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Prevalence of depression among students at Ethiopian universities and associated factors: A systematic review and meta-analysis

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Abstract

Background

Depression is the most common cause of disability in the world, which affects 350 million people. University students struggle to cope with stressors that are typical of higher education institutions as well as anxiety related to education. Although evidence indicates that they have a high prevalence of depression, no reviews have been done to determine the prevalence of depression among students at Ethiopian universities comprehensively.

Methods

Without regard to time constraints, PubMed, Scopus, and EMBASE were investigated. A manual search for an article reference list was also conducted. The Meta XL software was used to extract relevant data, and the Stata-11 meta-prop package was used to analyze it. The Higgs I2 test was used to test for heterogeneity.

Results

A search of the electronic and manual systems resulted in 940 articles. Data were extracted from ten studies included in this review involving a total number of 5207 university students. The pooled prevalence of depression was 28.13% (95% CI: 22.67, 33.59). In the sub-group analysis, the average prevalence was higher in studies having a lower sample size (28.42%) than studies with a higher sample; 27.70%, and studies that utilized other (PHQ-9, HADS); 30.67% higher than studies that used BDI-II; 26.07%. Being female (pooled AOR = 5.56) (95% CI: 1.51, 9.61), being a first-year (pooled AOR = 4.78) (95% CI: 2.21, 7.36), chewing khat (pooled AOR = 2.83) (95% CI: 2.32, 3.33), alcohol use (pooled AOR = 3.12 (95% CI:3.12, 4.01) and family history of mental illness (pooled AOR = 2.57 (95% CI:2.00, 3.15) were factors significantly associated with depression.

Abbreviations: AOR, Adjusted Odds Ratio; BDI-I, Beck's Depression Inventory-I; CES-D, Center for Epidemiologic Studies Depression scale; CI, Confidence Interval; CS, Cross-Sectional; ETB, Ethiopian Birr; HADS, Hospital Anxiety and Depression Scale; OR, Odds Ratio; PHQ-9, Patient Health Questionnaire-9; PRISMA-P, Preferred Reporting Items for Systematic Reviews and Meta-analysis.

Conclusion

This systematic review and meta-analysis revealed that more than one-fourth of students at Ethiopian universities had depression. More efforts need to be done to provide better mental healthcare to university students in Ethiopia.

Background

Depression is a common mental disorder which is characterized by sadness, loss of pleasure or interest, disturbance of sleep, psychomotor activity, difficulty to concentrate, decreased energy, guilty feeling, and recurring thought of death wish [1]. Depression has received increasing global attention because of its negative effects on interpersonal, social, and occupational functioning [2].

University students are a special group of people who are going through a key transition from adolescence to adulthood, which may be one of the most stressful times in their lives. Many students experience anxiety as they try to fit in, keep decent grades, prepare for the future, and be away from home [3]. As a reaction to this stress, some students become depressed. Also, depression contributes to lower academic performance, the chance of dropping out, suicidal behavior (ideation, plan, and attempt), and impact on peer and teacher interactions in addition to negative health consequences [4]. Without recognizing depression, students may cry all the time, skip classes, or isolate themselves [5]. Globally, the prevalence of depression among university students is estimated differently in different studies from 1.4% to 73.5% [6]. Depression has a great impact or impairment among university students that require attention for a better existence in public society. Various Studies across the world have reported different prevalence rates for depression. The prevalence of depression among university students in the United States 27.2% [3], Pakistan 42.66% [7], Iran 33% [5], and China 74% [8].

Different factors significantly associated with depression among university students such as being single [5], female gender [9–13], age [11, 14, 15], low academic achievement [11, 16], family problems [11, 17, 18], poor social support [19], family history of mental illness [17, 20], parental education [11, 17, 21], financial struggles [14, 16], the field of study [22], year of study [13, 14, 19], type of college [11], the satisfaction of major study [17], risky sexual behavior [23, 24], and substance use (alcohol, tobacco, and khat) [11, 16, 20, 23, 25–27]. Studies conducted in Ethiopia showed, being female [25, 26, 28], being a first-year student [25, 26, 28–30], monthly pocket money [31], having a mentally ill family member [30, 31], stressful life events [29], violent behavior [31, 32], being from the College of Social science and humanity [31], younger age [29], having a chronic medical illness [30], and current use of illicit substances [27].

Even though a wide range of studies showed depression as a significant public health problem in developing nations including Ethiopia, still there is no systematic review and meta-analysis conducted to assess the prevalence of depression among university students. Therefore, this systematic review and meta-analysis aimed to summarize the existing evidence on the prevalence of depression and the pooled odds ratio of the associated factors for depressive symptoms among university students and to formulate possible suggestions for future clinical practice and research community.

Materials and methods

Study designed

The PRISMA (preferred reporting items for systematic reviews and meta-analyses) standard was used to perform the frame of the whole review process [33].

Search strategy

An electronic and manual search of eligible articles was performed as part of a systematic review of the literature. Our search was conducted on October 10, 2022, using electronic libraries in Scopus, PubMed, and EMBASE, as well as manual exploration of the reference lists of articles. For searching articles on the prevalence of depression among university students using the PubMed database, we used the following search terms: "epidemiology" OR "prevalence" OR "magnitude" OR "incidence" AND "factor" OR "associated factor" OR "risk" OR "risk factor" OR "determinant", "depressive symptoms", "depressive disorder" OR "major depressive disorder" AND "University students AND Ethiopia". Besides, the literature search in EMBASE and Scopus followed database-specific searching parameters. Furthermore, there was no specification for studies based on the study period in the reference list of included studies.

Inclusion and exclusion criteria

The researchers included original quantitative studies on the frequency and determinants of depression among university students. All observational studies were conducted by using different study-designed cross-sectional reports from June 2006 up to June 2021 were included. This systematic review and meta-analysis included publications with full-text papers and studies of depression that were published in peer-reviewed journals. Fortunately, studies published as review articles, qualitative studies, brief reports, letters to the editor, or editorial comments, working papers publications, published in a language other than English, research on non-human subjects, and studies with duplicate data from other studies were also excluded.

Outcome measurements

We have two objectives in this systematic review and meta-analysis study. These are to determine the pooled prevalence of depression among university students in Ethiopia and to estimate the pooled effects of associated factors with depression among university students in Ethiopia. The pooled prevalence of depression was calculated using STATA version 14.0. The pooled effect estimate of associated factors with depression was calculated. The odds ratio was prepared from the searched research reports using two by two tables.

Data extraction and appraisal of study quality

Two authors (TA, and YZ) checked study titles and abstracts for eligibility after deleting duplicates. The full texts were evaluated by the same reviewers if at least one of them thought an article was potentially eligible. Two authors (TA and YZ) extracted detailed information using a Microsoft Excel spreadsheet after the papers were scrutinized for their titles, abstracts, and entire texts. All studies approved by both reviewers were included and any differences were worked out through discussion to reach a consensus. Following the agreement, information about the principal investigator, years of publications, study period, study population, and sample size was retrieved from the identified articles. The identified articles were organized using EndNote X7.3.1. Each of the included studies' risk of bias was assessed by six (TA, MN, MG, TS, FK, and TB) investigators. The Newcastle Ottawa quality evaluation checklist was

used to assess the quality of the studies included in the final analysis [34]. Study participants and setting, research design, recruiting technique, response rate, sample representativeness, valid measuring convention, measurement reliability, and proper statistical analysis are all included in the quality evaluation checklist.

Data synthesis and analysis

We used a random-effect model to assess the overall prevalence of depression and the related variables for depression among university students, as well as their 95% CI's [35]. Meta-XL version 5.3 [36] was employed to extract relevant data from included studies and the STATA11 Meta-prop package [37] was implemented to estimate the pooled prevalence of depression among university students and pooled odds ratio of the associated factors for depression. The Higgs I^2 statistic was also utilized to detect heterogeneity. Thus, percentages I^2 statistical values around 0% (I^2 0), 25% (I^2 25), 50% (I^2 50), and 75% (I^2 75) would mean absent, low, medium, and high heterogeneity, respectively [38]. Subgroup analysis and sensitivity analysis analyses were also used to investigate the source of heterogeneity among the studies included. To detect publication bias, researchers utilized the funnel plot test [39] and the eggers publication bias test.

Search results

Identification of studies

Our search with the pre-specified search strategies resulted in an overall of 935 articles. Besides, five articles were obtained from the reference list of included articles making the total number of retrieved articles to be 930 [25, 27, 29, 30, 32]. Of this, we removed 45 duplicated studies before further screening. In the next stage, we excluded 895 by title screening, being irrelevant to the main subject; and repetitive publications. Therefore the remaining 23 articles had been completely inspected for eligibility to be included in the current systematic review and meta-analysis study; nevertheless, only 10 articles were tailored in the final meta-analysis since the rest 13 articles were also excluded due to various reasons; 7 articles were poor methodological assessment, 4 articles were reviewed studies, and 2 articles were published other than the English language) (Fig 1).

Characteristics of included studies

We included ten studies that assessed the prevalence and associated factors of depression among university students [25–32, 40, 41]. These studies included a total of 5207 university students. Five [27, 30, 31, 40, 41], two [25, 28] two [26, 32], and one [29] of the included studies used the BDI-II, PHQ-9, CESD's questionnaire, and HADS, respectively, to measure depression in university students. Regarding the study's design, all studies were institutional-based cross-sectional [25–32, 40, 41]. Also, eight of the studies employed a simple random sampling technique during data collection, and two studies used systematic random sampling [27, 29]. All of the studies reported response rates [25–32, 40, 41] (Table 1).

Quality of included studies

The quality of ten studies [25–32, 40, 41] was assessed with the modified Newcastle Ottawa quality assessment scale. This scale divides the total quality score into 3 ranges; a score of 7 to 10 as very good/good, a score of 5 to 6 as having satisfactory quality, and a quality score less than 5 as unsatisfactory [42]. All studies had scored good quality (Table 2).
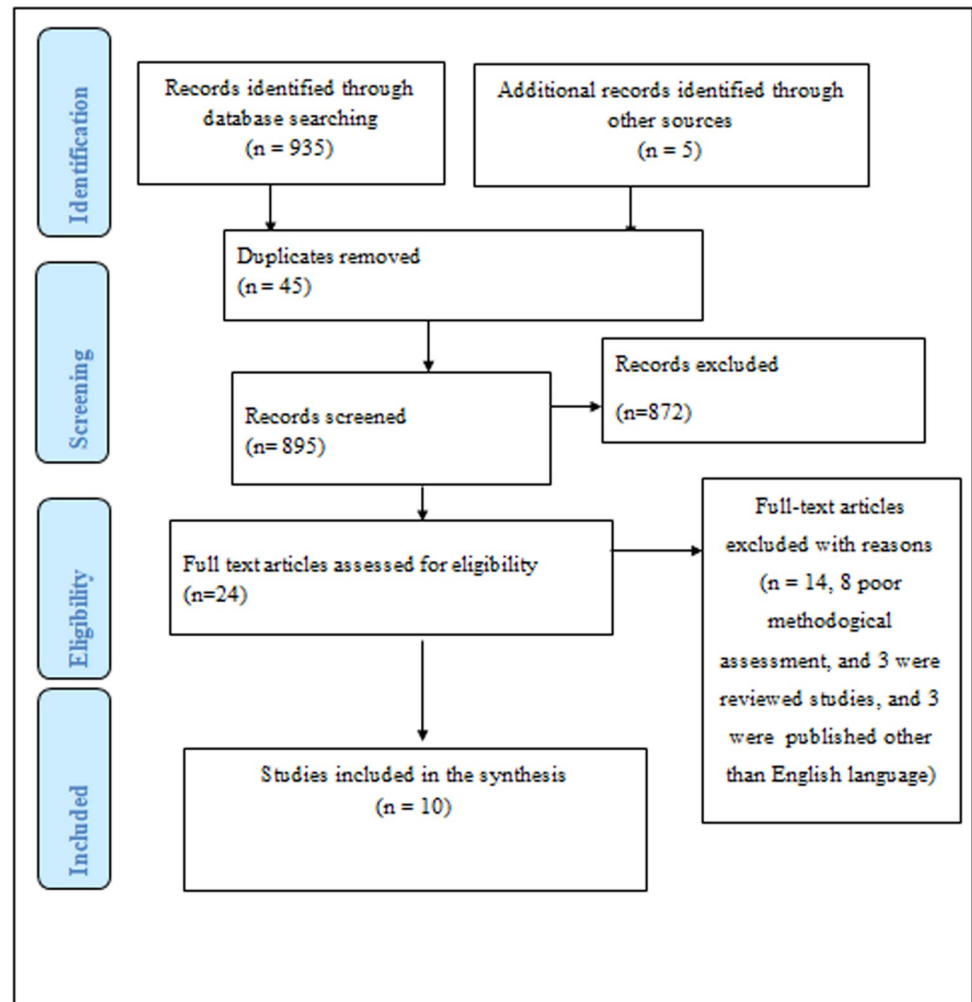
Fig 1. PRISMA flow chart for the review search process.

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The pooled prevalence of depression among university students

The pooled prevalence of depression among students at Ethiopian universities was found to be 28.13% (95% CI: 22.67, 33.59); (I^2 = 100%, p-value < 0.001) (Fig 2).

Subgroup analysis of the prevalence of depression among university students

Subgroup analysis of the prevalence of depression among university students by the sample size. Since the average prevalence of depression was significantly influenced by the difference between the included studies, it was mandatory to conduct a subgroup analysis. Therefore, we used a sample size of below 400 [25, 27, 31, 32] provided a higher prevalence of depression; 28.42% than those who had a sample size above 400 [25, 26, 29, 30, 40, 41]; 27.70% (Fig 3).

Subgroup analysis of the prevalence of depression among university students by the tools. The measurement tools for depression to perform subgroup analysis. The subgroup analysis by assessment instrument yields that measurement with other (PHQ-9, HADS) [26,

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Table 1. Characteristics of studies on depression among university students are incorporated in this meta-analysis according to author's first name, year of publication, setting of the study, design, sample size, assessment tools, study population, sampling methods, age, and magnitude of depression, response rate.

Author, year of publication	Place	Study design	Sample size	Instrument and cutoff value	Study Population	Sampling Technique	Age	Overall prevalence of depression (%)	Response Rate
Birhanu et al. 2016 [25]	Ambo, Ethiopia	CS	410	CES-D >22	University students	Simple random	M & F 17–23 years	32.2.(n = 132)	96.9%.
Tamene et al. 2021 [26]	Debre birhan, Ethiopia	CS	369	PHQ-9 ≥10	University students	Simple random	M & F 18 and 33	17.1(n = 63)	100%
Ahmed et al. 2020 [31]	Jimma, Ethiopia	CS	556	BDI-II> 14	University students	Simple random	M & F 18 to 35 years	28.2.(n = 157)	94.9%
Terasaki et al. 2009 [32]	Hawassa, Ethiopia	CS	1,176	PHQ-9 >10.	University students	Simple random.	M & F > 18 years	23.6(n = 277)	100%
Kebede et al. 2019 [29]	Addis Abba, Ethiopia	CS	273	HADS>8	University students	Systematic sampling	M & F 18–21 years	51.30(140)	98.5%
Muhammed et al. 2019 [30]	Wollo, Ethiopia	CS	*334*	BDI-II 14–63	University students	Simple random	M & F 18 to 35 years	*35.3(118)*	100%
Dagnew et al. 2020 [41]	Gondar, Ethiopia	CS	383	BDI-II = 21–63	University students	Simple random	M & F 18–34	34.73(n = 133)	97.7%
Worku et al. 2020 [40]	Arsi, Ethiopia	CS	384	BDI-II >14	University students	Simple random	M & F 18–30 years	4.4(n = 17)	100%
Berhanu et al. 2020 [28]	Addis Ababa, Ethiopia	CS	300	CES-D >16	University students	Simple random	M & F 17–28 years	27.7(n = 83)	95.5%
Teshome et al. 2020 [27]	Haramaya, Ethiopia	CS	1022	BDI-II > 13	University students	Systematic random	M & F 20–24	26.8(274)	98.3%

Key: M = Male, F = Female

Table 2. Quality assessment result of the studies included in this meta-analysis.

Study ID	Representation	Sampling	Random Selection	Non-response Bias	Data Collection	Case Definition	Reliability and Validity	Method of Data Collection	Prevalence Period	Numerator and Denominator	Summary
Birhanu et al. 2016 [25]	1	1	1	1	1	1	1	1	1	1	10
Tamene et al. 2021 [26]	0	1	1	0	1	1	1	1	1	1	8
Ahmed et al. 2020 [31]	1	1	1	1	1	1	1	1	1	1	10
Terasaki et al. 2009 [32]	1	1	1	1	1	1	1	1	1	1	10
Kebede et al. 2019 [29]	0	1	1	1	0	0	1	1	1	1	7
Muhammed et al. 2019 [30]	0	1	1	1	1	0	1	1	0	1	7
Dagnew et al. 2020 [41]	0	1	1	1	1	1	1	1	1	1	9
Worku et al. 2020 [40]	0	1	1	1	1	1	1	1	1	1	9
Berhanu et al. 2020 [28]	0	1	1	1	1	1	1	1	1	1	9
Teshome et al. 2020 [27]	1	1	1	1	1	1	1	1	1	1	10

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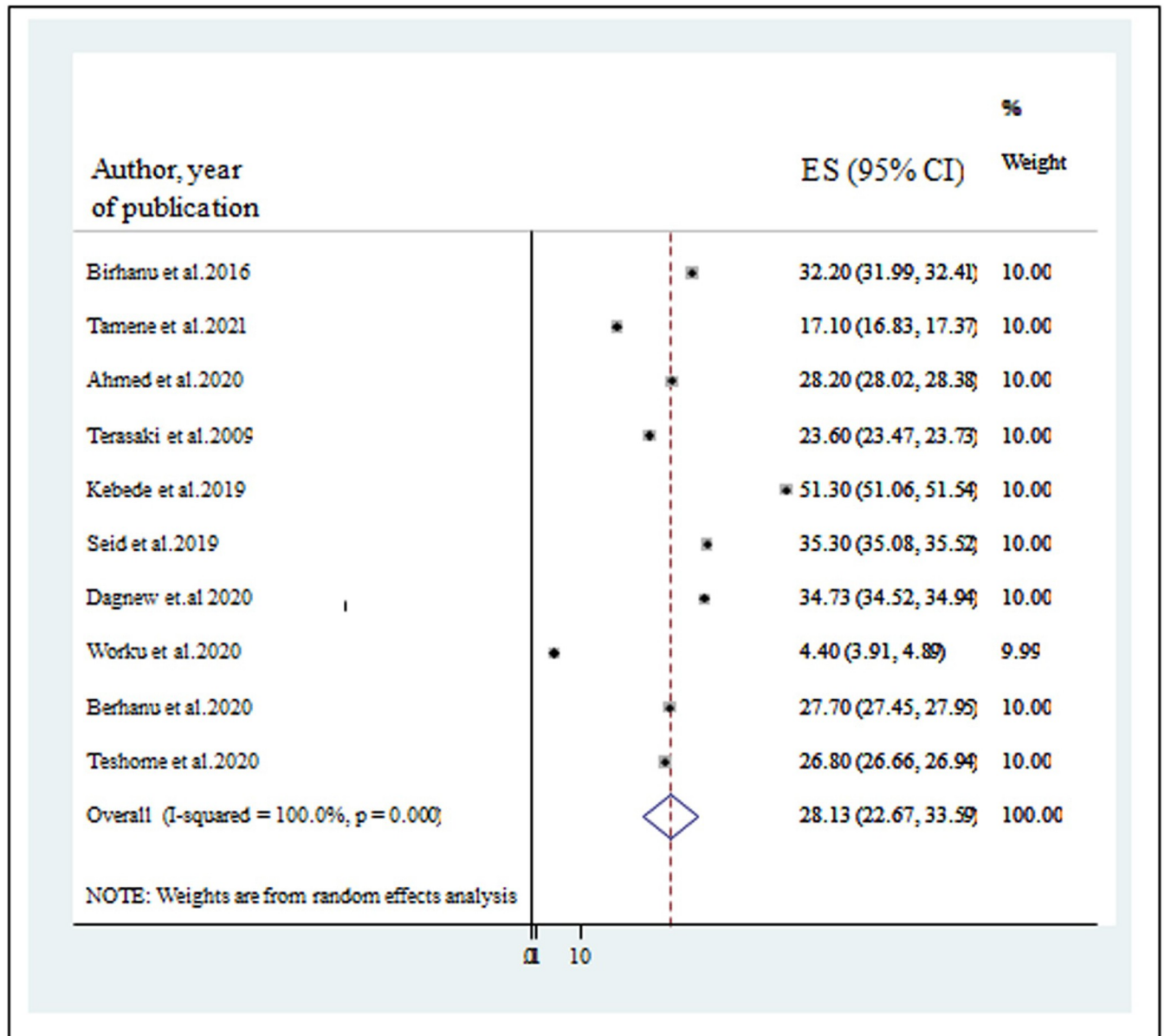
Fig 2. A forest plot for the prevalence of depression.

29, 32] provided relatively higher result, 30.67% (95% CI: 12.06, 49.27) with (I2 = 100%, p < 0.001) than the result with CEDS's [25, 27], which was 29.50% (95% CI:24.21, 34.79) (I2 = 99.9%, p < 0.001) and BDI-II [25, 30, 31, 40, 41], which was 26.07(19.42,32.72) (I2 = 100%) (Fig 4).

Sensitivity analysis

The sensitivity analysis was performed to identify whether one or more of the ten studies had out-weighted the average prevalence of depression among university students. However, the findings show that all values are within the estimated 95% confidence interval, indicating that the absence of one study had no significant difference in the prevalence of this meta-analysis (Fig 5).
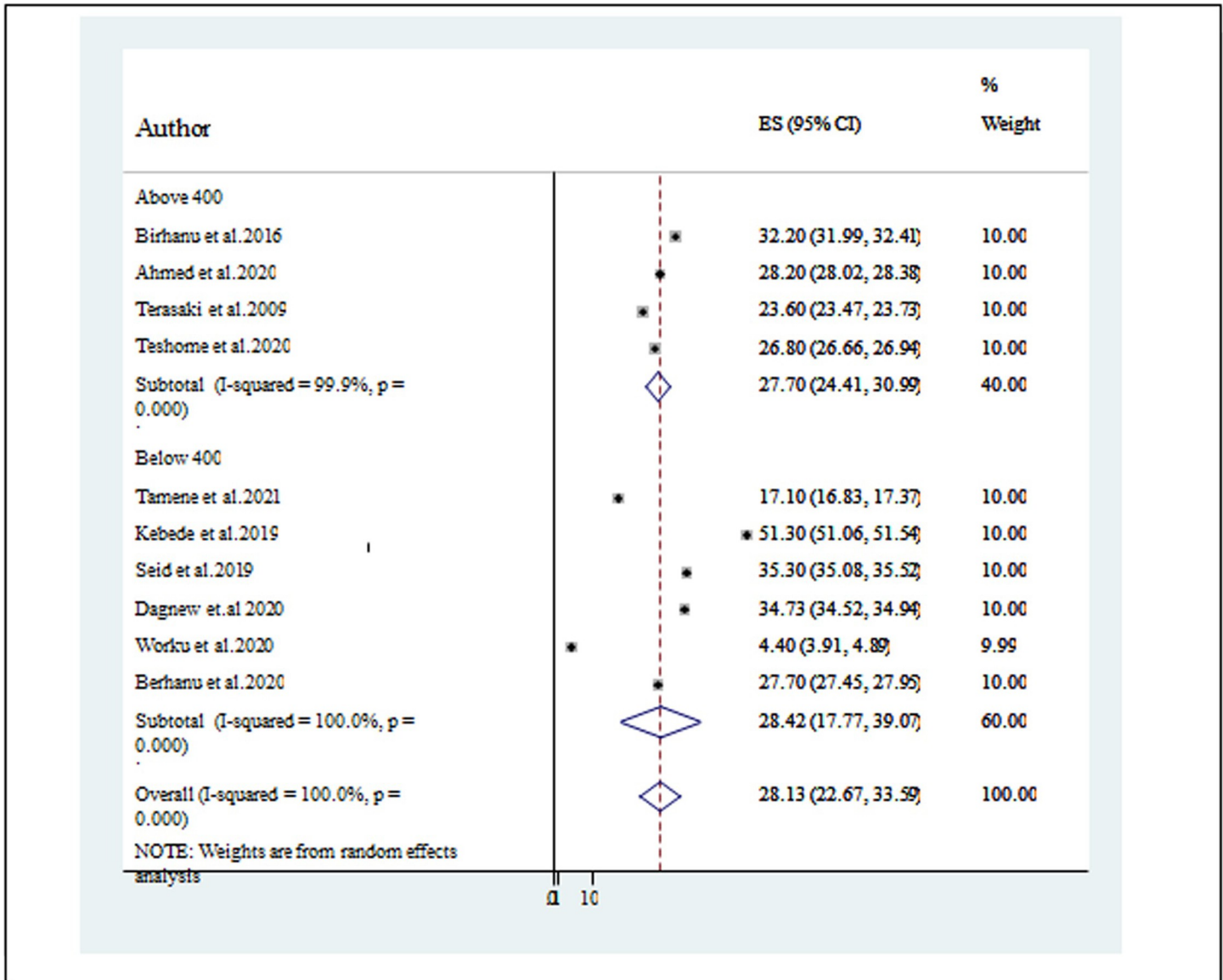
Fig 3. A forest plot for the sub-group analysis of the prevalence of depression based on the sample size of studies.

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Publication bias

A scatter plot of the logit event rate of depression on the X-axis and its standard error on the Y-axis was done, which showed that there was a publication bias since the graph was slightly asymmetrical. However, the Eggers publication bias test revealed that there was no significant publication bias (B = 9.19, SE = 94.5, and P-value = 0.92) (Fig 6).

Associated factors for depression among students at Ethiopian universities

As stated previously, ten studies [25–32, 40, 41] reported one or more factors related to the development of depression among university students. Our narrative synthesis revealed that being female [25, 26, 28], being a first-year student [25, 27, 30], current use of khat [25, 30],
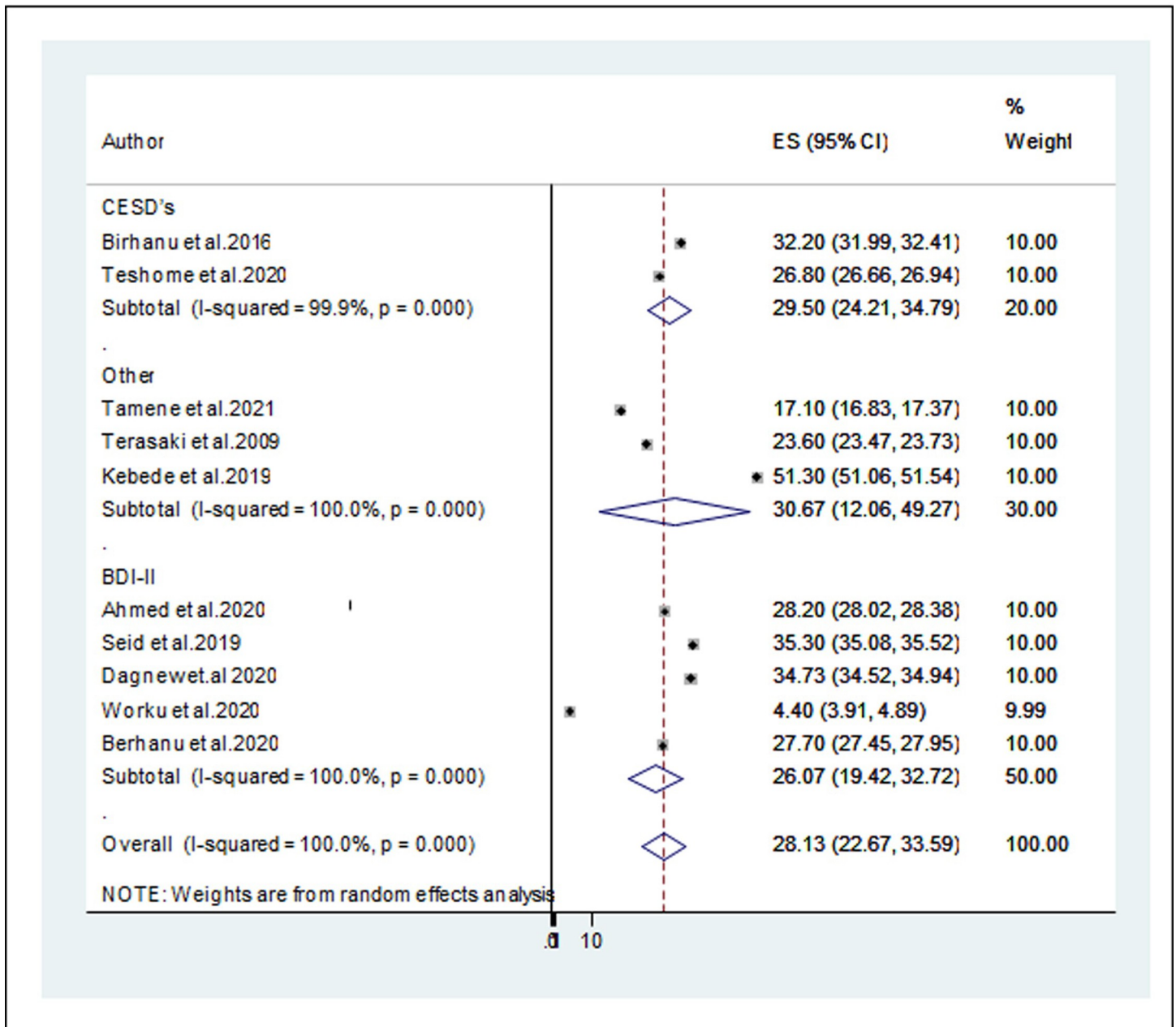
Fig 4. Forest plot for the sub-group analysis of the prevalence of depression by measurement tool used.

alcohol use [26, 27], and having a family history of mental illness [30, 31] were among the most commonly reported factors contributing to the development of depression among university students (Table 3).

The pooled odds ratio of being female among the above-mentioned studies was 5.56 (95% CI: 1.51, 9.61). This implied that female students were 5.56 times at higher risk of developing depression than male students. The pooled odds ratio for being a first-year student for the three studies reported above was found to be 4.78 (95% CI: 2.21, 7.36). Students who were first-year students were 4.78 times more likely to be depressed than senior students. History of

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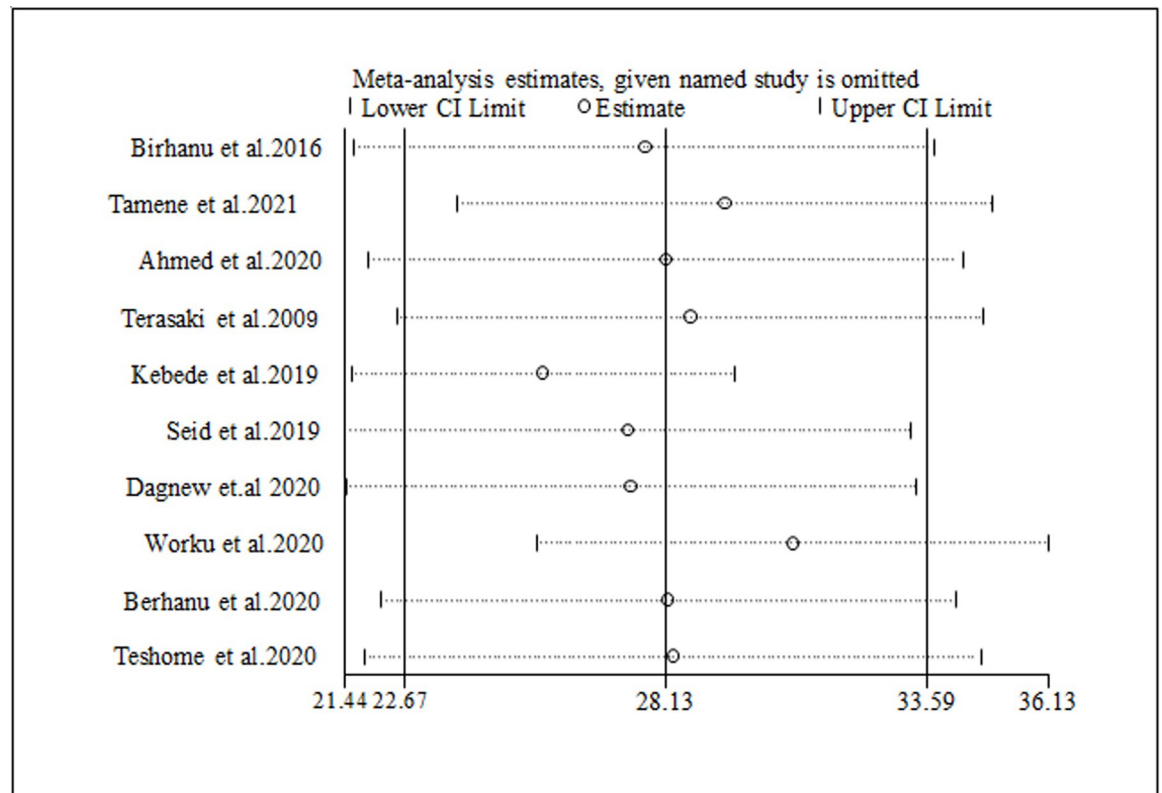

Fig 5. Sensitivity analysis for the prevalence of depression among university students.

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chewing khat was also an associated factor for the development of depression with a pooled estimate odds ratio of 2.83 (95% CI: 2.32, 3.33). Besides, alcohol use was also found to have a significant association with the development of depression with an estimated pooled odds ratio of 3.12 (95% CI:3.12, 4.01). Participants who had a family history of mental illness was found to have a significant association with the development of depression with an estimated pooled odds ratio of 2.57 (95% CI:2.00, 3.15) (Table 4).

Discussion

The pooled estimated prevalence of this systematic review and meta-analysis was 28.13% with a 95% CI (95% CI: 22.67, 33.59). This result was in line with another study conducted in China (32.74%) which analyzed 15 studies and 35,160 students [8]. It was also consistent with the result of a systematic review and meta-analysis study from Iranian university students which assessed 35 studies with a sample size of 9743 and 33% of them were found to have depression [5]. It was consistent with the study of Chinese university students which assessed 113 studies, and 28.4% of them were found to have depression [43]. Another study that involved 76,608 and 37 studies from low and middle-income countries [44] reported 24.4% of students as having depression, which was also supportive of the current finding. Our meta-analysis is much higher than in investigating the pooled prevalence of depression among the general population in Ethiopia (9.1% to 11%) [45, 46]. The findings revealed that several distinct characteristics of university students, such as increased social interactions and shifting residential and financial situations, may raise the risk of depression [47].
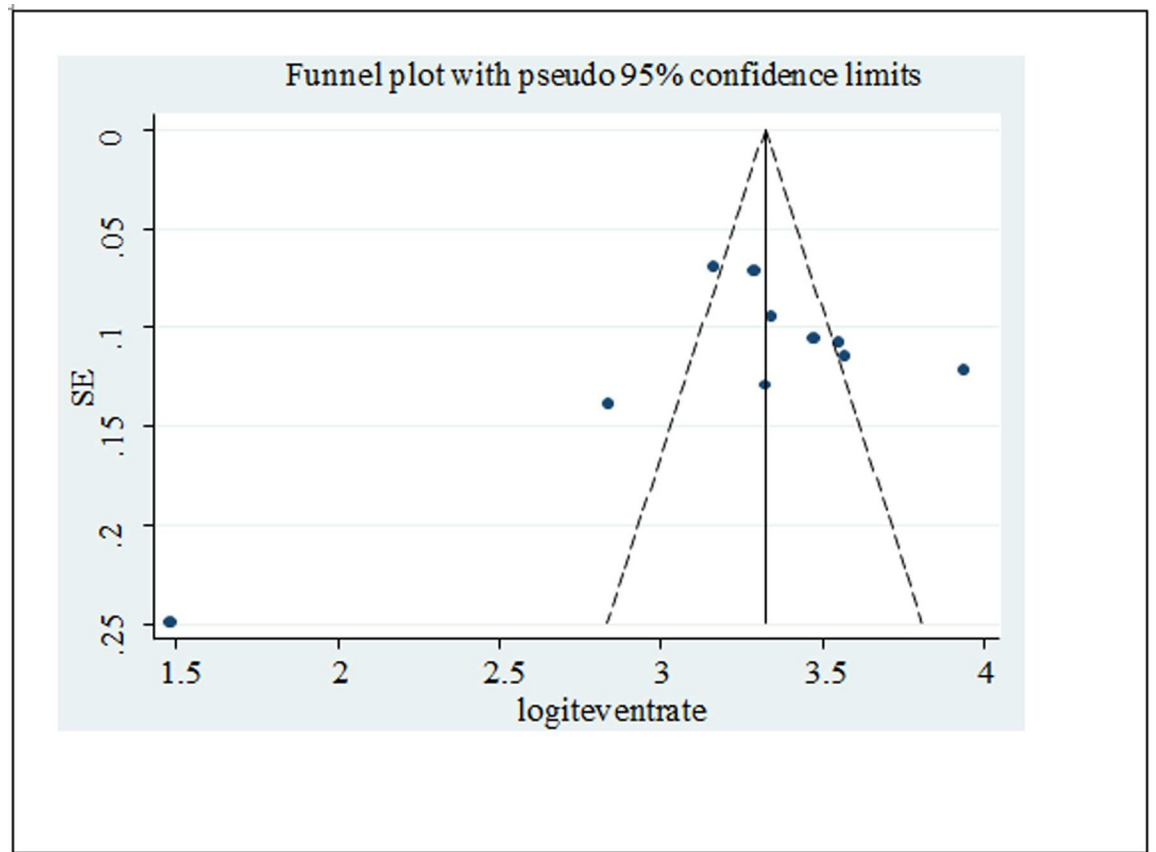
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Fig 6. A funnel plot for publication bias for depression.

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On the contrary, the average prevalence of depression in the present review was lower when compared with Asian university students on 8916 subjects, and in 27 articles a pooled prevalence of depression was 34.0% [48]. It was also lower than the systematic review and meta-analysis conducted on depression in Pakistani among 7652 university students and 26 studies in which the mean prevalence of depression was 42.66% (95% CI: 34.8–50.9%) [7]. The reason for the discrepancy might be because these investigations used different evaluation standards and measurement instruments, there could have been differences in prevalence rates.

The pooled prevalence of depression among university students in studies using a sample size below 400 study subjects (28.42%) [25, 27, 31, 32] was higher than the pooled prevalence of depression in university students that used a sample size of greater than 400 (27.07%) [25, 26, 29, 30, 40, 41]. The reason could be a smaller sample size increases the probability of a standard error thus providing a less precise and reliable result with weak power. Likewise, the present study revealed that pooled prevalence of depression was higher in studies as measured with other (PHQ-9, HADS) [26, 29, 32]; 30.67% (95% CI: 12.06, 49.27) than the result with CEDS's [25, 27] (29.50% (95% CI:24.21, 34.79) and BDI-II [25, 30, 31, 40, 41], which was 26.07 (19.42,32.72). This could be because studies that utilized delineated (PHQ-9, HADS) a lower cut-off point (PHQ-9 score $\geq$ 10 and HADS score > 8), which might result in an overestimation of the prevalence of depression.

Regarding the associated factors of depression, ten studies [25–32, 40, 41] had reported different factors and being female [25, 26, 28], being a first-year student [25, 27, 30], current use

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Table 3. Characteristics of associated factors for depression among university students in Ethiopia by their odds ratio, confidence interval, association strength, author, and year of publication.

Author, year of publication	Factor category	Associated factors	AOR	95% CI	Strength of association
Birhanu et al. 2016	Socio-demographic factors	Being female	4.02	1.22,4.03	Strong
		Being first-year student	3.00	3.02,7.25	Strong
	Substance-related	Current use of Khat	3.05	2.05,6.02	Strong
Tamene et al. 2021	Socio-demographic factors	Female	9.28	3.47–24.81	Strong
		Academic year	0.236	0.059–0.936	Weak
		Smoking	26.3	9.33–74.1	Strong
		Alcohol use	2.62	0.95–7.21	Strong
Ahmed et al. 2020	Socio-demographic factors	Having monthly pocket money between 500–999 ETB	0.450	0.204–0.995	Weak
		Being from the College of Social Science and Humanity	2.582	1.332–5.008	Strong
		Promoted academic performance	2.912	1.063–7.975	Strong
	Clinical factors	Having a mentally ill family member	2.307	1.055–5.049	Strong
	Risky sexual behavior	Having sex after drinking	3.722	1.818–7.619	Strong
		Being hit by sexual partner	3.132	1.561–6.283	Strong
	Negative life event	Having childhood emotional abuse	2.167	1.169–4.017	Strong
Terasaki et al. 2009	Negative life event	Moderate outward anger	1.97	1.33–2.93	Weak
		High outward anger	3.23	2.14–4.88	Strong
		Violent behavior	1.82	1.37–2.40	Weak
Kebede et al. 2019	Socio-demographic factors	Age interval 18–21 years	2.42	1.64, 9.22	Strong
		1st-year educational level	1.63	1.43, 6.26	Weak
		2nd-year educational level,	1.39	1.17, 5.18	Weak
	Negative life event	Stressful life events	1.61	1.14, 2.76	Weak
Muhammed et al. 2019	Socio-demographic factors	Being male	1.69	1.96–2.98	Weak
		Study year (first year)	4.33	1.40–13.39	Strong
	Clinical factors	Having a chronic medical illness	2.07	1.19, 3.57	Strong
		Family history of mental illness	2.89	1.37–6.16	Strong
	Substance use	Khat chewing,	2.53	1.16–5.51	Strong
Dagnew et al. 2020	Socio-demographic factors	Students who came from a rural family	1.67	1.02–2.72	Weak
		Those studying Health sciences	2.65	1.34–5.26	Strong
	Clinical factors	Experienced tooth grinding,	2.79	1.36–5.74	Strong
		Night sleep disturbances	1.95	1.17–3.25	Weak
		Who reported daytime sleepiness	1.93	1.16–3.20	Weak
		Stress	4.20	1.90–9.26	Strong
Worku et al. 2020	Psychosocial	Thinking about a future career prospect	8.415	1.039, 68.14	Strong
Berhanu et al. 2020	Socio-demographic factors	Female students	3.36	1.88, 6.01	Strong
Teshome et al. 2020	Socio-demographic factors	Being divorced/widowed	5.91	1.31, 26.72	Strong
		Being a first-year student	6.99	2.31, 21.15	Strong
		Being second-year student	6.25	2.05, 19.07	Strong
		Being a third-year student	3.85	1.26, 11.78	Strong
	Substance-related	Current drinking alcohol	2.53	1.72,3.72	Strong
		Current smoking cigarettes	1.71	1.02, 2.86	Weak
		Current use of illicit substances	2.20	1.26, 3.85	Strong

of khat [25, 30], alcohol use [26, 27], and having a family history of mental illness [30, 31] were among the most commonly reported factors. The pooled odds ratio of being female among the above-mentioned studies was 5.56, which implies, that those female students were 5.56 times at higher risk of developing depression than males. A meta-analysis study in China showed a

Table 4. A pooled estimate of the associated factors for depression among students in Ethiopian universities.

Associated Factors	Risk Groups	Pooled Effect Size & 95% CI	I2	Studies Pooled
Being female	Students who were females	5.56 (1.51,9.61)	99.5%	[25, 26, 28]
Being a first-year student	Students who were a first-year student	4.78 (2.21,7.36)	99.1%	[25, 27, 30]
Current use of khat	Those students who are using Khat	2.83(2.32,3.33)	24.6%	[25, 30]
Alcohol use	Those students who are using alcohol	3.12(2.23,4.01)	83.7%	[26, 27]
Family history of mental illness	Students who had a family history of mental illness	2.57(2.00,3.15)	46.4%	[30, 31]

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similar conclusion supporting this [49]. Female students are more likely to be depressed [26], and women are more likely than men to suffer from depression. Women are more likely than males to suffer from moderate to severe depression [17]. The disparity could be related to social and cultural factors. Biological conditions are another factor that contributes to the disparity [47].

Besides, the pooled odds ratio of first-year students for the three studies reported above was found to be 4.78. This showed that those who were first-year students were 4.78 times more likely to be depressed than senior students. This might be caused by a lack of social interaction, an unfamiliar exam schedule, a lesser grade than expected, a lack of vacation or a break, a language barrier, or any combination of these factors [50].

Furthermore, the pooled odds ratio of chewing khat and alcohol usage was 2.83 and 3.12 respectively. Even if the cause and effect are not obvious in this study, this result could be related to either the fact that depressed students are more prone to substance use to relieve themselves from the melancholy mood or because maladaptive drug use can modify their mood to the point of depression [1]. Participants who use drugs or alcohol may experience feelings of isolation, despair, and hopelessness that are frequently linked to depression [51].

Finally, students who had a family history of mental illness were 2.57 times more likely to have depression as compared to students who had no family history of mental illness. This association might present as a result of genetic factors, the burden of stigma, and there are many various sorts of financial constraints on family members, and caring for the patient and the children may also put them under stress and worry about their parent's health, which may raise the likelihood that they may experience depression [1]. There are many various sorts of financial constraints on family members, and caring for the patient and the children may also put them under stress and worry about their parent's health, which may raise the likelihood that they may experience depression [52].

Strengths and limitations

To our knowledge, this is the first meta-analysis of the prevalence of depression among students at Ethiopian universities. However, one of the limitations of this meta-analysis study is that the choice of cut-point by researchers and assessment tools varies depending on where the study was conducted. Second, because so many studies were observational and their subjects were not chosen randomly, it was challenging for us to assess how well they were conducted because so many of them lacked trustworthy information on key factors or appropriate information on the persons they were examining. Confounding and selection bias, therefore, appears inevitable. Thirdly, limited research on mental health in Ethiopia given it is a country that has few psychiatrists nowadays and that stigma may play a role in the responses given by students. Finally, studies other than cross-sectional.

Implications of this study for clinical practice, researchers, and policymakers

First, this review showed that clinical professionals (clinical psychologists, psychiatrists, sociologists, lecturers, and student counselors) who work in student clinics should be aware that depression is a widespread issue among university students and be prepared to provide patients with management or treatment. Second, the review's findings that the average estimated prevalence of depression among university students is higher than the average estimated prevalence of depression in the general population prompt the question of why this is so and what causes it to be so. Finally, the findings let policy-makers and program planners know that depression is a serious public health issue among university students. This lessens the need for a comprehensive strategy for treating depression among university students.

Conclusion

This review and meta-analysis study found that the pooled prevalence of depression among students is 28.13%. The findings suggest a high prevalence of depression among university students. Factors being female, being a first-year, chewing khat, alcohol use and family history of mental illness were factors significantly associated with depression.

Supporting information

S1 Checklist. PRISMA-P 2015 checklist.
(DOCX)

S1 Data.
(XLSX)

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References

1. Sadock BJ. Kaplan & Sadock's synopsis of psychiatry: behavioral sciences/clinical psychiatry. 2007.

2. Ustün T. The global burden of mental disorders. American journal of public health. 1999; 89(9):1315–8. https://doi.org/10.2105/ajph.89.9.1315 PMID: 10474545

3. 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. https://doi.org/10.1001/jama.2016.17324 PMID: 27923088

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4. Das I, Mishra S. Effect of depression upon time management of undergraduate students. Journal of Psychosocial Research. 2010; 5(2):291.

5. Sarokhani D, Delpisheh A, Veisani Y, Sarokhani MT, Manesh RE, Sayehmiri K. Prevalence of depression among university students: a systematic review and meta-analysis study. Depression research and treatment. 2013; 2013. https://doi.org/10.1155/2013/373857 PMID: 24187615

6. Buchanan JL. Prevention of depression in the college student population: a review of the literature. Archives of psychiatric nursing. 2012; 26(1):21–42. https://doi.org/10.1016/j.apnu.2011.03.003 PMID: 22284078

7. Khan MN, Akhtar P, Ijaz S, Waqas A. Prevalence of depressive symptoms among university students in Pakistan: a systematic review and meta-analysis. Frontiers in public health. 2021: 968. https://doi.org/10.3389/fpubh.2020.603357 PMID: 33490022

8. Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety in medical students in China. BMC medical education. 2019; 19(1):1–13.

9. Awan ABI. Relationship between the demographic variables and prevalence of depression among the university students. Biomedical Journal of Scientific & Technical Research. 2019; 17(4):12959–61.

10. Ghaedi L, MohdKosnin A. Prevalence of depression among undergraduate students: gender and age differences. International Journal of Psychological Research. 2014; 7(2):38–50.

11. Salem GM, Allah MBA, Said RM. Prevalence and Predictors of Depression, Anxiety, and Stress among Zagazig University Students. Med J Cairo Univ. 2016; 84(2):325–34.

12. Brenneisen Mayer F, Souza Santos I, Silveira PS, Itaqui Lopes MH, de Souza ARND, Campos EP, et al. Factors associated to depression and anxiety in medical students: a multicenter study. BMC medical education. 2016; 16(1):1–9. https://doi.org/10.1186/s12909-016-0791-1 PMID: 27784316

13. Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. Social psychiatry and psychiatric epidemiology. 2008; 43 (8):667–72. https://doi.org/10.1007/s00127-008-0345-x PMID: 18398558

14. Chen L, Wang L, Qiu XH, Yang XX, Qiao ZX, Yang YJ, et al. Depression among Chinese university students: prevalence and socio-demographic correlates. PloS one. 2013; 8(3):e58379. https://doi.org/10.1371/journal.pone.0058379 PMID: 23516468

15. Singh M, Goel NK, Sharma MK, Bakshi RK. Prevalence of depression, anxiety and stress among students of Punjab University, Chandigarh. Age. 2017; 86(211):52–8.

16. Tuyen NTH, Dat TQ, Nhung HTH. Prevalence of depressive symptoms and its related factors among students at Tra Vinh University, Vietnam in 2018. AIMS public health. 2019; 6(3):307. https://doi.org/10.3934/publichealth.2019.3.307 PMID: 31637279

17. Sokratous S, Merkouris A, Middleton N, Karanikola M. The prevalence and socio-demographic correlates of depressive symptoms among Cypriot university students: a cross-sectional descriptive co-relational study. BMC psychiatry. 2014; 14(1):1–15.

18. Villatte A, Marcotte D, Potvin A. Correlates of depression in first-year college students. Canadian Journal of Higher Education. 2017; 47(1):114–36.

19. Argyropoulos K, Giourou E, Dimopoulou M, Argyropoulou A, Gourzis P, Jelastopulu E. Anxiety and depression among Greek undergraduate students at the University of Patras. Glob J Med PUBLIC Heal Anxiety. 2017; 6(5).

20. Yadav R, Gupta S, Malhotra AK. A cross sectional study on depression, anxiety and their associated factors among medical students in Jhansi, Uttar Pradesh, India. Int J Community Med Public Health. 2016; 3(5):1209–14.

21. Mohamed EAA, Ahmed B, Abdelgadir EBA. Prevalence of depression among medical students in Sudan international university in may 2017–august 2017. J Nurs Healthcare. 2018; 3(4).

22. Othman N, Ahmad F, El Morr C, Ritvo P. Perceived impact of contextual determinants on depression, anxiety and stress: a survey with university students. International journal of mental health systems. 2019; 13(1):1–9.

23. Othieno CJ, Okoth R, Peltzer K, Pengpid S, Malla LO. Risky HIV sexual behaviour and depression among University of Nairobi students. Annals of general psychiatry. 2015; 14(1):1–8.

24. Peltzer K, Pengpid S, Tiembre I. Mental health, childhood abuse and HIV sexual risk behaviour among university students in Ivory Coast. Annals of general psychiatry. 2013; 12(1):1–8.

25. Birhanu A, Hassein K. Prevalence and factors associated to depression among Ambo university students, Ambo, West Ethiopia. Prevalence. 2016; 25.

26. Tamene M, Dagne B. Prevalence and factors associated to depression among Debrebirhan University students: a cross-sectional study. 2021.

PLOS ONE

Prevalence of depression among students at Ethiopian Universities:a systematic review and meta-analysis.

27. Teshome Hambisa M, Derese A, Abdeta T. Depressive symptoms among Haramaya University students in Ethiopia: a cross-sectional study. Depression research and treatment. 2020; 2020. https://doi.org/10.1155/2020/5027918 PMID: 32099677

28. Berhanu Y. Prevalence of depression and associated factors among Addis Ababa University students, Addis Abeba, Ethiopia. Journal of Multidisciplinary Research in Healthcare. 2015; 2(1):73–90.

29. Kebede MA, Anbessie B, Ayano G. Prevalence and predictors of depression and anxiety among medical students in Addis Ababa, Ethiopia. International journal of mental health systems. 2019; 13(1):1–8. https://doi.org/10.1186/s13033-019-0287-6 PMID: 31080499

30. Seid Muhammed, TekleHaymanot D. Prevalence of Depression and Associated Factors Among Under Graduate Students of Second Generation Ethiopian University.

31. Ahmed G, Negash A, Kerebih H, Alemu D, Tesfaye Y. Prevalence and associated factors of depression among Jimma University students. A cross-sectional study. International journal of mental health systems. 2020; 14(1):1–10. https://doi.org/10.1186/s13033-020-00384-5 PMID: 32742303

32. Terasaki DJ, Gelaye B, Berhane Y, Williams MA. Anger expression, violent behavior, and symptoms of depression among male college students in Ethiopia. BMC public health. 2009; 9(1):1–8. https://doi.org/10.1186/1471-2458-9-13 PMID: 19138431

33. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery. 2021; 88:105906. https://doi.org/10.1016/j.ijsu.2021.105906 PMID: 33789826

34. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. European journal of epidemiology. 2010; 25(9):603–5. https://doi.org/10.1007/s10654-010-9491-z PMID: 20652370

35. Doi SA, Thalib L. A quality-effects model for meta-analysis. Epidemiology. 2008:94–100. https://doi.org/10.1097/EDE.0b013e31815c24e7 PMID: 18090860

36. Barendregt JJ, Doi SA. MetaXL user guide. Version. 2016;4:2011–6.

37. Nyaga VN, Arbyn M, Aerts M. Metaprop: a Stata command to perform meta-analysis of binomial data. Archives of Public Health. 2014; 72(1):1–10.

38. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. Statistics in medicine. 2002; 21(11):1539–58. https://doi.org/10.1002/sim.1186 PMID: 12111919

39. Liu JL. The role of the funnel plot in detecting publication and related biases in meta-analysis. Evidence-based dentistry. 2011; 12(4):121–2. https://doi.org/10.1038/sj.ebd.6400831 PMID: 22193659

40. Worku D, Dirriba AB, Wordofa B, Fetensa G. Perceived stress, depression, and associated factors among undergraduate health science students at Arsi University in 2019 in Oromia, Ethiopia. Psychiatry journal. 2020; 2020. https://doi.org/10.1155/2020/4956234 PMID: 32550225

41. Dagnew B, Dagne H, Andualem Z. Self-Reported Rapid Eye Movement Sleep Behavior Disturbance and Its Associated Factors among Medicine and Health Science Students at the University of Gondar. BioMed research international. 2020; 2020:1810836. Epub 2020/06/09. https://doi.org/10.1155/2020/1810836 PMID: 32509850; PubMed Central PMCID: PMC7245670.

42. Ayele A. Assessing major adjustment problems of first year students in Ethiopia, Wolaita Sodo University. Am J Educ Res. 2018; 6(9):1326–32.

43. Gao L, Xie Y, Jia C, Wang W. Prevalence of depression among Chinese university students: a systematic review and meta-analysis. Scientific reports. 2020; 10(1):1–11.

44. Akhtar P, Ma L, Waqas A, Naveed S, Li Y, Rahman A, et al. Prevalence of depression among university students in low and middle income countries (LMICs): a systematic review and meta-analysis. Journal of Affective Disorders. 2020; 274:911–9. https://doi.org/10.1016/j.jad.2020.03.183 PMID: 32664032

45. Bitew T. Prevalence and risk factors of depression in Ethiopia: a review. Ethiopian journal of health sciences. 2014; 24(2):161–9. https://doi.org/10.4314/ejhs.v24i2.9 PMID: 24795518

46. Hailemariam S TF, Asefa M, Tadesse H, Tenkolu G. The prevalence of depression and associated factors in Ethiopia: findings from the National Health Survey. Int J Ment Health Syst. 2012; 6(1):23. https://doi.org/10.1186/1752-4458-6-23 PMID: 23098320

47. Kessler RC, Walters EE. Epidemiology of DSM-III-R major depression and minor depression among adolescents and young adults in the national comorbidity survey. Depression and anxiety. 1998; 7 (1):3–14. https://doi.org/10.1002/(sici)1520-6394(1998)7:1<3::aid-da2>3.0.co;2-f PMID: 9592628

48. Tung Y-J, Lo KK, Ho RC, Tam WSW. Prevalence of depression among nursing students: A systematic review and meta-analysis. Nurse education today. 2018; 63:119–29. https://doi.org/10.1016/j.nedt.2018.01.009 PMID: 29432998

49.   Jiang CX, Li ZZ, Chen P, Chen LZ. Prevalence of depression among college-goers in mainland China: A methodical evaluation and meta-analysis. Medicine. 2015; 94(50). https://doi.org/10.1097/MD.0000000000002071 PMID: 26683916

50.   Singh A, Lal A, Singh S. Prevalence of depression among medical students of a private medical college in India. Online Journal of Health and Allied Sciences. 2011; 9(4).

51.   Ainsworth P. Understanding depression: Univ. Press of Mississippi; 2000.

52.   Sun J, Buys N, Wang X. Depressive symptoms, family functioning, university environment, and social support: A population based study in university students in Beijing China. International Journal of Psychology and Behavioral Sciences. 2011; 1(1):41–7.