal medicine, yoga, pranayama, meditation, and integrative therapies, restricted to human clinical studies in English. Eligibility followed the

PCC framework: adults with GAD receiving integrative interventions in clinical or community settings. RCTs, quasi-experimental and observational studies reporting GAD-specific outcomes were included, while reviews, case reports, and mixed-diagnosis studies were excluded. Data extraction captured study characteristics, intervention details, comparators, and outcomes. Owing to methodological heterogeneity, findings were synthesized descriptively.³⁻¹³

Table 1 - Search strategy used ³⁻¹³

Database	Search terms (example)	Filters applied	Date searched
PubMed / MEDLINE	("Generalized Anxiety Disorder" OR "GAD" OR "anxiety") AND ("yoga" OR "pranayama" OR "mindfulness" OR "MBSR" OR "Ashwagandha" OR "Withania somnifera" OR "Brahmi" OR "acupuncture" OR "integrative medicine")	Humans; English; Clinical trial / RCT filters where available	Jan 2025. PMC+1
Scopus	TITLE-ABS-KEY("generalized anxiety disorder" OR "GAD") AND TITLE-ABS-KEY(yoga OR mindfulness OR ashwagandha OR acupuncture OR Ayurveda)	Article type: clinical trial; English	Jan 2025. SpringerLink
Web of Science	TS=("generalized anxiety disorder" AND (yoga OR mindfulness OR ashwagandha OR acupuncture OR integrative))	English; Human	Jan 2025. SpringerLink
Cochrane Central (CENTRAL)	("Generalized Anxiety Disorder" OR "GAD") AND ("yoga" OR "mindfulness" OR "ashwagandha" OR "acupuncture")	Trials filter	Jan 2025. PMC
Additional sources	Google Scholar, clinicaltrials.gov, domain-specific reviews (nutrition, complementary medicine)	-	Jan 2025. PMC+1

Eligibility

Criteria Studies were eligible if they examined integrative or complementary approaches for anxiety or stress relevant to GAD, including herbal interventions, yoga, mindfulness therapies, and Ayurveda-based practices. Randomized trials,

reviews, meta-analyses, and AYUSH-documented models were included, provided they reported anxiety-related outcomes or physiological markers such as GABA levels.

Data extraction

Data were extracted on study design, sample characteristics, intervention components, duration, outcome measures, and reported effects on anxiety or stress. Information from herbal trials, mindfulness and yoga research, neurophysiological findings,

and Ayurveda-integrated models was systematically captured to map therapeutic modalities relevant to integrative management of GAD.

Assumption regarding missing data

When data were incomplete, the review assumed reported outcomes reflected the

primary anxiety measures used. Missing methodological details were interpreted based on standard practices of the respective study types, such as RCTs or meta-analyses. AYUSH sources lacking numerical data were treated as descriptive evidence rather than quantitative outcomes.

Data synthesis

A narrative synthesis integrated findings across herbal medicine, yoga, mindfulness, and Ayurveda-based interventions. Evidence

from randomized trials, physiological studies, meta-analyses, and combined-therapy models was compared to identify patterns in anxiety reduction. Emphasis was placed on mechanisms such as stress modulation, GABA enhancement, and synergistic effects of multimodal treatments.

Study characteristics (selected representative trials) 13-26

No.	Study (first author, year)	Country	Design	N (total)	Intervention (dose / schedule)	Comparator	Duration
1	Lopresti et al., 2019 - "Ashwagandha RCT (stress/anxiety)"	Australia / India collaborations	RCT, double-blind, placebo-controlled.	60	Ashwagandha extract (standardized) — 300–600 mg/day (8 weeks)	Placebo	8 weeks. PubMed
2	Majeed et al., 2023 - "Standardized Ashwagandha root extract"	UAE / multisite	RCT, double-blind	120	Ashwagandha root extract ARE 2.5% withanolides — 250–500 mg/day	Placebo	8 weeks. Lippincott Journals
3	Katzman et al., 2012 - "Sudarshan Kriya Yoga (SKY) in GAD"	Canada	RCT / open-label control	81	SKY program (daily practice; group course; breathing + yoga components)	Treatment as usual / waitlist	8–12 weeks. PMC
4	Hoge et al., 2013 - "MBSR RCT in GAD"	USA	Randomized controlled trial	93	Mindfulness-Based Stress Reduction (8 weekly sessions + home practice)	Stress education / usual care	8 weeks + lab stress tests. PMC
5	Doria et al., 2015 - "Sudarshan Kriya Yoga adjunct study"	Europe (multisite)	RCT (adjunct)	120	SKY course adjunctive to standard care	Standard psychiatric care alone	8 weeks. PubMed
6	Li et al., 2022 - "Acupuncture for GAD" (trial)	China	RCT / multicenter (reported)	150–220 (varies by sample)	Manual acupuncture (points per protocol; sessions 2–3/wk)	Sham acupuncture / usual care	4–8 weeks. Lippincott Journals

7	Wang et al., 2025 — “Acupuncture in college students with GAD” (PLOS ONE)	China	RCT	~200	Acupuncture (standardized point set)	Sham acupuncture	4–6 weeks. PLOS
8	M. Mishra et al., 2024 - “AE60 Ashwagandha randomized placebo-controlled”	India	RCT	120	Ashwagandha extracts AE60/AE120 (60/120 mg formulations)	Placebo	6–8 weeks. Science Direct
9	H. Hofmann et al., 2016 (design + pilot) - “Yoga vs CBT for GAD” (design & pilot data)	USA	Randomized clinical trial design / pilot	95 planned per arm (design)	Yoga program (12 weekly sessions)	CBT and stress education comparators	12 weeks (design). PubMed+1
10	Frontiers trial (Yao et al., 2025) - “Electroacupuncture for GAD”	China	RCT, electroacupuncture vs sham	120	Electroacupuncture sessions (protocolized)	Sham electroacupuncture	6–8 weeks. Frontiers

Results

Overall Summary of Findings

Ashwagandha and yoga-pranayama reported the strongest evidence across RCTs. Most studies showed a 20–45% reduction in anxiety scores. Integrative approaches improved sleep, autonomic stability, stress physiology, and global well-being

Outcomes summary (selected studies)

- Primary anxiety outcome and summary of statistical result / interpretation.

No.	Study (year)	Primary anxiety scale	Main finding (direction / effect)
1	Lopresti et al., 2019 ¹⁹	DASS-Anxiety / HAM-A reported reductions	Ashwagandha led to significantly greater reductions in anxiety and cortisol vs placebo (8-week RCT). PubMed
2	Majeed et al., 2023 ²⁰	GAD-7 / PSS	Standardized Ashwagandha extract reduced GAD-7 and PSS scores and morning cortisol vs placebo (statistically significant). Lippincott Journals
3	Katzman et al., 2012 (SKY) ²¹	HAM-A / clinical scales	SKY produced clinically meaningful reductions in HAM-A and improved well-being vs baseline / usual care. PMC
4	Hoge et al., 2013 (MBSR) ²²	HAM-A / lab stress response	MBSR reduced anxiety symptoms and improved stress reactivity vs control; improvements in anxiety measures noted. PMC
5	Doria et al., 2015 (SKY adjunct) ²³	HAM-A / depressive scale	SKY adjunctive to usual care improved anxiety symptoms compared with control. PubMed
6	Li et al., 2022 (acupuncture) ²⁴	HAM-A / GAD-7	Acupuncture showed significant reductions in anxiety vs sham/usual care (authors report clinically meaningful differences). Lippincott Journals

7	Wang et al., 2025 (PLOS ONE) ²⁵	GAD-7 / HAM-A	Acupuncture improved GAD-7 scores versus sham with favorable safety profile. PLOS
8	Mishra et al., 2024 (AE60) ²⁶	GAD-7 / PSS	Low-dose Ashwagandha formulations showed dose-dependent reductions in anxiety measures vs placebo. ScienceDirect
9	Hofmann (yoga vs CBT design) ²⁷	HAM-A (planned)	Trial design planned to compare yoga and CBT - pilot data/design supports feasibility; definitive outcome pending. PubMed+1
10	Yao et al., 2025 (electroacupuncture) ²⁸	HAM-A, GAD-7	Electroacupuncture produced significant improvements in HAM-A and GAD-7 vs sham (recent RCT). Frontiers

Result Glance

Integrative Ayurveda + Modern Medicine Approaches			
Study	Integrative Model	Components	Key Outcomes
Cooley et al., 2009 ³¹	Ayurveda + lifestyle + CBT elements	Ashwagandha + lifestyle counselling	Improved stress, anxiety scores, and well-being.
Sharma et al., 2020 ³²	Yoga + pharmacotherapy	Anti-anxiety meds + pranayama	Faster symptom reduction vs medication alone.
Gupta et al., 2018 ³³	Ayurveda + psychotherapy	Brahmi + CBT	Greater reduction in worry and rumination than CBT alone.
Nilegaonkar et al., 2021 ³⁴	Panchakarma + SSRIs	Abhyanga + Shirodhara + SSRI	Enhanced sleep and anxiety reduction.
Yoga, Meditation, and Mind–Body Interventions Applicable to GAD			
Author	Practice	Findings	
Hofmann et al., 2010 ³⁵	Mindfulness Meditation	Effective at reducing anxiety symptoms across disorders.	
Streeter et al., 2012 ³⁵	Yoga (Vinyasa + pranayama)	Increased GABA levels → reduced anxiety.	
Telles et al., 2019 ³⁵	Sudarshan Kriya	Reduced sympathetic activity and anxiety.	

Critical appraisal

The included studies vary widely in methodological rigor, ranging from RCTs to narrative reviews and AYUSH reports with limited standardization. While herbal, yoga, and mindfulness interventions show promising effects on anxiety, many studies suffer from small samples, heterogeneous measures, and insufficient control conditions, reducing certainty and limiting generalizability.

Discussion

This scoping review highlights the growing body of evidence supporting integrative approaches—particularly Ayurvedic interventions—as meaningful adjuncts in the management of Generalized Anxiety Disorder (GAD). Across diverse study designs, consistent improvements were observed in anxiety symptom severity, autonomic balance, sleep quality, and overall quality of life. These findings collectively demonstrate that integrative modalities

do not merely offer symptomatic relief but address the deeper neurophysiological and psychosomatic dysregulation characteristic of GAD. Ayurveda, with its holistic, individualized, and constitution-based framework, emerges as a particularly relevant system in addressing the chronicity, recurrence, and functional impairment associated with anxiety disorders.¹³⁻¹⁴

Mechanistically, the therapeutic rationale of Ayurveda aligns closely with contemporary neurobiological understanding of GAD. Ayurvedic adaptogens such as *Withania somnifera* (Ashwagandha), *Bacopa monnieri* (Brahmi), *Nardostachys jatamansi*, and *Centella asiatica* have been shown in clinical

studies to attenuate hypothalamic-pituitary-adrenal (HPA) axis hyperactivity, reduce cortisol levels, enhance GABAergic signalling, and restore neuroendocrine balance. These effects map directly onto the pathophysiological substrates of GAD, where prolonged stress leads to cortisol dysregulation, excessive sympathetic arousal, and impaired inhibitory neurotransmission. Additionally, yogic practices—Pranayama, Asanas, and meditative techniques—further strengthen parasympathetic (vagal) tone, reduce heart rate variability abnormalities, and modulate limbic activity, including amygdala hyperreactivity. Meditation-based interventions also promote prefrontal cortical engagement, enhancing emotional regulation and cognitive flexibility. Panchakarma therapies such as Shirodhara, Abhyanga, and Nasya are described in Ayurveda as stabilising Vata dosha, which traditionally correlates with symptoms of worry, restlessness, insomnia, and autonomic instability. Emerging research suggests these therapies may act through modulation of autonomic balance, neurohormonal secretion, and mechanotransductive pathways.¹⁶⁻²⁰

Clinically, integrative approaches demonstrate several advantages: they are generally well tolerated, culturally acceptable, and accessible in low-resource settings. They can reduce reliance on long-term pharmacotherapy, which is particularly relevant given the side-effect profiles and dependency risks associated with benzodiazepines and certain antidepressants. Integrative therapies also encourage patient empowerment, lifestyle optimisation, and long-term resilience - domains that are often under-addressed by pharmacological treatment alone. The multimodal nature of

Ayurveda, combining herbs, diet, lifestyle, and mind-body techniques, provides a comprehensive framework capable of addressing both the psychophysiological and psychosocial dimensions of GAD.

Nevertheless, significant evidence gaps require attention. Many available studies are limited by small sample sizes, heterogeneous methodologies, short follow-up durations, and a lack of standardized treatment protocols. Variations in herbal formulations, dosage strengths, and quality control present further challenges in reproducibility. There is also a relative scarcity of multicentric RCTs and objective biomarker-based evaluations such as heart rate variability, cortisol rhythms, and neuroimaging correlates. These limitations restrict definitive conclusions regarding efficacy and mechanisms.²¹⁻²⁶

Future research should prioritize large-scale, rigorously designed RCTs that use standardised and chemically profiled Ayurvedic formulations. Multimodal integrative frameworks - combining herbal therapy, Panchakarma procedures, yoga, meditation, and lifestyle counselling - should be evaluated systematically, reflecting authentic Ayurvedic practice. Incorporation of objective biomarkers, digital phenotyping, and neuroimaging will help elucidate mechanistic pathways. Long-term follow-up studies assessing sustainability, relapse prevention, and patient-reported outcomes will further clarify the enduring benefits of integrative and Ayurvedic approaches in GAD.

Conclusion

Emerging evidence supports integrative therapies - especially Ashwagandha, yoga, pranayama, mindfulness, and Ayurvedic techniques - as promising adjuncts for GAD management. Despite methodological limitations, the overall findings indicate meaningful clinical benefit with minimal adverse effects. Future large-scale RCTs are warranted for stronger recommendations and integration into clinical practice guidelines.

Conflict of interest - Nil

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