



Prevalence of suicidal ideation and suicide attempts among health sciences students: a systematic review and meta-analysis

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ABSTRACT

Introduction: Suicidal ideation and suicide attempts among health sciences students represent a growing concern that requires a systematic evaluation of their global prevalence.

Objective: To determine the prevalence of suicidal ideation and suicide attempts among health sciences students through a systematic review and meta-analysis.

Methods: A systematic search was conducted in SCOPUS, Web of Science, PubMed, and EMBASE. Studies that used validated instruments for suicide risk assessment, including standardized scales and self-reports, were considered eligible. Studies could employ either probabilistic or non-probabilistic sampling, with no restrictions on language. Stratified meta-analyses were performed according to assessment instrument and time frame, and meta-regression was conducted by year of study.

Results: Of 1277 identified records, 38 studies met the eligibility criteria. Suicidal ideation assessment was conducted using two instruments: the Beck Scale, which assesses lifetime suicidal thoughts, showing a prevalence of 14.09 % (95 % CI: 11.39–17.02 %), and item 9 of the PHQ-9 (Patient Health Questionnaire-9), which evaluates death thoughts in the past two weeks, with a prevalence of 19.18 % (95 % CI: 12.65–26.69 %). Suicide attempts, evaluated by time frame, showed a prevalence of 7.06 % (95 % CI: 4.35–10.35 %) for "lifetime" and 4.45 % (95 % CI: 2.62–6.71 %) for the "past 12 months." Temporal meta-regression showed no significant trends.

Conclusions: The prevalence of suicidal ideation and suicide attempts among health sciences students is substantial, varying by assessment instrument and time frame. These findings, though affected by considerable heterogeneity across studies and limited representativeness of samples, underscore the need to implement systematic screening and prevention programs in health sciences educational institutions.

Introduction

Mental health among university students has emerged as a growing focus of concern in global public health. While stressors linked to the transition to adult life, academic demands, and future employment uncertainty affect all university students (1), consistent evidence indicates

that health sciences students constitute a particularly vulnerable group for mental health problems, including suicidal behaviors (Dyrbye et al., 2006). Comparative studies have documented significantly higher rates of depression, anxiety, and burnout in students of healthcare disciplines compared to their peers in other academic areas (Tung et al., 2018).

This differential vulnerability is attributed to several unique factors

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that characterize health sciences education: early exposure to human suffering and death; ethical and legal responsibility for patients during clinical training; extended working hours combining clinical practice with academic demands; a professional culture that may stigmatize help-seeking; and the paradoxical combination of knowledge about symptoms with potential access to lethal means (Moutier et al., 2012). These factors, acting synergistically, create a distinctive risk profile that justifies focused research in this population.

Consistently, literature indicates that students in programs such as Medicine, Nursing, and Dentistry may present elevated rates of stress, anxiety, and depression, which in turn increases the likelihood of suicidal ideation and attempts. Psychology students also show concerning rates, though through potentially different mechanisms; recent evidence suggests selection biases may play a role, with individuals having pre-existing mental health concerns being more likely to choose this field—a phenomenon sometimes termed the ‘therapy hypothesis’ (Kaźmierczak et al., 2023; Robinson et al., 2023; Jacobsen & Diseth, 2020) (4a, 4b, 4c). A meta-analysis conducted by Rotenstein et al. (Rotenstein et al., 2016) found that 11.1 % of medical students reported suicidal ideation throughout their academic training, evidencing a problem that transcends geographical and cultural barriers. Similarly, Coentre and Góis (Coentre & Góis, 2018) synthesized findings indicating variable prevalence of suicidal ideation, ranging from 7.4 % to 24.2 %, depending on factors such as institutional environment and year of study."

Despite these advances, important gaps remain in the global understanding of this phenomenon. Existing reviews have primarily focused on medical students (Rotenstein et al., 2016; Coentre & Góis, 2018), without considering the full spectrum of health sciences disciplines. Furthermore, most studies have not systematically differentiated between various assessment instruments and time frames, which limits the interpretation and comparability of results. This underlying methodological variability might explain the wide differences in prevalences reported in the literature, hindering the development of effective detection and prevention strategies (O'Connor et al., 2013).

In line with these results, the relevance of addressing this knowledge gap transcends the academic sphere, as students with untreated problems will eventually constitute the healthcare workforce, with potential consequences for quality of care and patient safety (O'Connor et al., 2013). The precise identification of the prevalence of suicidal behaviors and their variations according to contexts and instruments will enable the development of specific preventive interventions tailored to the particular needs of this population.

Given all the above, the present systematic review (SR) seeks to fill a critical gap in the literature by: 1) comprehensively synthesizing prevalence data on suicidal ideation and suicide attempts specifically in health sciences students; 2) stratifying analyses according to assessment instruments and time frames to allow valid comparisons; and 3) exploring potential variations according to geographical contexts and specific disciplines. This rigorous synthesis of available evidence will provide a solid empirical foundation to guide future strategies for prevention, intervention, and mental health care in this population that is both vulnerable and fundamental to healthcare systems worldwide.

Methodology

Design

A SR with meta-analysis of observational studies was conducted, following the PRISMA 2020 statement guidelines (Page et al., 2021). Additionally, specific methodological recommendations for meta-analyses of prevalence studies proposed by Munn et al. (Munn et al., 2015) and JBI criteria for prevalence reviews and validity of observational studies were considered (13).

Search strategy

The systematic search was conducted in major biomedical databases: SCOPUS, Web of Science (including SciELO catalog), PubMed, and EMBASE, following the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions (14). MeSH terms and keywords related to "suicidal ideation," "suicide attempt," "prevalence," "students," "health sciences," "medicine," "nursing" were used, combined through Boolean operators. The complete search strategy for each database is detailed in Supplementary Material 1. The search was conducted without language restrictions and spanned from November to December 2024.

Eligibility criteria

Observational studies, primarily cross-sectional in design, that reported prevalence data of suicidal ideation and/or suicide attempts among health sciences students were included. Studies that used validated instruments for suicide risk assessment, including standardized scales and self-reports, were considered eligible. Studies could employ either probabilistic or non-probabilistic sampling and be published in any language. The following were excluded: (1) studies in populations with specific predefined characteristics (e.g., only students with previous depression diagnosis), (2) case reports, (3) letters to the editor, (4) systematic or narrative reviews, (5) bibliometric studies, (6) qualitative studies, and (7) studies that did not report original prevalence data.

Study selection process

Study selection was conducted in two phases. Initially, database search results were imported into Rayyan QCRI software for management and duplicate removal. Subsequently, two independent reviewers performed simultaneous and blinded screening of titles and abstracts. After completing this phase, blinding was lifted and reviewers compared their selections. Discrepancies were discussed until consensus was reached; in cases where agreement was not achieved, a third reviewer resolved the discrepancy. The same process was applied for reviewing full texts of preselected articles.

Data extraction

Data from selected articles were extracted using a standardized template in Microsoft Excel 2023. The extraction was performed independently by two reviewers, who collected the following information: author(s), publication year, country where the study was conducted, methodological design, data collection period, sample characteristics (sample size, mean age, sex distribution), sampling method used (probabilistic or non-probabilistic), instruments used to assess suicidal ideation and attempts, time frame of assessment (lifetime, past 12 months, past two weeks), and reported prevalences. Discrepancies in extraction were resolved through discussion between reviewers or, when necessary, through the intervention of a third reviewer.

Risk of bias assessment

Risk of bias assessment was conducted independently by two researchers using the Munn et al. (Munn et al., 2015) critical appraisal tool for prevalence studies. This tool was selected for its specificity in evaluating prevalence studies and its international recognition in the field of systematic reviews. The assessment considered nine key methodological criteria: (1) appropriate sampling frame to address target population, (2) appropriate participant selection method, (3) adequate sample size, (4) detailed description of subjects and setting, (5) data analysis with sufficient coverage of identified sample, (6) validity of methods for condition identification, (7) standard and reliable measurement for all participants, (8) appropriate statistical analysis, and (9) adequate

identification and handling of confounding factors. Each criterion was evaluated as "Yes," "No," or "Unclear." A total score was calculated by assigning one point for each "Yes" response. Studies were classified according to their risk of bias as: low risk (7–9 points), moderate risk (4–6 points), and high risk (0–3 points).

Statistical analysis

Quantitative analyses were performed using R statistical software version 4.2.2. The meta-analysis included studies that reported prevalence data of suicidal ideation and/or attempts, considering both sample size (n) and number of cases (r). The 'metaprop' function from the 'meta' package was used, employing Freeman-Tukey double arcsine transformation to stabilize proportions' variances, particularly important given that extreme prevalences were anticipated in some studies. Confidence intervals were calculated using the Clopper-Pearson method, which provides more conservative and appropriate estimates for proportions.

Considering the expected heterogeneity due to different populations, assessment instruments, and time frames, a random-effects model was used with the DerSimonian and Laird method. The Hartung-Knapp correction was applied to obtain more conservative standard error

estimates. Between-study heterogeneity was assessed using the I^2 statistic and Cochran's Q test. Main analyses were stratified by assessment time frame (lifetime, past 12 months, current), type of instrument used (validated scales versus direct questions), and sampling method employed.

Meta-analysis results were presented through forest plots using the 'forest' function from the 'meta' package. Additionally, meta-regressions by year were performed for suicidal ideation, which was visualized through the generation of bubble plots where each bubble's size represents the study's weight in the analysis.

Results

Eligible studies

The initial database search identified 2100 records. After removing duplicates, screening of 1276 records was performed, of which 1226 were excluded for not evaluating suicidal ideation or attempts ($n = 523$), ineligible population ($n = 412$), inappropriate study types ($n = 156$), absence of prevalence data ($n = 98$), and duplicates not initially detected ($n = 37$). Of the 51 articles assessed in full text, 37 studies were included in the qualitative analysis (Tyssen et al., 2001; Khokher & Khan, 2005;

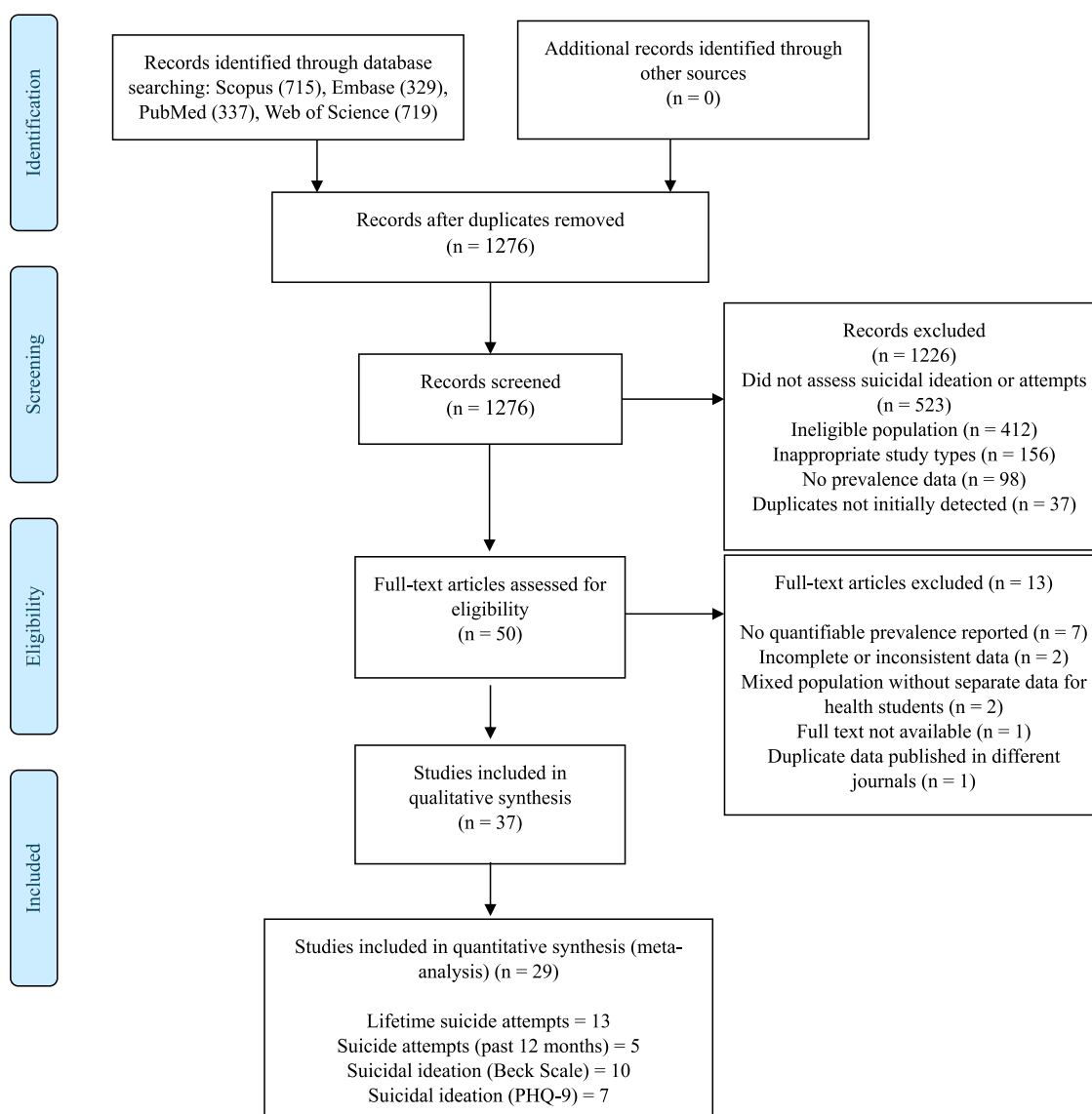


Fig. 1. Flowchart of study selection.

Alexandrino-Silva et al., 2009; Van Niekerk et al., 2012; Sobowale et al., 2014; Osama et al., 2014; Pinzón-Amado et al., 2013; Coentre et al., 2016; Sun et al., 2017; Knipe et al., 2018; Chow et al., 2018; Ribeiro et al., 2020; Asfaw et al., 2020; Atienza & Balanzá, 2020; Tsegay et al., 2021; Khosravi & Kasaeiyan, 2020; Almoammar et al., 2021; Alhothali et al., 2021; Neres et al., 2021; Leombruni et al., 2021; Yamazaki et al., 2022; Li et al., 2022; Chomon, 2022,38; Ali et al., 2022; Mufti et al., 2022; Nakhostin-Ansari et al., 2022; Lodha et al., 2023; Nascimento, 2023; Lee et al., 2023; Luethy et al., 2023; Cjuno et al., 2023; Valladares-Garrido et al., 2024; García-Montalvo et al., 2024; Silva & Marcolan, 2024; Huang et al., 2024; Pitanupong et al., 2024) and only 29 in the quantitative analysis, due to similarity in analyses used. It should be noted that the total in the flow diagram differs because some studies used more than one instrument, being counted twice or more in the final tally (see Fig. 1).

Study characteristics

The included studies were published between 2001 and 2024, with a notable increase in publications during the last five years (2020–2024), a period that concentrated 68.42 % (26/38) of the studies (See Table 1).

Regarding geographical distribution, the studies came from 20 different countries, with significant representation from Asia (Pakistan, China, Iran, Saudi Arabia, Japan, Bangladesh, Thailand) (Khokher & Khan, 2005; Sobowale et al., 2014; Osama et al., 2014; Sun et al., 2017; Khosravi & Kasaeiyan, 2020; Almoammar et al., 2021; Alhothali et al., 2021; Yamazaki et al., 2022; Li et al., 2022; Chomon, 2022; Ali et al., 2022; Mufti et al., 2022; Nakhostin-Ansari et al., 2022; Huang et al., 2024; Pitanupong et al., 2024), and America (Brazil, Colombia, Mexico, Peru, United States) (Alexandrino-Silva et al., 2009; Pinzón-Amado et al., 2013; Ribeiro et al., 2020; Neres et al., 2021,38; Nascimento, 2023; Lee et al., 2023; Luethy et al., 2023; Cjuno et al., 2023; Valladares-Garrido et al., 2024; García-Montalvo et al., 2024; Silva & Marcolan, 2024). Brazil had the highest number of studies (5) (Alexandrino-Silva et al., 2009; Ribeiro et al., 2020; Neres et al., 2021; Nascimento, 2023; Silva & Marcolan, 2024), followed by China (4) (Sobowale et al., 2014; Sun et al., 2017; Li et al., 2022; Huang et al., 2024) and Saudi Arabia (3) (Almoammar et al., 2021; Alhothali et al., 2021; Mufti et al., 2022). Most research was conducted in a single country, although some multicenter studies were identified. Fig. 2 shows a world map indicating which countries have evaluated suicide attempts or ideation.

Regarding methodological design, only two studies had a longitudinal design (Tyssen 2001, Domínguez-Gonzales 2022) (Tyssen et al., 2001; Domínguez-Lara et al., 2019) and two studies were multicentric (Osama 2014, Leombruni 2021) (Osama et al., 2014; Leombruni et al., 2021). Concerning sampling, only five studies used probabilistic sampling (Osama et al., 2014; Asfaw et al., 2020; Tsegay et al., 2021; Khosravi & Kasaeiyan, 2020; Chomon, 2022).

Sample size varied considerably among studies, from 98 participants (Yamazaki 2022) (Yamazaki et al., 2022) to 6643 (Huang 2024) (Huang et al., 2024), with a median of 415 participants. The proportion of women in the samples ranged from 31.1 % to 89 %. The average age of participants was between 18.77 and 28 years, with the range between 20 and 23 years being most frequent.

Most studies focused on medical students, although some included other health science programs such as nursing, dentistry, and pharmacy. Participants generally were enrolled between the first and sixth year of their respective programs, with several studies including multiple academic years in their samples.

Finally, for the analysis of suicidal behavior, studies were stratified according to the assessment instrument used. Suicidal ideation was evaluated using two main instruments: the Beck Scale for Suicide Ideation, which assesses suicidal thoughts and behaviors throughout life, and item 9 of the PHQ-9 (Patient Health Questionnaire-9), which evaluates thoughts of death and self-harm in the past two weeks. For

suicide attempts, stratification was done according to the time frame: "lifetime" and "past 12 months." Consequently, eight studies using other assessment instruments were excluded: Tyssen (2001) (Tyssen et al., 2001) and Niekerk (2012) (Van Niekerk et al., 2012) for using the Paykel scale, Khokher (2005) (Khokher & Khan, 2005) for employing the GHQ-28 (General Health Questionnaire – 28), Mufti (2022) (Mufti et al., 2022) for using the SBQ-R (The Suicide Behaviors Questionnaire-Revised), Luethy (2023) (Luethy et al., 2023) for using the DSM-5 Scale (The Diagnostic and Statistical Manual of Mental Illnesses - 5), Cjuno (2023) (Cjuno et al., 2023) for using the PANSI (Positive and Negative Suicide Ideation Inventory), Yamazaki (2022) (Yamazaki et al., 2022) for employing a modification of the MINI (International Neuropsychiatric Interview), and Domínguez-Gonzales (2022) (38) for using the Plutchik Suicide Risk Scale (PSRS).

Risk of bias analysis

Of the total studies evaluated, 2 (5.26 %) obtained the maximum score of 8 stars, followed by 18 studies (47.37 %) with 7 stars, 12 studies (31.58 %) with 6 stars, and 2 studies (5.26 %) with 5 stars. The main methodological limitations identified were inadequate or unjustified sample sizes, and none met the criterion of low or unreported response rates. Regarding the sampling frame, only seven studies met the probabilistic sampling criterion: Osama (2014) (Osama et al., 2014), Asfaw (2020) (Asfaw et al., 2020), Tsegay (2020) (Tsegay et al., 2021), Khosravi (2020) (Khosravi & Kasaeiyan, 2020), and Chomon (2022) (Chomon, 2022) (See Table 2).

Meta-analysis of lifetime suicide attempts among health sciences students

Regarding lifetime suicide attempts, a meta-analysis was conducted including 13 studies (Osama et al., 2014; Pinzón-Amado et al., 2013; Coentre et al., 2016; Sun et al., 2017; Asfaw et al., 2020; Tsegay et al., 2021; Almoammar et al., 2021; Alhothali et al., 2021; Li et al., 2022; Nakhostin-Ansari et al., 2022; Nascimento, 2023; Lee et al., 2023; Silva & Marcolan, 2024) with a total of 12,413 health sciences students (See Fig. 3). The pooled prevalence using a random-effects model was 7.06 % (95 % CI: 4.35 - 10.35 %). Significant heterogeneity was found among studies ($I^2 = 97 %$, $p < 0.01$). Individual prevalences varied considerably, from 0.66 % in Portuguese students (Coentre 2016) (18) to 15.14 % in Saudi Arabian students (Almoammar 2021) (Almoammar et al., 2021). In turn, larger studies, such as the one conducted in China by Li (2022) (Li et al., 2022) with 4882 participants, reported a prevalence of 13.97 % (95 % CI: 13.03 % - 14.97 %), while medium-sized studies like the one from Colombia (Pinzón-Amado 2014, $n = 963$) (Pinzón-Amado et al., 2013) gfound prevalences close to the global average (4.88 %, 95 % CI: 3.69 - 6.43 %).

Meta-analysis of recent suicide attempts (Past 12 months) among health sciences students

In the analysis of suicide attempts during the past 12 months, 5 studies (20,23,29,35,38) were included, evaluating a total of 3149 students (See Fig. 4). The random-effects meta-analysis showed a pooled prevalence of 4.45 % (95 % CI: 2.62 - 6.71 %), with significant heterogeneity among studies ($I^2 = 86 %$, $p < 0.01$). Individual prevalences ranged from 2.19 % in the United Kingdom (Knipe 2018, $n = 1139$) (20) to 6.38 % in India (Lodha 2023, $n = 188$) (Lodha et al., 2023), suggesting possible variations according to geographical and cultural context. Notably, the study with the highest weight in the analysis (22.2 %) was conducted in the United Kingdom, while the Indian study, despite reporting the highest prevalence, had the lowest weight (16.0 %) due to its smaller sample size.

Table 1
Characteristics of prevalence studies of suicidal attempt and ideation.

First Author, Year	Country	Health Sciences Students	Sample Size	Female (%)	Age (Mean)	Suicide Attempt Assessment	Suicidal Ideation Assessment
Tyssen (2001)	Norway	Medicine	522	57	28	Paykel (1974): direct questions about attempts, methods, and frequency	Paykel (1974)-based question on suicidal thoughts
Khokher (2005)	Pakistan	Medicine	217	55.8	22.6	–	GHQ-28 depression subscale
Alexandrino-Silva (2009)	Brazil	Medicine, Nursing, Pharmacy	563	78	22.21	–	Beck Scale for Suicide Ideation (BSI)
Niekerk (2012)	South Africa	Medicine	874	63	–	Paykel instrument: direct question on suicide attempts	Paykel questions on life perception and suicidal thoughts
Sobowale (2014)	China	Medicine	348	–	–	–	PHQ-9 item 9: suicidal thoughts
Osama (2014)	Pakistan	Medicine	331	58.8	20.73	Direct question on suicide attempts	Questions on suicidal thoughts in past year (Likert scale)
Pinzón-Amado (2014)	Colombia	Medicine	963	57	20.3	Specific question on history of suicide attempts	Self-administered questionnaire designed for the study
Coentre (2016)	Portugal	Medicine	456	66.7	23.35	Dichotomous question based on Meehan and Lee inventories	Dichotomous question on suicidal thoughts based on same inventories
Sun (2017)	China	Medicine	2198	68.7	20.3	Direct question: suicide attempts	Based on U.S. National Comorbidity Survey: suicidal thoughts
Knipe (2018)	UK	Medicine, Dentistry, Veterinary Medicine	1139	76.4	21	Question on self-harm with suicidal intent in past 12 months	PHQ-9 item 9
Chow (2018)	Germany	Medicine	251	71.3	22	–	PHQ-9 item 9
Ribeiro (2020)	Brazil	Medicine	331	77.3	–	–	Beck Scale for Suicide Ideation (Portuguese adaptation)
Asfaw (2020)	Ethiopia	Medicine	710	31.1	22.71	WHO mental health module (CIDI)	WHO mental health module (CIDI)
Atienza-Carbonell (2020)	Spain	Medicine	858	69.2	–	–	BDI-II item 9
Tsegay (2020)	Ethiopia	Medicine	423	40.5	21.8	WHO CIDI	–
Khosravi (2020)	Iran	Medicine	376	50	–	–	Beck Scale for Suicide Ideation (BSSI)
Almoammar (2021)	Saudi Arabia	Dentistry	218	57.8	23.1	Direct question on suicide attempts	Adapted scale from PHQ-9 and questions on suicidal thoughts
Alhothali (2021)	Saudi Arabia	Medicine	346	49.4	–	C-SSRS adaptation	C-SSRS adaptation
Neres (2021)	Brazil	Medicine	381	68.1	22.85	Beck Scale for Suicide Intent (BSIS)	BSIS and BDI
Leombruni (2021)	Italy	Medicine	2457	61.6	22	–	BDI-II item 9
Yamazaki (2022)	Japan	Medicine	98	36.7	–	–	MINI modification
Li (2022)	China	Medicine	4882	89	18.77	Based on C—CASA: suicide attempts	Direct question on suicidal thoughts
Chomon (2022)	Bangladesh	Medicine	237	50.2	–	–	BDI-II items related to suicidal thoughts
Domínguez-Gonzales (2022)	Mexico	Medicine	247	68.4	20.76	–	Plutchik Suicide Risk Scale (PSRS)
Ali (2022)	Bangladesh	Physical Therapy, Occupational Therapy, Speech Therapy	731	48.56	22.2	Direct question about attempts in past year	Direct question about suicidal thoughts in past year
Mufti (2022)	Saudi Arabia	Medicine	308	71.8	–	SBQ-R	SBQ-R
Nakhostin-Ansari (2022)	Iran	Medicine, Dentistry, Pharmacy	419	50.5	22.5	Specific questions from questionnaire on attempts	GHQ adaptation
Cjuno (2023)	Peru	Psychology, Nursing, Nutrition	578	69	22	–	PANSI Scale
Lodha (2023)	India	Nursing	188	–	21.3	Scale on suicidal behaviors (attempts in past 12 months)	Scale on suicidal behaviors (thoughts in past 12 months)
Albuquerque (2023)	Brazil	Nursing	253	85.8	21.3	Brazilian validated questionnaire: suicide attempts	Brazilian validated questionnaire: suicidal thoughts
Lee (2023)	USA	Medicine, Pharmacy	799	62.4	25.3	Direct question on suicide attempts (ISP)	Adaptation of PHQ-9 item 9
Luethy (2023)	USA	Veterinary Medicine	112	78	27	–	Adaptation of DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure
Valladares-Garrido (2024)	Peru	Medicine	370	61.9	20	–	PHQ-9 item 9: recent suicidal thoughts
García-Montalvo (2024)	Mexico	Medicine	203	63.5	22.4	–	Beck Scale for Suicide Ideation (BSSI)
Silva (2024)	Brazil	Various (Medicine, Dentistry, Pharmacy, etc.)	415	72.77	–	Questions about previous attempts and treatment received	Questions about suicidal thoughts before and during university
Huang (2024)	China	Medicine	6643	64.1	21	–	Beck Scale for Suicide Ideation (BSSI)
Pitanupong (2024)	Thailand	Medicine	868	63.5	20.8	–	PHQ-9 item 9



Fig. 2. Geographical distribution of studies included in the systematic review on suicidal ideation and attempts in health sciences students.

Table 2
Bias analysis of the selected studies.

Study	P1	P2	P3	P4	P5	P6	P7	P8	P9	Total	Risk of bias
Tyssen (2001)	*	—	*	*	*	*	*	*	—	7	Low risk
Khokher (2005)	*	—	—	*	*	*	*	—	—	6	Moderate risk
Alexandrino-Silva (2009)	*	—	*	*	*	*	*	*	—	7	Low risk
Niekerk (2012)	*	—	*	*	*	*	*	*	—	7	Low risk
Sobowale (2014)	*	—	—	*	—	*	*	*	—	5	Moderate risk
Osama (2014)	*	*	—	*	*	*	*	*	—	7	Low risk
Pinzón-Amado (2014)	*	—	*	*	*	*	*	*	—	7	Low risk
Coentre (2016)	*	—	*	*	*	*	*	*	—	7	Low risk
Sun (2017)	*	—	*	*	*	*	*	*	—	7	Low risk
Knipe (2018)	*	—	*	*	*	*	*	*	—	7	Low risk
Chow (2018)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Ribeiro (2020)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Asfaw (2020)	*	*	*	*	*	*	*	*	—	8	Low risk
Atienza-Carbonell (2020)	*	—	*	*	*	*	*	*	—	7	Low risk
Tsegay (2020)	*	*	*	*	*	*	*	*	—	8	Low risk
Khosravi (2020)	*	*	—	*	*	*	*	*	—	7	Low risk
Almoammar (2021)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Alhothali (2021)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Neres (2021)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Leombruni (2021)	*	—	*	*	*	*	*	*	—	7	Low risk
Yamazaki (2022)	*	—	—	*	—	*	*	*	—	5	Moderate risk
Li (2022)	*	—	*	*	*	*	*	*	—	7	Low risk
Chomon (2022)	*	*	—	*	*	*	*	*	—	7	Low risk
Domínguez-Gonzales (2022)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Ali (2022)	*	—	*	*	*	*	*	*	—	7	Low risk
Mufti (2022)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Nakthostin-Ansari (2022)	*	—	—	*	*	*	*	*	—	7	Low risk
Cjuno (2023)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Lodha (2023)	*	—	*	*	*	*	*	*	—	6	Moderate risk
Albuquerque (2023)	*	—	*	*	*	*	*	*	—	7	Low risk
Lee (2023)	*	—	*	*	*	*	*	*	—	7	Low risk
Luethy (2023)	*	—	*	*	*	*	*	*	—	7	Low risk
Valladares-Garrido (2024)	*	—	*	*	*	*	*	*	—	7	Low risk
García-Montalvo (2024)	*	—	—	*	*	*	*	*	—	6	Moderate risk
Silva (2024)	*	—	*	*	*	*	*	*	—	7	Low risk
Huang (2024)	*	—	*	*	*	*	*	*	—	7	Low risk
Pitanupong (2024)	*	—	*	*	*	*	*	*	—	7	Low risk

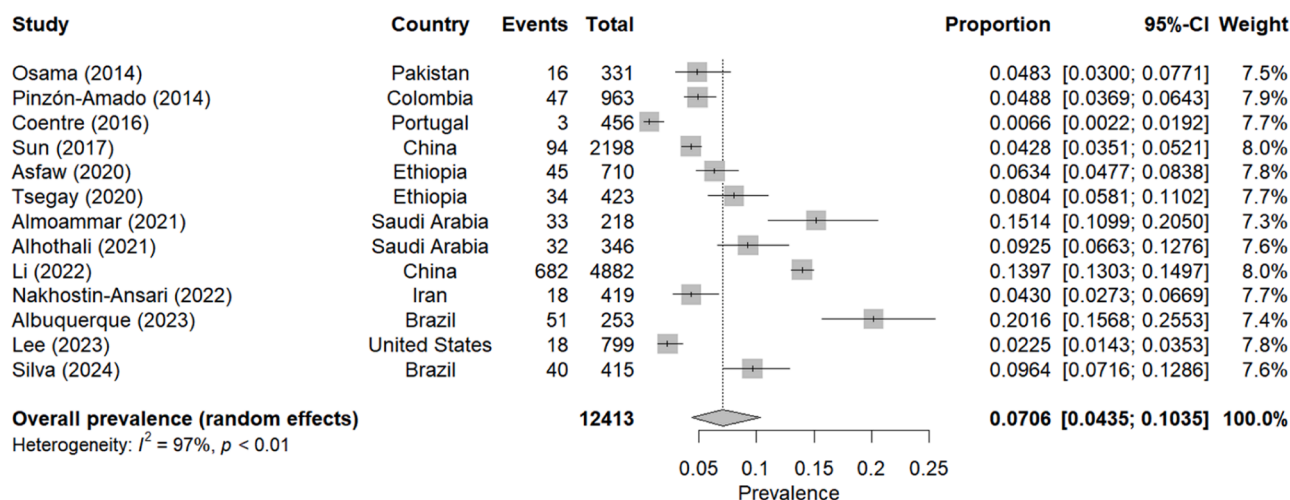


Fig. 3. Meta-analysis of suicide attempt (ever).

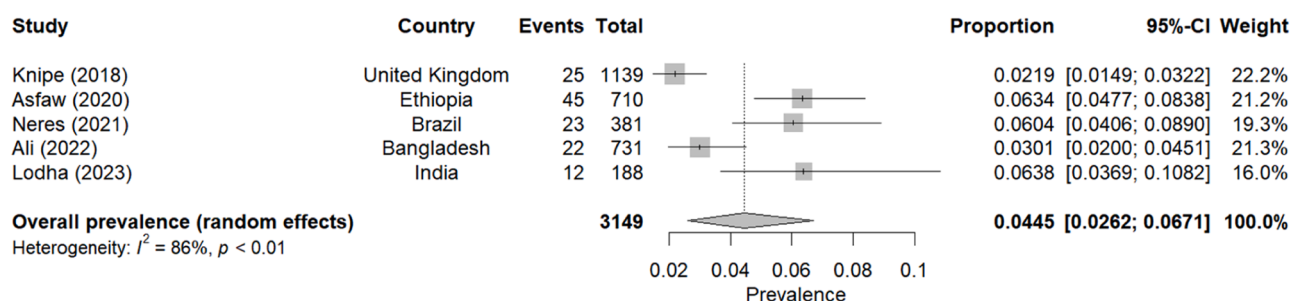


Fig. 4. Meta-analysis of suicide attempts (in the last 12 months).

Meta-analysis of suicidal ideation (Beck scale) among health sciences students

The meta-analysis of suicidal ideation assessed using the Beck scale included 12 studies with a total of 12,760 students (See Fig. 5). The pooled prevalence using the random-effects model was 14.09 % (95 % CI: 11.39 % - 17.02 %), with significant heterogeneity among studies ($I^2 = 93\%$, $p < 0.01$). Notably, Alexandrino-Silva's study (2009) (Alexandrino-Silva et al., 2009) in Brazil evaluated three different health sciences student populations, finding similar prevalences among medicine (13.39 %), nursing (12.26 %), and pharmacy (12.30 %).

highest prevalences were reported in Bangladesh (Chomon 2022: 27.43 %) (Chomon, 2022) and Ethiopia (Asfaw 2020: 23.66 %) (Asfaw et al., 2020), while the lowest were observed in Mexico (García-Montalvo 2024: 5.42 %) (García-Montalvo et al., 2024) and Brazil (Ribeiro 2020: 4.83 %) (Ribeiro et al., 2020). The study with the largest sample size was conducted in China (Huang 2024, $n = 6643$) (Huang et al., 2024), reporting a prevalence of 11.49 %, close to the global average.

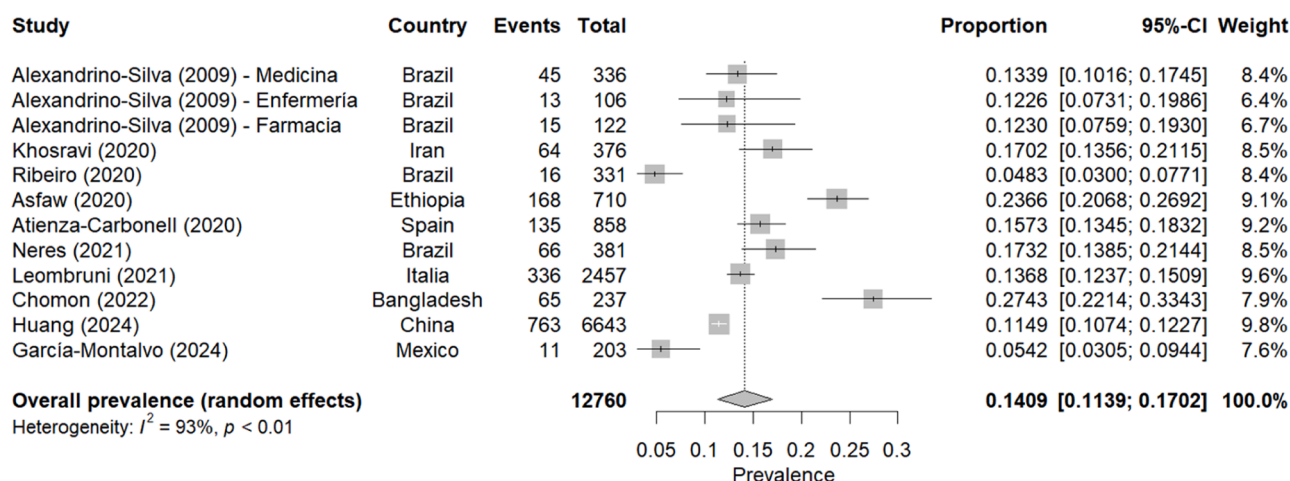


Fig. 5. Meta-analysis of suicidal ideation - Beck scale.

Meta-analysis of suicidal ideation (past two weeks - PHQ9) among health sciences students

The meta-analysis of suicidal ideation assessed using item 9 of the PHQ-9 (past two weeks) included 7 studies (Sobowale et al., 2014; Knipe et al., 2018; Chow et al., 2018; Almoammar et al., 2021; Lee et al., 2023; Valladares-Garrido et al., 2024; Pitanupong et al., 2024) with a total of 3993 students (See Fig. 6). The pooled prevalence using the random-effects model was 19.18 % (95 % CI: 12.65 - 26.69 %), with significant heterogeneity among studies ($I^2 = 97\%$, $p < 0.01$). Notable variability in prevalences was observed, from 7.47 % in China (Sobowale 2014) (Sobowale et al., 2014) to 43.58 % in Saudi Arabia (Almoammar 2021) (Almoammar et al., 2021). Studies conducted in Western countries showed relatively similar prevalences: United Kingdom (Knipe 2018: 12.99 %) (Knipe et al., 2018), United States (Lee 2023: 14.39 %) (Lee et al., 2023), and Germany (Chow 2018: 14.74 %) (Chow et al., 2018). Notably, the only Latin American study reported a contrasting prevalence: Peru (Valladares-Garrido 2024) (Valladares-Garrido et al., 2024) with 34.32 %.

Meta-regression of suicidal ideation (past two weeks) - PHQ9

To explore the temporal evolution of suicidal ideation assessed using PHQ-9, a meta-regression was conducted using publication year as a predictor (See Fig. 7). The mixed-effects model revealed a non-statistically significant positive trend ($\beta = 0.0222$, $p = 0.2132$, 95 % CI [-0.0178, 0.0622]) during the 2014–2024 period. The bubble plot visualization shows a dispersion in reported prevalences, with recent studies such as Valladares-Garrido (2024) (Valladares-Garrido et al., 2024) and Pitanupong (2024) (Pitanupong et al., 2024) showing contrasting estimates (34.32 % and 15.90 % respectively), while older studies like Sobowale (2014) (Sobowale et al., 2014) reported lower prevalences (7.47 %).

The model showed that >95 % of the observed variability is due to real differences between studies rather than sampling error ($I^2 = 96.47\%$). The tau² value = 0.0133 (SE = 0.0096) suggests considerable between-study variance. The model explained only 4.53 % of the observed heterogeneity ($R^2 = 0.0453$), suggesting the existence of other relevant moderators not considered in this analysis, such as cultural or methodological factors specific to each study.

Discussion

Main findings

Our findings reveal a concerning landscape regarding the mental health of health sciences students, with significant prevalences of both suicidal ideation and suicide attempts. The estimates vary considerably depending on the time frame evaluated and the instrument used, a pattern that reflects the inherent complexity in measuring suicidal

behaviors. It is important to note that these estimates are subject to uncertainty due to substantial heterogeneity between studies ($I^2 > 90\%$ in all measurements) and potential sampling biases, as most included studies used non-probabilistic sampling methods. The highest prevalence was found in suicidal ideation assessed through the PHQ-9, which is especially relevant considering that this instrument evaluates a recent period (past two weeks). However, it should be acknowledged that the PHQ-9's item 9 assesses both suicidal thoughts and self-harm ideation, which may partly explain the higher prevalence estimates compared to more specific suicide assessment tools. Nonetheless, these findings suggest that suicidal thoughts remain a current and active concern in this population.

The observed difference between the prevalence of "lifetime" versus "past 12 months" suicide attempts follows an expected and logical pattern, but the magnitude of this difference deserves special attention. The lower prevalence in the 12 months could reflect both the temporal nature of the measurement and possible protective factors within the academic environment, including access to mental health services and institutional support networks. However, it could also indicate under-reporting due to stigma associated with more recent events or reluctance to report active suicide attempts.

The variation in suicidal ideation prevalence between the Beck scale and the PHQ-9 likely reflects fundamental differences in the construction and purpose of these instruments. The PHQ-9, being a rapid screening tool, might capture a broader spectrum of death-related thoughts. At the same time, the Beck scale, being more specific and detailed, might identify more defined cases of suicidal ideation. This methodological difference, along with the distinct time frames evaluated, underscores the importance of considering the context and purpose of each instrument when interpreting their results.

Analysis of instruments and temporality

The observed differences between assessment instruments reflect fundamental methodological aspects in measuring suicide risk. The PHQ-9, initially validated by Kroenke et al. (Kroenke et al., 2001) as a depression screening tool, assesses suicidal ideation through a single item that captures thoughts of death and self-harm in the past two weeks. This approach, although practical for initial screening, might overestimate prevalence by including a broader spectrum of death-related cognitions. In contrast, the Beck Scale for Suicide Ideation, specifically developed to evaluate the intensity of suicidal attitudes, behaviors, and plans (Beck et al., 1979), provides a more comprehensive and specific assessment of the phenomenon, which could explain the more conservative prevalences found with this instrument.

Regarding the measurement of suicide attempts, our findings reveal substantial differences between lifetime and past 12-month assessments. Bryan et al. (Bryan et al., 2019), in their study on the reliability of suicide behavior self-reports, indicate that lifetime assessments may be subject to memory bias and retrospective reinterpretation, which could

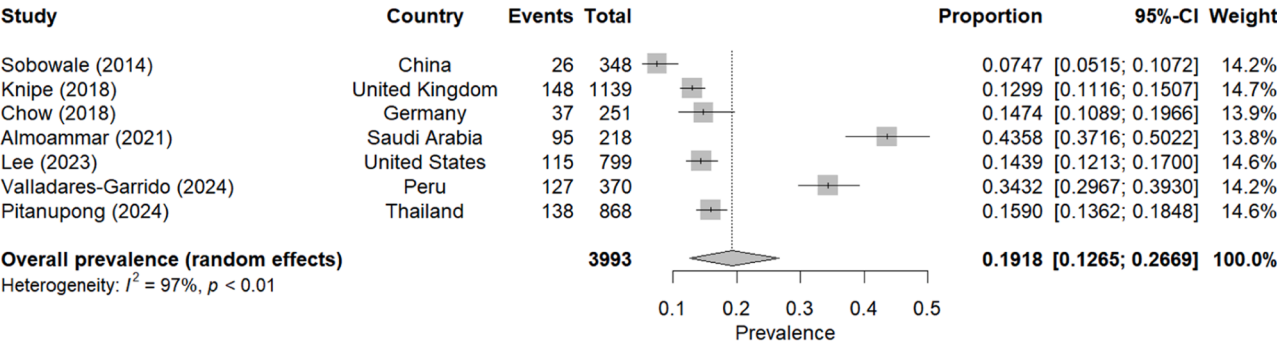


Fig. 6. Meta-analysis of suicidal ideation (in the last two weeks) - PHQ9.

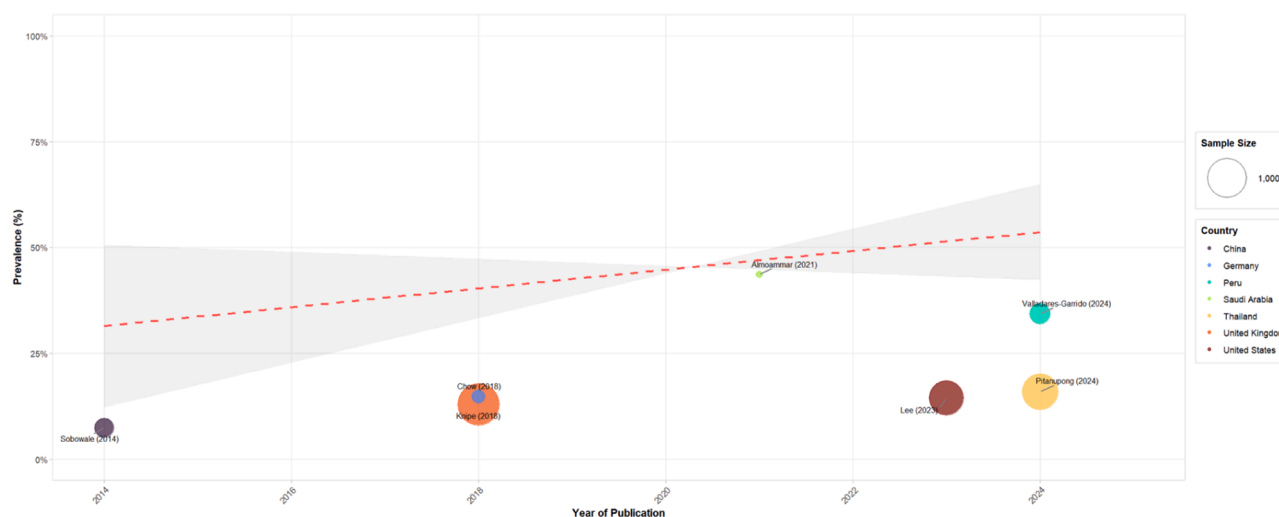


Fig. 7. Meta-regression of suicidal ideation (in the last two weeks) – PHQ9.

partially explain the higher prevalence found in this time frame. Conversely, Simon et al. (Simon et al., 2016) argue that past 12-month assessments, although more precise in terms of recall, might underestimate true prevalence due to stigma associated with recent events and reluctance to report current attempts, especially among health sciences students.

The reliability of self-reporting varies significantly according to the time frame evaluated. According to Millner et al. (2017), assessments of more recent periods tend to show greater accuracy and test-retest reliability but may be more influenced by stigma and fear of academic or professional consequences. This phenomenon could be particularly relevant in health sciences students where, as noted by Lustig et al. (Lustig et al., 2023), there is additional concern about the impact that reporting suicidal behaviors could have on their future professional career.

Despite these methodological differences, the use of PHQ-9 item 9 offers particular advantages for suicide risk surveillance in academic settings. As O'Connor et al. (O'Connor et al., 2023) note in their review of screening tools, the assessment of the past two weeks allows identification of students requiring immediate attention, facilitating timely interventions. On the other hand, while the Beck Scale provides a more comprehensive and stable assessment of lifetime suicide risk, its retrospective nature might not reflect the student's current state or immediate need for intervention, as highlighted by Na et al. (Na et al., 2018) in their study on the comparative utility of different suicide risk assessment instruments. This distinction is crucial for student wellness services, which need to identify and respond to current crises rather than lifetime histories of suicidal ideation.

Additionally, a notable finding from our analysis is the relative temporal stability in the prevalence of suicidal ideation and attempts assessed through the PHQ-9, even during and after the COVID-19 pandemic. Our findings revealed a substantial increase in publications during the 2020–2024 period, which concentrated 68.42 % (26/38) of all included studies, likely reflecting heightened research interest in mental health during this unprecedented health crisis. Despite this surge in attention, when comparing pre-pandemic versus pandemic-era prevalence estimates, we observed remarkable resilience, with suicide attempt rates remaining relatively stable (pre-pandemic: 6.89 %, 95 % CI: 3.92–10.74 % vs. pandemic-era: 7.21 %, 95 % CI: 3.76–11.76 %). While Xiong et al. (Xiong et al., 2020) documented a significant increase in anxiety and depression symptoms during the pandemic in the general population, and Wang et al. (Wang et al., 2020) reported higher levels of psychological stress in health sciences students, our findings suggest that these impacts did not necessarily translate into an increase in suicidal

ideation or attempts. This observation is consistent with what Mansfield et al. (Mansfield et al., 2021) reported, finding that while the pandemic significantly affected general mental health indicators, suicidal thoughts and attempts remained relatively stable in university populations. This phenomenon could be explained by what Glette et al. (Knutsen et al., 2023) term "adaptive resilience" in health sciences students, where commitment to healthcare and sense of professional purpose might have acted as protective factors against more severe manifestations of psychological distress, as also noted by Bruffaerts et al. (Bruffaerts et al., 2021) and Savage et al. (Savage et al., 2021). These findings highlight the importance of future longitudinal research examining how the pandemic experience has reshaped mental health trajectories among health sciences students, following methodological approaches suggested by Elmer et al. (Elmer et al., 2020).

Heterogeneity among findings

The marked heterogeneity found in our analyses ($I^2 > 90$ % in all measurements) suggests that contextual factors strongly influence the prevalences of suicidal ideation and attempts. Chen et al. (Chen et al., 2010), in their multinational study on medical students' mental health, identified that cultural differences in the expression and reporting of psychological distress can significantly influence reported prevalences. For instance, in societies where mental health stigma is more pronounced, as noted by Patel and Gonsalves (Patel & Gonsalves, 2019), prevalences tend to be lower, not necessarily reflecting lower incidence but possibly systematic underreporting.

The marked discrepancies in prevalence estimates likely stem from multiple methodological sources beyond contextual factors. As demonstrated in methodological studies (Pirkis et al., 2021; Millner et al., 2017), different measurement instruments can yield substantially different estimates even within the same population. Additionally, sampling methods significantly influence results, as individuals with histories of suicidal distress or mental illness may be more likely to participate in studies on this topic, particularly in non-probabilistic sampling designs. The composition of the sample frame (undergraduate versus graduate students, clinical versus pre-clinical years) and data collection methods (anonymous online surveys versus in-person interviews) represent further sources of systematic variation. These methodological considerations are particularly relevant when interpreting cross-national or cross-institutional comparisons, as differences in reported prevalences may reflect measurement artifacts rather than true population differences. Future research in this field would benefit from greater standardization of measurement approaches and sampling

strategies to enhance comparability across studies.

Educational systems and their particular characteristics emerge as another crucial factor in the observed variability. Dyrbye et al. (Dyrbye et al., 2019) have documented how different curricular models and evaluation systems can significantly impact students' mental health. Variations in academic workload, institutional support systems, and available mental health resources, aspects highlighted by Mortier et al. (2018a) in their international comparative study, could explain part of the heterogeneity found. Furthermore, socioeconomic contexts play a fundamental role; Mateen et al. (74) explore how, in low and middle-income countries, factors such as job uncertainty, financial pressures, and limited access to mental health services can exacerbate suicide risk among health sciences students.

The diversity of health sciences disciplines included in this meta-analysis represents another important source of heterogeneity. While we have discussed factors affecting health sciences students broadly, the vulnerability pathways likely differ across specific disciplines. For example, while medical, nursing, and dentistry students face stressors directly related to clinical responsibilities and patient care, psychology students, particularly undergraduates, may experience different risk trajectories. Recent research suggests that for psychology students, selection mechanisms may play a more prominent role, with evidence indicating that individuals with pre-existing mental health concerns or personal experiences with psychological distress may be more likely to pursue psychology as a field of study (Kazmierczak et al., 2023; Robinson et al., 2023). This 'therapy hypothesis' (Jacobsen & Diseth, 2020) suggests that elevated rates of suicidal ideation in some disciplines might reflect pre-existing vulnerabilities rather than exclusively training-induced stressors. Such discipline-specific vulnerability patterns warrant consideration when interpreting heterogeneity in prevalence estimates and designing targeted prevention strategies.

Practical implications

Our findings have important implications for suicide risk screening and monitoring in health sciences students. The notable prevalence found, particularly in recent assessments using the PHQ-9, suggests the need to implement systematic screening protocols in educational institutions. As Downs et al. (2014) note, universal and regular screening can facilitate early identification and timely intervention, especially in populations with high risk of underreporting due to professional stigma.

The choice of screening instrument should consider both diagnostic accuracy and implementation feasibility. The PHQ-9, due to its brevity and ability to detect current risk, could serve as a first-line tool in routine assessments, as suggested by Na et al. (Na et al., 2018). However, cases identified through this initial screening should be subsequently evaluated with more specific instruments like the Beck Scale, following the stepped assessment model proposed by McDowell et al. (McDowell et al., 2011). This two-stage approach would allow efficient resource use while maintaining the necessary sensitivity to not overlook cases of significant risk.

Temporal monitoring emerges as a crucial component of the assessment protocol. Mortier et al. (2018b) have demonstrated that periods of highest risk often coincide with specific moments in the academic calendar, such as final examinations or the start of clinical rotations. Therefore, we recommend intensifying screening during these critical periods, complementing routine assessments with additional support when necessary. Furthermore, it is essential to establish clear referral and follow-up pathways for at-risk students, ensuring continuity of care without compromising their academic progression.

Our recommendation for systematic screening warrants further clarification regarding implementation approaches and expected outcomes. While we advocate for regular screening, evidence suggests that screening alone is insufficient without linkage to effective interventions. As demonstrated by Downs et al. (2014) with the HEAR program and Mortier et al. (2018c) in their comparative study, screening programs

that incorporate direct pathways to treatment services ("screening plus" approach) show greater efficacy than isolated screening efforts. For health sciences educational institutions, we specifically recommend implementing multicomponent prevention programs that combine: (1) regular screening using validated tools like the PHQ-9 with clear referral protocols; (2) curriculum-integrated resilience training and stress management, as demonstrated effective by Thompson et al. (Thompson et al., 2010); (3) peer support programs specifically tailored to health sciences contexts, which have shown particular promise in reducing stigma and facilitating help-seeking (Wasson et al., 2016); and (4) institutional policy changes addressing structural factors like excessive workload and sleep deprivation. These recommendations align with emerging evidence that comprehensive, contextually-appropriate interventions addressing both individual vulnerability and environmental stressors are most effective in reducing suicidal behaviors in this population.

Strengths and limitations of the study

The present study has several significant methodological strengths. Our stratified analysis by instrument type and time frame provides a more nuanced understanding of suicidal phenomena in health sciences students, overcoming limitations of previous meta-analyses that combined different measures without this crucial distinction. Including recent studies through the COVID-19 pandemic period offers an updated perspective for the current context. The rigor in methodological quality assessment and sensitivity analysis strengthens the reliability of our estimates.

Our study has important limitations that should be considered. Although common in prevalence meta-analyses, the high heterogeneity found in all analyses limits the generalization of results. Most included studies used non-probabilistic sampling, which could introduce selection biases. Additionally, our database search strategy did not include PsycInfo, which may have led to the omission of relevant studies, particularly those focused on psychology students. However, this limitation is mitigated by our exhaustive search in four global databases, which collectively index the majority of high-quality peer-reviewed journals in health sciences, including those dedicated to mental health and psychology research. Furthermore, the reporting of lifetime suicide attempts is subject to substantial recall bias, reinterpretation biases, and temporal fluctuations in reporting. As documented by Forbes et al. (Klimes-Dougan et al., 2022), self-reported lifetime suicide attempts demonstrate considerable inconsistency over time, with both false negative and positive reports occurring frequently. This instability likely affects the precision and accuracy of our pooled lifetime prevalence estimates, suggesting that more recent time frames may offer greater reliability.

Further limitations concern the measurement instruments and their practical application. The proprietary nature of the Beck Scale, requiring substantial fees for use, likely influences instrument selection in research, particularly in low-resource contexts. This constraint partially explains the diversity of assessment tools observed. It highlights the need for validated, open-access instruments like the Columbia-Suicide Severity Rating Scale (C-SSRS) to enhance standardization across studies. Finally, the reliance on self-reporting for stigmatized phenomena such as suicidal behaviors likely results in an underestimation of actual prevalences, a challenge that future research methodologies should address through complementary assessment approaches.

Conclusions and recommendations

This study provides evidence on the prevalence of suicidal ideation and attempts among health sciences students, with important variations according to measurement instrument and time frame evaluated. Our findings underscore the critical need to implement systematic screening and prevention programs in health sciences educational institutions,

particularly considering the PHQ-9 as a first-line tool for early detection, followed by more specific assessments when necessary.

Educational institutions must develop clear protocols that ensure risk identification and effective referral and support pathways that consider the particularities of the academic health context. Future research should focus on longitudinal studies that allow better understanding of the temporal evolution of suicide risk and evaluate the effectiveness of preventive interventions, paying special attention to critical moments in the academic calendar and considering specific contextual factors of health sciences education.

CRedit authorship contribution statement

Víctor Juan Vera-Ponce: Writing – review & editing, Writing – original draft, Resources, Methodology, Investigation, Conceptualization. **Joan A. Loayza-Castro:** Writing – review & editing, Software, Methodology, Formal analysis, Data curation. **Fiorella E. Zuzunaga-Montoya:** Writing – review & editing, Writing – original draft, Project administration, Investigation. **Luisa Erika Milagros Vásquez-Romero:** Writing – review & editing, Writing – original draft, Project administration, Investigation. **Witre Omar Padilla:** Writing – original draft, Resources, Methodology, Investigation. **Christian Humberto Huaman-Vega:** Writing – review & editing, Writing – original draft, Project administration, Investigation. **Germán Lobos:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision. **Carmen Inés Gutierrez De Carrillo:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Víctor Juan Vera Ponce reports financial support and article publishing charges were provided by Vicerectorado de Investigación de la Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Informed consent

This study is a systematic review therefore informed consent is not required.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.mhp.2025.200432](https://doi.org/10.1016/j.mhp.2025.200432).

Data availability

Data are available upon request to the corresponding author.

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