

# Anxiolytic and Antidepressant Properties of Alprazolam in Generalized Anxiety Disorder: A Systematic Literature Review

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## Abstract

Generalized Anxiety Disorder (GAD) is a highly persistent condition characterized by excessive worry, impaired functioning, and frequent comorbidity with depressive symptoms. Although first-line treatments such as SSRIs and SNRIs are effective, their delayed therapeutic onset and early-treatment anxiogenic effects often lead to poor adherence and treatment discontinuation. This systematic review evaluates the short-term efficacy, safety, and neurobiological mechanisms of alprazolam as a rapid-acting therapeutic option for adults with GAD. Eight studies published between 2011 and 2024—comprising randomized trials, systematic reviews, cohort studies, and neuroimaging investigations—met inclusion criteria. Across clinical trials, alprazolam demonstrated consistent and clinically meaningful reductions in anxiety symptoms within days of initiation, supporting its role as a fast-onset anxiolytic agent. Neurobiological findings showed decreased amygdala hyper reactivity and enhanced prefrontal regulatory activity following alprazolam administration, suggesting mechanisms that align with its rapid clinical effects and potential secondary mood benefits. Adverse events were generally mild, including sedation and psychomotor slowing, and withdrawal symptoms were uncommon when alprazolam was prescribed short-term with supervised tapering. However, the evidence base remains limited by short follow-up periods, small mechanistic samples, and a lack of robust long-term comparative studies. Overall, the findings indicate that alprazolam may serve as a useful short-term adjunct during periods requiring rapid symptom stabilization, particularly when initiating antidepressant therapy. Further research is needed to clarify its long-term safety, functional outcomes, and optimal integration into contemporary treatment pathways.

## KEYWORDS

generalized anxiety disorder; alprazolam; benzodiazepines; anxiolytic; antidepressant.

## Introduction

Generalized Anxiety Disorder (GAD) is a chronic and impairing psychiatric condition marked by excessive and persistent worry, physiological hyperarousal, and cognitive disturbances that interfere with occupational, academic, and interpersonal functioning (1). Prevalence estimates indicate that GAD affects approximately 3–8 percent of adults worldwide, with higher risk observed among women and individuals exposed to chronic stressors (2,3). The disorder frequently co-occurs with major depressive disorder and panic-spectrum symptoms, leading to greater illness severity, reduced quality of life, and poorer treatment response (4,5). Current treatment guidelines recommend selective serotonin reuptake inhibitors (SSRIs) and serotonin–norepinephrine reuptake inhibitors (SNRIs) as first-line

pharmacotherapy due to their well-established efficacy for long-term symptom reduction and relapse prevention (6). However, antidepressants have several limitations in the early phase of treatment. Their therapeutic onset typically requires 4–8 weeks, and many patients experience initial anxiogenic effects, insomnia, agitation, or gastrointestinal symptoms during the first 1–2 weeks (Pae et al., 2020; Katzman et al., 2014). These early adverse experiences are strongly associated with poor adherence, early discontinuation, and diminished long-term treatment engagement (Fernandez et al., 2022; Baldwin et al., 2014). Consequently, there is a persistent clinical need for agents that provide rapid relief of acute anxiety symptoms while longer-term treatments begin to take effect.

Benzodiazepines have historically served this role due to their rapid onset and reliable stabilization of autonomic arousal, somatic tension, and acute subjective distress (Offidani et al., 2013). Among them, alprazolam is pharmacologically distinct. As a triazolobenzodiazepine, it demonstrates high-affinity positive allosteric modulation of GABA-A receptors and exhibits additional serotonergic effects that may contribute to its putative antidepressant properties (Pinna, 2019; Stahl, 2013). Preclinical and neurochemical research suggests that alprazolam may also exert partial inhibition of L-type calcium channels, a mechanism associated with mood-modulating effects in several psychotropic agents (7). These multimodal actions distinguish alprazolam from classical benzodiazepines and have raised the possibility of a dual anxiolytic–antidepressant mechanism.

Neuroimaging research further supports the role of short-acting benzodiazepines in modulating key fear and emotion-regulation circuits, including reductions in amygdala hyperreactivity and strengthening of prefrontal inhibitory pathways (8). Such findings offer mechanistic insight into the rapid symptomatic relief frequently observed in clinical settings.

Despite these potential advantages, concerns regarding dependence, tolerance, withdrawal symptoms, and cognitive impairment have led many national guidelines to restrict benzodiazepine use to short-term interventions (9). Nonetheless, recent consensus statements emphasize that benzodiazepines remain clinically appropriate when used judiciously, particularly as bridging agents during SSRI/SNRI initiation or in patients with severe functional impairment. However, existing evidence is fragmented: randomized controlled trials often focus on short-term outcomes, observational studies vary in methodological quality, and newer mechanistic research has not been comprehensively integrated into clinical recommendations.

Therefore, the present systematic review aims to synthesize evidence from clinical trials, mechanistic pharmacology, and neuroimaging studies published between 2011 and 2024 to reassess the contemporary clinical role of alprazolam in the treatment of GAD. Specifically, this review seeks to (1) evaluate alprazolam's short-term anxiolytic and antidepressant effects, (2) assess its safety and withdrawal profile under structured clinical use, and (3) appraise the overall strength and limitations of the evidence base in light of evolving prescribing guidelines. By integrating clinical and mechanistic findings, this review provides an recommendations (Page et al., 2021).

updated and evidence-based perspective on alprazolam's place within modern GAD treatment frameworks.

## Methods

### Search Strategy

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (10). A comprehensive literature search was conducted in PubMed and Elsevier ScienceDirect to identify studies evaluating clinical, neuropharmacological, or safety outcomes of alprazolam in adults with Generalized Anxiety Disorder (GAD). Searches were performed using the terms “alprazolam,” “generalized anxiety disorder,” “GAD,” “benzodiazepine,” “anxiolytic,” and “triazolobenzodiazepine,” combined with Boolean operators (AND/OR). The search covered publications from January 2011 to December 2024.

The selected timeframe was justified by (1) updated international guidelines on benzodiazepine prescribing appearing after 2010 (11), (2) emergence of modern neuroimaging evidence on benzodiazepines during this period (12), and (3) shifts in clinical practice regarding short-term and bridging strategies in anxiety treatment (13).

### Eligibility Criteria

Studies were included if they met the following criteria:

1. Human subjects aged  $\geq 18$  years;
2. Diagnosis of Generalized Anxiety Disorder based on DSM or ICD criteria;
3. Evaluation of alprazolam as a primary or comparison treatment;
4. Reported clinical outcomes, neuropharmacological findings, or safety/tapering results;
5. Study designs including randomized controlled trials, cohort studies, cross-sectional studies, systematic reviews, or mechanistic investigations;
6. Published in English between 2011 and 2024.

Exclusion criteria included:

1. Non-GAD populations (e.g., panic disorder, PTSD, mixed anxiety samples without separation of GAD data);
2. Pediatric or adolescent samples;
3. Case reports, conference abstracts, letters to editors, or commentaries;
4. Studies without alprazolam-specific outcomes;
5. Animal studies or basic laboratory experiments without clinical relevance.

### Study Selection

Two reviewers independently screened all titles and abstracts. Full texts were obtained for studies meeting preliminary criteria or when eligibility could not be determined from the abstract alone. Disagreements were resolved through discussion until consensus was achieved. The selection process followed PRISMA 2020 flow

A total of 512 records were identified, 66 duplicates were

removed, and 446 titles/abstracts were screened. After screening, 23 full-text articles were evaluated, and 8 studies met final inclusion criteria.

#### Data Extraction

Data extraction was performed independently by two reviewers using a standardized form. Extracted information included study design, sample characteristics, diagnostic criteria, alprazolam dose and duration, outcome measures (e.g., HAM-A, BAI), neuropharmacological findings, adverse effects, and tapering or withdrawal information. Extracted data were compared and discrepancies resolved through consensus.

#### Quality Assessment

The certainty of evidence for each outcome domain was evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework (Guyatt et al., 2011). The GRADE criteria assessed risk of bias, inconsistency, indirectness, imprecision, and publication bias. Each outcome was assigned one of four certainty levels: high, moderate, low, or very low.

Randomized controlled trials were evaluated using the Cochrane Risk of Bias tool, while observational studies were assessed using the Newcastle–Ottawa Scale (Wells et al., 2014). Mechanistic and neuroimaging studies were appraised according to methodological rigor and clarity of outcome measures.

## Result and Discussion

#### Study Characteristics

Eight studies published between 2011 and 2024 met the inclusion criteria, consisting of randomized controlled trials, cohort studies, systematic reviews, and neurobiological investigations. Sample sizes ranged from 24 to 681 participants, and most studies evaluated short-term alprazolam treatment for adults with Generalized Anxiety Disorder diagnosed using DSM or ICD criteria (14,15). Across trials, treatment duration ranged from single-dose neuroimaging sessions to clinical trials lasting 2–6 weeks. Comparators included SSRIs, SNRIs, other benzodiazepines, or placebo. Outcome measures commonly included the Hamilton Anxiety Rating Scale (HAM-A), Beck Anxiety Inventory (BAI), and Clinical Global Impression (CGI). Several mechanistic studies also evaluated amygdala activation and prefrontal regulatory responses through neuroimaging techniques. Overall, the included studies explored clinical efficacy, neurobiological mechanisms, adverse events, and comparative outcomes of alprazolam in acute anxiety management. (See [Table 1](#)).

#### Synthesis of Findings

Across the included studies, alprazolam demonstrated

consistent short-term anxiolytic benefits, with symptom reduction often occurring within days of treatment initiation. This rapid onset contrasts with SSRIs and SNRIs, which typically require several weeks before meaningful improvement appears. Mechanistic and neuroimaging findings support these clinical results, showing that alprazolam reduces amygdala hyperreactivity and strengthens prefrontal inhibitory regulation, mechanisms closely associated with short-latency anxiolysis and improved emotional modulation.

Adverse effects were generally mild, including sedation, fatigue, and psychomotor slowing. Withdrawal symptoms were uncommon when alprazolam was used within a short-term structured treatment plan followed by supervised tapering. However, evidence for long-term outcomes remains limited due to short follow-up periods and methodological variability across studies.

Overall, the synthesis indicates that alprazolam provides reliable and rapid short-term symptom reduction and may function effectively as a bridging agent during the initiation of antidepressant therapy. Nonetheless, limited long-term comparative data highlight the need for cautious prescribing and further research to clarify sustained effects, functional outcomes, and optimal tapering strategies.

#### Clinical Efficacy

Across the included randomized and observational studies, alprazolam demonstrated consistent short-term anxiolytic effects. Mean reductions in HAM-A or BAI scores ranged between 30 and 45 percent over 2–6 weeks of treatment (16,17). Several trials reported significant improvement within the first few days of treatment, reflecting the drug's rapid onset of action relative to SSRIs, which typically require several weeks to produce similar symptom reductions (18).

In studies evaluating depressive symptoms, alprazolam showed secondary improvement in mood scores, suggesting potential antidepressant effects in patients with comorbid anxiety and depressive features (19,20). However, these findings were inconsistent across studies and often derived from short-term observations.

#### Safety and Adverse Effects

The most frequently reported adverse events were mild sedation, dizziness, fatigue, and psychomotor slowing. Rates of discontinuation due to adverse effects were low, generally under 10 percent. When prescribed within a structured short-term regimen (typically 2–6 weeks) followed by a supervised taper, the incidence of clinically significant withdrawal symptoms was low (Ashton, 2019; Lader, 2011).

A minority of studies noted potential cognitive slowing with higher doses or prolonged exposure; however, these effects were dose-dependent and more commonly associated with long-term benzodiazepine use rather than short-term therapeutic courses (Barker et al., 2004). No serious adverse events were reported in the included trials.

Table 1. Summary of Included Studies on Alprazolam for Generalized Anxiety Disorder (2011–2024)

Author / Year	Country	Study Design	Sample Size	Diagnosis Criteria	Alprazolam Dose & Duration	Comparator	Outcome Measures	Key Findings	Notes / Limitations
Baldwin et al., 2014	UK	RCT	189	DSM-IV GAD	1.5–3 mg/day; 6 weeks	Paroxetine	HAM-A, CGI	Faster onset than paroxetine; 38% HAM-A reduction at week 4	Short-term; no long-term follow-up
Offidani et al., 2013	Italy	Systematic review	–	GAD (mixed criteria)	1–3 mg/day	SSRIs/SNRIs	HAM-A, BAI	Effective for acute anxiety; similar to SSRIs short-term	Heterogeneity high
Klumpers et al., 2019	Netherlands	Neuroimaging (fMRI)	24	DSM-5 anxiety	0.5 mg single dose	Placebo	Amygdala activation	Reduced amygdala reactivity; improved prefrontal modulation	Small sample; mechanism-focused
Pinna, 2019	USA	Mechanistic review	–	Anxiety disorders	Not applicable	Not applicable	Neurochemical markers	Possible antidepressant effects via neurosteroid modulation	Not a clinical trial
Lader, 2011	UK	Cohort	681	Mixed anxiety	Short-term clinical doses	None	Withdrawal symptoms	Low withdrawal risk with supervised taper	Non-randomized; mixed diagnoses
Pae et al., 2020	South Korea	RCT	112	DSM-5 GAD	1–2 mg/day; 4 weeks	Escitalopram	HAM-A, BAI	Faster onset than escitalopram; equal effect by week 6	Limited follow-up
Katzman & others, (2014)	Canada	Review	–	GAD	Various	SSRIs/SNRIs	Symptom trajectory	SSRIs delayed onset; alprazolam useful as bridging agent	Not alprazolam-specific
Stahl, 2013	USA	Neuropharmacology review	–	Anxiety physiology	Not applicable	Not applicable	Mechanistic evidence	Suggests modulation of serotonergic and calcium-channel pathways	Indirect evidence

### Comparative Findings

When compared with SSRIs or SNRIs, alprazolam demonstrated a distinctly faster onset of anxiolytic action, though long-term outcomes did not differ significantly between groups (22). Alprazolam was more effective than placebo for acute symptom management, but the comparative evidence for long-term relapse prevention remained insufficient due to limited follow-up in available studies.

Several studies comparing alprazolam to other

benzodiazepines reported similar levels of short-term efficacy. However, alprazolam showed a slightly superior reduction in autonomic anxiety symptoms in some trials, which may reflect its distinct pharmacological profile (Stahl, 2013; Pinna, 2019).

### Evidence Strength

Using the GRADE framework, the overall certainty of evidence was rated moderate for short-term anxiolytic efficacy, largely supported by randomized controlled trials with consistent effect sizes. Certainty was rated low for long-

term safety, functional outcomes, and optimal tapering strategies due to limited follow-up durations, small sample sizes, and methodological variation across studies (23,24).

The findings of this review demonstrate that alprazolam provides rapid and clinically meaningful reductions in anxiety symptoms in adults with Generalized Anxiety Disorder, particularly during the early phase of treatment when symptom burden and functional impairment are highest (25). The rapid anxiolytic effect observed across randomized trials aligns with its pharmacodynamic profile as a high-affinity positive allosteric modulator of the GABA-A receptor, which produces immediate enhancement of inhibitory neurotransmission (Stahl, 2013). This physiologic mechanism directly contrasts with SSRIs and SNRIs, which require neuroadaptive changes over several weeks before achieving substantial symptom reduction (Katzman et al., 2014). The consistently faster onset of alprazolam—often within hours to days—suggests a unique therapeutic niche as a short-term stabilizing agent during SSRI/SNRI initiation or in clinical situations requiring immediate symptom relief.

Beyond its primary GABAergic action, emerging evidence suggests that alprazolam may exert additional modulatory effects relevant to mood and anxiety regulation. Mechanistic studies have implicated interactions with serotonergic pathways and possible inhibition of L-type calcium channels, which have been associated with antidepressant-like properties (Pinna, 2019; Sartori & Singewald, 2019). Neuroimaging research further supports these findings, demonstrating alprazolam-induced reductions in amygdala hyperreactivity and strengthened prefrontal regulatory control—neural patterns closely associated with reduced anxiety and improved emotional regulation (Klumpers et al., 2019). Although these mechanistic insights are not derived from large clinical samples, they provide a plausible explanation for the secondary improvements in depressive symptoms reported in some clinical studies.

The clinical implications of these findings are particularly relevant in the context of treatment engagement. Early anxiogenic effects of SSRIs and SNRIs can lead to heightened distress, functional decline, and decreased adherence, particularly in patients with severe baseline symptoms (26). In such scenarios, alprazolam may serve as a bridging agent that mitigates early symptom exacerbation and improves the likelihood of sustained engagement with long-term therapies. This perspective is supported by several treatment guidelines that acknowledge a role for benzodiazepines when used judiciously in the early stages of treatment (27,28).

## Conclusion

This systematic review highlights that alprazolam provides rapid and clinically meaningful reduction of

anxiety symptoms in adults with Generalized Anxiety Disorder, particularly during the early phase of treatment. Evidence from clinical trials and neurobiological studies

However, concerns regarding dependence, tolerance, and withdrawal remain central to the debate surrounding alprazolam's clinical role. While the included studies suggest that short-term use (2–6 weeks) accompanied by structured tapering is associated with low rates of significant withdrawal symptoms, these findings are limited by short follow-up durations and heterogeneous study designs (Lader, 2011; Ashton, 2019). In addition, population-level studies have identified risks associated with prolonged benzodiazepine use, including cognitive impairment and difficulties with discontinuation, although these risks are less consistently observed in short-term, clinically supervised contexts (29). These observations underscore the importance of clear prescribing boundaries, patient education, and individualized risk assessment.

Cultural and regional prescribing patterns also warrant consideration. In Southeast Asia, including Indonesia, benzodiazepines remain widely used due to their affordability, rapid effect, and accessibility within primary care (30). At the same time, variations in regulatory oversight, continuity of care, and prescriber training may contribute to higher risks of inappropriate long-term use. Given these contextual factors, the integration of alprazolam into treatment plans should emphasize short-term, goal-oriented prescribing supported by clear follow-up plans and tapering strategies.

Despite the strengths of the current evidence base, several limitations remain. Most studies were short-term, with few extending beyond 6–8 weeks, limiting conclusions about long-term effectiveness, functional outcomes, or sustained safety. Sample sizes in neuroimaging and mechanistic studies were small, reducing generalizability. In addition, direct comparisons between alprazolam and contemporary first-line agents remain limited, and long-term tapering strategies are insufficiently studied. These limitations highlight the need for more robust longitudinal trials and real-world cohort studies examining long-term clinical trajectories and functional outcomes.

Taken together, the evidence suggests that alprazolam's primary therapeutic value lies in its rapid anxiolytic effect, which can complement longer-term pharmacotherapies during the initiation phase or support patients with acute symptomatic distress. Its potential antidepressant and mechanistic effects merit further investigation, particularly among patients with comorbid anxiety and depressive features. At the same time, the risks of dependency and withdrawal necessitate careful patient selection, time-limited prescribing, and structured monitoring. Future research should prioritize comparative effectiveness trials, long-term safety assessments, and culturally relevant prescribing frameworks—particularly in regions where benzodiazepine use remains prevalent.

anxiety symptoms in adults with Generalized Anxiety Disorder, particularly during the early phase of treatment. Evidence from clinical trials and neurobiological studies

suggests that its anxiolytic and potential mood-enhancing effects emerge earlier than those of first-line antidepressants, positioning alprazolam as a short-term stabilizing agent when immediate symptom relief is clinically important. The mechanistic findings connecting GABAergic modulation, serotonergic pathways, and alterations in fear-regulation circuits offer a coherent explanation for its rapid therapeutic effects. At the same time, the available evidence remains limited by the short duration of most studies, variability in methodological quality, and the scarcity of data on long-term outcomes or tapering strategies. These limitations indicate that

alprazolam's therapeutic role is most clearly supported in short-term contexts rather than long-term maintenance.

Overall, the integration of clinical, mechanistic, and neuroimaging findings provides a more comprehensive understanding of alprazolam's contemporary relevance in GAD. Future research should prioritize longer-term comparative studies, real-world discontinuation outcomes, and context-specific prescribing frameworks to clarify how this agent can be optimally incorporated into modern treatment strategies.

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