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Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students:

A Systematic Review and Meta-Analysis

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Abstract

IMPORTANCE—Medical students are at high risk for depression and suicidal ideation. However, the prevalence estimates of these disorders vary between studies.

OBJECTIVE—To estimate the prevalence of depression, depressive symptoms, and suicidal ideation in medical students.

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DATA SOURCES AND STUDY SELECTION—Systematic search of EMBASE, ERIC, MEDLINE, psycARTICLES, and psycINFO without language restriction for studies on the prevalence of depression, depressive symptoms, or suicidal ideation in medical students published before September 17, 2016. Studies that were published in the peer-reviewed literature and used validated assessment methods were included.

DATA EXTRACTION AND SYNTHESIS—Information on study characteristics; prevalence of depression or depressive symptoms and suicidal ideation; and whether students who screened positive for depression sought treatment was extracted independently by 3 investigators. Estimates were pooled using random-effects meta-analysis. Differences by study-level characteristics were estimated using stratified meta-analysis and meta-regression.

MAIN OUTCOMES AND MEASURES—Point or period prevalence of depression, depressive symptoms, or suicidal ideation as assessed by validated questionnaire or structured interview.

RESULTS—Depression or depressive symptom prevalence data were extracted from 167 crosssectional studies (n = 116628) and 16 longitudinal studies (n = 5728) from 43 countries. All but 1 study used self-report instruments. The overall pooled crude prevalence of depression or depressive symptoms was 27.2% (37 933/122 356 individuals; 95% CI, 24.7% to 29.9%, $l^2 =$ 98.9%). Summary prevalence estimates ranged across assessment modalities from 9.3% to 55.9%. Depressive symptom prevalence remained relatively constant over the period studied (baseline survey year range of 1982–2015; slope, 0.2% increase per year [95% CI, -0.2% to 0.7%]). In the 9 longitudinal studies that assessed depressive symptoms before and during medical school (n = 2432), the median absolute increase in symptoms was 13.5% (range, 0.6% to 35.3%). Prevalence estimates did not significantly differ between studies of only preclinical students and studies of only clinical students (23.7% [95% CI, 19.5% to 28.5%] vs 22.4% [95% CI, 17.6% to 28.2%]; P = .72). The percentage of medical students screening positive for depression who sought psychiatric treatment was 15.7% (110/954 individuals; 95% CI, 10.2% to 23.4%, P = 70.1%). Suicidal ideation prevalence data were extracted from 24 cross-sectional studies ($n = 21\ 002$) from 15 countries. All but 1 study used self-report instruments. The overall pooled crude prevalence of suicidal ideation was 11.1% (2043/21 002 individuals; 95% CI, 9.0% to 13.7%, $\hat{I}^2 = 95.8\%$). Summary prevalence estimates ranged across assessment modalities from 7.4% to 24.2%.

CONCLUSIONS AND RELEVANCE—In this systematic review, the summary estimate of the prevalence of depression or depressive symptoms among medical students was 27.2% and that of suicidal ideation was 11.1%. Further research is needed to identify strategies for preventing and treating these disorders in this population.

Studies have suggested that medical students experience high rates of depression and suicidal ideation.¹ However, estimates of the prevalence of depression or depressive symptoms among students vary across studies from 1.4% to 73.5%,^{2,3} and those of suicidal ideation vary from 4.9% to 35.6%.^{4,5} Studies also report conflicting findings about whether student depression and suicidality vary by undergraduate year, sex, or other characteristics.^{6–11}

Reliable estimates of depression and suicidal ideation prevalence during medical training are important for informing efforts to prevent, treat, and identify causes of emotional distress among medical students,¹² especially in light of recent work revealing a high prevalence of

depression in resident physicians.¹³ We conducted a systematic review and meta-analysis of published studies of depression, depressive symptoms, and suicidal ideation in undergraduate medical trainees.

Methods

Search Strategy and Study Eligibility

Two authors (M.A.R. and D.A.M.) independently identified cross-sectional and longitudinal studies published prior to September 17, 2016, that reported on the prevalence of depression, depressive symptoms, or suicidal ideation in medical students by systematically searching EMBASE, ERIC, MEDLINE, psycARTICLES, and psycINFO. In addition, the authors screened the reference lists of identified articles and corresponded with study investigators using the approaches implied by the Preferred Reporting Items for Systematic Reviews and Meta-analyses and Meta-analysis of Observational Studies in Epidemiology reporting guidelines.^{14,15}

For the database searches, terms related to medical students and study design were combined with those related to depression and suicide without language restriction (complete details of the search strategy appear in eMethods 1 in the Supplement). Included studies (1) reported data on medical students, (2) were published in peer-reviewed journals, and (3) used a validated method to assess for depression, depressive symptoms, or suicidal ideation.¹⁶ A third author (L.S.R.) resolved discrepancies by discussion and adjudication.

Data Extraction and Quality Assessment

Three authors (L.S.R., M.T., and J.B.S.) independently extracted the following data from each article using a standardized form: study design; geographic location; years of survey; year in school; sample size; average age of participants; number and percentage of male participants; diagnostic or screening method used; outcome definition (ie, specific diagnostic criteria or screening instrument cutoff); and reported prevalence estimates of depression, depressive symptoms, or suicidal ideation. Whether students who screened positive for depression sought psychiatric or other mental health treatment also was extracted. When there were studies involving the same population of students, only the most comprehensive or recent publication was included.

The same 3 authors independently assessed the risk of bias of these nonrandomized studies using a modified version of the Newcastle-Ottawa scale, which assesses sample representativeness and size, comparability between respondents and nonrespondents, ascertainment of depressive or suicidal symptoms, and thoroughness of descriptive statistics reporting (complete details regarding scoring appear in eMethods 2 in the Supplement).¹⁷ Studies were judged to be at low risk of bias (3 points) or high risk of bias (<3 points). A fourth author (D.A.M.) resolved discrepancies through discussion and adjudication.

Data Synthesis and Analysis

Prevalence estimates of depression or depressive symptoms and suicidal ideation were calculated by pooling the study-specific estimates using random-effects meta-analyses that

accounted for between-study heterogeneity.¹⁸ The same approach was used to estimate the summary percentage of students screening positive for depression who sought treatment. When studies reported point prevalence estimates made at different periods within the year, the overall period prevalence was used. Standard χ^2 tests and the I^2 statistic (ie, the percentage of variability in prevalence estimates due to heterogeneity rather than sampling error, or chance, with values 75% indicating considerable heterogeneity) were used to assess between-study heterogeneity.^{19,20}

Sensitivity analyses were performed by serially excluding each study to determine the influence of individual studies on the overall prevalence estimates. Results from studies grouped according to prespecified study-level characteristics were compared using stratified meta-analysis (for diagnostic criteria or screening instrument cutoff, study design, undergraduate level, continent or region, country, and Newcastle-Ottawa Scale components) or random-effects meta-regression (for year of baseline survey, age, and sex).^{21,22} To isolate associations within the medical school experience from associations with assessment tools, an analysis restricted to longitudinal studies reporting both pre- and intramedical school depressive symptom prevalence estimates was performed.

Bias secondary to small study effects was investigated using funnel plots and the Egger test.^{23,24} All analyses were performed using R version 3.2.3 (R Foundation for Statistical Computing).²⁵ Statistical tests were 2-sided and used a significance threshold of P < .05.

Results

Study Characteristics

One hundred ninety-five studies^{2–11,26–210} involving a total of 129 123 individuals in 47 countries were included in the analysis (Figure 1). The median number of participants per study was 336 (range, 44–10 140). One hundred sixty-seven cross-sectional studies^{2–4,6–9,11,26–184} (n = 116 628) and 16 longitudinal studies^{10,196–210} (n = 5728) in 43 countries reported on depression or depressive symptom prevalence (Table 1). Twenty-four cross-sectional studies (n = 21 002) in 15 countries reported on the prevalence of suicidal ideation (Table 2),^{4,5,34,62,65,73,74,79,112,160,165,167,174,185–195}

Medical student training level, continent or region, country, diagnostic criteria or screening instrument cutoff, and total Newcastle-Ottawa scores for the studies appear in eTable 1 in the Supplement. Newcastle-Ottawa score components for all 195 individual studies appear in eTable 2 in the Supplement.

Prevalence of Depression or Depressive Symptoms Among Medical Students

Meta-analytic pooling of the prevalence estimates of depression or depressive symptoms reported by 183 studies yielded a crude summary prevalence of 27.2% (37 933/122 356 individuals; 95% CI, 24.7%–29.9%), with significant evidence of between-study heterogeneity (Q = 16721.1, $\tau^2 = 0.78$, $I^2 = 98.9\%$, P < .001) (Figures 2, 3, 4, 5, and 6). The prevalence estimates reported by the individual studies ranged from 1.4% to 73.5%. Sensitivity analysis, in which the meta-analysis was serially repeated after exclusion of each

study, demonstrated that no individual study affected the overall prevalence estimate by more than 0.3% (eTable 3 in the Supplement).

To further characterize the range of depression or depressive symptom prevalence estimates identified by these methodologically diverse studies, meta-analyses stratified by screening instrument and cutoff score were conducted (Figure 7). Summary prevalence estimates ranged from 9.3% (157/1234 individuals [95% CI, 5.3%–15.7%]; Q = 19.7, $\tau^2 = 0.24$, $I^2 = 84.8\%$) for the Hospital Anxiety and Depression Scale with a cutoff score of 11 or greater to 55.9% (540/1039 individuals [95% CI, 45.1%–66.2%]; Q = 32.9, $\tau^2 = 0.18$, $I^2 = 90.9\%$) for the Aga Khan University Anxiety and Depression Scale with a cutoff score of 19 or greater. The median summary prevalence was 32.4% (5042/19 160 individuals [95% CI, 25.8%–39.7%]; Q = 1665.3, $\tau^2 = 0.62$, $I^2 = 98.6\%$) for the Beck Depression Inventory (BDI) with a cutoff score of 10 or greater.

Among medical students who screened positive for depression, 15.7% (110/954 individuals [95% CI, 10.2%–23.4%]; Q = 20.1, $\tau^2 = 0.26$, $I^2 = 70.1\%$) reportedly sought psychiatric or other mental health treatment as assessed by a subset of 7 studies reporting this information (eFigure 1 in the Supplement).

Prevalence of Depression or Depressive Symptoms by Study-Level Characteristics

No statistically significant differences in prevalence estimates were noted between crosssectional studies (36 632/116 628 [27.3%; 95%CI, 24.7%–30.1%]) and longitudinal studies (1301/5728 [26.7%; 95%CI, 19.1%–36.1%]) (test for subgroup differences, Q = 0.02, P = .90) or studies performed in the United States (14 356/36 249 [26.7%; 95% CI, 22.5%– 31.3%]) compared with those performed outside the United States (23 577/86 107 [27.4%; 95% CI, 24.5%–30.6%]) (Q = 0.08, P = .78). Studies were further stratified by continent or region in Figure 8. Prevalence estimates from studies limited to preclinical students (4866/25 462 [23.7%; 95% CI, 19.5%–28.5%]) did not significantly differ from estimates from studies limited to clinical students (2917/13 172 [22.4%; 95% CI, 17.6%–28.2%]) (Q =0.13, P = .72).

Prevalence estimates did not significantly vary with baseline survey year (survey year range, 1982–2015; slope = 0.2% 1-year increase [95%CI, -0.2%to0.7%]; Q = 1.17, P = .28). There Were no significant associations between prevalence and mean or median age (slope = 0.2% per 1-year increase [95%CI, -1.4% to 1.8%]; Q = 0.07, P = .79) or sex (slope = -1.1% per percentage increase in male study participants [95% CI, -15.9% to 13.7%]; Q = 0.02, P = .88).

When evaluated by Newcastle-Ottawa criteria, higher prevalence estimates were found among studies with more representative participant populations (24 366/68 693; 36.3% [95%CI, 29.9%–43.3%]) compared with those with less representative participant populations (13 567/53 663; 25.4% [95% CI, 22.8%–28.2%]) (Q = 9.6, P = .002; Figure 9). There were no statistically significant differences in prevalence estimates when studies were stratified by sample size, respondent and nonrespondent comparability, validity of ascertainment of depression or depressive symptoms (details regarding determination of screening instrument validity appear in eMethods 2 in the Supplement), thoroughness of

descriptive statistics reporting, or total Newcastle-Ottawa score (P>.05 for all comparisons).

Heterogeneity Within Depression Screening Instruments

To identify potential sources of heterogeneity independent of assessment modality, heterogeneity was examined within subgroups of studies using common instruments when at least 6 studies were available (complete results appear in eTable 4 in the Supplement). No significant differences between cross-sectional and longitudinal studies were observed within any instruments when at least 3 studies were in each comparator subgroup.

Heterogeneity was partially accounted for by country with US studies yielding lower depression or depressive symptom prevalence estimates than non-US studies among the 24 studies using the BDI and a cutoff score of 10 or greater (13.0% vs 37.5%, respectively; Q = 12.7, P < .001) and the 13 studies using the Center for Epidemiological Studies Depression Scale (CES-D) and a cutoff score of 16 or greater (34.4% vs 50.3%; Q = 3.8, P = .05). However, this difference was not seen among other instruments.

Level of training did not significantly contribute to between study heterogeneity among any of the examined instruments. Year of baseline survey significantly contributed to observed statistical heterogeneity among 3 instruments, although the results were inconsistent (ie, 2 analyses suggested that depression was increasing with time, whereas a third suggested it was decreasing). Age and sex were not significantly associated with depression prevalence among any instruments.

Analysis of Longitudinal Studies

The temporal relationship between exposure to medical school and depressive symptoms was assessed in an analysis of 9 longitudinal studies that measured depressive symptoms before and during medical school (Table 3). Because studies used different assessment instruments, the relative change in depressive symptoms was calculated for each study individually (ie, follow-up prevalence divided by baseline prevalence) and then the relative changes derived from the individual studies were examined. Overall, the median absolute increase in depressive symptoms was 13.5% (range, 0.6%–35.3%) following the onset of medical training.

Prevalence of Suicidal Ideation Among Medical Students

In an analysis of 24 studies, the crude summary prevalence of suicidal ideation, variably reported as having occurred over the past 2 weeks to the past 12 months, was 11.1% (2043/21 002 individuals; 95% CI, 9.0%–13.7%), with significant evidence of between-study heterogeneity (Q = 547.1, $\tau^2 = 0.32$, $f^2 = 95.8\%$, P < .001) (Figure 10). The prevalence estimates reported by the individual studies ranged from 4.9% to 35.6%. Sensitivity analysis showed that no individual study affected the overall pooled estimate by more than 1.9% (eTable 5 in the Supplement).

To further characterize the range of the suicidal ideation prevalence estimates identified, stratified meta-analyses were performed by screening instrument and cutoff score. Summary

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prevalence estimates ranged from 7.4% (69/938 individuals [95% CI, 5.9%–9.2%]; Q = 0.01, $\tau^2 = 0$, $I^2 = 0\%$) over the past 2 weeks for studies using the 9-item Patient Health Questionnaire (PHQ-9) to 24.2% (208/754 individuals [95% CI, 13.0%–40.5%]; Q = 37.2, $\tau^2 = 0.42$, $I^2 = 94.6\%$) over the past 12 months for studies using the 28-item General Health Questionnaire.

The median prevalence of suicidal ideation over the past 12 months reported by 7 studies using variably worded short-form screening instruments was 10.2% (723/8636 individuals [95% CI, 6.8%–15.0%]; Q = 176.5, $\tau^2 = 0.33$, $I^2 = 96.6\%$). Among the full set of studies, no statistically significant differences in prevalence estimates were noted by country (United States vs other countries), continent or region, level of training, baseline survey year, average age, proportion of male study participants, or total Newcastle-Ottawa score (P > .05 for all comparisons). Within-instrument heterogeneity was not examined because there were not enough studies using identical screening instruments (4 for each assessment modality), precluding meaningful analysis.

Assessment of Publication Bias

Visual inspection of the funnel plot of studies reporting on depression or depressive symptoms revealed significant asymmetry (eFigure 2 in the Supplement). There was evidence of publication bias, with smaller studies yielding more extreme prevalence estimates (P=.001 using the Egger test). The funnel plot of studies reporting on suicidal ideation revealed minimal asymmetry (eFigure 3 in the Supplement), suggesting the absence of significant publication bias (P=.49 using the Egger test).

Discussion

This systematic review and meta-analysis of 195 studies involving 129 123 medical students in 47 countries demonstrated that 27.2% (range, 9.3%–55.9%) of students screened positive for depression and that 11.1% (range, 7.4%–24.2%) reported suicidal ideation during medical school. Only 15.7% of students who screened positive for depression reportedly sought treatment. These findings are concerning given that the development of depression and suicidality has been linked to an increased short-term risk of suicide as well as a higher long-term risk of future depressive episodes and morbidity.^{211,212}

The present analysis builds on recent work demonstrating a high prevalence of depression among resident physicians, and the concordance between the summary prevalence estimates (27.2% in students vs 28.8% in residents) suggests that depression is a problem affecting all levels of medical training.^{13,213} Taken together, these data suggest that depressive and suicidal symptoms in medical trainees may adversely affect the long-term health of physicians as well as the quality of care delivered in academic medical centers.^{214–216}

When interpreting these findings, it is important to recognize that the data synthesized in this study were almost exclusively derived from self-report inventories of depressive symptoms that varied substantially in their sensitivity and specificity for diagnosing major depressive disorder (eTable 6 in the Supplement).²¹⁷ Instruments such as the PHQ-9 have high sensitivity and specificity for diagnosing major depression, whereas others such as the

Primary Care Evaluation of Mental Disorders (PRIME-MD) have low specificity and should be viewed as screening tools. Although these self-report measures of depressive symptoms have limitations, they are essential tools for accurately measuring depression in medical trainees because they protect anonymity in a manner that is not possible through formal diagnostic interviews.²¹⁸ To control for the differences in these inventories, we stratified our analyses by survey instrument and cutoff score, identifying a range of estimates not captured in another evidence synthesis.²¹⁹

The prevalence of depressive symptoms among medical students in this study was higher than that reported in the general population.^{220–222} For example, the National Institute of Mental Health study of behavioral health trends in the United States, including 67 500 nationally representative participants, found that the 12-month prevalence of a major depressive episode was 9.3% among 18- to 25-yearolds and 7.2% among 26- to 49-year-olds.²²⁰ In contrast, the BDI, CES-D, and PHQ-9 summary estimates obtained in the present study were between 2.2 and 5.2 times higher than these estimates. These findings suggest that depressive symptom prevalence is substantially higher among medical students than among individuals of similar age in the general population.

How depression levels in medical students compare with those in nonmedical undergraduate students and professional students is unclear. One review concluded that depressive symptom prevalence did not statistically differ between medical students and nonmedical undergraduate students.²²³ However, this conclusion may be confounded because the analysis did not control for assessment modality and did not include a comprehensive or representative set of studies (only 12 studies and 4 studies exclusively composed of medical students and nonmedical students, respectively). Two large, representative epidemiological studies have estimated that depressive symptom prevalence in nonmedical students ranges from 13.8% to 21.0%, lower than the estimates reported by many studies of medical students in the present meta-analysis.^{224,225}

Some professional students, such as law students, may not markedly differ from medical students in their susceptibility to depression, although firm conclusions cannot be drawn from the currently available data.^{226,227} Together, these findings suggest that factors responsible for depression in medical students may also be operative in other undergraduate and professional schools. The finding in the longitudinal analysis of an increase in depressive symptom prevalence with the onset of medical school suggests that it is not just that medical students (and other students) are prone to depression, but that the school experience may be a causal factor.

This analysis identified a pooled prevalence of suicidal ideation of 11.1%. Endorsement of suicidal ideation as assessed by the PHQ-9 or other similar instruments increases the cumulative risk of a suicide attempt or completion over the next year by 10- and 100-fold, respectively.²²⁸ Combined with the finding that only 15.7% of medical students who screened positive for depression sought treatment, the high prevalence of suicidal ideation underscores the need for effective preventive efforts and increased access to care that accommodate the needs of medical students and the demands of their training.

Limitations

This study has important limitations. First, the data were derived from studies that had different designs, screening instruments, and trainee demographics. The substantial heterogeneity among the studies remained largely unexplained by the variables inspected. Second, many subgroup analyses relied on unpaired cross-sectional data collected at different medical schools, which may cause confounding. Third, because the studies were heterogeneous with respect to screening inventories and student populations, the prevalence of major depression could not be determined. Fourth, the analysis relied on aggregated published data. A multicenter, prospective study using a single validated measure of depression and suicidal ideation with structured diagnostic interviews in a random subset of participants would provide a more accurate estimate of the prevalence of depression and suicidal students.

Future Directions

Because of the high prevalence of depressive and suicidal symptomatology in medical students, there is a need for additional studies to identify the root causes of emotional distress in this population. To provide more relevant information, future epidemiological studies should consider adopting prospective study designs so that the same individuals can be assessed over time, use commonly used screening instruments with valid cutoffs for assessing depression in the community (eg, the BDI, CES-D, or PHQ-9), screen for comorbid anxiety disorders, and completely and accurately report their data, for example, by closely following the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.²²⁹

Possible causes of depressive and suicidal symptomatology in medical students likely include stress and anxiety secondary to the competitiveness of medical school.⁶² Restructuring medical school curricula and student evaluations (such as using a pass-fail grading schema rather than a tiered grading schema and fostering collaborative group learning through a "flipped-classroom" education model) might ameliorate these stresses.^{230,231} Future research should also determine how strongly depression in medical school predicts depression during residency and whether interventions that reduce depression in medical students carry over in their effectiveness when those students transition to residency.²³² Furthermore, efforts are continually needed to reduce barriers to mental health services, including addressing the stigma of depression.^{146,233}

Conclusions

In this systematic review, the summary estimate of the prevalence of depression or depressive symptoms among medical studentswas27.2% and that of suicidal ideation was11.1%. Further research is needed to identify strategies for preventing and treating these disorders in this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Points

Question

Are medical students at high risk for depression and suicidal ideation?

Findings

In this meta-analysis, the overall prevalence of depression or depressive symptoms among medical students was 27.2%, and the overall prevalence of suicidal ideation was 11.1%. Among medical students who screened positive for depression, 15.7% sought psychiatric treatment.

Meaning

The overall prevalence of depressive symptoms among medical students in this study was higher than that reported in the general population, which underscores the need for effective preventive efforts and increased access to care for medical students.



Figure 1. Study Identification and Selection

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Kim and Bub, ¹³⁴ 2014 42 Gopta and Basis, ¹² 2013 68 Mande et al., ¹² 2017 67 Herzog et al., ¹⁵¹ 2017 67 Herzog et al., ¹⁵¹ 2017 67 Herzog et al., ¹⁵² 2017 67 Herzog et al., ¹⁵² 2017 68 Mole Carrillo et al., ¹⁵² 2012 161 Zoccollino et al., ¹⁵² 3012 164 Chan, ⁶⁴ 9191 161 Smith et al., ¹⁵² 2017 265 Smith et al., ¹⁵² 2017 265 Serrie et al., ⁴⁵² 2012 164 Aphathani et al., ⁵² 2017 164 Aphathani et al., ⁵² 2017 265 Smith et al., ¹⁵² 2017 265 Serrie et al., ⁴² 2012 164 Aphathani et al., ⁵² 2017 268 Kerrie et al., ⁴² 2012 164 Aphathani et al., ⁵² 2015 200 Air 2015 200 Air 2014 350	122 150 165 192 200 287	34.4 (26.1-43.6) 45.3 (37.2-53.7) 28.5 (21.7-36.0) 34.9 (28.2-42.1) 7.0 (3.9-11.5) 26.8 (21.8-32.4) 38.4 (32.9-44.2)
Gupta and Buski, ¹² 2013 6 Gupta and Buski, ¹² 2013 6 Ahmed et al., ¹⁰ 2007 4 Atta Stantapanaki et al., ¹¹⁶² 2008 77 Medo-Land Stantapanaki et al., ¹⁰⁵ 2001 77 Medo-Landie et al., ¹⁰⁵ 2012 116 Consult et al., ¹¹² 2018 66 Marakoli et al., ¹¹³ 2006 145 Stantie et al., ¹¹² 2012 116 Kumar et al., ¹¹⁸ 2007 37 Baldsnier et al., ¹¹⁷ 2007 37 Baldsnier et al., ¹¹⁷ 2007 37 Baldsnier et al., ¹¹⁷ 2017 32 Aphabhane et al., ¹¹⁸ 2015 2000 Ar-Aris et al., ¹¹⁸ 2015 200 Ar-Aris et al., ¹¹⁸ 2015 200	150 165 192 200 287	45.3 (37.2-53.7) 28.5 (21.7-36.0) 34.9 (28.2-42.1) 7.0 (3.9-11.5) 26.8 (21.8-32.4) 38.4 (32.9-44.2)
Source and a sector of the sector o	150 165 192 200 287	28.5 (21.7-36.0) 34.9 (28.2-42.1) 7.0 (3.9-11.5) 26.8 (21.8-32.4) 38.4 (32.9-44.2)
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Marca et al., ³³ 2006 -7 Melo-Granito et al., ¹³³ 2012 116 Melo-Granito et al., ¹³³ 2012 116 Constanti et al., ¹³³ 2016 68 Mara Golgi et al., ¹¹³ 2066 68 Mara Golgi et al., ¹¹³ 2066 145 Stanti et al., ¹¹³ 2012 245 Stanti et al., ¹¹² 2007 37 Baldssini et al., ¹¹² 2007 31 Aphathan et al., ¹¹² 2017 137 Statici-opparovic et al., ¹¹² 2017 328 Aphathan et al., ²¹² 2015 2000 Ai-Faries tal., ¹¹² 2012 344 Minaz et al., ²¹² 2013 340	287	26.8 (21.8-32.4) 38.4 (32.9-44.2)
Anison et al., ¹²² 2012 116 Zaccosilio et al., ¹¹²³ 2912 116 Zaccosilio et al., ¹¹²³ 1986 68 Amarkogili et al., ¹¹²³ 2012 116 Kumar et al., ¹¹²³ 2012 116 Simar et al., ¹¹²³ 2012 225 Smith et al., ¹¹²³ 2012 225 Simith et al., ¹¹²³ 2012 236 Baldissin et al., ¹¹²³ 2018 140 Aghabani et al., ¹¹² 2018 140 Aghabani et al., ¹¹² 2013 120 Are et al., ¹¹² 2015 200 Al-Faris et al., ¹¹² 2012 344 Nima et al., ¹¹² 2013 340	207	38.4 (32.9-44.2)
metro-Carmine et al., "2012 110 metro-Carmine et al., "2016 168 Marakolju et al., 113/2006 168 Kumar et al., et al., al., al., al., al., al., al., al.,	202	30.4 (32.9-44.2)
JACCOMP et al., *** 1980 68 Anardogii et al., *** 2006 145 Chan, *** 1991 161 Kumar et al., *** 2012 225 Smith et al., *** 2012 225 Smith et al., *** 2007 37 Balcksin et al., *** 2008 144 Risk/-lipylatović et al., *** 2013 140 Aphabam et al., *** 2015 2000 Al-Faries tal. *** 2015 200 Al-Faries tal. **** 2015 204 Minaz et al., *** 2014 350	302	33 4 (17 8 37 5)
main and guide et al., "2008 145 Kumar et al., ¹⁶ 2012 285 Santha et al., ¹⁶² 2007 37 Baldassin et al., ¹⁶² 2007 37 Baldassin et al., ¹⁶² 2008 184 Rist(-ippinovic et al., ¹⁶⁹ 2013 140 Aphabani et al., ¹⁶² 2011 328 Serra et al., ¹⁶² 2015 200 Ai-Faris et al., ¹⁶³ 2015 384 Vinnar et al., ¹⁷⁹ 2014 350	304	22.4 (17.6-27.5)
Chan, "- 1923 101 Kimma et al, ¹⁵² 2012 285 Smith et al, ¹⁵³ 2007 37 Baldassin et al, ²⁴² 2008 184 Risti-Opintović et al, ¹⁵³ 2013 140 Aghakhani et al, ²⁸ 2015 200 Ai-Faris et al, ¹⁴² 2015 200 Ai-Faris et al, ²⁷ 2012 384	331	43.8 (38.4-49.5)
Numa et al., ¹⁴² 2012 283 Smith et al., ¹⁵³ 2007 37 Baldassin et al., ¹⁶² 2008 184 Ristić-Ignjatović et al., ¹⁵⁹ 2013 140 Aphaknai et al., ¹²⁷ 2011 328 Serra et al., ¹⁴⁷ 2015 200 Al-Faris et al., ¹⁵⁷ 2012 384 Vimaz et al., ¹⁷² 2012 384	333	40.1 (42.0-55.0)
Smith e 31, ²⁷⁷ ,2007 37 Baldassin et al, ⁴⁷⁷ ,2008 184 Risić-Isrjjstović et al, ¹³⁹ ,2013 140 Aghakhani et al, ²⁹ ,2011 328 Serra et al, ⁴⁷⁷ ,2015 200 Al-Faris et al, ⁸² ,2012 384 Yiimaz et al, ¹²⁷ ,2014 350	400	/1.2 (00.5-/5.0)
balaassin et al.," 2008 184 Ristić-inginković et al., ¹³⁹ 2013 140 Aghakhani et al., ²⁹ 2011 328 Sera et al., ¹⁴⁷ 2015 200 Al-Faris et al., ⁸ 2012 384 Viimaz et al., ¹⁷⁸ 2014 350	438	8.4 (6.0-11.5)
Nistic-ignjatovic et al. ²⁹ 2013 140 Aghakhani et al. ²⁹ 2011 328 Serra et al. ⁴⁴ 2015 200 Al-Faris et al. ⁸ 2012 384 Yilmaz et al. ¹⁷⁸ 2014 350	481	38.3 (33.9-42.8)
Agnaknani et al, ** 2011 328 Serra et al, ¹⁴⁷ 2015 200 Al-Faris et al, ⁸ 2012 384 Yilmaz et al, ¹⁷⁸ 2014 350	615	22.8 (19.5-26.3)
Serra et al, ** 2015 200 Al-Faris et al, ⁸ 2012 384 Yilmaz et al, ¹⁷⁸ 2014 350	628	52.2 (48.2-56.2)
AL-Faris et al, ⁹ 2012 384 Yilmaz et al, ¹⁷⁸ 2014 350	657	30.4 (26.9-34.1)
Yilmaz et al, 178 2014 350	/9/	48.2 (44.7-51.7)
	995	35.2 (32.2-38.2)
Seweryn et al, 148 2015 521	1262	41.3 (38.6-44.1)
Sun et al, ¹⁶² 2011 1699	10140	16.8 (16.0-17.5)
Beck Depression Inventory Score >10		
Hirata et al, ⁸⁷ 2007 53	161	32.9 (25.7-40.8)
Beck Depression Inventory Score ≥11		
Bassols et al, ⁴⁹ 2014 43	232	18.5 (13.8-24.1)
Jurkat et al, ¹⁰⁰ 2011 123	651	18.9 (16.0-22.1)
Beck Depression Inventory Score ≥12		
Leão et al, ⁶⁶ 2011 22	111	19.8 (12.9-28.5)
Adamiak et al, ²⁸ 2004 63	263	24.0 (18.9-29.6)
Beck Depression Inventory Score ≥14		
Pan et al, ¹²⁹ 2016 1751	8819	19.9 (19.0-20.7)

Figure 2. Meta-analysis by Scores on the Aga Khan University Anxiety and Depression Scale and the Beck Depression Inventory

The vertical dashed lines indicate the pooled summary estimate (95% CI) for all studies in Figures 2–6: 27.2% (37 933/122 356 individuals); 95% CI, 24.7%–29.9%; $I^2 = 98.9\%$, $\tau^2 = 0.78$, P < .001. The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% confidence intervals of the estimate. The studies in Figures 2–6 are ordered alphabetically by screening instrument and then sorted by increasing sample size within each instrument.

Source	Depressed	No.	(95% CI)		We
Beck Depression Inventory Score ≥15					
Castaldelli-Maia et al, ⁵⁵ 2012	76	465	16.3 (13.1-20.0)		0.6
Beck Depression Inventory Score ≥16					
Roh et al,141 2009	689	7357	9.4 (8.7-10.1)		0.6
Beck Depression Inventory Score ≥17					
David and Hamid Hashmi.64 2013	15	128	11.7 (6.7-18.6)		0.5
Ibrahim and Abdelreheem, 89 2015	95	164	57.9 (50.0-65.6)		0.5
Mayda et al. ¹¹⁸ 2010	24	202	11.9 (7.8-17.2)		0.5
Kaya et al. ¹⁰² 2007	77	352	21.9 (17.7-26.6)		0.6
Manceyska et al. 114 2008	36	354	10.2 (7.2-13.8)		0.5
Gülec et al. 81 2005	232	668	34.7 (31.1-38.5)		0.6
leck Depression Inventory Score >19					
Chan 57 1992	15	95	15.8 (9.1.24.7)		0.5
lack Depression Inventory Score 321	15		15.0 (5.1 24.7)		0.5
Newsadvino Silva et al 34 2000	27	226	11.0 (7.0.14.0)		0.5
Alexandi mo-sitva et al,- 2005	37	330	11.0(7.9-14.9)		0.3
Lune and Stream 111 2011	20	110	25.2 (17.7.24.0)	11	0.5
cupo and Strous, *** 2011	30	113	23.2 (17.7-34.0)		0.5
eck Depression Inventory II Score ≥14	15	00	15 3 (0 7 33 0)		
Zeldow et al, 102 1987	15	99	15.2 (8.7-25.8)		0.5
Haglund et al, 10 2009	22	101	21.8 (14.2-31.1)		0.5
Alvi et al, ³⁸ 2010	98	279	35.1 (29.5-41.0)		0.6
Ghodasara et al, // 2011	71	301	23.6 (18.9-28.8)		0.6
AlFaris et al,35 2014	317	543	58.4 (54.1-62.6)		0.6
leck Depression Inventory II Score ≥17					
Choi et al, ⁶⁰ 2015	118	534	22.1 (18.6-25.9)		0.6
Beck Depression Inventory II Score ≥20					
Aziz et al, ⁴⁵ 2011	117	295	39.7 (34.0-45.5)		0.6
leck Depression Inventory II Score ≥21					
Chandavarkar et al,58 2007	21	427	4.9 (3.1-7.4)	=	0.5
eck Depression Inventory Short Form	Score ≥8				
Givens and Tjia,78 2002	46	194	23.7 (17.9-30.3)		0.5
Tjia et al, 168 2005	49	322	15.2 (11.5-19.6)	-	0.6
rief Symptom Inventory Depression So	ale Score >0.41				
Borst et al, 197 2015	359	951	37.7 (34.7-40.9)		0.6
enter for Epidemiological Studies Dep	ression Scale Sco	re ≥16			
Thompson et al, 165 2010	26	44	59.1 (43.2-73.7)		- 0.5
Peleg-Sagy and Shahar, 131 2012	28	60	46.7 (33.7-60.0)		0.5
Mosley et al. ¹²³ 1994	16	69	23.2 (13.9-34.9)		0.5
Jeong et al. 99 2010	33	89	37.1 (27.1-48.0)		0.5
Peleo-Sagy and Shahar, 205 2013	92	192	47.9 (40.7-55 2)		0.6
Guerrero López et al. ⁷ 2013	179	455	39.3 (34.8-44.0)		0.6
Smith et al 159 2011	135	480	28 1 (24 1-32 4)		0.0
Smith et al 158 2010	310	844	36.7 (33.5.40.1)		0.0
Pinzón-Amado et al 137 2012	295	072	30.6 (36.5.42.7)		0.0
Coobert et al 79 2000	202	373	33.0 (30.3*42.7)		0.0
Gueueri et al., * 2009 Chiedel et al. 155 2011	257	1247	45.0 (43.1.40.7)		0.6
Simpler et al, 57 2011	202	1241	+3.9 (43.1-48.7)		0.6
Shi et al, 194 2015	1230	1738	70.8 (68.6-72.9)		0.6
Shi et al, 153 2016	1954	2925	66.8 (65.1-68.5)		0.6
enter for Epidemiological Studies Dep	ression Scale Sco	re >16			
Ludwig et al, 203 2015	131	336	39.0 (33.7-44.4)	-	0.6
enter for Epidemiological Studies Dep	ression Scale Sco	re ≥19			
Shah et al,149 2009	1093	2683	40.7 (38.9-42.6)		0.6
enter for Epidemiological Studies Dep	ression Scale Sco	re ≥80th per	centile		
Rosal et al 207 1007	67	171	39 2 (31 8-46 9)		0.6

Figure 3. Meta-analysis by Scores on the First, Second, and Short Form Versions of the Beck Depression Inventory, Brief Symptom Inventory Depression Scale, and the Center for Epidemiological Studies Depression Scale

The vertical dashed lines indicate the pooled summary estimate (95% CI) for all studies in Figures 2–6: 27.2% (37 933/122 356 individuals); 95% CI, 24.7%–29.9%; $I^2 = 98.9\%$, $\tau^2 = 0.78$, P < .001. The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% confidence intervals of the estimate. The studies in Figures 2–6 are ordered alphabetically by screening instrument and then sorted by increasing sample size within each instrument.

	Democrand	NI-	(050(CI)		14/-
Source	Depressed	NO.	(95% CI)		we
21-Item Depression Anxiety Stress Scal	e Score 210	107	21 5 (22 5 40 2)	1 1 14 1 1	0.5
Bore et al, 32 2016	40	127	31.5 (23.5-40.3)	ii.	0.5
Yusoff et al, 210 2013	70	1/0	41.2 (33.7-49.0)		0.6
Saravanan and Wilks, 143 2014	125	358	34.9 (30.0-40.1)		0.6
Abdel Wahed and Hassan, 27 2016	266	442	60.2 (55.4-64.8)		0.6
21-Item Depression Anxiety Stress Scal	e Score ≥14				
Yusoff, ¹⁸¹ 2013	58	194	29.9 (23.5-36.9)		0.6
Carter et al, ⁵⁴ 2014	24	198	12.1 (7.9-17.5)		0.5
Kulsoom and Afsar, 108 2015	190	442	43.0 (38.3-47.7)		0.6
12-Item Depression Anxiety Stress Scal	e Score ≥10				
Rizvi et al, ¹⁴⁰ 2015	27	66	40.9 (29.0-53.7)		0.5
Baykan et al, ⁵⁰ 2012	57	193	29.5 (23.2-36.5)		0.5
Iqbal et al, ⁹⁵ 2015	181	353	51.3 (45.9-56.6)		0.6
Diagnostic and Statistical Manual of Me	ntal Disorders, Fo	urth Edition	a, Criteria A and C		
Dahlin et al, ⁶² 2005	40	309	12.9 (9.4-17.2)		0.5
Derogatis Stress Profile Score >50					
Helmers et al, ⁸⁴ 1997	217	356	61.0 (55.7-66.1)		0.6
Emotional State Questionnaire Score ≥	12				
Eller et al, ¹⁸⁴ 2006	126	413	30.5 (26.1-35.2)	-	0.6
General Depression Scale Short Form So	core >17				
Kohls et al, ¹⁰⁵ 2012	107	419	25.5 (21.4-30.0)	-	0.6
2-Item General Health Questionnaire	Score ≥4				
Aktekin et al, ¹⁹⁶ 2001	57	119	47.9 (38.7-57.2)		0.5
Guthrie et al, ²⁰¹ 1998	63	172	36.6 (29.4-44.3)		0.5
James et al, ⁹⁸ 2013	103	324	31.8 (26.8-37.2)		0.6
Sherina et al, ¹⁵² 2004	166	396	41.9 (37.0-47.0)	_	0.6
Sreeramareddy et al, ¹⁶¹ 2007	85	407	20.9 (17.0-25.2)		0.6
Oku et al, ¹²⁸ 2015	177	451	39.2 (34.7-43.9)		0.6
2-Item General Health Questionnaire	Score ≥5				
Berner et al, ⁵¹ 2014	88	384	22.9 (18.8-27.5)		0.6
2-Item General Health Questionnaire	Score >15				
Imran et al, ⁹² 2016	276	527	52.4 (48.0-56.7)		0.6
28-Item General Health Questionnaire	Score >6				
Akbari et al, ³¹ 2014	20	138	14.5 (9.1-21.5)		0.5
28-Item General Health Questionnaire	Score ≥23				
Bayati et al, ⁹ 2009	93	172	54.1 (46.3-61.7)		0.6
Farahangiz et al, ⁷⁶ 2016	105	208	50.5 (43.5-57.5)		0.6
lospital Anxiety and Depression Scale	Score ≥7				
Akvardar et al, ³³ 2004	56	166	33.7 (26.6-41.5)		0.5
Akvardar et al, ³² 2003	154	447	34.5 (30.1-39.1)		0.6
lospital Anxiety and Depression Scale	Score ≥8				
Rab et al, ¹³⁸ 2008	17	87	19.5 (11.8-29.4)		0.5
Khan et al, ¹⁰³ 2015	18	110	16.4 (10.0-24.6)		0.5
Newbury-Birch et al, 204 2001	5	114	4.4 (1.4-9.9)	-	0.4
Pickard et al, ¹³⁵ 2000	13	136	9.6 (5.2-15.8)	-	0.5
Ashton and Kamali, ⁴⁴ 1995	73	186	39.2 (32.2-46.7)	11 - - -	0.6
Vaysse et al, ¹⁷¹ 2014	7	197	3.6 (1.4-7.2)		0.5
Amir and Gillany, ⁴⁰ 2010	88	311	28.3 (23.4-33.7)	4	0.6
Bunevicius et al. ⁵³ 2008	48	338	14.2 (10.7-18.4)	-	0.6
Kötter et al. ¹⁰⁷ 2014	12	350	3.4 (1.8-5.9)		0.5
Wagas et al. ¹⁷³ 2015	118	409	28.9 (24.5-33.5)		0.6
	126	485	28.0 (24.1-32.3)		0.0
Karaoğlu and Seker 101 2011	150	10/1	/// ///////////////////////////////////		0.0

Figure 4. Meta-analysis by Scores on the Depression Anxiety Stress Scale, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, Criteria A and C, Derogatis Stress Profile, Emotional State Questionnaire, General Depression Scale Short Form, General Health Questionnaire, and the Hospital Anxiety and Depression Scale

The vertical dashed lines indicate the pooled summary estimate (95% CI) for all studies in Figures 2–6: 27.2% (37 933/122 356 individuals); 95% CI, 24.7%–29.9%; $I^2 = 98.9\%$, $\tau^2 = 0.78$, P < .001. The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% confidence intervals of the estimate. The studies in Figures 2–6 are ordered alphabetically by screening instrument and then sorted by increasing sample size within each instrument.



Figure 5. Meta-analysis by Scores on Several Scales

The vertical dashed lines indicate the pooled summary estimate (95% CI) for all studies in Figures 2–6: 27.2% (37 933/122 356 individuals); 95% CI, 24.7%–29.9%; $I^2 = 98.9\%$, $\tau^2 = 0.78$, P < .001. The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% confidence intervals of the estimate. The studies in Figures 2–6 are ordered alphabetically by screening instrument and then sorted by increasing sample size within each instrument. *DSM-IV*, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*.

Source	No. Depressed	Total No.	Prevalence, % (95% CI)			Weight, %
Patient-Reported Outcomes Measurement Inform	ation System Sc	ore >60		-		
Hardeman et al, ⁸³ 2015	316	3149	10.0 (9.0-11.1)			0.6
Quick Inventory of Depressive Symptomatology Se	core ≥9					
Perveen et al, ¹³³ 2016	524	1000	52.4 (49.3-55.5)			0.6
90-Item Symptom Checklist Score >2						
Yang et al, ⁶ 2014	36	1137	3.2 (2.2-4.4)			0.5
Thai Depression Inventory Score >35						
N Wongpakaran and T Wongpakaran, ¹⁷⁷ 2010	19	368	5.2 (3.1-7.9)			0.5
Zung Self-Rating Depression Scale Score >30						
Pillay et al, ¹³⁶ 2016	166	230	72.2 (65.9-77.9)			0.6
Zung Self-Rating Depression Scale Score ≥40						
Supe, ³ 1998	175	238	73.5 (67.4-79.0)			0.6
Zung Self-Rating Depression Scale Score >45						
Nasioudis et al, ¹²⁶ 2015	57	146	39.0 (31.1-47.5)			0.5
Zung Self-Rating Depression Scale Score ≥50						
Basnet et al, ⁴⁸ 2012	28	94	29.8 (20.8-40.1)			0.5
Tang, ¹⁶³ 2005	41	121	33.9 (25.5-43.0)			0.5
Phillips et al, ¹³⁴ 2006	26	122	21.3 (14.4-29.6)			0.5
Marwat, ¹¹⁶ 2013	29	166	17.5 (12.0-24.1)			0.5
Ali and Vankar, ³⁷ 1994	51	215	23.7 (18.2-30.0)	-		0.5
Camp et al, ¹⁹⁸ 1994	42	232	18.1 (13.4-23.7)			0.5
Aniebue and Onyema, ⁴² 2008	61	262	23.3 (18.3-28.9)			0.6
Ashor, ⁴³ 2012	34	269	12.6 (8.9-17.2)	-		0.5
Liao et al, ¹¹⁰ 2010	26	487	5.3 (3.5-7.7)			0.5
Valle et al, ¹⁶⁹ 2013	143	615	23.3 (20.0-26.8)			0.6
Wan et al, ⁴ 2012	1881	4063	46.3 (44.8-47.8)	—		0.6
Zung Self-Rating Depression Scale Score ≥53						
Shen et al, ¹⁵¹ 2009	99	313	31.6 (26.5-37.1)			0.6
Zung Self-Rating Depression Scale Short Form Sco	ore ≥22					
Pereyra-Elías et al, ¹³² 2010	184	590	31.2 (27.5-35.1)			0.6
				0 20 40 Prevalence %	60 80 1 (95% CI)	

Figure 6. Meta-analysis by Scores on the Patient-Reported Outcomes Measurement Information System, Quick Inventory of Depressive Symptomatology, 90-Item Symptom Checklist, Thai Depression Inventory, and the Zung Self-Rating Depression Scale

The vertical dashed lines indicate the pooled summary estimate (95% CI) for all studies in Figures 2–6: 27.2% (37 933/122 356 individuals); 95% CI, 24.7%–29.9%; $I^2 = 98.9\%$, $\tau^2 = 0.78$, P < .001. The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% confidence intervals of the estimate. The studies in Figures 2–6 are ordered alphabetically by screening instrument and then sorted by increasing sample size within each instrument.

		Study Samp	le		
Screening Method and Cutoff Score	No. of Studies	No. Depressed	Total No.	Prevalence, % (95% CI)	
Aga Khan University Anxiety and Depression Scale Score \geq 19 l^2 =98.9%, τ^2 =0.78, P<.001	4	540	1039	55.9 (45.1-66.2)	-
Beck Depression Inventory II Score \geq 14 $l^2 = 97.2\%$, $\tau^2 = 0.73$, P<.001	5	523	1323	29.5 (16.3-47.4)	
Beck Depression Inventory Score ≥ 8 $l^2 = 81.9\%$, $\tau^2 = 0.09$, $P = .004$	3	226	796	30.2 (22.8-38.7)	•
Beck Depression Inventory Short Form Score ≥ 8 $l^2 = 82.6\%$, $\tau^2 = 0.12$, $P = .02$	2	95	516	19.0 (12.1-28.7)	-
Beck Depression Inventory Score \geq 9 $l^2 = 84.3\%$, $\tau^2 = 0.20$, $P = .01$	2	146	444	29.0 (17.2-44.6)	
Beck Depression Inventory Score ≥ 10 $l^2 = 98.6\%$, $\tau^2 = 0.62$, $P < .001$	24	5042	19160	32.4 (25.8-39.7)	•
Beck Depression Inventory Score \geq 11 $l^2 = 0\%$, $\tau^2 = 0$, $P = .91$	2	166	883	18.8 (16.4-21.5)	•
Beck Depression Inventory Score \geq 12 $l^2 = 0\%$, $\tau^2 = 0$, $P = .39$	2	85	374	22.8 (18.8-27.3)	•
Beck Depression Inventory Score \geq 17 $l^2=97.1\%$, $\tau^2=0.75$, P<.001	6	479	1868	21.7 (12.0-36.0)	
Center for Epidemiological Studies Depression Scale Score $\geq \!\! 16$ $l^2 \! = \! 99.0\%, \tau^2 \! = \! 0.61, P \! < \! .001$	13	5214	10294	42.8 (32.7-53.6)	-
21-Item Depression Anxiety Stress Scale Score \ge 10 $l^2=95.3\%$, $\tau^2=0.35$, $P<.001$	4	501	1097	41.9 (28.5-56.6)	
21-Item Depression Anxiety Stress Scale Score \ge 14 $l^2 =$ 96.3%, $\tau^2 =$ 0.58, $P <$.001	3	272	834	26.5 (13.0-46.6)	
42-Item Depression Anxiety Stress Scale Score ≥10 l^2 =91.5%, τ^2 =0.28, P<.001	3	265	612	40.4 (26.5-56.0)	
12-Item General Health Questionnaire Score ≥ 4 $l^2 = 91.1\%$, $\tau^2 = 0.15$, $P < .001$	6	651	1869	35.7 (28.5-43.6)	•
28-Item General Health Questionnaire Score \ge 23 $I^2 = 0\%$, $\tau^2 = 0$, $P = .49$	2	198	380	52.1 (47.1-57.1)	*
Hospital Anxiety and Depression Scale Score \geq 7 $l^2 = 0\%$, $\tau^2 = 0$, $P = .87$	2	210	613	34.3 (30.6-38.1)	*
Hospital Anxiety and Depression Scale Score ≥8 I ² =97.2%, τ ² =0.85, P<.001	12	677	4878	13.6 (8.4-21.3)	•
Hospital Anxiety and Depression Scale Score ≥11 I ² =84.8%, τ ² =0.24, P<.001	4	157	1234	9.3 (5.3-15.7)	
Kessler Psychological Distress Scale Score \geq 20 $l^2=95.2\%$, $\tau^2=0.76$, P<.001	2	148	312	54.9 (26.0-80.8)	
9-Item Patient Health Questionnaire Score ≥5 I ² =97.5%, τ ² =0.47, P<.001	2	672	1500	53.5 (30.5-75.1)	
9-Item Patient Health Questionnaire Score ≥ 10 $l^2 = 98.0\%$, $\tau^2 = 0.67$, P<.001	15	1530	8551	18.3 (12.8-25.4)	•
Primary Care Evaluation of Mental Disorders $l^2 = 98.4\%$, $\tau^2 = 0.19$, $P < .001$	14	10120	20112	37.5 (32.0-43.3)	•
Zung Self-Rating Depression Scale Score \geq 50 $l^2 = 98.0\%$, $\tau^2 = 0.76$, $P < .001$	11	2362	6646	21.3 (13.8-31.5)	
					0 20 40 60 80 100 Prevalence, % (95% Cl)

Figure 7. Meta-analyses of the Prevalence of Depression or Depressive Symptoms Among Medical Students Stratified by Screening Instrument and Cutoff Score

Pooled summary estimates are ordered alphabetically by screening instrument. The individual studies contributing to each summary estimate are reported in Figures 2 through 6. The area of each diamond is proportional to the inverse variance of the estimate. Horizontal extremes of the diamonds indicate 95% CIs of the estimate.

		Study Samp	le			
	No. of Studies	No. Depressed	Total No.	Prevalence, % (95% CI)		P Value for Difference
Type of Study						
Cross-sectional ($I^2 = 99.0\%$, $\tau^2 = 0.78$, $P < .001$)	167	36632	116628	27.3 (24.7-30.1)	•	00
Longitudinal ($I^2 = 97.5\%$, $\tau^2 = 0.75$, $P < .001$)	16	1301	5728	26.7 (19.1-36.1)		.90
Academic Year						
Preclinical (I ² =97.8%, τ ² =0.68, P < .001)	45	4866	25462	23.7 (19.5-28.5)		
Both ($I^2 = 99.0\%$, $\tau^2 = 0.67$, $P < .001$)	108	29273	79966	30.4 (27.2-33.9)	•	.72 ^a
Clinical (I ² =96.4%, τ ² =0.35, P < .001)	17	2917	13172	22.4 (17.6-28.2)		
Continent or Region						
Africa (I ² =97.5%, τ ² =0.58, P < .001)	6	853	1860	46.3 (31.7-61.6)		
Asia ($I^2 = 99.4\%$, $\tau^2 = 1.14$, $P < .001$)	51	13435	49602	29.1 (23.4-35.6)		
Eurasia (I ² = 90.4%, τ ² = 0.12, P < .001)	10	1288	3958	31.5 (26.8-36.6)		
Europe (<i>I</i> ² =97.8%, τ ² =0.65, <i>P</i> < .001)	26	2728	12604	16.9 (12.8-21.9)	•	
Middle East (I ² = 97.0%, τ ² = 0.49, P < .001)	20	2414	6610	35.2 (28.5-42.7)		<.001
North America ($I^2 = 99.0\%$, $\tau^2 = 0.61$, $P < .001$)	49	15238	40655	26.7 (22.5-31.2)	 Image: A start of the start of	
Oceania (I ² =89.5%, τ ² =0.31, P < .001)	3	107	580	19.0 (10.8-31.4)		
South America ($I^2 = 93.6\%$, $\tau^2 = 0.22$, $P < .001$)	18	1870	6487	26.6 (22.4-31.2)		
Country						
All other countries ($I^2 = 98.8\%$, $\tau^2 = 0.83$, $P < .001$)	141	23 577	86107	27.4 (24.5-30.6)	•	70
United States ($l^2 = 98.9\%$, $\tau^2 = 0.53$, $P < .001$)	42	14356	36249	26.7 (22.5-31.3)	•	.78
					0 20 40 60 80 Prevalence, % (95% CI)	100

Figure 8. Meta-analyses of the Prevalence of Depression or Depressive Symptoms Among Medical Students Stratified by Study-Level Characteristics

The area of each diamond is proportional to the inverse variance of the estimate. Horizontal extremes of the diamonds indicate 95% CIs of the estimate.

^aComparison of studies reporting only on preclinical students with those studies reporting only on clinical students.

		Study Samp	le			
Newcastle-Ottawa Scale Components	No. of Studies	No. Depressed	Total No.	Prevalence, % (95% CI)		P Value Differen
Sample Representativeness						
Less representive ($I^2 = 97.8\%$, $\tau^2 = 0.77$, $P < .001$)	150	13567	53663	25.4 (22.8-28.2)	♦	002
More representive ($l^2 = 99.7\%$, $\tau^2 = 0.73$, $P < .001$)	33	24366	68693	36.3 (29.9-43.3)		.002
Sample Size						
<200 Participants (I ² =93.6%, τ ² =0.62, P<.001)	57	2274	7632	27.2 (23.2-31.6)		0.5
≥200 Participants (I ² =99.2%, τ ² =0.79, P< .001)	126	35659	114724	27.3 (24.3-30.6)	•	.95
Respondent-Nonrespondent Comparability						
Less comparable (<i>l</i> ² = 99.0%, τ ² = 0.81, <i>P</i> < .001)	165	34774	113260	27.6 (24.9-30.5)	•	20
More comparable ($I^2 = 97.6\%$, $\tau^2 = 0.52$, $P < .001$)	18	3159	9096	23.8 (18.1-30.6)		.29
Ascertainment of Depression						
Less valid ($I^2 = 99.0\%$, $\tau^2 = 0.78$, $P < .001$)	102	22566	71291	28.6 (25.2-32.3)	•	24
More valid (I ² = 98.8%, τ ² = 0.81, P< .001)	81	15367	51065	25.5 (21.9-29.5)	•	.24
Descriptive Statistics Reporting						
Less thorough ($l^2 = 99.0\%$, $\tau^2 = 0.94$, $P < .001$)	97	18595	60300	25.8 (22.2-29.7)	•	25
More thorough ($I^2 = 98.8\%$, $\tau^2 = 0.66$, $P < .001$)	86	19338	62056	28.8 (25.4-32.6)	•	.25
Total Newcastle-Ottawa Score						
<3 points (I ² =98.7%, τ ² =0.91, P< .001)	138	21518	69789	27.0 (23.9-30.3)	•	75
\geq 3 points ($l^2 = 99.3\%$, $\tau^2 = 0.64$, $P < .001$)	45	16415	52567	27.9 (23.4-32.9)		.75
					2 20 40 60	80 100
				(, 20 40 60 Prevalence, % (95% CI)

Ctudy Cample

Figure 9. Meta-analyses of the Prevalence of Depression or Depressive Symptoms Among Medical Students Stratified by Newcastle-Ottawa Scale Components and Total Score Full details regarding Newcastle-Ottawa risk of bias scoring are provided in eMethods 2 in the Supplement. Component scores for all individual studies are presented in eTable 2 in the Supplement. The area of each diamond is proportional to the inverse variance of the estimate. Horizontal extremes of the diamonds indicate 95% CIs of the estimate.

Source	No. Suicidal	Total No.	Prevalence, % (95% CI)		Weigh
Score >0 on Beck Scale for Suicidal Ideation					
Alexandrino-Silva et al, ³⁴ 2009	45	336	13.4 (9.9-17.5)		4.2
Score >24 on Beck Scale for Suicidal Ideation					
Ahmed et al. ¹⁸⁵ 2016	78	612	12.7 (10.2-15.6)		4.4
Mini International Neuropsychiatric Interview					
de Melo Cavestro and Rocha. ⁶⁵ 2006	16	213	7.5 (4.4-11.9)		3.8
Score ≥7 on Revised Suicidial Behaviors Questionnaire					
Tan et al. ¹⁶⁷ 2015	36	517	7.0 (4.9-9.5)		4.3
Suicidal Ideation Over Past Month			, , ,		
Alem et al. ¹⁸⁶ 2005	16	273	5.9 (3.4-9.3)		3.5
Suicidal Ideation Over Past 12 mo					
Amiri et al. ¹⁸⁷ 2013	8	115	7.0 (3.1-13.2)	-	3.3
Wallin and Runeson. ¹⁹⁵ 2003	40	305	13.1 (9.5-17.4)	-	4.5
Okasha et al. ¹⁹² 1981	66	516	12.8 (10.0-16.0)		4.3
Eskin et al. ¹⁸⁹ 2011	75	646	11.6 (9.2-14.3)	- E	4.4
Chen et al. ¹⁸⁸ 2004	156	892	17.5 (15.1-20.1)		4.5
Tran et al. ¹⁹³ 2015	179	2099	8.5 (7.4-9.8)		4.5
Wan et al ⁴ 2012	199	4063	49(43-56)		4
Summary Prevalence $l^2 = 96.6\%$ $\tau^2 = 0.33$ $P < .001$	723	8636	10.2 (6.8-15.0)		29.1
Suicidal Ideation Over Past 12 mo (28-Item General Health Out	estionnaire)	0000	10.2 (0.0 10.0)		23.
Menezes et al ¹⁹¹ 2012	22	206	107(68-157)		3 (
Khokher and Khan ¹⁹⁰ 2005	68	200	31.3 (25.2-38.0)		4
Osama et al 52014	118	331	35.6 (30.5-41.1)		4
Summary Prevalence $l^2 = 94.6\%$ $\tau^2 = 0.42$ P < 0.01	208	754	24 2 (13 0-40 5)		12
Suicidal Ideation Over Past 12 mo (Meehan Inventory)	200	751	21.2 (15.0 10.5)		12.
Dahlin et al 6^2 2005	16	296	5 4 (3 1-8 6)		3
MacLean et al 112 2016	45	385	11 7 (8 7-15 3)		4
Dyrhye et al. 73 2008	249	2230	11.2 (9.9-12.5)		4
Dyrbye et al ⁷⁴ 2014	375	4032	93(84-102)		4
Summary Provalence $l^2 = 77.7\%$ $\tau^2 = 0.03. P = .004$	685	6943	9.7 (8.0-11.7)		17
Suicidal Ideation Over Past 12 mo (Paykel Inventory)	005	0545	5.7 (0.0 11.7)	×	17.
Tyccon et al 194 2001	74	522	14.2 (11.3-17.5)		4
Suicidal Ideation Over Past 2 wk (9-Item Patient Health Questi	onnaire)	JZZ	14.2 (11.5-17.5)		
Sobowala at al 160 2014	26	348	75(49-108)		4.0
Were et al 174 2016	43	590	7 3 (5 3-9 7)		4.1
Summary Provalence $l^2 = 0\%$ $\tau^2 = 0$ $P = 0.2$	45	038	7.5 (5.5-5.7)		4
Suicidal Ideation Over Past 2 wk (Primary Care Evaluation of M	ental Disorders)	550	7.4 (3.3-3.2)		0
Thompson at al 165 2010	12	12	30.2 (17.2-46.1)		2
Coopert at al 79 2000	13	1015	6.6 (5.2-9.1)		5.4
Summary Browslongs $l^2 = 06(20)/r^2 = 1.60$ B < 001	03	1215	14 5 (2.9 50 2)		4.
Summary Prevalence $l^{*} = 90.3\%$, $l^{*} = 1.59$, $P^{<}$.001	2042	1258	14.5 (2.8-50.2)		/.
Pooled Summary Estimate $l^2 = 95.8\%$, $\tau^2 = 0.32$, $P < .001$	2043	21.002	11.1 (9.0-13.7)		100.0

Figure 10. Meta-analysis of the Prevalence of Suicidal Ideation Among Medical Students Contributing studies are stratified by screening modality and sorted by increasing sample size. The dotted line marks the overall summary estimate for all studies, 11.1% (2043/21 002 individuals; 95% CI, 9.0%–13.7%; Q = 547.1, $\tau^2 = 0.32$, $I^2 = 95.8\%$, P < .001). The area of each square is proportional to the inverse variance of the estimate. Horizontal lines indicate 95% CIs of the estimate.

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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score
Bore et al, ⁵² 2016	Australia	2013	1–5	127	Mean (SD): 23 (5.6)	32 (25.6)	DASS-21 10
De Sousa Lima et al, ⁶⁷ 2010	Brazil	2001	1-4	80	Range: 18–30	45 (56.3)	BDI 10
de Melo Cavestro and Rocha,652006	Brazil	2003	1–6	213	Mean (SD): 23.1 (2.3)	109 (51.2)	MINI DSM IV criteria
Amaral et al, ³⁹ 2008	Brazil	2006	1-6	287	Mean: 21.3	131 (45.7)	BDI 10
Costa et al, ⁶¹ 2012	Brazil	2008	5, 6	84	NR	NR	BDI 10
Serra et al, ¹⁴⁷ 2015	Brazil	2012	16	657	Mean: 22.7	255 (38.8)	BDI 10
Castaldelli-Maia et al, ⁵⁵ 2012	Brazil	2001-2006	16	465	NR	NR	BDI 15
Alexandrino-Silva et al, ³⁴ 2009	Brazil	2006-2007	1–6	336	Mean (SD): 22.4 (2.5)	105 (31)	BDI 21
Paro et al, ¹³⁰ 2010	Brazil	2006-2007	1–6	352	Mean (SD): 22.3 (2.4)	134 (38.4)	BDI>9
Bassols et al, ⁴⁹ 2014	Brazil	2010-2011	1, 6	232	Mean (SD): 23.1 (3.2)	117 (50.4)	BDI 11
Del-Ben et al, ²⁰⁰ 2013	Brazil	NR	1	85	Mean (SD): 19.1 (1.6)	58 (68.2)	BDI 10
Leão et al, ⁶⁶ 2011	Brazil	NR	6	111	Mean (SD): 24.6 (1.4)	87 (56)	BDI 12
Hirata et al, ⁸⁷ 2007	Brazil	NR	1–2	161	Mean (SD): 22.1 (2.1)	77 (47.8)	BDI>10
Baldassin et al, ⁴⁷ 2008	Brazil	NR	1-6	481	Mean (SD): 21.9 (2.4)	195 (40.5)	BDI 10
Matheson et al, ¹¹⁷ 2016	Canada	2013	1-4	232	NR	NR	K-10 20
Helmers et al, ⁸⁴ 1997	Canada	1994–1995	1-4	356	Mean (SD): 23.5 (2.6)	185 (52)	DSP >50
Berner et al, ⁵¹ 2014	Chile	2012	1-5	384	Mean (SD): 20.8 (1.8)	224 (58.3)	GHQ-12 5
Tang, ¹⁶³ 2005	China	2003	2	121	NR	0	Zung-SDS 50
Shen et al, ¹⁵¹ 2009	China	2006	1	313	Mean (SD): 23.8 (1.8)	NR	Zung-SDS 53
Wan et al, ⁴ 2012	China	2010	1–5	4063	Mean (SD): 20.5 (1.1)	1895 (46.6)	Zung-SDS 50
Sobowale et al, ¹⁶⁰ 2014	China	2012	2–3	348	NR	NR	РНQ-9 10
Shi et al. ¹⁵⁴ 2015	China	2014	1–5	1738	Mean (SD): 21.4 (1.6)	586 (33.7)	CES-D 16
Shi et al. ¹⁵³ 2016	China	2014	1-7	2925	Mean (SD): 21.7 (2)	1028 (35.2)	CES-D 16
Pan et al, ¹²⁹ 2016	China	2013-2014	1–5	8819	Mean (SD): 20.7 (1.6)	3415 (37.9)	BDI 14
Liao et al, ¹¹⁰ 2010	China	NR	1	487	Mean (SD): 18.5 (0.8)	181 (37.4)	Zung-SDS 50

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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score
Sun et al, ¹⁶² 2011	China	NR	1–2	10140	Mean (SD): 19.6 (1.3)	4680 (46.2)	BDI 10
Yang et al, ⁶ 2014	China	NR	1-5	1137	Range: 17–24	624 (54.9)	SCL-90 >2
Pinzón-Amado et al, ¹³⁷ 2013	Colombia	2006	1–6	973	Mean (SD): 20.3 (2.3)	414 (43)	CES-D 16
Amir and Gillany, ⁴⁰ 2010	Egypt	2010	1–6	311	Mean (SD): 20.7 (2.4)	164 (52.7)	HADS-D 8
Ibrahim and Abdelreheem, ⁸⁹ 2015	Egypt	2013	1	164	NR	82 (50)	BDI 17
Abdel Wahed and Hassan, ²⁷ 2016	Egypt	2015	1-4	442	Mean (SD): 20.2 (1.9)	172 (38.9)	DASS-21 10
Eller et al, ¹⁸⁴ 2006	Estonia	2003	1–6	413	Mean (SD): 21.3 (2.5)	95 (23)	EST-Q 12
Vaysse et al, ¹⁷¹ 2014	France	2012-2013	2	197	Mean (SD): 19.7 (0.9)	79 (39.9)	HADS-D 8
Prinz et al, ² 2012	Germany	2008	4,5	73	NR	54 (74)	HADS-D 11
Voltmer et al, ¹⁷² 2012	Germany	2010-2011	1, 2, 5	153	Mean (SD): 25.6 (3.1)	44 (28.7)	HADS-D 11
Kötter et al, ¹⁰⁷ 2014	Germany	2011-2012	1	350	Mean (SD): 20.9 (3.2)	118 (33.7)	HADS-D 8
Wege et al, ¹⁷⁴ 2016	Germany	2012-2013	1	590	Mean (SD): 21.1 (3.9)	177 (29.9)	PHQ-9>10
Jurkat et al, ¹⁰⁰ 2011	Germany	NR	1, 4	651	NR	252 (38.7)	BDI 11
Kohls et al, ¹⁰⁵ 2012	Germany	NR	NR	419	NR	122 (29.1)	ADS-K >17
Nasioudis et al, ¹²⁶ 2015	Greece	2013	1–3	146	Mean (SD): 19.8 (1)	91 (62.3)	Zung-SDS >45
Chan, ⁵⁷ 1992	Hong Kong	NR	1	95	Mean (range): 19.6 (18–29)	64 (67.4)	BDI 19
Chan, ⁵⁶ 1991	Hong Kong	NR	1-4	335	Mean (SD): 20.1 (1.6)	239 (71.3)	BDI 10
Kumar et al, ²⁶ 2012	India	2008	1-4	400	NR	217 (54.3)	BDI 10
Gupta and Basak, ⁸² 2013	India	2008	1–5	150	Range: 18–26	104 (69.3)	BDI 10
David and Hamid Hashmi, ⁶⁴ 2013	India	2012	1	128	Mean (range): 17.9 (17–21)	46 (35.9)	BDI 17
Vankar et al, ¹⁷⁰ 2014	India	2012	1-4	331	Mean (SD): 19.8 (1.4)	178 (53.8)	РНQ-9 10
Iqbal et al, ⁹⁵ 2015	India	2012	1–5	353	Mean (SD): 20.8 (1.5)	145 (41.1)	DASS-42 10
Ali and Vankar, ³⁷ 1994	India	NR	1–3	215	Mean (range): 19.6 (17–25)	132 (61.4)	Zung-SDS 50
Supe, ³ 1998	India	NR	1–3	238	NR	128 (53.8)	Zung-SDS 40
Sidana et al, ¹⁵⁶ 2012	India	NR	1–5	237	NR	126 (53.2)	PHQ-9 10
Bayati et al. ⁹ 2009	Iran	2008	NR	172	NR	NR	GHQ-28 23
Akbari et al, ³¹ 2014	Iran	2011	NR	138	NR	NR	GHQ-28 >6
Farahangiz et al. ⁷⁶ 2016	Iran	2014	1-4	208	Mean (SD): 20.7 (1.1)	82 (39.4)	GHQ-28 23

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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score
Vahdat Shariatpanaahi et al, ¹⁵⁰ 2007	Iran	2004-2005	NR	192	Mean (SD): 24.5 (1.6)	0	BDI 10
Aghakhani et al, ²⁹ 2011	Iran	NR	NR	628	Mean (SD): 22 (0.3)	334 (53.2)	BDI 10
Ashor, ⁴³ 2012	Iraq	2010-2011	1–6	269	NR	147 (54.6)	Zung-SDS 50
Lupo and Strous, ¹¹¹ 2011	Israel	NR	1–6	119	Mean (SD): 25.1 (2.8)	NR	BDI-II 10
Peleg-Sagy and Shahar, ¹³¹ 2012	Israel	NR	1–7	60	Mean (SD): 27 (2.9)	0	CES-D 16
Peleg-Sagy and Shahar, 205 2013	Israel	NR	1, 4, 7	192	Mean (SD): 26.6 (2.6)	0	CES-D 16
Yoon et al, ¹⁷⁹ 2014	Korea	NR	2, 3, 5	174	Mean (SD): 23.3 (2.8)	96 (55.2)	РНQ-9 10
Naja et al, ¹²⁵ 2016	Lebanon	2014	2-5	340	NR	145 (42.6)	РНQ-9 10
Mehanna and Richa, ¹¹⁹ 2006	Lebanon	2003-2004	1–6	356	NR	NR	BDI 8
Bunevicius et al, ⁵³ 2008	Lithuania	2005	NR	338	Mean (SD): 21 (1)	73 (21.6)	HADS-D 8
Mancevska et al, ¹¹⁴ 2008	Macedonia	2007-2008	1–2	354	NR	120 (33.9)	BDI 17
Sherina et al, ¹⁵² 2004	Malaysia	2002	1-5	396	Mean (range): 21.6 (18–29)	152 (38.4)	GHQ-12 4
Tan et al, ¹⁶⁷ 2015	Malaysia	2013	1-5	537	NR	188 (35)	РНQ-9 10
Yusoff et al, ⁴⁶ 2011	Malaysia	2008	5	92	NR	25 (27.2)	BDI 9
Yusoff, ¹⁸¹ 2013	Malaysia	2009-2010	1	194	NR	66 (34)	DASS-21 14
Yusoff et al, ²¹⁰ 2013	Malaysia	2010-2011	1	170	NR	57 (32.8)	DASS-21 10
Saravanan and Wilks, ¹⁴⁵ 2014	Malaysia	NR	1–5	358	NR	177 (49.4)	DASS-21 10
Manaf et al, ¹¹³ 2016	Malaysia	NR	2-5	206	Mean (SD): 19.5 (2.6)	0	РНQ-9 5
Guerrero López et al. ⁷ 2013	Mexico	2007	1	455	Mean (SD): 18.3 (1.2)	139 (30.5)	CES-D 16
Romo-Nava et al, ¹⁴² 2016	Mexico	2011	1–5	1068	NR	421 (39.4)	РНQ-9 10
Melo-Carrillo et al, ¹²⁰ 2012	Mexico	2006-2007	1-4	302	NR	NR	BDI 10
Nava et al, ¹²⁷ 2013	Mexico	2010-2011	1, 5	1871	NR	707 (37.9)	РНQ-9 10
El-Gilany et al, ⁷⁵ 2008	Multiple	2007	1–6	588	Mean: 20.8	588 (100)	HADS-D 12
Seweryn et al, ¹⁴⁸ 2015	Multiple	2015	1–6	1262	Median: 22	345 (27.3)	BDI 10
Sreeramareddy et al, ¹⁶¹ 2007	Nepal	2005-2006	NR	407	Mean (SD): 20.7 (1.8)	227 (55.8)	GHQ-12 4
Basnet et al, ⁴⁸ 2012	Nepal	2008–2009	1, 3	94	Mean (SD): 21.2 (1.7)	57 (60.6)	Zung-SDS 50
Borst et al, ¹⁹⁷ 2015	Netherlands	2010-2011	1–6	951	Mean (SD): 23 (2.6)	279 (29)	BSI-DEP >0.41
Carter et al, ⁵⁴ 2014	New Zealand	2010	4–6	198	Mean (SD): 23.5 (2.1)	75 (38.1)	DASS-21 14

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New Zealand	2008–2009	3	255	Median (range): 20 (18–36)	123 (48.2)	РНQ-9 10	
Nigeria	2010	1, 2, 4, 5	451	Mean (SD): 23.4 (4.4)	288 (63.8)	GHQ-12 4	
Nigeria	2008–2009	NR	262	Mean (SD): 23.7 (2.7)	133 (50.8)	Zung-SDS 50	
Pakistan	2002	1–5	87	Mean (SD): 20.7 (1.9)	0	8 D-SDAH	_
Pakistan	2008	1–5	482	Mean (SD): 20.7 (1.8)	257 (53.3)	AKUADS 19	
Pakistan	2011	3	166	NR	73 (28.7)	Zung-SDS 50	
Pakistan	2013	NR	527	Mean (SD): 20.2 (2.3)	282 (53.5)	GHQ-12>15	
Pakistan	2014	3	110	Mean: 21	55 (50)	8 D-SDA	
Pakistan	2014	1–2	182	NR	114 (62.6)	AKUADS >19	
Pakistan	2014	1-5	66	Mean (SD): 22.2 (1.3)	28 (40)	DASS-42 10	
Pakistan	2007-2008	2–5	279	Mean (SD): 21.4 (1.4)	77 (27.6)	BDI-II 14	_
Pakistan	2014-2015	1-5	409	Mean (SD): 19.9 (1.3)	123 (30)	8 D-SDA	_
Pakistan	NR	1-4	189	NR	60 (31.7)	AKUADS 19	
Pakistan	NR	1-5	142	Mean (SD): 21.3 (1.9)	59 (41.5)	AKUADS 19	
Pakistan	NR	1,5	1000	NR	431 (43.1)	6 SCID	
Pakistan	NR	NR	477	NR	NR	KADS 6	
Panama	2005	1–6	122	NR	63 (51.6)	Zung-SDS 50	
Peru	2010	1-4	590	Mean (SD): 19 (2.5)	184 (28.9)	Zung SF 22	_
Peru	2010	1–6	615	Mean (SD): 22 (4.5)	357 (58)	Zung-SDS 50	_
Poland	1999–2005	2	178	NR	NR (69)	MMPI-D >70	
Poland	NR	2, 4	263	Mean: 22.3	NR	BDI 12	_
Saudi Arabia	2002	1–3	226	NR	149 (65.9)	AKUADS 19	
Saudi Arabia	2010	1–5	295	Mean (SD): 21.6 (1.7)	0	BDI-II 20	
Saudi Arabia	2011	1–2	543	NR	340 (62.6)	BDI-II 14	
Saudi Arabia	2012	2–6	558	Mean (SD): 21.7 (1.8)	300 (50.3)	HADS-D 11	
Saudi Arabia	2010-2011	2–6	450	Mean (SD): 21.1 (1.4)	0	HADS-D 11	
Saudi Arabia	2012-2013	1–5	442	NR	274 (62)	DASS-21 14	
Saudi Arabia	NR	1–5	797	Mean (SD): 21.6 (1.6)	590 (74)	BDI 10	
	New Zealand Nigeria Nigeria Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pakistan Pa	New Zealand 2008–2009 Nigeria 2010 Nigeria 2008–2009 Pakistan 2008–2009 Pakistan 2008–2009 Pakistan 2008–2009 Pakistan 2001 Pakistan 2011 Pakistan 2014 Pakistan NR Pakistan NR Pakistan NR Pakistan 2014 Pakistan 2014 Pakistan 2010 Pakistan NR Pakistan 2010 Pakistan 2010 Pakistan 2010	New Zealand $2008-2009$ 3 Nigeria 2010 $1, 2, 4, 5$ Nigeria $2008-2009$ NRPakistan 2002 $1-5$ Pakistan 2002 $1-5$ Pakistan 2013 NRPakistan 2013 NRPakistan 2013 NRPakistan 2014 3 Pakistan 2014 3 Pakistan 2014 $1-5$ Pakistan 2014 $1-5$ Pakistan 2014 $1-5$ Pakistan NR $1-6$ Pakistan 2010 $1-6$ Pakistan 2010 $1-6$ Pakistan 2010 $1-6$ Pakistan 2010 $1-5$ Pakistan 2010 $1-6$ Pakistan 2010 $1-6$ Pakistan 2010 $1-6$ Pakistan 2010 $1-5$ Paki Arabia 2010	New Zealand 2008–2009 3 255 Nigeria 2010 1, 2, 4, 5 451 Nigeria 2008 NR 262 Pakistant 2002 1-5 87 Pakistant 2002 1-5 87 Pakistant 2011 3 482 Pakistant 2011 3 110 Pakistant 2014 3 166 Pakistant 2014 1-2 403 Pakistant 2014 1-5 403 Pakistant NR 1-5 </td <td>New Zealand 2008–2009 3 Media (SD): 23.4 (4.4) Nigeria 2002 1.2. 4.5 451 Mean (SD): 23.7 (2.7) Nigeria 2008–2009 NR 262 Mean (SD): 23.7 (2.7) Pakistan 2002 1-5 87 Mean (SD): 20.7 (1.9) Pakistan 2002 1-5 87 Mean (SD): 20.7 (1.9) Pakistan 2011 3 Nean (SD): 20.7 (1.9) Pakistan 2011 3 Mean (SD): 20.7 (1.9) Pakistan 2013 NR 166 NR Pakistan 2014 1-2 Mean (SD): 20.7 (1.9) Pakistan 2014 1-2 Mean (SD): 21.4 (1.4) Pakistan 2014 1-5 Mean (SD): 21.4 (1.4) Pakistan <td< td=""><td>New Zadiad 3008-2000 3 255 Media (mage): 20 (1850) 123 (48.3) Nigeria 2100 1,2,4,5 451 Mean (SD): 23,4 (4.4) 288 (6.3.8) Nigeria 2008-2009 NR 262 Mean (SD): 237 (2.7) 237 (5.9.) Pakisum 2002 1-5 87 Mean (SD): 207 (1.9) 267 (5.3.) Pakisum 2013 NR 27 Mean (SD): 207 (1.9) 257 (5.3.) Pakisum 2014 3 110 Mean (SD): 207 (1.9) 263 (5.0.) Pakisum 2014 3 110 Mean (SD): 207 (1.9) 263 (5.0.) Pakisum 2014 1-2 182 Mean (SD): 202 (1.3) 263 (5.0.) Pakisum 2014 1-5 06 Mean (SD): 201 (1.4) 77 (2.5.0) Pakisum 2014 1-5 27 Mean (SD): 21.4 (1.4) 77 (2.5.0) Pakisum 2014 1-5 12 Mean (SD): 21.4 (1.4) 77 (2.5.0) Pakisum 2014 1-5 Mean (SD): 21.4 (1.4)</td><td>New Zachad 2006 3 235 Median (mage), 20(18, -36) 124 (4.2) Prep, 9 Nigeria 200 1, 2, 4, 5 451 Mean (SD), 23.4 (4.4) 258 (6.3.8) CHQ-12 4 Nigeria 2008 1-5 453 Mean (SD), 23.4 (4.4) 258 (6.3.8) CHQ-12 4 Pakisam 2002 1-5 483 Mean (SD), 20.7 (1.3) 237 (5.9.3) ZMODS 19 Pakisam 2011 3 Mean (SD), 20.7 (1.3) 237 (5.9.3) CHQ-12 -15 Pakisam 2014 1-5 48 Mean (SD), 20.7 (1.3) 257 (5.9.3) CHQ-12 -15 Pakisam 2014 1-5 68 Mean (SD), 20.7 (1.3) 257 (5.9.1) Z57 (5.9.1)</td></td<></td>	New Zealand 2008–2009 3 Media (SD): 23.4 (4.4) Nigeria 2002 1.2. 4.5 451 Mean (SD): 23.7 (2.7) Nigeria 2008–2009 NR 262 Mean (SD): 23.7 (2.7) Pakistan 2002 1-5 87 Mean (SD): 20.7 (1.9) Pakistan 2002 1-5 87 Mean (SD): 20.7 (1.9) Pakistan 2011 3 Nean (SD): 20.7 (1.9) Pakistan 2011 3 Mean (SD): 20.7 (1.9) Pakistan 2013 NR 166 NR Pakistan 2014 1-2 Mean (SD): 20.7 (1.9) Pakistan 2014 1-2 Mean (SD): 21.4 (1.4) Pakistan 2014 1-5 Mean (SD): 21.4 (1.4) Pakistan <td< td=""><td>New Zadiad 3008-2000 3 255 Media (mage): 20 (1850) 123 (48.3) Nigeria 2100 1,2,4,5 451 Mean (SD): 23,4 (4.4) 288 (6.3.8) Nigeria 2008-2009 NR 262 Mean (SD): 237 (2.7) 237 (5.9.) 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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score
Saeed et al, ¹⁴³ 2016	Saudi Arabia	NR	NR	80	Mean (SD): 25.9 (1.5)	55 (68.8)	K-10 20
Risti -Ignjatovi et al, ¹³⁹ 2013	Serbia	2002-2012	4	615	Mean (SD): 23.6 (1.5)	239 (36.8)	BDI 10
Miletic et al, ¹²¹ 2015	Serbia	2012-2013	1, 3, 6	1294	Mean (SD): 21.9 (2.8)	500 (38.6)	РНQ-9 10
Pillay et al, ¹³⁶ 2016	South Africa	NR	1–5	230	Mean: 21	66 (28.7)	Zung-SDS >30
Jeong et al, ⁹⁹ 2010	South Korea	2008	1–2	89	NR	0	CES-D 16
Kim and Roh, ¹⁰⁴ 2014	South Korea	2011	1–2	122	NR	92 (75.4)	BDI 10
Choi et al, ⁶⁰ 2015	South Korea	2013	1-4	534	NR	308 (57.7)	BDI-II 17
Roh et al, ¹⁴¹ 2009	South Korea	2006-2007	1-4	7357	NR	NR	BDI 16
Dahlin et al, ⁶³ 2011	Sweden	2006	NR	408	Median (range): 24 (22–27)	157 (36.5)	MDI>27
Dahlin et al, ⁶² 2005	Sweden	2001-2002	1, 3, 6	309	Mean (range): 26.1 (18-44)	126 (39.8)	DSM-IV criteria A and C
Kongsomboon, ¹⁰⁶ 2010	Thailand	2008	1–6	593	Mean (range): 20.7 (15–27)	243 (41)	HRSRS 25
Angkurawaranon et al, ⁴¹ 2016	Thailand	2013	2–6	1014	Mean (SD): 20.8 (1.5)	476 (46.9)	6 6-дна
N Wongpakaran and T Wongpakaran, ¹⁷⁷ 2010	Thailand	NR	1–5	368	Mean (SD): 20.8 (1)	155 (42)	TDI >35
Youssef, ¹⁸⁰ 2016	Trinidad and T	obliged	1–3	381	Mean (SD): 22.4 (3)	126 (0.3)	РНQ-9 10
Güleç et al, ⁸¹ 2005	Turkey	1993	1–6	668	Mean (SD): 21.1 (2)	658 (96.2)	BDI 17
Akvardar et al, ³² 2003	Turkey	2002	1, 6	447	Mean (SD): 21 (1.2)	272 (39.1)	HADS-D 7
Marako lu et al, ¹¹⁵ 2006	Turkey	2006	1–2	331	Mean (SD): 19.5 (1.4)	186 (56.2)	BDI 10
Mayda et al, ¹¹⁸ 2010	Turkey	2009	1–5	202	Mean (SD): 20.5 (2.2)	85 (40.1)	BDI 17
Yilmaz et al, ¹⁷⁸ 2014	Turkey	2010	1–6	995	Mean (SD): 21.1 (1.9)	517 (52)	BDI 10
Aktekin et al, ¹⁹⁶ 2001	Turkey	1996–2002	1–2	119	NR	NR	GHQ-12 4
Karao lu and eker, ¹⁰¹ 2011	Turkey	2008–2009	1–3	485	Mean (SD): 19.5 (1.5)	272 (56.1)	HADS-D 8
Baykan et al. ⁵⁰ 2012	Turkey	NR	6	193	Mean (SD): 24.5 (1.5)	107 (55.4)	DASS-42 10
Akvardar et al, ³³ 2004	Turkey	NR	1, 6	166	NR	NR	HADS-D 7
Kaya et al. ¹⁰² 2007	Turkey	NR	NR	352	NR	226 (64.2)	BDI 17
Ahmed et al, ³⁰ 2009	UAE	2008	1–5	165	NR	0	BDI 10
James et al, ⁹⁸ 2013	UK	2007	1	324	NR	194 (60)	GHQ-12 4
Honney et al, ⁸⁸ 2010	UK	2008	NR	553	Mean (SD): 21.6 (3)	220 (39.8)	PHQ-9 10

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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score	_
Ashton and Kamali, ⁴⁴ 1995	UK	1993–1994	2	186	Mean (SD): 20.4 (1.8)	77 (40.7)	HADS-D 8	
Newbury-Birch et al, ²⁰⁴ 2001	UK	1995, 1998	5	114	NR	38 (33.3)	8 d-Sdh	
Quince et al, ²⁰⁶ 2012	UK	2007-2010	1–6	2155	NR	122 (43.2)	8 D-SDAH	_
Guthrie et al, ²⁰¹ 1998	UK	NR	1	172	NR	88 (51.2)	GHQ-12 4	
Pickard et al, ¹³⁵ 2000	UK	NR	2	136	NR	46 (33.8)	8 G-SQH	-
Herzog et al, ⁸⁶ 1987	SU	1985	1–2	200	Mean (range): 23.1 (19–31)	NR	BDI 10	
Hendryx et al, ⁸⁵ 1991	SU	1988	1	110	Mean (SD): 24.1 (3.1)	70 (63.6)	BDI 10	
Givens and Tjia, ⁷⁸ 2002	SU	1994	1–2	194	NR	83 (43)	BDI-SF 8	
Thomas et al, ¹⁶⁴ 2007	SU	2004	1-4	535	NR	248 (45.4)	PRIME-MD	
Dyrbye et al. 72 2006	SU	2004	NR	545	NR	245 (45)	PRIME-MD	
Shah et al, ¹⁴⁹ 2009	SU	2005	1-4	2683	Mean (SD): 26 (3.2)	1076 (40)	CES-D 19	-
Dyrbye et al. ⁷¹ 2007	NS	2006	1-4	1691	NR	777 (46)	PRIME-MD	
Smith et al, ¹⁵⁹ 2011	SU	2008	1–5	480	Mean (range): 26.3 (18–51)	480 (100)	CES-D 16	
Smith et al, ¹⁵⁸ 2010	NS	2008	1–5	844	Mean (SD): 25.7 (4.1)	844 (100)	CES-D 16	
Shindel et al, ¹⁵⁵ 2011	SU	2008	1-5	1241	Mean (SD): 25.4 (3.4)	0	CES-D 16	-
Schwenk et al, ¹⁴⁶ 2010	SU	2009	1–4	504	NR	210 (41.6)	РНQ-9 10	
Wimsatt et al, ¹⁷⁵ 2015	SU	2009	1-4	505	NR	210 (41.6)	РНQ-9 10	
Dyrbye et al, ⁶⁹ 2010	SU	2009	1-4	2661	NR	1352 (51.4)	PRIME-MD	
Chang et al, ⁵⁹ 2012	SU	2010	1–3	364	NR	160 (44)	PRIME-MD	
Jackson et al, ⁹⁶ 2016	NS	2012	1-4	4354	Median (range): 25 (22–32)	1957 (45.3)	PRIME-MD	
Dyrbye et al, ⁶⁸ 2015	US	2012	2-4	870	NR	442 (50.9)	PRIME-MD	
Thompson et al. ¹⁶⁶ 2016	NS	2013	1-4	153	NR	75 (46.6)	РНQ-9 10	
Gold et al, ⁸⁰ 2015	US	2013	1–5	183	NR	79 (43.2)	PRIME-MD	
Lapinski et al, ¹⁰⁹ 2016	NS	2014	1–4	1294	NR	681 (52.6)	РНQ-9 5	
Zoccolillo et al, ¹⁸³ 1986	NS	1982–1984	1–2	304	NR	NR	BDI 10	
Vitaliano et al, ²⁰⁸ 1988	NS	1984–1985	1	312	Mean (SD): 25.6 (3.5)	196 (63)	BDI 5	
Rosal et al, ²⁰⁷ 1997	NS	1987–1993	2	171	NR	140 (51)	CES-D 80th percentile	
Camp et al, ¹⁹⁸ 1994	NS	1991–1993	1	232	NR	153 (65.9)	Zung-SDS 50	

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Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score
Mosley et al, ¹²³ 1994	NS	1992–1993	3	69	Mean (range): 26 (24–37)	47 (68)	CES-D 16
Levine et al, ²⁰² 2006	SU	2000-2003	2	330	NR	NR	BDI 8
Tjia et al, ¹⁶⁸ 2005	SU	2001-2002	1-4	322	Mean (SD): 25.3 (2.6)	175 (54.4)	BDI-SF 8
Thompson et al, ¹⁶⁵ 2010	NS	2002-2003	3	44	NR	NR	CES-D 16
Goebert et al, ⁷⁹ 2009	N	2003-2004	1-4	1184	NR	NR	CES-D 16
Dyrbye et al, ⁷⁰ 2011	NS	2006, 2007, 200	194	1428	NR	NR	PRIME-MD
Haglund et al, ¹⁰ 2009	SU	2006-2007	3	101	Mean (SD): 25.4 (2.2)	47 (47)	BDI-II 14
Dyrbye et al, 73 2008	SU	2006-2007	1-4	2228	NR	1159 (51.6)	PRIME-MD
Ghodasara et al, 77 2011	US	2008-2009	1–3	301	NR	154 (51)	BDI-II 14
Hardeman et al, ⁸³ 2015	N	2010-2011	1	3149	NR	1592 (49.4)	PROMIS-T >60
Ludwig et al, ²⁰³ 2015	NS	2010-2014	3	336	NR	NR	CES-D >16
Dyrbye et al, ⁷⁴ 2014	SU	2011-2012	1-4	4402	Median: 25	1972 (45.1)	PRIME-MD
Wolf and Rosenstock, ¹⁷⁶ 2016	NS	2012-2013	1-4	130	NR	NR	PRIME-MD
Mousa et al, ¹²⁴ 2016	US	2013-2014	1-4	336	NR	NR	PRIME-MD
Clark and Zeldow, ¹⁹⁹ 1988	US	NR	2	110	Mean (SD): 23.6 (2.9)	80 (73)	BDI 8
MacLean et al, ¹¹² 2016	NS	NR	1-4	385	NR	NR	PRIME-MD
Chandavarkar et al, ⁵⁸ 2007	NS	NR	1-4	427	NR	145 (34)	BDI-II 21
Zeldow et al, ¹⁸² 1987	SU	NR	NR	66	Mean: 25.4	67 (67.7)	BDI-II 14
Smith et al, ¹⁵⁷ 2007	NS	NR	NR	438	Mean (SD): 24.8 (2.8)	318 (72.6)	BDI 10

Evaluation of Mental Disorders, PROMIS-T, Patient-Reported Outcomes Measurement Information System; QIDS, Quick Inventory of Depressive Symptomatology; SCL-90, 90-item Symptom Checklist; Mental Disorders, Fourth Edition, DSP, Derogatis Stress Profile; EST-Q, Emotional State Questionnaire; GHQ, General Health Questionnaire; HADS-D, Hospital Anxiety and Depression Scale; HRSRS, BSI-DEP, Brief Symptom Inventory Depression; CES-D, Center for Epidemiological Studies Depression Scale; DASS, Depression Anxiety Stress Scale; DSM-IV, Diagnostic and Statistical Manual of Abbreviations: ADS-K, General Depression Scale Short Form (in German); AKUADS, Aga Khan University Anxiety and Depression Scale; BDI, Beck Depression Inventory; BDI-SF, BDI Short Form; Neuropsychiatric Interview; MMPI-D, Minnesota Multiphasic Personality Inventory-Depression Scale; NR, not reported; PHQ-9, 9-item Patient Health Questionnaire; PRIME-MD, Primary Care Health-Related Self-Reported Scale; K-10, Kessler Psychological Distress Scale; KADS, Kutcher Adolescent Depression Scale; MDI, Major Depression Inventory; MINI, Mini International IDI, Thai Depression Inventory; UAE, United Arab Emirates; UK, United Kingdom; US, United States; Zung-SDS, Zung Self-Rating Depression Scale; Zung-SF, Zung-SDS Short Form.

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Table 2

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Country

Source

Brazil

de Melo Cavestro and Rocha,⁶⁵ 2006 Brazil China

Alexandrino-Silva et al,³⁴ 2009

Chen et al,¹⁸⁸ 2004

Wan et al,⁴ 2012

China

Sobowale et al,¹⁶⁰ 2014

of Suicidal Idea	tion ^a					
Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score or Description ^b	
2003	1–6	213	Mean (SD): 23.1 (2.3)	109 (51.2)	MINI	
2006–2007	1–6	336	Mean (SD): 22.4 (2.5)	105 (31)	BSI >0	-
2002	2–3	892	Mean (SD): 17.5 (0.4)	0	Suicidal ideation over past 12 mo	_
2010	1–5	4063	Mean (SD): 20.5 (1.1)	1895 (46.6)	Suicidal ideation over past 12 mo	
2012	2–3	348	NR	NR	Suicidal ideation over past 2 wk (PHQ-9)	
2016	NR	612	Mean (SD): 21.2 (1.6)	190 (31)	BSI>24	
1978-1979	5	516	NR	NR	Suicidal ideation over past 12 mo	
2001	NR	273	NR	227 (83.2)	Suicidal ideation over past 1 mo	
2012-2013	1	590	Mean (SD): 21.1 (3.9)	177 (29.9)	Suicidal ideation over past 2 wk (PHQ-9)	
2013	1–5	517	NR	188 (35)	SBQ-R 7	
NR	1–6	646	Mean: 21.4	353 (54.6)	Suicidal ideation over past 12 mo	
2010	2–3	206	Mean (SD): 21 (1.7)	112 (54.4)	Suicidal ideation over past 12 mo (GHQ-28)	
1993–1994	6	522	Mean (SD): 28 (2.8)	224 (43)	Suicidal ideation over past 12 mo (Paykel Inventory)	
2013	1–5	331	Mean (SD): 20.7 (1.7)	135 (41.2)	Suicidal ideation over past 12 mo (GHQ-28)	
NR	1–5	217	Mean: 22.6	96 (44.2)	Suicidal ideation over past 12 mo (GHQ-28)	

Germany

Wege et al,¹⁷⁴ 2016

Alem et al, 186 2005

Ethiopia

Egypt

Ahmed et al,¹⁸⁵ 2016 Okasha et al,¹⁹² 1981

Egypt

Malaysia

Multiple

Nepal

Menezes et al,¹⁹¹ 2012

Eskin et al,¹⁸⁹ 2011

Tin et al, 167 2015

Suicidal ideation over past 2 wk (PRIME-MD)

RR

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1215

4

2003-2004

SU

Goebert et al,79 2009

Suicidal ideation over past 12 mo Suicidal ideation over past 12 mo (Meehan Inventory) Suicidal ideation over past 12 mo Suicidal ideation over past 2 wk (PRIME-MD)

127 (41.6) 126 (39.8)

Mean: 27.4

305

296

1, 3, 6

2001-2002

Sweden Sweden

Dahlin et al,⁶² 2005

Wallin and Runeson,¹⁹⁵ 2003

1,5

1998

Pakistan

Khokher and Khan,¹⁹⁰ 2005

Pakistan

Osama et al,⁵ 2014

Norway

Tyssen et al, ¹⁹⁴ 2001

47 (40.9) NR

Mean (range): 26.1 (18–44) Mean (SD): 20.7 (2.1)

115

1 - 6

RR

United Arab Emirates

 \mathfrak{c}

2002-2003

SU

Thompson et al,¹⁶⁵ 2010

Amiri et al, 187 2013

g

43

Source	Country	Survey Years	Year of Training	No. of Students	Age, y	Men, No. (%)	Instrument and Cutoff Score or Description ^b
Dyrbye et al, 73 2008	SU	2006–2007	1-4	2230	NR	1159 (51.6)	Suicidal ideation over past 12 mo (Meehan Inventory)
Dyrbye et al, ⁷⁴ 2014	SU	2011-2012	1-4	4032	Median: 25	1972 (45.1)	Suicidal ideation over past 12 mo (Meehan Inventory)
MacLean et al, ¹¹² 2016	NS	NR	1-4	385	NR	NR	Suicidal ideation over past 12 mo (Meehan Inventory)
Tran et al, ¹⁹³ 2015	Vietnam	2009	1, 3, 5	2099	Mean (range): 21.5 (18–30)	1052 (50.1)	Suicidal ideation over past 12 mo

Abbreviations: BSI, Beck Scale for Suicidal Ideation; GHQ, General Health Questionnaire; MINI, Mini International Neuropsychiatric Interview; NR, not reported; PHQ-9, 9-item Patient Health Questionnaire; PRIME-MD, Primary Care Evaluation of Mental Disorders; SBQ-R, Revised Suicidal Behaviors Questionnaire; US, United States.

 $^{a}\mathrm{S}\mathrm{tudies}$ are ordered alphabetically by country and then by year of survey.

 $b_{
m M}$ Studies for which a specific instrument is not specified used variably worded short form screening instruments.

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Table 3

Secondary Analysis of 9 Longitudinal Studies Reporting Depression or Depressive Symptom Prevalence Estimates Both Before and During Medical School

Rotenstein et al.

				Baseline			Follow-up			Compariso	_
Source ^a	Screening Instrument	Cutoff Score	Follow-up, mo	No. Depressed	Sample Size	Prevalence, % (95% CI)	No. Depressed	Sample Size	Prevalence, % (95% CI)	Absolute Increase, % (95% CI)	Relative Increase, Ratio (95% CI)
Walkiewicz et al, ²⁰⁹ 2012	Q-IAMM	>70	12	31	178	17.4 (11.8 to 23.0)	32	178	18.0 (12.4 to 23.6)	0.6 (-7.4 to 8.5)	1.0 (0.6 to 1.8)
Quince et al, ²⁰⁶ 2012	D-SDAH	8	12	38	665	5.7 (3.9 to 7.5)	36	429	8.4 (5.8 to 11.0)	2.7 (-0.4 to 6.1)	1.5 (0.9 to 2.4)
Levine et al, ²⁰² 2006	21-Item BDI	8	20	64	376	17.0 (13.2 to 20.8)	80	330	24.2 (19.6 to 28.8)	7.2 (1.3 to 13.2)	1.4 (1.0 to 2.0)
Camp et al, ¹⁹⁸ 1994	Zung-SDS	50	3	14	232	6.0 (2.9 to 9.1)	42	232	18.1 (13.2 to 23.1)	12.1 (6.2 to 18.0)	3.0 (1.6 to 5.6)
Vitaliano et al, ²⁰⁸ 1988	BDI	5.	8	36	312	11.5 (8.0 to 15.0)	78	312	25.0 (20.2 to 29.8)	13.5 (7.4 to 19.4)	2.2 (1.4 to 3.3)
Clark and Zeldow, ¹⁹⁹ 1988	21-item BDI	8	14	11	116	9.5 (4.2 to 14.8)	24	88	27.3 (18.0 to 36.6)	17.8 (7.2 to 28.7)	2.9 (1.3 to 6.2)
Rosal et al, ²⁰⁷ 1997	CES-D	$80 ext{th} b$	18	48	264	18.2 (13.6 to 22.9)	67	171	39.2 (31.9 to 46.5)	21.0 (12.3 to 29.6)	2.2 (1.4 to 3.3)
Aktekin et al, ¹⁹⁶ 2001	дно	4	12	21	119	17.6 (10.8 to 24.4)	57	119	47.9 (38.9 to 56.9)	30.3 (18.5 to 40.9)	2.7 (1.5 to 4.8)
Yusoff et al, ²¹⁰ 2013	DASS-21	10	12	10	170	5.9 (2.4 to 9.4)	70	170	41.2 (33.8 to 48.6)	35.3 (26.8 to 43.3)	7.0 (3.5 to 14.0)
Abbreviations: HADS-D, Hos	BDI, Beck Depression Inveprised on BDI, Beck Depression	entory; CES-D, C on Scale; MMPI-J	Zenter for Epidemic D, Minnesota Multi	ological Studies De iphasic Personality	pression Scale; / Inventory-Depr	DASS-21, 21-ite ession Scale; Zu	em Depression An ang-SDS, Zung Se	xiety Stress Scale If-Rating Depres	e; GHQ, Genera sion Scale	al Health Ques	tionnaire;

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^aStudies are sorted by the percentage increase in depressive symptoms from baseline to the follow-up survey. The median percentage increase among the studies was 13.5%.

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