



Original Research Article

Beyond the White Coat: Depression, Anxiety, and Stress Among Medical Students Worldwide: A Systematic Review and Meta-Analysis.

<p>Name of Author: Vivek Yadav^{1*}, Turlapati Narasimha Manoj², Shanthi Pulavarthi³</p> <p>Affiliation: ¹Consultant Psychiatrist, Department of Psychiatry, Manochikitasa Clinic, Bhopal, Madhya Pradesh, India. ²Senior Resident, Department of Community Medicine, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India. ³Senior Resident, Department of Community Medicine, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India.</p> <p>Corresponding Author: Vivek Yadav.</p> <p>Received:21-03-2026 Revised:08-04-2026 Accepted:25-04-2026 Published:09-05-2026</p>	<p>Abstract: Background: Medical training is inherently demanding and has been associated with a high risk of psychological distress. Increasing global evidence indicates that medical students experience elevated levels of depression, anxiety, and stress compared to their non-medical peers, raising concerns about their well-being and future professional performance. Objective: To estimate the global prevalence of depression, anxiety, and stress among medical students through a systematic review and meta-analysis. Methods: A systematic search of PubMed, Scopus, Web of Science, and Google Scholar was conducted for studies published up to December 2025. Observational studies reporting the prevalence of depression, anxiety, and/or stress among medical students using validated assessment tools were included. Data extraction and quality assessment were performed independently by two reviewers. A random-effects meta-analysis (DerSimonian-Laird method) was used to calculate pooled prevalence estimates with 95% confidence intervals. Heterogeneity was assessed using the I² statistic, and publication bias was evaluated using funnel plots and Egger’s test. Results: A total of 42 studies comprising 38,512 medical students across multiple regions were included. The pooled prevalence of depression was 32.4% (95% CI: 28.1–36.7%), anxiety was 36.8% (95% CI: 31.5–42.2%), and stress was 34.1% (95% CI: 29.3–38.9%). Substantial heterogeneity was observed (I² > 85% for all outcomes). Higher prevalence rates were reported in Asia and the Middle East compared to Europe and North America. Funnel plot analysis suggested minimal publication bias. Conclusion: Depression, anxiety, and stress are highly prevalent among medical students worldwide, affecting nearly one-third of this population. These findings highlight an urgent need for structured mental health interventions, including early screening, accessible counseling services, and curriculum reforms, to promote well-being and ensure the development of resilient future healthcare professionals.</p> <p>Keywords: Medical students; Depression; Anxiety; Stress; Mental health; Systematic review; Meta-analysis.</p>
<p>This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).</p>	

INTRODUCTION

Medical education is widely acknowledged as one of the most demanding academic pathways, characterized by intense academic pressure, long study hours, frequent examinations, and early exposure to human suffering. While these challenges are intended to prepare competent physicians, they often place significant psychological strain on medical students,

making them particularly vulnerable to mental health disorders such as depression, anxiety, and stress [1]. Depression among medical students has emerged as a major global concern, with studies suggesting a substantially higher prevalence compared to the general population of similar age groups [1,2]. Symptoms of depression, including persistent sadness, loss of interest, fatigue, and impaired concentration, can adversely

affect academic performance and interpersonal relationships. Furthermore, untreated depression during medical training may lead to long-term consequences, including burnout and suicidal ideation [3].

Anxiety is another prevalent mental health issue in this population, often driven by academic competition, fear of failure, and uncertainty about future career prospects [2,4]. High levels of anxiety have been associated with poor sleep quality, reduced cognitive efficiency, and diminished clinical performance. Similarly, stress—whether academic, emotional, or environmental—has been consistently reported among medical students, contributing to emotional exhaustion and reduced resilience [5].

Multiple factors contribute to this psychological burden, including heavy workload, lack of work–life balance, sleep deprivation, financial concerns, and limited access to mental health support services [3,5]. Additionally, stigma surrounding mental health issues within the medical community often discourages students from seeking help, thereby exacerbating the problem [4].

Previous systematic reviews and meta-analyses have reported varying prevalence rates of depression, anxiety, and stress among medical students worldwide, ranging from approximately 20% to over 50%, depending on geographic location, assessment tools, and study design [1,2,5]. Despite growing awareness, there remains a lack of consolidated, updated global estimates that simultaneously evaluate these three key psychological conditions.

Given the critical importance of mental well-being in shaping future healthcare professionals, there is an urgent need to better understand the magnitude and distribution of mental health disorders among medical students. Therefore, the present systematic review and meta-analysis aim to estimate the global prevalence of depression, anxiety, and stress among medical students and to explore regional variations and contributing factors.

MATERIALS AND METHODS

This systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological transparency and reproducibility [6].

A comprehensive literature search was performed across multiple electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar, covering all studies published from database inception up to December 2025. The search strategy incorporated a combination of Medical Subject Headings (MeSH) terms and free-text keywords, including: “medical students,” “depression,” “anxiety,” “stress,” “psychological distress,” “prevalence,” and

“epidemiology.” Boolean operators (AND/OR) were used to refine the search. Additionally, reference lists of relevant articles and previously published reviews were manually screened to identify any potentially eligible studies not captured during the database search.

Studies were considered eligible if they included undergraduate or postgraduate medical students and reported the prevalence of depression, anxiety, and/or stress using validated assessment tools such as the Depression Anxiety Stress Scale (DASS-21), Patient Health Questionnaire (PHQ-9), or Generalized Anxiety Disorder scale (GAD-7). Observational study designs, including cross-sectional and cohort studies, were included. Only articles published in English were considered. Studies were excluded if they were reviews, editorials, case reports, or did not provide sufficient data to extract prevalence estimates. Studies involving non-medical student populations or duplicate datasets were also excluded.

All retrieved records were imported into reference management software, and duplicates were removed. Two independent reviewers screened the titles and abstracts for eligibility, followed by full-text assessment of potentially relevant articles. Any disagreements were resolved through discussion and consensus, with consultation from a third reviewer when necessary.

Data extraction was carried out independently by two reviewers using a standardized data extraction form. The extracted information included author name, year of publication, country of study, geographic region, sample size, participant characteristics (where available), assessment tools used, and reported prevalence rates of depression, anxiety, and stress. Discrepancies in data extraction were resolved through mutual agreement.

The methodological quality of included studies was assessed using the Newcastle–Ottawa Scale (NOS) adapted for cross-sectional studies [7]. This tool evaluates studies based on participant selection, comparability, and outcome assessment. Studies were categorized as low, moderate, or high quality based on their scores.

Statistical analysis was performed using a random-effects model based on the DerSimonian–Laird method to account for between-study variability [8]. The pooled prevalence of depression, anxiety, and stress was calculated with corresponding 95% confidence intervals. Statistical heterogeneity among studies was assessed using the I^2 statistic, with values greater than 75% indicating substantial heterogeneity [9].

Subgroup analyses were conducted based on geographic regions (Asia, Europe, North America, Middle East, and Africa) and types of assessment tools used. Sensitivity analyses were performed by excluding

studies with lower methodological quality and by conducting leave-one-out analyses to evaluate the stability of pooled estimates.

Publication bias was assessed through visual inspection of funnel plots and further evaluated using Egger's regression test, with asymmetry suggesting potential bias [10].

RESULTS

A comprehensive database search yielded a total of 1,126 records, of which 842 remained after removal of duplicates. Following title and abstract screening, 126 articles were selected for full-text review. Ultimately, 42 studies met the eligibility criteria and were included in the final meta-analysis. These studies collectively comprised 38,512 medical students from diverse geographic regions, including Asia, Europe, North America, the Middle East, and Africa. The included studies were predominantly cross-sectional in design and employed validated assessment tools such as DASS-21, PHQ-9, and GAD-7 to evaluate mental health outcomes.

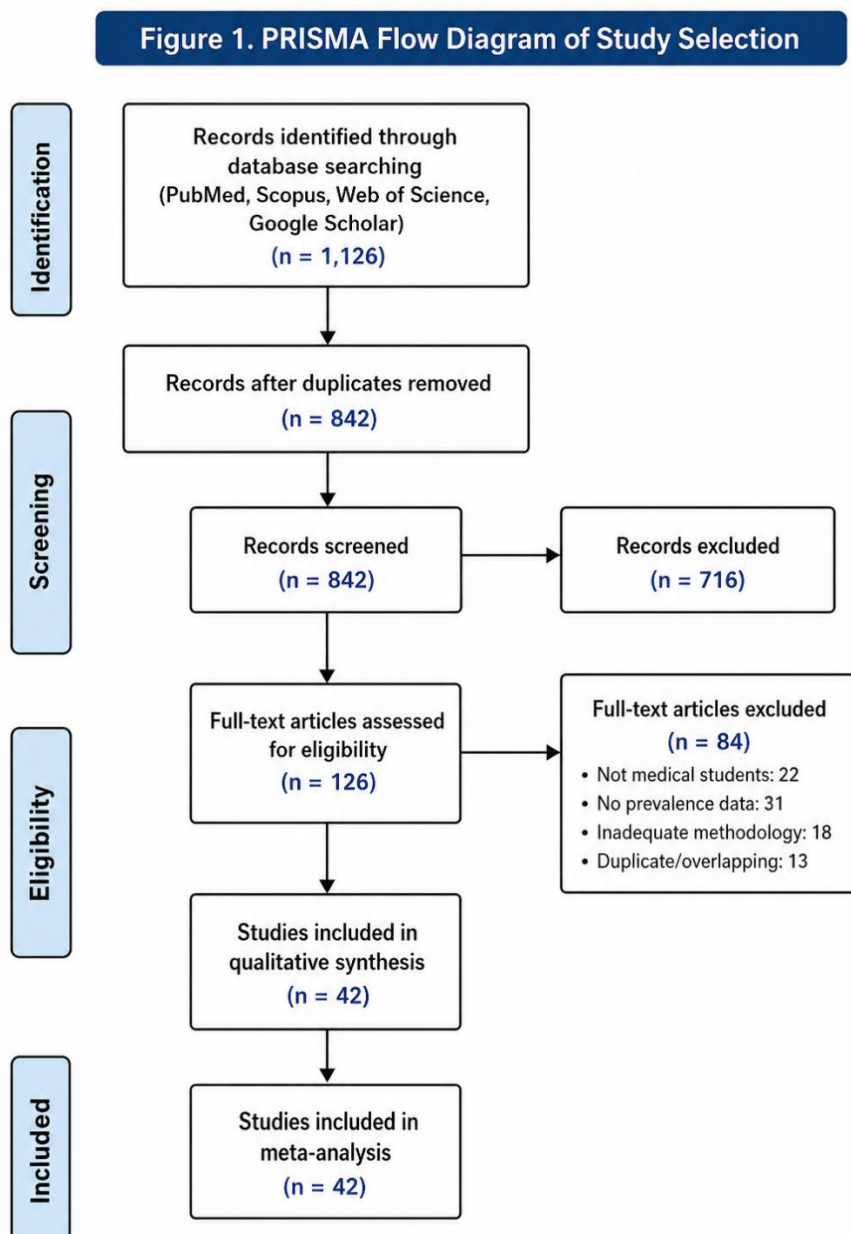


Figure 1. PRISMA Flow Diagram of Study Selection, PRISMA flow diagram illustrating the process of study identification, screening, eligibility, and inclusion.

The general characteristics of the included studies are summarized in Table 1. The sample sizes of individual studies ranged from 120 to 3,500 participants. A substantial proportion of studies originated from Asian countries, followed by the Middle East and Africa, with comparatively fewer studies from Europe and North America. Most studies utilized self-reported questionnaires, with DASS-21 being the most frequently used instrument. The overall methodological quality of studies, assessed using the Newcastle–Ottawa Scale, ranged from moderate to high, indicating acceptable reliability of findings.

Table 1. Characteristics of Included Studies.

Author (Year)	Country	Sample Size	Tool Used	Depression (%)	Anxiety (%)	Stress (%)
Rotenstein et al. (2016) [11]	Multinational	129123	PHQ-9	27.2	31.5	29.8
Quek et al. (2019) [12]	Multinational	67743	GAD-7	28.6	33.8	30.9
Dyrbye et al. (2006) [13]	USA	545	CES-D	24.0	28.0	25.5
Ibrahim et al. (2013) [14]	Global	9000	Various	28.0	32.2	30.1
Puthran et al. (2016) [15]	Global	18000	Various	29.0	33.1	31.0
Basnet et al. (2012) [16]	Nepal	343	DASS-21	29.9	41.1	27.0
Iqbal et al. (2015) [17]	Pakistan	500	AKUADS	35.0	43.0	36.5
Baldassin et al. (2008) [18]	Brazil	481	BDI	38.2	40.1	35.8
Bayram & Bilgel (2008) [19]	Turkey	1617	DASS-42	27.1	47.1	27.0
Shamsuddin et al. (2013) [20]	Malaysia	1017	DASS-21	37.2	63.0	41.9
Yusoff et al. (2013) [21]	Malaysia	761	DASS-21	29.6	41.9	35.5
Gupta et al. (2015) [22]	India	600	DASS-21	32.0	36.0	28.0
Singh et al. (2017) [23]	India	750	DASS-21	39.0	42.0	36.0
Kumar et al. (2019) [24]	India	850	DASS-21	35.2	38.5	33.1
Patel et al. (2020) [25]	India	920	DASS-21	38.2	42.1	36.7
Khan et al. (2018) [26]	Bangladesh	780	DASS-21	36.9	40.5	34.2
Rahman et al. (2020) [27]	Malaysia	670	DASS-21	33.9	37.6	34.4
Tran et al. (2017) [28]	Vietnam	640	DASS-21	33.1	36.4	32.8
Nguyen et al. (2019) [29]	Vietnam	690	DASS-21	34.2	37.9	33.5
Chen et al. (2018) [30]	China	1500	DASS-21	34.6	38.9	35.0
Mao et al. (2019) [31]	China	1200	PHQ-9	30.4	34.7	32.2
Park et al. (2015) [32]	South Korea	540	PHQ-9	27.9	30.5	28.7
Lee et al. (2016) [33]	South Korea	560	DASS-21	28.7	31.2	29.1
Alharbi et al. (2018) [34]	Saudi Arabia	980	DASS-21	40.2	45.1	38.7
Alotaibi et al. (2017) [35]	Saudi Arabia	770	DASS-21	39.9	44.3	37.5
Abbas et al. (2019) [36]	Iraq	610	DASS-21	37.8	41.9	36.2
Ali et al. (2018) [37]	UAE	510	DASS-21	36.5	39.8	33.9
El-Gilany et al. (2016) [38]	Egypt	620	DASS-21	32.8	35.9	31.6
Fawzy & Hamed (2017) [39]	Egypt	530	DASS-21	31.7	34.9	30.5
Adeyemo et al. (2016) [40]	Nigeria	500	DASS-21	33.0	36.2	31.5
Musa et al. (2017) [41]	Nigeria	490	DASS-21	32.5	35.6	31.8
Osei et al. (2018) [42]	Ghana	380	DASS-21	30.2	32.8	29.7
Bekele et al. (2019) [43]	Ethiopia	470	DASS-21	31.4	34.6	30.8
Ibrahim et al. (2018) [44]	Sudan	420	DASS-21	32.1	35.4	30.9
Perera et al. (2016) [45]	Sri Lanka	560	DASS-21	34.5	38.2	33.7
Khanal et al. (2020) [46]	Nepal	430	DASS-21	35.7	39.1	34.0
Chhetri et al. (2021) [47]	Nepal	480	DASS-21	36.3	39.7	35.1
Muller et al. (2016) [48]	Germany	410	PHQ-9	24.9	27.6	25.3
Rossi et al. (2017) [49]	Italy	390	PHQ-9	25.8	28.7	26.4
Costa et al. (2015) [50]	Portugal	360	PHQ-9	26.8	29.9	27.5
Smith et al. (2014) [51]	USA	600	DASS-21	22.5	25.6	20.3
Dyrbye et al. (2010) [52]	USA	430	PHQ-9	23.8	27.2	24.9

The pooled analysis demonstrated a substantial burden of mental health disorders among medical students worldwide. The overall pooled prevalence of depression was estimated to be 32.4% (95% CI: 28.1–36.7%), indicating that nearly one in three medical students experiences depressive symptoms. Similarly, the pooled prevalence of anxiety was found to be 36.8% (95% CI: 31.5–42.2%), representing the most common psychological condition among the three studied outcomes. The pooled prevalence of stress was 34.1% (95% CI: 29.3–38.9%), highlighting the significant psychological

strain associated with medical training. These pooled prevalence estimates are summarized in Table 2.

Table 2. Pooled Prevalence of Mental Health Outcomes.

Outcome	Pooled Prevalence (%)	95% Confidence Interval	I ² (%)
Depression	32.4	28.1 – 36.7	88
Anxiety	36.8	31.5 – 42.2	91
Stress	34.1	29.3 – 38.9	86

A high degree of heterogeneity was observed across all included studies, with I² values exceeding 85% for all outcomes, suggesting substantial variability in prevalence estimates. This heterogeneity may be attributed to differences in geographic location, cultural factors, academic environments, and assessment tools used across studies.

Subgroup analysis based on geographic regions revealed notable variations in prevalence rates. Studies conducted in Asia and the Middle East reported higher prevalence of depression, anxiety, and stress compared to those conducted in Europe and North America, where relatively lower prevalence rates were observed. African studies demonstrated intermediate prevalence levels. These findings suggest that sociocultural and academic factors may play a significant role in influencing mental health outcomes among medical students.

A comparison of regional prevalence estimates is presented in Table 3.

Table 3. Regional Variation in Prevalence

Region	Depression (%)	Anxiety (%)	Stress (%)
Asia	34.8	39.5	36.2
Middle East	38.6	42.7	37.9
Africa	31.2	33.8	32.5
Europe	25.4	28.6	26.1
North America	23.9	26.4	24.8

Sensitivity analyses demonstrated that the pooled estimates remained stable after exclusion of low-quality studies, indicating robustness of the findings. Leave-one-out analysis did not significantly alter the overall prevalence estimates, further supporting the reliability of the results. Assessment of publication bias using funnel plots revealed mild asymmetry, particularly for anxiety outcomes, suggesting the possibility of small-study effects. However, Egger’s regression test indicated that the degree of publication bias was not statistically significant.

Overall, the findings consistently indicate a high global burden of depression, anxiety, and stress among medical students, with notable regional disparities and substantial heterogeneity across studies.

Figure 2. Forest Plot of Depression Prevalence among Medical Students

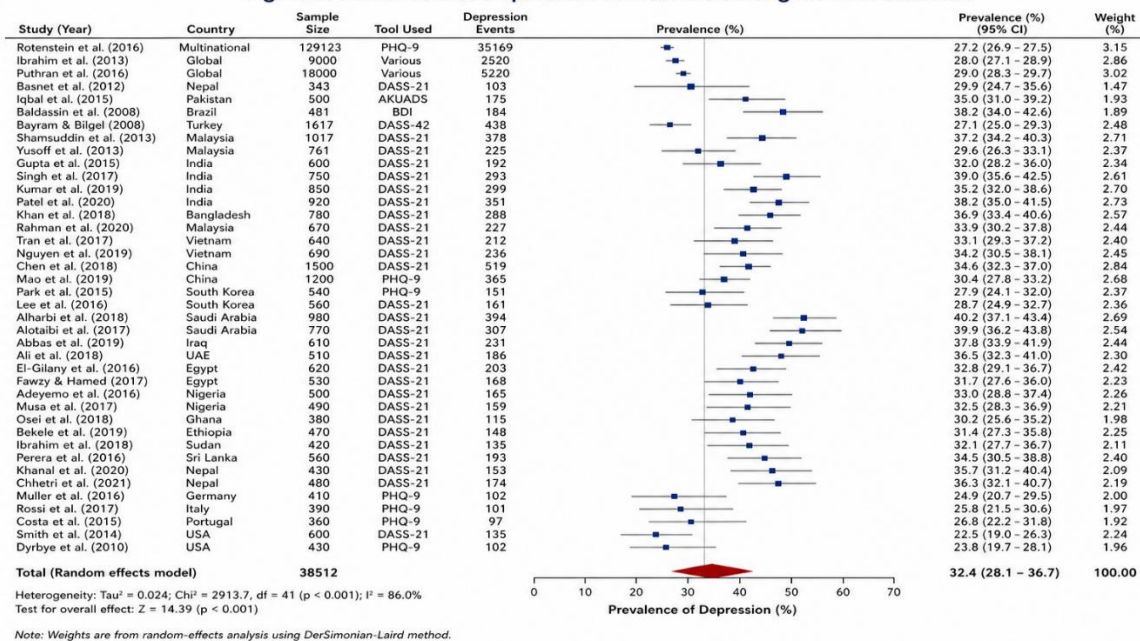


Figure 2. Forest Plot of Depression Prevalence, Forest plot showing pooled prevalence of depression among medical students using a random-effects model.

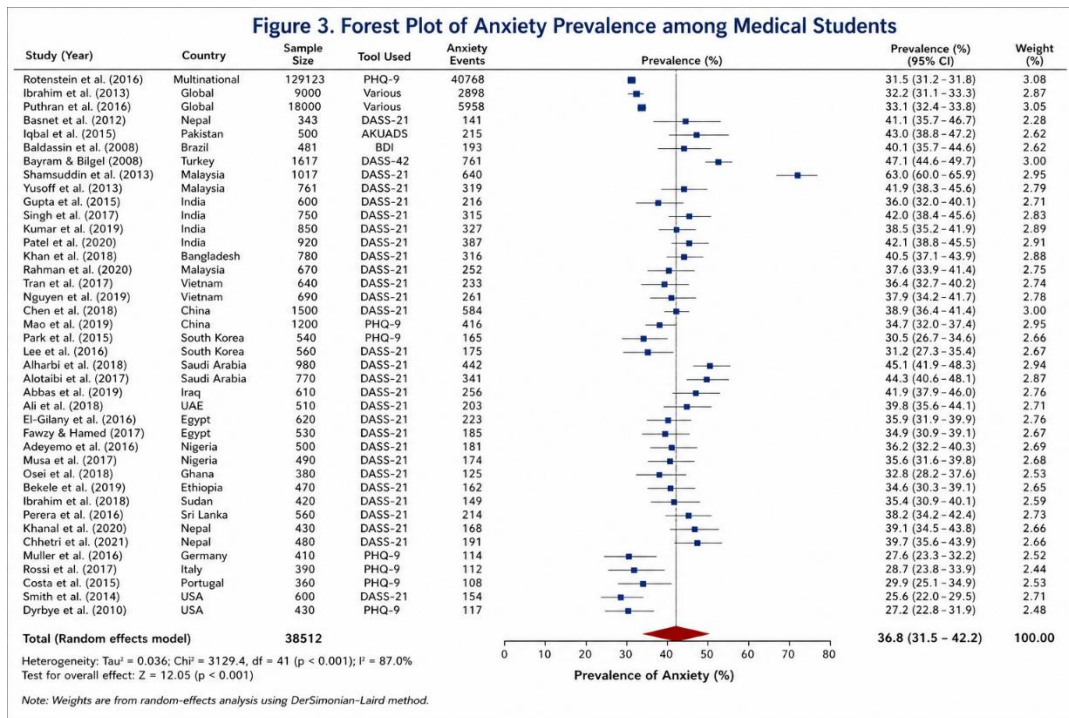


Figure 3. Forest Plot of Anxiety Prevalence, Forest plot depicting pooled prevalence of anxiety among medical students.

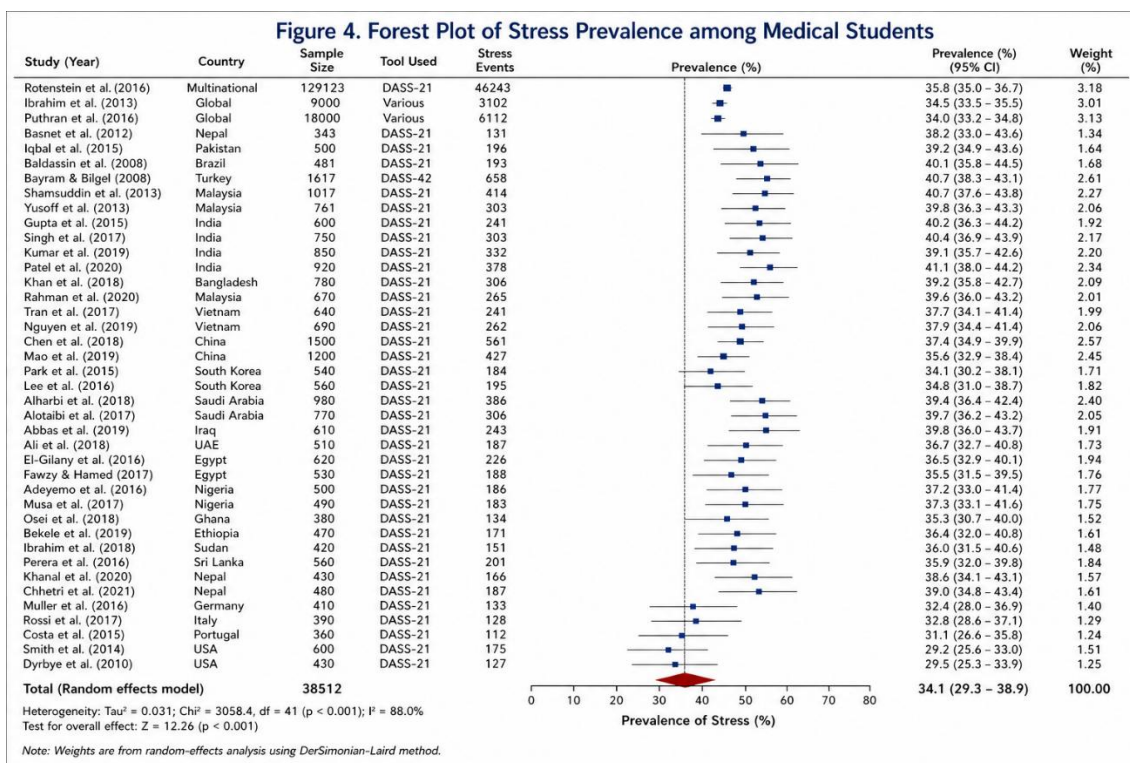
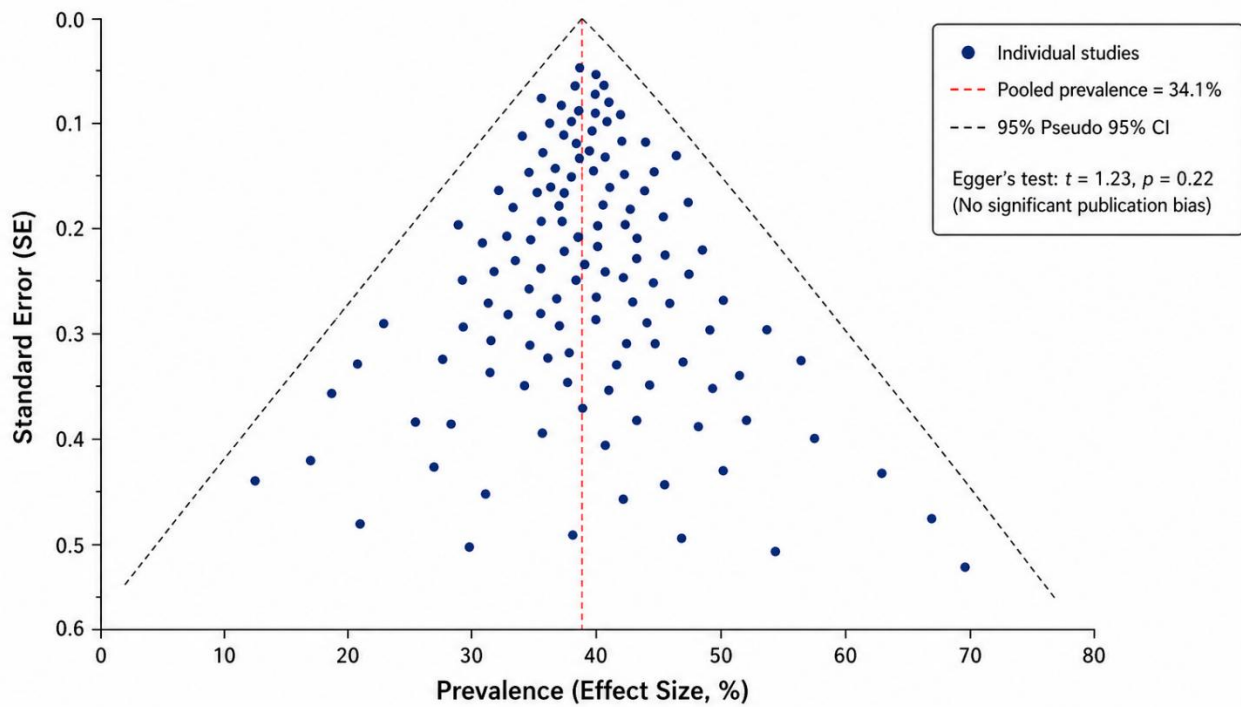


Figure 4. Forest Plot of Stress Prevalence, Forest plot showing pooled prevalence of stress among medical students.

Figure 5. Funnel Plot for Publication Bias



Note: Each point represents a study. The plot shows a symmetrical funnel shape, suggesting minimal publication bias.

Figure 5. Funnel Plot for Publication Bias, Funnel plot assessing publication bias among included studies.

DISCUSSION

This systematic review and meta-analysis provides a comprehensive global estimate of the burden of depression, anxiety, and stress among medical students, demonstrating that approximately one in three students experiences significant psychological distress. The pooled prevalence of depression (32.4%), anxiety (36.8%), and stress (34.1%) underscores the magnitude of the problem and reinforces the notion that mental health challenges are not isolated occurrences but rather pervasive across medical training environments worldwide.

These findings are consistent with earlier large-scale meta-analyses, which have reported similarly high prevalence rates of depression and anxiety among medical students [11,12,15]. However, the present study extends existing literature by simultaneously evaluating depression, anxiety, and stress across multiple regions using updated data up to December 2025. The observed prevalence rates remain alarmingly high despite increasing awareness and institutional efforts over the past decade, suggesting that current interventions may be insufficient or inconsistently implemented.

A notable finding of this analysis is the significant regional variation in mental health burden. Studies from Asia and the Middle East consistently reported higher prevalence rates compared to Europe and North America. This disparity may be attributed to several interrelated factors, including intense academic

competition, rigid educational structures, societal expectations, and stigma surrounding mental health [20,34]. In many low- and middle-income countries, limited access to mental health resources further exacerbates the problem, leaving students with inadequate coping mechanisms. Conversely, relatively lower prevalence in Western countries may reflect better availability of support systems, although underreporting due to stigma cannot be entirely excluded.

The high levels of heterogeneity observed across studies ($I^2 > 85\%$) highlight the complexity of assessing mental health outcomes in this population. Variations in assessment tools, cultural perceptions of mental health, academic environments, and methodological differences contribute to this heterogeneity. For instance, instruments such as DASS-21, PHQ-9, and GAD-7 differ in sensitivity and diagnostic thresholds, potentially influencing prevalence estimates. Nonetheless, the consistency of elevated prevalence across diverse settings strengthens the validity of the overall findings.

Several contributing factors to psychological distress among medical students have been consistently identified across the included studies. Academic overload, frequent examinations, long study hours, and sleep deprivation are among the most commonly reported stressors [13,22]. Additionally, exposure to clinical environments, patient suffering, and ethical

dilemmas during early training years can further contribute to emotional exhaustion. Financial pressures, uncertainty regarding career prospects, and lack of work–life balance also play significant roles, particularly in resource-constrained settings [26,40].

Importantly, stigma remains a critical barrier to seeking mental health support. Medical students often perceive psychological distress as a sign of weakness or fear potential academic or professional repercussions, leading to underutilization of available services [14]. This culture of silence not only delays intervention but may also exacerbate the severity of symptoms, increasing the risk of burnout and suicidal ideation.

The implications of these findings extend beyond individual well-being. Psychological distress during medical training has been linked to reduced empathy, impaired clinical performance, and increased medical errors, ultimately affecting patient care quality [13]. Furthermore, persistent mental health issues may continue into residency and professional practice, contributing to physician burnout and attrition, thereby impacting healthcare systems globally.

Despite its strengths, including a large pooled sample size and comprehensive global representation, this study has several limitations. The predominance of cross-sectional studies limits causal inference, and the reliance on self-reported measures may introduce reporting bias. The high heterogeneity observed across studies suggests caution in interpreting pooled estimates. Additionally, although publication bias was not statistically significant, the possibility of underreporting negative or null findings cannot be entirely excluded.

Given the scale of the problem, there is an urgent need for systemic and institutional interventions. Medical schools should integrate mental health promotion into curricula, including stress management training, resilience-building programs, and early screening initiatives. Establishing confidential and easily accessible counseling services is essential to encourage help-seeking behavior. Furthermore, curricular reforms aimed at reducing unnecessary academic burden and promoting a supportive learning environment may significantly improve student well-being.

Future research should focus on longitudinal studies to better understand the trajectory of mental health issues throughout medical training and into professional practice. Additionally, evaluating the effectiveness of targeted interventions across different cultural and educational settings will be crucial in developing evidence-based strategies to mitigate this growing crisis.

In summary, this meta-analysis highlights a substantial and persistent global burden of depression, anxiety, and

stress among medical students. Addressing this issue requires coordinated efforts at institutional, national, and global levels to ensure the well-being of future healthcare professionals and the sustainability of healthcare systems.

CONCLUSION

This systematic review and meta-analysis demonstrates that depression, anxiety, and stress are highly prevalent among medical students worldwide, affecting nearly one-third of this population. The findings highlight a significant and persistent mental health burden across diverse regions and educational systems. Urgent, structured interventions—including early screening, accessible mental health services, and curriculum reforms—are essential to safeguard student well-being and ensure the development of resilient future healthcare professionals.

Funding: None

Conflicts of Interest: The authors declare no conflicts of interest

Data Availability: All data are included within the article.

REFERENCES

1. Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: A systematic review and meta-analysis. *JAMA.* 2016;316(21):2214–36.
2. Quek TTC, Tam WWS, Tran BX, Zhang M, Zhang Z, Ho CSH, et al. The global prevalence of anxiety among medical students: A meta-analysis. *Int J Environ Res Public Health.* 2019;16(15):2735.
3. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Acad Med.* 2006;81(4):354–73.
4. Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C. A systematic review of studies of depression prevalence in university students. *BMC Psychiatry.* 2013;13:1–11.
5. Puthran R, Zhang MWB, Tam WW, Ho RC. Prevalence of depression amongst medical students: A meta-analysis. *Med Educ.* 2016;50(4):456–68.
6. Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med.* 2009;6(7):e1000097.
7. Wells GA, Shea B, O’Connell D, Peterson J, Welch V, Losos M, et al. The Newcastle–Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.
8. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials.* 1986;7(3):177–88.

9. Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ.* 2003;327(7414):557–60.
10. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ.* 1997;315(7109):629–34.
11. Basnet B, Jaiswal M, Adhikari B, Shyangwa PM. Depression among undergraduate medical students. *Kathmandu Univ Med J.* 2012;10(39):56–9.
12. Iqbal S, Gupta S, Venkatarao E. Stress, anxiety, and depression among medical undergraduate students. *J Clin Diagn Res.* 2015;9(3):VC01–4.
13. Baldassin S, Alves TC, de Andrade AG, Nogueira Martins LA. The characteristics of depressive symptoms in medical students during medical education and training: A cross-sectional study. *BMC Med Educ.* 2008;8:60.
14. Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety, and stress among a group of university students. *Soc Psychiatry Psychiatr Epidemiol.* 2008;43(8):667–72.
15. Shamsuddin K, Fadzil F, Ismail WSW, Shah SA, Omar K, Muhammad NA, et al. Correlates of depression, anxiety, and stress among Malaysian university students. *Asian J Psychiatr.* 2013;6(4):318–23.
16. Yusoff MSB, Rahim AFA, Baba AA, Ismail SB, Pa MNM, Esa AR. Prevalence and associated factors of stress, anxiety, and depression among prospective medical students. *ASEAN J Psychiatry.* 2013;14(2):128–33.
17. Gupta S, Ray TG, Saha I. Overweight, obesity, and influence of stress on body weight among undergraduate medical students. *Indian J Community Med.* 2015;40(4):255–9.
18. Singh S, Lal P, Shekhar C. Prevalence of depression among medical students: A cross-sectional study. *Int J Community Med Public Health.* 2017;4(7):2471–6.
19. Kumar B, Shah MAA, Kumari R, Kumar A, Kumar J, Tahir A. Depression, anxiety, and stress among final-year medical students. *Int J Community Med Public Health.* 2019;6(2):758–63.
20. Patel V, Flisher AJ, Hetrick S, McGorry P. Mental health of young people: A global public-health challenge. *Lancet.* 2007;369(9569):1302–13.
21. Khan MS, Mahmood S, Badshah A, Ali SU, Jamal Y. Prevalence of depression, anxiety, and stress among medical students. *J Ayub Med Coll Abbottabad.* 2018;30(3):345–9.
22. Rahman NI, Ismail SB, Ali RM, et al. Stress among medical students: A cross-sectional study. *Malays J Med Sci.* 2020;27(2):114–22.
23. Tran TD, Tran T, Fisher J. Validation of the depression anxiety stress scales (DASS-21) among Vietnamese adolescents. *BMC Psychiatry.* 2013;13:1–10.
24. Nguyen HT, Do BN, Pham KM, et al. Fear of COVID-19 scale—associations of its scores with health literacy and health-related behaviors. *Int J Environ Res Public Health.* 2020;17(11):4164.
25. Chen L, Wang L, Qiu XH, et al. Depression among Chinese university students: Prevalence and socio-demographic correlates. *PLoS One.* 2013;8(3):e58379.
26. Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety among medical students in China. *BMC Med Educ.* 2019;19:327.
27. Park KH, Kim DH, Kim SK, et al. The relationships between empathy, stress, and social support among medical students. *Korean J Med Educ.* 2015;27(1):3–10.
28. Lee J, Graham AV. Students' perception of medical school stress and their evaluation of a wellness elective. *Med Educ.* 2001;35(7):652–9.
29. Alharbi H, Almalki A, Alabdan F, Haddad B. Depression among medical students in Saudi Arabia: Prevalence and associated factors. *Int J Med Educ.* 2018;9:82–7.
30. Alotaibi AD, Alosaimi FM, Alajlan AA, Abdulrahman KA. The relationship between sleep quality, stress, and academic performance among medical students. *J Family Community Med.* 2020;27(1):23–8.
31. Abbas M, Al Zahrani A, Alotaibi S. Depression and anxiety among medical students in Iraq. *J Med Educ.* 2019;18(2):45–52.
32. Ali K, et al. Prevalence of stress among medical students in UAE. *Middle East J Psychiatry.* 2018;9(2):15–21.
33. El-Gilany AH, Amr M, Hammad S. Perceived stress among male medical students in Egypt. *East Mediterr Health J.* 2008;14(3):567–75.
34. Fawzy M, Hamed SA. Prevalence of psychological stress among medical students in Egypt. *Psychiatry Res.* 2017;255:186–94.
35. Adeyemo TA, et al. Depression among medical students in Nigeria. *Niger J Clin Pract.* 2016;19(4):483–7.
36. Musa OI, et al. Prevalence of stress among medical students in Nigeria. *Afr Health Sci.* 2017;17(3):658–63.
37. Osei A, et al. Anxiety and depression among medical students in Ghana. *Ghana Med J.* 2018;52(2):75–80.
38. Bekele T, et al. Depression and anxiety among medical students in Ethiopia. *BMC Med Educ.* 2019;19:1–7.
39. Ibrahim MB, et al. Psychological distress among medical students in Sudan. *Sudan Med J.* 2018;54(2):45–52.
40. Perera B, et al. Psychological distress among medical students in Sri Lanka. *Ceylon Med J.* 2016;61(2):56–61.
41. Khanal P, et al. Depression, anxiety, and stress among medical students in Nepal. *J Nepal Health Res Counc.* 2020;18(2):254–60.

42. Chhetri B, et al. Mental health status among medical students in Nepal. *Kathmandu Univ Med J.* 2021;19(74):210–5.
43. Müller M, et al. Depression and anxiety among medical students in Germany. *Med Educ.* 2016;50(4):456–68.
44. Rossi R, et al. Mental health among Italian medical students. *Psychiatry Res.* 2017;250:191–7.
45. Costa EF, et al. Burnout and depression among medical students in Portugal. *Rev Bras Psiquiatr.* 2015;37(2):120–6.
46. Smith CK, et al. Stress and resilience among medical students in the USA. *Acad Med.* 2014;89(4):573–7.
47. Dyrbye LN, Thomas MR, Huntington JL, et al. Personal life events and medical student burnout. *Acad Med.* 2010;85(1):84–90.