Journal An-Nafs
Kajian Penelitian Psikologi
ISSN (Print) : 2528-0600
ISSN (Online): 2549-6166
https://ejournal.uit-lirboyo.ac.id/index.php/psikologi
https://doi.org/10.33367/psi.v10i2.8191

Psychometric Properties of the GAD-7 for Assessing Anxiety Disorder Among Students and Populations in Developing Countries: A Systematic Review

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Article Information:
Received
October 20, 2025
Revised
December 20, 2025
Accepted
December 20, 2025

Keywords:
Anxiety disorder
Developing countries
Generalized Anxiety Disorder 7
Psychometric

Abstract

Generalized anxiety disorder (GAD) is one of the most common anxiety disorders and significantly impacts individual well-being. Early detection using a valid instrument, such as the GAD-7, is essential for effective intervention. However, evidence regarding the psychometric performance of the GAD-7 in developing countries remains fragmented, particularly across student and community populations, necessitating systematic synthesis. This study aimed to systematically review and synthesise evidence on the psychometric properties of the GAD-7, including its validity, reliability, cut-off values, and cultural adaptability, among students and general populations in developing-country contexts. A systematic review was conducted using three databases: PubMed, ScienceDirect, and SAGE Journals. The search employed the keywords “Anxiety Disorder,” “Developing Country,” “Generalized Anxiety Disorder-7,” “Mental Health,” “Psychometric,” and “Student,” using Boolean operators (AND, OR). Of the 3,255 records identified, 15 studies met the inclusion criteria after screening and eligibility assessment and were included in the final synthesis. The review demonstrates that the GAD-7 shows consistently strong construct validity, a stable unidimensional factor structure, and robust convergent validity across diverse cultural and educational settings, with positive correlations observed with related instruments such as the PHQ-9. With high internal consistency (Cronbach’s $\alpha = 0.85 - 0.93$) and a commonly supported cut-off score of ≥10, the GAD-7 effectively identifies anxiety symptoms, although context-specific lower cut-off scores were reported in certain clinical and community populations. Overall, the findings indicate that the GAD-7 is a valid, reliable, and culturally adaptable screening instrument for anxiety assessment. By consolidating psychometric evidence across developing-country contexts, this review provides an integrated and up-to-date synthesis that supports the informed use of the GAD-7 in educational, clinical, and public mental health settings, particularly in low-resource environments.

INTRODUCTION

Generalized anxiety disorder (GAD) is one of the most prevalent mental health conditions globally and has a substantial impact on psychological well-being, social functioning, and quality of life (Gong et al., 2021; Lutkiewicz et al., 2024). Although anxiety can be an adaptive stress response, pathological anxiety associated with GAD, when left untreated, often results in chronic functional impairment, reduced productivity, an increased risk of comorbid depression, and a considerable economic burden (Chodavadia et al., 2023; de Oliveira et al., 2023). According to the World Health Organization, more than 301 million individuals worldwide experienced anxiety disorders in 2019, underscoring GAD as a major global public health concern (WHO, 2022).

Early identification of GAD is therefore essential, particularly given its multifactorial etiology, which involves biological vulnerability, psychological stressors, and socio-environmental pressures (Alipour et al., 2025; Lewandrowski et al., 2025; Peedicayil, 2023). Validated and efficient screening instruments play a central role in enabling early detection and timely intervention, especially in settings with limited mental health resources. Among available tools, the Generalized Anxiety Disorder-7 (GAD-7) is one of the most widely used self-report instruments for assessing anxiety severity (Kliem et al., 2025; López et al., 2025). Developed in accordance with the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria, the GAD-7 is valued for its brevity, ease of administration, and robust evidence supporting its validity and reliability across diverse populations (Idaiani et al., 2022; Plummer et al., 2016; Vogazianos et al., 2022).

Over the past decade, the prevalence of anxiety symptoms has increased markedly among students and general populations in developing countries, driven by academic pressure, economic uncertainty, and the psychosocial consequences of the COVID-19 pandemic (Kohls et al., 2023; Lin et al., 2024). Students are particularly vulnerable to anxiety-related distress in educational contexts, which may negatively affect academic performance, engagement, and overall well-being (Liyanage et al., 2022). Brief and cost-effective screening tools such as the GAD-7 are therefore especially relevant in developing countries, where access to trained mental health professionals and diagnostic services remains limited (Khoury-Malhame et al., 2025; Lutkiewicz et al., 2024).

Despite its widespread international use, evidence regarding the psychometric performance of the GAD-7 among students and populations in developing countries remains mixed and context-dependent (Dhira et al., 2021; Gómez-Gómez et al., 2024; Kim et al., 2021). Several instruments have been developed to assess anxiety symptoms, including the Beck Anxiety Inventory (BAI), the Hamilton Anxiety Rating Scale (HARS), and the Depression Anxiety Stress Scales (DASS) (Jeong & Lee, 2024; Wiglusz et al., 2019), each reflecting distinct conceptual frameworks and measurement characteristics. However, their length, target populations, and contextual suitability often

limit their routine application as brief screening tools, particularly in large-scale or resource-limited settings. Furthermore, cultural, linguistic, educational, and socioeconomic differences may influence how respondents interpret and respond to GAD-7 items, potentially affecting factor structure, cut-off scores, and validity estimates (Dhira et al., 2021; Villarreal-Zegarra et al., 2024). Indeed, variations in reported reliability coefficients, construct validity, and measurement invariance across countries highlight the need for a systematic synthesis of existing validation evidence.

Previous systematic reviews have primarily examined the psychometric properties of the GAD-7 in general and clinical populations, with a predominant focus on high-income and Western contexts. While these reviews provide valuable support for the overall validity of the GAD-7, they have not systematically focused on students and populations in developing countries, nor have they comprehensively compared factor structures, reliability indices, and methodological quality across diverse socio-cultural settings. As a result, current knowledge regarding the cross-cultural consistency and educational applicability of the GAD-7 remains fragmented**.**

Despite the extensive international use of the Generalized Anxiety Disorder-7 (GAD-7), a critical gap remains in the literature concerning the systematic synthesis of its psychometric performance among students and general populations in developing countries. Existing validation studies are predominantly country-specific and vary considerably in methodological rigor, sample characteristics, and analytical approaches, making it difficult to draw coherent conclusions regarding the instrument's cross-cultural consistency and educational applicability. Moreover, prior systematic reviews have largely focused on clinical or general populations in high-income settings, with limited attention to socio-cultural, linguistic, and educational contexts characteristic of developing and resource-limited regions. As a result, evidence regarding the stability of factor structures, reliability estimates, cut-off thresholds, and measurement invariance of the GAD-7 across developing-country populations remains fragmented and insufficiently synthesized. This lack of integrative evidence constrains informed decision-making by researchers, clinicians, and policymakers who rely on brief screening tools for early anxiety detection in educational and community-based settings. Addressing this gap through a systematic review that critically appraises and consolidates recent psychometric validation studies represents a timely and necessary contribution to the field, particularly in light of the rising burden of anxiety symptoms among students and populations in developing countries.

This systematic review seeks to address these gaps by providing a comprehensive synthesis of evidence on the validity, reliability, and broader psychometric properties of the GAD-7, with a particular focus on students and populations in developing countries. While earlier reviews have examined the validation and diagnostic accuracy of the GAD-7 in general populations and clinical settings, evidence specifically targeting students in developing and resource-limited contexts remains scarce (Bright et al., 2019; Plummer et

al., 2016). By integrating recent cross-national validation studies and critically appraising their methodological quality, this review offers novel insights into the psychometric stability, cultural adaptability, and measurement consistency of the GAD-7 in educational and socio-culturally diverse environments. The findings are expected to inform researchers, clinicians, and policymakers regarding the appropriate use and interpretation of the GAD-7, thereby supporting evidence-based mental health screening and intervention strategies across diverse global contexts.

METHOD

Design

This systematic review aimed to identify, synthesise, and critically analyse studies examining the psychometric properties of the Generalized Anxiety Disorder-7 (GAD-7) questionnaire for identifying anxiety disorders among students and general populations in developing countries. The review process adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and followed four sequential stages: identification, screening, eligibility assessment, and inclusion. This structured and transparent approach was adopted to address the heterogeneity and fragmentation of existing validation studies, thereby enabling a coherent synthesis of psychometric evidence across diverse cultural, educational, and methodological contexts.

Search strategy

A comprehensive literature search was conducted across three major electronic databases—PubMed, ScienceDirect, and SAGE Journals—using a combination of keywords and Boolean operators to maximise both sensitivity and specificity. The search terms included “generalized anxiety disorder-7” OR “GAD-7” OR “anxiety disorder”, combined with “student” OR “college” OR “university”, and “developing countries” OR “low- and middle-income countries”, as well as “psychometric” OR “validity” OR “reliability.” Quotation marks were used to ensure phrase-level precision, and Boolean operators (AND/OR) were systematically applied to integrate conceptual domains.

In addition, the reference lists of all included studies were manually screened to identify potentially relevant articles not captured through the database search. The search was restricted to peer-reviewed, English-language articles published between 2019 and 2024, reflecting an intentional focus on recent psychometric evidence generated in the context of evolving educational demands and post-pandemic mental health challenges.

Selection criteria

Articles were included if they (a) reported empirical findings on the psychometric properties of the GAD-7, (b) involved student or general population samples drawn from developing countries, (c) were published in English between 2019 and 2024, and (d) were available in full text. Studies were excluded if they were systematic reviews, editorials, commentaries, letters to the editor, or case reports, if they did not report psychometric outcomes specific to the GAD-7, or if they were published prior to 2019 or in languages other than English.

These inclusion and exclusion criteria were deliberately defined to ensure methodological comparability while acknowledging the diversity of study designs and population characteristics, thereby supporting a focused yet comprehensive synthesis aligned with the study's research gap.

Data Extraction and Quality Appraisal

A total of 3,255 records were retrieved from the initial database search, comprising 187 articles from PubMed, 2,513 from ScienceDirect, and 555 from SAGE Journals. After the removal of 1,079 duplicate records, 2,176 articles remained for title and abstract screening. This process yielded 1,148 articles eligible for full-text assessment, of which 503 were excluded for failing to meet the inclusion criteria. Ultimately, 15 studies were retained for final synthesis. The study selection process is summarised in Figure 1 using a PRISMA flow diagram.

All included studies were evaluated for methodological quality using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool, which assesses risk of bias across four domains: patient selection, index test, reference standard, and flow and timing. Overall, most studies demonstrated a low risk of bias in patient selection and index test domains, indicating generally robust sampling strategies and appropriate use of the GAD-7. Variability was noted primarily in reference standards and reporting practices, reflecting contextual differences in diagnostic resources across developing-country settings.

Overview of Included Studies

The results from the review of the 15 included articles revealed five key psychometric domains examined across studies: (1) GAD-7 validity, (2) GAD-7 reliability, (3) GAD-7 cut-off scores and gold standards, (4) cultural adaptability of the GAD-7 in developing countries, and (5) accuracy of the GAD-7 for detecting anxiety disorders among students (see Figure 2). This categorization was used to organise and synthesise heterogeneous psychometric evidence across diverse study contexts.

Figure 1.
PRISMA Flow Diagram

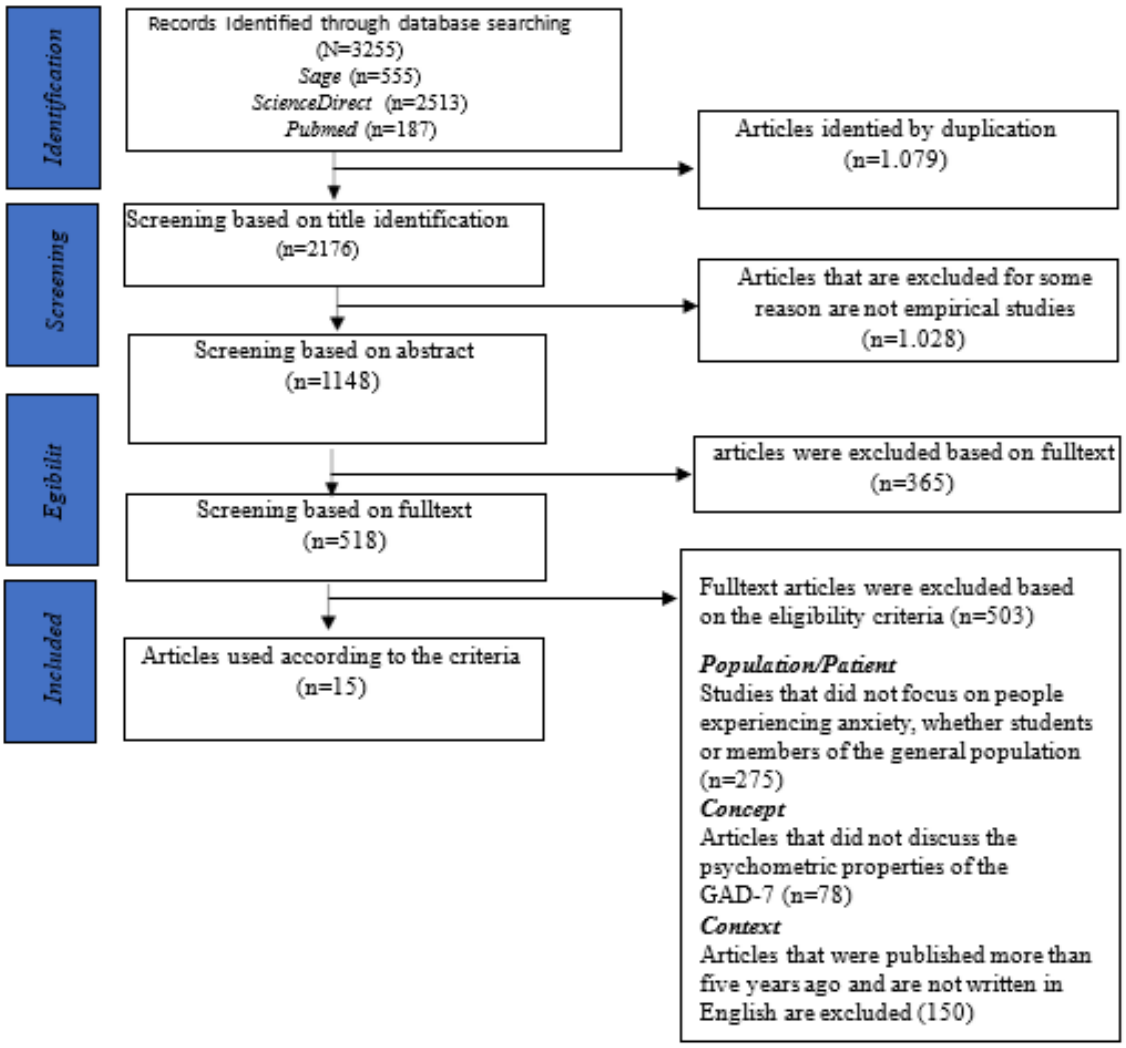

Figure 1 presents the PRISMA flow diagram, illustrating the process of study identification, screening, eligibility assessment, and final inclusion. This figure provides a transparent overview of the systematic selection process applied in the review, in accordance with PRISMA guidelines.

Figure 2

Visual summary of key psychometric findings

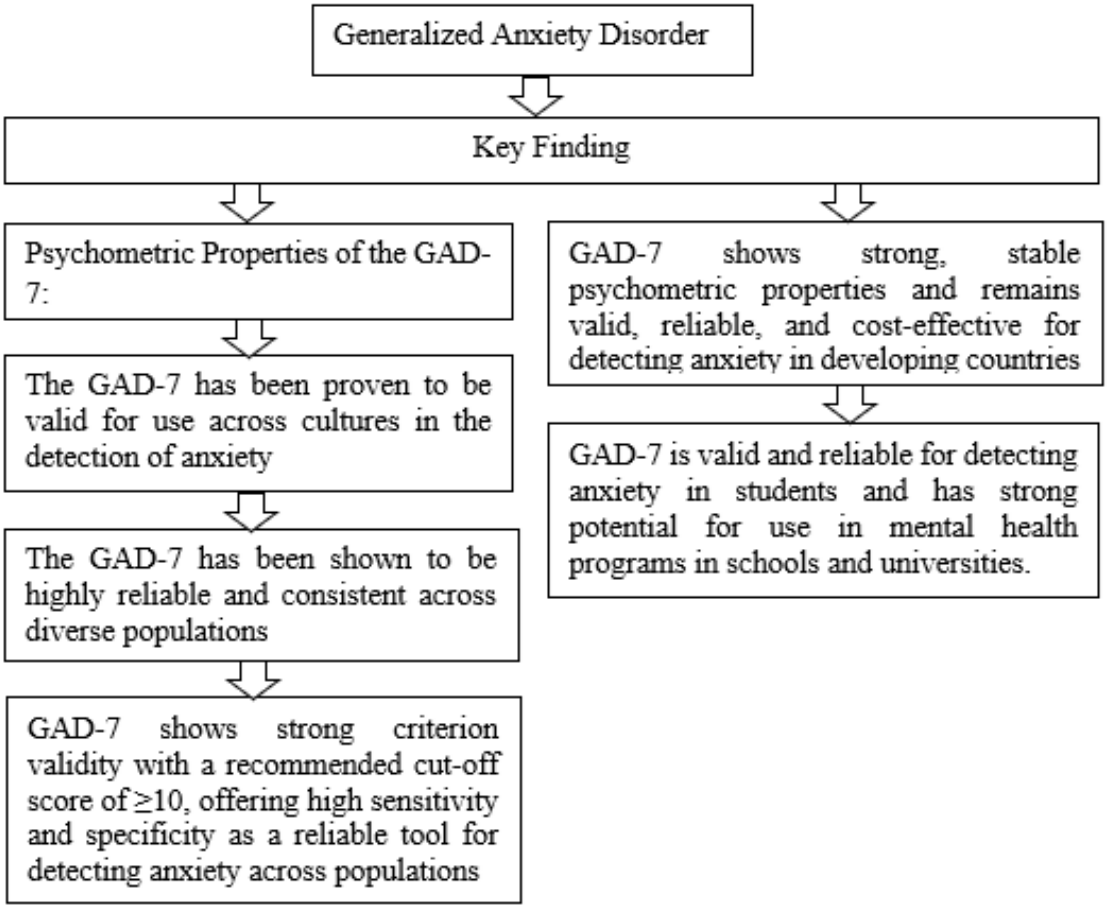

Figure 2 provides a visual summary of the key psychometric findings derived from the included studies, including indicators of validity, reliability, recommended cut-off scores, and cost-effectiveness of the GAD-7 for anxiety screening among students and populations in developing countries. This figure serves as a descriptive synthesis of the primary outcome domains assessed across studies, rather than an interpretive analysis.

Table 1

Overview of Psychometric Validation Results of the GAD-7 in Various Populations

Author and Year	Country	Sample	Data Collection Method	Validity	Reliability	Gold Standard	Cut-off	Key Findings
(Camargo et al., 2023)	Colombia	1,500 adults (18–65 years)	Online (Google Form)	CFA supported one-factor structure (CFI=0.99, RMSEA=0.05) Sensitivity 88%, Specificity 79%	α = 0.92	PHQ-9, PHQ-ADS	≥10	GAD-7 reliable and valid; suitable for detecting anxiety in primary care
(Suh et al., 2023)	South Korea	1,327 community participants	Community-based mental health screening (tablet & paper forms)	PCA confirmed one-factor model, explaining 68.5% variance	α = 0.919	-	≥10	GAD-7 reliable for large-scale community screening; consistent with paper version results
(Gómez-Gómez et al., 2024)	Spain	3,082 pregnant & postpartum women	Web-based (online) longitudinal survey	EFA & CFA confirmed one-factor model (CFI=0.998; RMSEA=0.035 –0.038); strict invariance across groups	α = 0.92	EPDS and PTSD Checklist	≥10	Reliable for perinatal anxiety; valid and stable across pregnancy & postpartum.
(Villarreal-Zegarra et al., 2024)	Peru	4,431 general population (12–65 years)	Mixed online & offline surveys	CFA one-factor model (CFI=0.994, TLI=0.991, RMSEA=0.068) ; measurement	α = 0.93; ω = 0.90	None rePHQ-9 (r = 0.77)	≥10	Valid and reliable; invariant across sex and age; recommended for general population screening.

Author and Year	Country	Sample	Data Collection Method	Validity	Reliability	Gold Standard	Cut-off	Key Findings
				invariance by sex & age				
(Krizova et al., 2024)	Slovakia	2,239 helping professionals (psychologists, teachers, doctors, nurses)	majority online, but some in-person	CFA supported a one-dimensional model, invariant by sex; strong correlations with depression, self-criticism, and burnout (confirming convergent validity)	α = 0.89	PHQ-9 for depression, Self-Criticism	≥10	GAD-7 valid for Slovak professionals; gender invariance confirmed; suitable for both clinical and research use in Eastern Europe.
(López et al., 2025)	Latin America	11,279 participants	Online and institutional survey via e-health networks and university channels	EFA and CFA confirmed unidimensional structure (variance explained = 62.8–66.1%, KMO > 0.90, RMSEA = 0.061, CFI = 0.998)	Ω = 0.85–0.95 across countries; item-total correlation .642–.869	Compared with clinical cut-offs and previous GAD-7 validations; supported by PHQ-9 correlations	≥10	GAD-7 showed excellent construct validity and cross-cultural consistency; applicable across diverse Latin American populations; robust in both urban and rural contexts.

Author and Year	Country	Sample	Data Collection Method	Validity	Reliability	Gold Standard	Cut-off	Key Findings
(Byrd-Bredbenner et al., 2020)	United states	4,128 university students (aged 18–26)	Online survey	Confirmed single-factor model; stable across datasets (CFI, GFI, TLI > 0.95; RMSEA < 0.06)	Cronbach's α = 0.89–0.92	PHQ-2 for depression was used for convergent validity	≥10	Both GAD-7 and the 2-item GAD-Mini showed strong validity, sensitivity, and specificity; the GAD-Mini is proposed as a brief, universal screening version.
(Vogazianos et al., 2022)	Cyprus	457 perinatal women (222 pregnant, 235 postpartum; 18–45 years)	Online survey during COVID-19 via Qualtrics, recruited from maternity units, social media, and local organizations	CFA supported one-factor model (χ^2 = 21.21, p = 0.096; CFI = 0.999; RMSEA = 0.034)	α = 0.907; Ω = 0.909		≥10	Greek GAD-7 version for pregnant and postpartum women demonstrated excellent internal consistency and unidimensional structure; valid for perinatal anxiety screening in Cyprus, though diagnostic thresholds still need study.
(Liu et al., 2023)	China	1,244 adult respondents	Paper survey	AUC = 0.829 Sensitivity 66.0%, Specificity 89.2%	α = 0.869	Psychiatrist DSM-5 diagnosis	≥ 4	GAD-7 is valid and reliable for COPD patients; performance is not influenced by disease severity.
(Kliem et al., 2025)	Germany	5030 general population adults	Paper survey	Unidimensional model Sensitivity 89%, Specificity 82%	α = 0.89	PHQ / DSM-IV criteria	≥10	Reliable measure of generalized anxiety; validated across demographics.
(Vrublevska et al., 2022)	Latvia	279 primary care patients	Paper survey	AUC = 0.91 Sensitivity 92%, Specificity 76%	α = 0.89	MINI (Mini International Neuropsyc	≥5	Latvian version showed strong validity and reliability for GAD detection

Author and Year	Country	Sample	Data Collection Method	Validity	Reliability	Gold Standard	Cut-off	Key Findings
						hiatric Interview)		
(Johnson et al., 2019)	Norway	1201 psychiatric in- and outpatients	Mixed (paper and online)	Supported one-factor model (EFA/CFA); good convergent validity Sensitivity 74%, Specificity 54%	Excellent ($\alpha > 0.90$)	Beck Anxiety Inventory (criterion)	≥10	Strong psychometric properties; one-factor model fits heterogeneous psychiatric population
(Casares et al., 2024)	Spain	2235 adolescents	Paper surveys	Unidimensional model, scalar invariance by gender/age	$\omega = 0.90$	PHQ-9, SDQ, PANAS-C	Not specified	Valid and reliable tool for screening adolescent anxiety in educational contexts.
(Dhira et al., 2021)	Bangladesh	1136 adults (general population)	Mixed survey approach (online via Google Forms distributed by faculty and peers; some responses collected directly at the university)	Confirmatory factor analysis supported a single factor Sensitivity 89%, Specificity 82%	$\alpha = 0.87$	PHQ-9 and WHO-5	≥10	Bangla GAD-7 version is valid, reliable, and culturally appropriate for screening anxiety
(Lutkiewicz et al., 2024)	Poland	278 Polish postpartum mothers	Paper-based self-report questionnaires	Significant positive correlations: with parental	Cronbach's $\alpha = 0.90$; McDonal	EPDS	-	GAD-7 is a valid and reliable tool for assessing anxiety symptoms among postpartum Polish women. It demonstrated a strong correlation

Author and Year	Country	Sample	Data Collection Method	Validity	Reliability	Gold Standard	Cut-off	Key Findings
				stress (PSS r = 0.35, p < 0.01) and postpartum depression (EPDS r = 0.76, p < 0.01)	d's ω = 0.91			with depressive symptoms measured by the Edinburgh Postnatal Depression Scale (EPDS), supporting its convergent validity.
(Khoury-Malhame et al., 2025)	Lebanon	638 adolescents (15–18 years)	Offline survey administered in classrooms (paper-based Arabic questionnaires)	CFA: one-factor model (RMSEA = .085, SRMR = .035, CFI = .966, TLI = .949); AVE = .51 (good convergent validity); invariance across gender (configural, metric, scalar)	α = .87; ω = .88; ICC = .83 (3-month test–retest)	PTSD Checklist (PCL-5), Post-Traumatic Growth Inventory (PTGI-SF)	-	The Arabic version of the GAD-7 is valid, reliable, and unidimensional among Lebanese adolescents. Demonstrated gender invariance and stable test–retest reliability.

Table 1 summarises the psychometric validation characteristics of the GAD-7 across various populations and countries, including sample characteristics, data collection methods, validity and reliability indices, reference standards, and recommended cut-off scores. The table highlights both consistencies and methodological variations across studies, providing a structured overview of the empirical evidence included in the review.

Table 2

Implications for Practice and Policy Based on the Psychometric Evidence of GAD-7

Application Area	Key Implications
Education (Students and Academic Settings)	The GAD-7 can be used as a routine screening tool in schools and universities to identify student anxiety and support mental health education programs.
Public Health in Developing Countries	GAD-7 is highly suitable for use in primary care and community settings in developing countries due to its simplicity, speed, and cost-effectiveness. Integration into national screening systems can help identify individuals at high risk of anxiety and expand access to mental health services.
Clinical and Psychological Practice	The GAD-7 can serve as a diagnostic and monitoring instrument for mental health professionals across various healthcare facilities.
Psychometric and Academic Research	Further cross-cultural and longitudinal validation studies are needed, including the adjustment of cut-off scores to fit local cultural contexts.
Public and Institutional Policy	Governments and educational institutions can adopt the GAD-7 as a national standard tool for monitoring and preventing anxiety disorders.

RESULTS

A total of 15 studies published between 2019 and 2025 were included in the final synthesis (see Table 1). The reviewed studies examined the psychometric properties of the GAD-7 among students, adolescents, and general population samples, with a particular emphasis on developing and middle-income countries. These studies represented diverse geographical regions, including Bangladesh, Lebanon, Peru, Colombia, Poland, Cyprus, South Korea, Spain, and multiple Latin American countries. Sample sizes varied substantially, ranging from 278 to 11,279 participants, reflecting heterogeneity in study scope and design. Data collection methods included online surveys, paper-based questionnaires administered in classrooms or clinical settings, and mixed-mode community screening approaches, enabling comparison across methodological contexts.

GAD-7 Validity for Screening Anxiety Disorders

Across the included studies, the GAD-7 consistently demonstrated strong construct validity across diverse cultural and population contexts. Both Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) predominantly supported a unidimensional factor structure, with acceptable to excellent model fit indices (e.g., CFI > 0.95 and RMSEA < 0.08) reported in most studies (Camargo et al., 2023; Gómez-Gómez et al., 2024; Krizova et al., 2024; Suh et al., 2023; Vogazianos et al., 2022). This convergence across analytical approaches and contexts provides integrated evidence

countering prior concerns regarding structural instability of the GAD-7 in non-Western settings.

Convergent validity was also consistently supported, as indicated by moderate to strong positive correlations between GAD-7 scores and established psychological measures, including the PHQ-9, EPDS, PTSD Checklist, and related affective scales (Casares et al., 2024; Khoury-Malhame et al., 2025; Lutkiewicz et al., 2024). Several studies further examined measurement invariance across gender, age, and cultural subgroups, reporting configural, metric, and, in some cases, scalar invariance (Gómez-Gómez et al., 2024; Krizova et al., 2024; Villarreal-Zegarra et al., 2024). These findings collectively indicate that the GAD-7 measures the same underlying construct of anxiety across key demographic and cultural groups, although the depth of invariance testing varied across studies.

Nevertheless, not all studies conducted formal invariance analyses, and the extent of psychometric evaluation differed depending on population type (e.g., students versus general community samples) and study setting. This variability highlights the methodological heterogeneity of the existing literature while reinforcing the value of synthesizing evidence across contexts, rather than relying on single-country validations.

Reliability of the GAD-7 for screening Anxiety Disorders

Nearly all included studies reported excellent internal consistency for the GAD-7 across languages and populations. Cronbach's α values ranged from 0.85 to 0.93, while McDonald's ω values ranged from 0.88 to 0.95, indicating high reliability across diverse samples (López et al., 2025; Lutkiewicz et al., 2024; Villarreal-Zegarra et al., 2024). Comparable reliability estimates were observed across student, adolescent, and general population groups, suggesting stability of the instrument across educational and community contexts.

Among student and adolescent samples, reliability indices were consistently strong, with α values between 0.87 and 0.92 reported in university and school-based studies (Byrd-Bredbenner et al., 2020; Khoury-Malhame et al., 2025).

One study further demonstrated high temporal stability, reporting an intraclass correlation coefficient (ICC) of 0.83 over a three-month test–retest interval, thereby supporting the reliability of the GAD-7 over time (Khoury-Malhame et al., 2025). Collectively, these findings provide consolidated evidence that the GAD-7 maintains strong reliability across cultural, linguistic, and educational settings, addressing previous concerns regarding inconsistent reliability estimates.

Cut-off Scores and Gold Standards

Most studies identified a cut-off score of $\geqslant 10$ as the optimal threshold for detecting moderate-to-severe anxiety symptoms, balancing sensitivity and specificity across populations (Dhira et al., 2021; Krizova et al., 2024; López et al., 2025). However, context-specific variations were evident, with lower cut-off scores (e.g., $\geqslant 5$ or $\geqslant 4$) recommended in certain primary care or clinical populations, such as individuals with chronic pulmonary disease (Liu et al., 2023; Vrublevska et al., 2022). Sensitivity values ranged from 66% to 92%, while specificity values ranged from 76% to 89%, indicating

generally good diagnostic accuracy across studies (Camargo et al., 2023; Dhira et al., 2021; Kliem et al., 2025).

Criterion validity was further supported through comparisons with established diagnostic and screening instruments, including the PHQ-9, Beck Anxiety Inventory (BAI), Mini International Neuropsychiatric Interview (MINI), and DSM-5–based clinical diagnoses (Johnson et al., 2019; Krizova et al., 2024; Liu et al., 2023; Vrublevska et al., 2022). Reported correlation coefficients typically ranged from 0.70 to 0.80, supporting the accuracy of the GAD-7 relative to recognized reference standards. These findings underscore that while a $\geqslant 10$ cut-off is broadly supported, flexibility in threshold selection may be warranted depending on population characteristics and clinical context.

Cultural Adaptability and Data Collection Contexts

Studies conducted in developing-country settings, including Bangladesh, Lebanon, Peru, Poland, and Latin America, demonstrated that the GAD-7 retained robust psychometric properties following linguistic and cultural adaptation. High reliability coefficients ($\alpha > 0.87$) and stable unidimensional factor structures were consistently reported, even in resource-limited and educational settings (Dhira et al., 2021; Khoury-Malhame et al., 2025; López et al., 2025; Lutkiewicz et al., 2024; Villarreal-Zegarra et al., 2024). This convergence provides integrative evidence that cultural adaptation does not compromise the core measurement properties of the GAD-7.

Across studies, data collection modalities varied, with online surveys more frequently employed in student and urban populations, and offline or mixed-mode approaches used in classroom, clinical, and community-based contexts. Although these methodological differences influenced sample composition and reporting practices, the psychometric performance of the GAD-7 remained consistently strong across administration modes, suggesting robustness of the instrument under varied data collection conditions.

GAD-7 Accuracy for Screening Anxiety Disorders in Students Populations

Within student and adolescent samples, the GAD-7 demonstrated consistently strong validity and reliability, reinforcing its applicability in educational contexts. Studies involving university students and adolescents in the United States, Spain, and Lebanon reported Cronbach's α values ranging from 0.87 to 0.92, with several studies confirming measurement invariance across gender and age groups (Byrd-Bredbenner et al., 2020; Casares et al., 2024; Khoury-Malhame et al., 2025). These findings provide consolidated evidence that the GAD-7 functions equivalently across key student subgroups, supporting its use as a routine screening tool in schools and universities.

DISCUSSION

By synthesizing psychometric evidence across diverse developing-country contexts and student populations, this review directly addresses the previously fragmented nature of GAD-7 validation research and clarifies its cross-cultural and educational applicability. The findings of this systematic review underscore that the Generalized Anxiety Disorder-7 (GAD-7) is a valid, reliable, and efficient instrument for

assessing anxiety among students and the general population, including those in developing countries. The consistent support for a unidimensional factor structure across studies suggests that the GAD-7 robustly captures the core construct of generalized anxiety across cultural and demographic contexts. Evidence of measurement invariance across gender, age, and cultural groups reported in several studies further indicates that the instrument operates comparably across diverse populations (Camargo et al., 2023; Gómez-Gómez et al., 2023; Krizova et al., 2024; Villarreal-Zegarra et al., 2024).

Importantly, comparative synthesis across countries demonstrates that the psychometric performance of the GAD-7 in developing and middle-income settings is broadly comparable to that reported in high-income Western contexts, including Bangladesh, Lebanon, Peru, Poland, and Latin America. High internal consistency and stable factor structures were observed across regions, supporting the instrument's cross-cultural robustness (Dhira et al., 2021; Khoury-Malhame et al., 2025; López et al., 2025; Lutkiewicz et al., 2024). However, minor variations in factor loadings, recommended cut-off thresholds, and the extent of invariance testing were evident, suggesting that cultural, linguistic, and socioeconomic factors may influence how anxiety symptoms are expressed and quantified rather than indicating substantive differences in the underlying construct.

Analysis across population subgroups further refines these findings. Student and adolescent populations consistently demonstrated strong reliability and measurement invariance across gender and age, supporting the suitability of the GAD-7 for use in educational contexts (Byrd-Bredbenner et al., 2020; Casares et al., 2024; Khoury-Malhame et al., 2025). In contrast, studies involving general community and clinical populations showed greater variability in optimal cut-off scores and criterion validity, likely reflecting differences in symptom severity, health literacy, and clinical presentation. These subgroup-specific patterns indicate that while the GAD-7 is structurally stable, its applied interpretation benefits from contextual calibration, particularly in non-clinical or mixed-population settings.

The strong convergent validity observed between the GAD-7 and related instruments—including the PHQ-9, EPDS, PTSD Checklist, and BAI—across multiple countries reinforces its capacity to accurately capture anxiety symptoms in both clinical and non-clinical contexts (Casares et al., 2024; Khoury-Malhame et al., 2025; Lutkiewicz et al., 2024). Rather than reflecting construct redundancy, these associations align with contemporary dimensional and transdiagnostic models of mental health, in which anxiety commonly co-occurs with depressive and stress-related symptoms across populations (Stade et al., 2025; Ziebold et al., 2019).

Interpretation of cut-off score variability further underscores the importance of contextualized application. While a threshold of $\geqslant 10$ was most frequently supported across studies (Dhira et al., 2021; Krizova et al., 2024; López et al., 2025), lower cut-off values identified in primary care and medically vulnerable populations suggest heightened sensitivity to anxiety symptoms in these contexts (Liu et al., 2023; Vrublevska et al., 2022). Cultural norms surrounding emotional expression, stigma, and access to

mental health services may also shape response patterns, highlighting the limitations of applying a single universal cut-off across diverse populations.

Methodological considerations further inform cross-study interpretation. The predominance of online data collection in student samples may contribute to more homogeneous responses and higher internal consistency estimates, whereas offline or mixed-mode approaches used in classroom, clinical, and community settings capture broader population diversity (Zager et al., 2023; Zhang et al., 2017). These mode-of-administration differences, observed across the reviewed studies, may partly account for variations in psychometric outcomes, consistent with prior evidence on survey modality effects in mental health research (Adwi et al., 2025; Zager et al., 2023).

Overall, this review advances the literature by moving beyond isolated validation findings to provide an integrated, cross-contextual interpretation of the GAD-7's psychometric performance. By consolidating evidence across cultural, educational, and community-based settings, the findings demonstrate that the GAD-7 is both a robust and adaptable screening instrument. At the same time, the results underscore that psychometric equivalence does not imply contextual uniformity, emphasizing the need for population-specific interpretation. Future research should prioritize longitudinal designs, standardized invariance testing, and clinically anchored validation studies to further refine subgroup-specific cut-off scores and strengthen the cross-cultural applicability of the GAD-7, particularly within educational and community-based mental health programs.

Relevance to clinical practice

The findings of this systematic review indicate that the GAD-7 is a practical, reliable, and easily applicable screening instrument for anxiety across a range of clinical and educational contexts (see Table 2). In educational settings, the GAD-7 can be used for routine screening among students in schools and universities, facilitating early identification of anxiety symptoms and supporting the implementation of targeted mental health promotion and intervention programs. This application is particularly relevant in developing countries, where resource constraints often limit access to comprehensive psychological assessment services.

In primary care and community-based settings, the simplicity, brevity, and cost-effectiveness of the GAD-7 make it well suited for large-scale screening initiatives, enabling the early detection of individuals at increased risk of anxiety disorders. Integration of the GAD-7 into routine health assessments may contribute to improved referral pathways and timely access to mental health services, particularly in low-resource contexts.

In clinical practice, the GAD-7 can function both as an initial screening tool and as a monitoring instrument for tracking changes in anxiety symptom severity over time. However, interpretation of GAD-7 scores should consider population-specific characteristics, including cultural norms, clinical status, and contextual factors that may influence symptom reporting. Further cross-cultural and longitudinal validation research remains necessary to enhance the precision of cut-off scores and to strengthen global

measurement accuracy in psychometric assessment.

At the policy level, the GAD-7 offers a feasible option for adoption as a standardized national screening instrument to support population-level monitoring and prevention of anxiety disorders. Its use within educational and public health systems may facilitate evidence-based planning and allocation of mental health resources, particularly in developing regions where scalable and validated screening tools are urgently needed.

CONCLUSION

This systematic review concludes that the Generalized Anxiety Disorder-7 (GAD-7) is a valid, reliable, and practical screening instrument for assessing anxiety among students and general populations in developing countries. Across diverse cultural and educational contexts, the GAD-7 consistently demonstrated a stable unidimensional structure and strong psychometric properties, supporting its applicability in both educational and community-based settings. While a cut-off score of $\geqslant 10$ is most frequently supported, the evidence indicates that lower cut-off thresholds (e.g., $\geqslant 5$ or $\geqslant 4$) may be more appropriate in specific cultural, community, or clinical contexts, depending on population characteristics and screening objectives.

Accordingly, the use of culturally and contextually calibrated cut-off scores is recommended to enhance screening accuracy and interpretive validity. Overall, the findings underscore that the GAD-7 represents an accessible and evidence-based tool for early detection and monitoring of anxiety, particularly in low-resource and educational settings. By synthesizing fragmented validation evidence across developing-country contexts, this review contributes to a clearer and more integrated understanding of the GAD-7's cross-cultural applicability, thereby supporting informed use in research, clinical practice, and public mental health initiatives.

ACKNOWLEDGMENT

This research was made possible through financial support from the Directorate of Research, Technology, and Community Service under the Master's Thesis Research Grant (064/C3/DT.05.00/PL/2025). The authors gratefully acknowledge this support, as well as the institutional contribution of the Master of Nursing Program, Faculty of Health Sciences, Universitas Brawijaya, Malang, which facilitated the completion of this study.

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