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Prevalence of mental disorder symptoms among university students: An umbrella review

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ABSTRACT

This umbrella review synthesizes data on the prevalence of mental disorder symptoms among university students worldwide. A systematic search of seven databases (inception–July 23, 2023) followed PRISMA guidelines. We included meta-analyses assessing the prevalence of mental disorder symptoms, evaluating methodological quality with AMSTAR-2. A random-effects meta-analysis was conducted, along with meta-regression and sub-group analyses for moderators (percentage of females, publication date, healthcare-related degrees, COVID-19 pandemic). We included 1,655 primary studies from 62 meta-analyses, encompassing 8,706,185 participants. AMSTAR-2 ratings classified 35 % of meta-analyses as low quality and 65 % as critically low. Pooled prevalence estimates were: depression—mild (35.41 %, CI=33.9–36.93) and severe (13.42 %, CI=8.03–19.92; k=952; n=2,108,813); anxiety—mild (40.21 %, CI=37.39–43.07) and severe (16.79 %, CI=7.21–29.29; k=433; n=1,579,780); sleep disorders (41.09 %, CI=35.7–46.58); eating disorders (17.94 %, CI=15.79–20.20); gambling disorder (6.59 %, CI=5.52–7.75); post-traumatic stress disorder (25.13 %, CI=20.55–30.02); stress (36.34 %, CI=29.36–43.62); and suicide-related outcomes (ideation past 12 months: 10.76 %, CI=9.53–12.06; lifetime ideation: 20.33 %, CI=16.15–24.86; suicide attempt past 12 months: 1.37 %, CI=0.67–2.29; lifetime attempt: 3.44 %, CI=2.48–4.54). Meta-regression analyses identified statistically significant moderators of prevalence such as healthcare academic degrees and the pandemic in the case of depression and studies with more females in the case of sleep disorders. This is the most comprehensive synthesis on the prevalence of mental disorder symptoms in university students, providing crucial insights for clinicians, policymakers, and stakeholders.

1. Introduction

Globally, it is estimated that there are around 254 million university students, a figure that has doubled over the past two decades (UNESCO, n.d). This rapid growth reflects the increasing emphasis on higher education as an important pathway for development (Sommerfeld, 2016). However, there is also an increasing attention to the significant challenges that students may face during this phase of their life (King et al., 2021; Thompson et al., 2021). In fact, the transition to adulthood during university life often involves many changes such as gaining independence, which comes along with greater autonomy, but also with the need to assume new responsibilities (Thompson et al., 2021). Additionally, this phase also requires social, emotional, and academic adjustments (Worsley et al., 2021). A positive transition experience can enhance well-being, while a negative experience may be psychologically demanding, playing an important role in the mental health of university students (Cage et al., 2021).

Stressors associated with the university period can exacerbate pre-existing psychiatric disorders or make students vulnerable to new ones, leaving them particularly susceptible to mental health challenges (Slimmen et al., 2022; Thompson et al., 2021). Some studies have suggested that university students experience higher rates of mental disorder symptoms, underscoring the urgency of addressing this issue (Akhtar et al., 2020; Auerbach et al., 2016; Ibrahim et al., 2013; Regli et al., 2024; Sheldon et al., 2021; Storrie et al., 2010). Over the years, an evident increasing trend of psychopathology in young adults has been observed (Brunette et al., 2023; Gagné et al., 2022). However, these challenges have been further exacerbated by the COVID-19 pandemic, which introduced new stressors, disrupted educational routines, and triggered a global health crisis with profound impacts on mental health, especially among vulnerable groups (Deng et al., 2021; Li et al., 2021; Zhu et al., 2021). University students were particularly affected, with rates of depression and anxiety rising sharply during this period (Lai et al., 2020; Zhang et al., 2022).

There is a critical need to accurately estimate the prevalence of mental disorder symptoms based on large and comprehensive data, to inform preventive and intervention strategies aimed at addressing these issues in university students. However, despite the growing body of research on mental health in university students, there remains no comprehensive synthesis of prevalence data across countries.

2. Objective

This study aimed to fill this gap by conducting the first umbrella review of meta-analyses reporting data on the prevalence of a broad range of mental disorder symptoms in university students. We also aimed to study factors modifying these prevalence rates, including the impact of the COVID-19 pandemic.

3. Methods

3.1. Study design

The protocol of this umbrella review was registered on June 5, 2023 at PROSPERO (CRD42023429453). We followed PRISMA recommendations for the conduct and reporting of the umbrella review (Page et al., 2021). There were no deviations from the registered protocol.

3.2. Study outcome

The umbrella review outcome was the prevalence of mental disorder symptoms in university students. This included the prevalence of mild, moderate or severe symptoms of any mental disorder, and other related outcomes such as suicide and stress.

3.3. Inclusion criteria

We included systematic reviews with meta-analyses, reporting data on the prevalence of mental disorder symptoms, where the entire sample or a subgroup consisted of university undergraduate or postgraduate (pursuing masters' degrees or predoctoral studies) students. No specific age range was considered.

We included meta-analyses that provided prevalence of symptoms of mental disorders included in any version of the *International Classification of Diseases* (ICD) or the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). The definition of mild, moderate or severe symptoms was based on the criteria used in the primary studies through a score above a threshold on a validated instrument, a clinical interview, or a self-reported diagnosis.

Additionally, we included other outcomes that, although not classified as mental disorders, are closely associated with mental disorder symptoms: stress, suicidal ideation and intent, following definitions provided in the included meta-analyses.

We aimed to analyze data representative of the overall population of university students by including studies across various educational degrees, educational levels (e.g., freshmen, graduate, PhD students), or gender/sex. However, we excluded studies focusing on subgroups that did not reflect the broader student body, such as foreign students or university athletes.

3.4. Information sources and search strategy

The search was carried out on PubMed/MEDLINE and Web of Science. CINAHL, ERIC, ScienceDirect, Dialnet and PsycInfo were searched through Unika, an institutional reference aggregator that uses the EBSCO host service. Databases were searched from their inception to July 23, 2023. The search strategy was devised by the senior researchers and included terms for systematic review/meta-analysis, mental disorders (Arrondo et al., 2022), university students, and prevalence (Table 1). No language, date, or type of publication restrictions were applied. Reference lists of primary studies from the meta-analyses included in this study were also examined to retrieve any additional eligible study.

3.5. Selection process

Search outputs from each database were imported into Covidence (Veritas Health Innovation, n.d) . Duplicates were removed automatically, with automatic removal double checked manually, and two reviewers independently conducted the title/abstract screening and the full text review. Discrepancies were solved through consensus, or, when not possible, by consulting a senior co-author.

3.6. Data extraction at the meta-analysis level

Data extraction was completed independently by two authors, using a preformatted excel sheet. Any discrepancies were solved by consensus. Extraction was completed at two levels, meta-analysis and primary study (see supplementary methods). For each meta-analysis, key methodological details and prevalence data were recorded. Authors of included meta-analyses were systematically contacted to gather any relevant information/data on outcome data not reported in the published meta-analysis. Methodological quality of each meta-analysis was assessed independently by two authors using a modified version of the AMSTAR-2 tool (eMethods, eTable 2) (Shea et al., 2017). Data was also obtained for each unique primary study identified across all meta-analyses, including participant information, mental disorders and their evaluation and prevalence data. We accessed the texts of the primary studies to obtain additional information in specific cases where key data were not available at the meta-analysis level.

A variety of psychological tools and thresholds was used across

Table 1

Summary of the characteristics of included MAs. Covid-19: whether the meta-analysis includes studies during the COVID-19 pandemic (yes), or not (no), or both before and during the pandemic (mixed). k: number of studies included in the meta-analysis. n: number of participants included in the meta-analysis. Extracted disorders: mental disorders each meta-analysis dealt with. All the information in the table refers to the meta-analyses as presented in the publications, irrespective of the information used in our umbrella review.

Author, year	COVID-19	Search period	Databases searched	k	n	AMSTAR rating (critical domains)	Extracted disorders/outcomes
Ahmed 2023	Mixed	1980–2020	4	83	130,090	Low (1)	Anxiety
Akhtar 2020	No	2009–2018	3	37	76,608	Low (1)	Depression
Alhaj 2022	Mixed	up to 2021	9	105	145,629	Low (1)	Eating disorders
Batra 2021	Yes	2019–2020	5	27	90,879	Low (1)	Depression, Anxiety, PTSD, Stress disorders, Sleep disorders and Suicide
Binjabr 2023	Mixed	up to 2023	6	109	59,427	Low (1)	Sleep disorders
Blinn-Pike 2007	No	2005	3	15	9794	Critically low (4)	Disordered gambling
Carvalho 2022	Yes		3	13	18,220	Critically low (3)	Depression, Anxiety and Stress disorders
Chang 2021	Yes	2020	4	16	144,010	Critically low (3)	Depression and Anxiety
Chiang 2021	Unclear	up to 2021	8	6	2236	Critically low (3)	Internet gaming disorder
Demenech 2021	No	2020	4	47	37,486	Critically low (2)	Depression, Anxiety and Suicide
Deng 2021	Yes	2020–2021	11	89	1441,828	Low (1)	Depression, Anxiety and Sleep disorders
Dutta 2023	Mixed	2019–2022	3	19	5944	Low (1)	Depression
Ebrahim 2022	Yes	2020	5	90	46,284	Critically low (3)	Depression and Anxiety
Erbil 2021	No	2014–2018	5	18	6890	Critically low (4)	Premenstrual syndrome
Fekih-Romdhane 2022	Mixed	up to 2021	9	28	21,383	Low (1)	Eating disorders
Fernandes 2023	Mixed	2011–2023	6	26	24,704	Low (1)	Depression
Gao 2020	No	up to 2020	4	113	185,787	Critically low (4)	Depression
Guo 2021 SH	No	1980–2020	10	37	27,717	Critically low (2)	Depression
Hu 2023	Yes	2020–2022	3	38	95,375	Critically low (2)	PTSD
Idoiaga 2022	Yes	2019–2021	1	6	29,739	Critically low (3)	PTSD
Jaafari 2021	No	1991–2019	10	89	33,564	Critically low (2)	Depression
Jahrami 2019	No	1982–2017	4	18	5722	Critically low (3)	Eating disorders
Jahrami 2022	Yes	2019–2021	11	22	21,880	Low (1)	Sleep disorders
Jia 2022	Yes	2019–2021	5	41	36,608	Low (1)	Depression and Anxiety
Jiang 2015 M	No	2000–2014	5	45	50,826	Critically low (4)	Depression
Jiang 2015 PH	No	2000–2014	6	7	16,478	Critically low (2)	Sleep disorders
Kaggwa 2022	Mixed	1972–2021	5	4	1982	Low (1)	Depression
Kate 2020	No		2	98	31,905	Critically low (5)	Dissociative disorders
Khan 2021	No	up to 2019	4	26	7652	Low (1)	Depression
Lasheras 2020	Yes	up to 2020	1	8	11,710	Critically low (2)	Anxiety
Lei 2016	No	1995–2015	5	39	32,694	Critically low (4)	Depression
Li 2014	No	2004–2013	5	41	160,339	Critically low (3)	Suicide
Li 2018	No	up to 2016	6	76	112,939	Critically low (2)	Sleep disorders
Li 2021	Yes	2019–2020	10	27	706,415	Low (1)	Depression and Anxiety
Liyanage 2022	Yes	2020–2021	3	36	1090,901	Critically low (2)	Anxiety
Luo 2021	Yes	2020–2021	6	84	1292,811	Low (1)	Depression
Meaney 2016	No	1994–2014	16	43	26,343	Critically low (4)	Borderline personality disorder
Meng 2019	No	up to 2019	6	7	6217	Critically low (2)	Hypochondria
Mortier 2018	No	1980 – 2016	5	36	634,662	Low (1)	Suicide
Mulyadi 2021	Yes	2020–2021	4	17	13,247	Critically low (2)	Depression, Anxiety, PTSD, Stress disorders and Sleep disorders
Muniz 2021	No	up to 2020	3	58	16,805	Critically low (2)	Depression
Nowak 2014	No	2005–2013	4	19	13,080	Critically low (4)	Disordered gambling
Nowak 2018	No	1987 – 2016	4	72	41,989	Critically low (4)	Disordered gambling
Pacheco 2017	No	1909–2016	4	59	18,015	Low (1)	Depression, Anxiety and Sleep disorders
Peng 2023	Yes	2020–2022	7	201	198,000	Low (1)	Depression, Anxiety, PTSD, Stress disorders, Sleep disorders and Suicide
Puthran 2016	No	up to 2015	5	77	62,728	Critically low (2)	Depression
Quek 2019	No	up to 2019	3	68	40,438	Critically low (2)	Anxiety
Rotenstein 2016	No	1982–2015	5	195	129,123	Critically low (2)	Depression and Suicide
Santabarbara 2021 IJER	Yes	2019–2021	1	15	6141	Critically low (3)	Anxiety
Santabárbara 2021 M	Yes	2019–2021	3	13	4147	Critically low (2)	Depression
Santabárbara 2021 RMJ	Yes	2019–2020	3	11	6576	Critically low (2)	Depression
Sarokhani 2013	No	1995–2012	7	35	9743	Critically low (4)	Depression
Satinsky 2021	No	up to 2019	5	32	23,469	Low (1)	Depression and Anxiety
Sheldon 2021	No	1946–2020	4	12	16,376	Low (1)	Depression and Suicide
Sun 2022	Mixed	up to 2021	5	14	21,848	Low (1)	Sleep disorders
Trindade 2019	No	up to 2017	3	14	11,487	Low (1)	Eating disorders
Tsegay 2020	No	up to 2020	3	14	26,393	Critically low (4)	Suicide
Tung 2018	No	2015–2016	8	27	8918	Critically low (2)	Depression
Wang 2021	Yes	up to 2020	4	28	436,799	Critically low (3)	Depression, Anxiety and Stress disorders
Wang 2022	Yes	up to 2021	5	25	1003,743	Critically low (2)	Anxiety
Zeng 2019	No	1806–2018	6	10	30,817	Critically low (3)	Depression, Anxiety, Eating disorders and Suicide
Zhang 2021	Yes	up to 2020	9	31	274,175	Critically low (3)	Depression and Anxiety

studies. To combine results, scales were simplified into broader categories and symptom severity for depression, anxiety, and sleep disorders was categorized into mild, moderate, and severe by comparing thresholds used in the primary studies to those recommended in the literature. Severity classification for other disorders was not possible due to inconsistent thresholds or a lack of studies.

3.7. Data synthesis

Since the overlap of primary studies across different meta-analyses on the same disorder was deemed to be generally low- and this was confirmed when we retrieved the meta-analyses- our approach aimed to pool effect sizes from individual studies from multiple meta-analyses. This greatly increased the coverage across time periods, educational degrees and countries, as well as the overall sample size. Statistical analyses were performed using STATA 18.0 (StataCorp LLC). For each outcome, a random-effects meta-analysis was conducted, employing a Freeman-Tukey transformation to aggregate effect sizes from the primary studies. The pooled prevalence for each outcome, along with 95 % confidence intervals, was calculated. Heterogeneity was assessed using the I^2 statistic, where $I^2 > 50$ % indicated substantial heterogeneity due to true variance across studies. Additionally, the H^2 and τ^2 statistics were used to describe the variability in effect measures across studies or subgroups A leave-one-out analysis was performed to evaluate the influence of each study on the overall effect, and prediction intervals were also calculated.

Categorical meta-regressions and subgroup analyses were conducted to examine the impact of key variables available for most primary studies. These variables included: study period (before 2010, between 2010 and 2014, between 2015 and 2019 and after 2019, with the latter group further split in those carried out before or after the onset of the COVID-19 pandemic following description in the meta-analyses and texts of the primary studies); proportion of healthcare students, the percentage of women in study samples (divided into tertiles); and country-level gross national income (GNI) based on World Bank data (World Bank, n.d.). Low and middle-low-income countries were lumped due to a limited number of studies in the former category. Additionally, the potential change in these variables' prevalence rate before and after the pandemic was explored. Each variable was included in a one-factor meta-regression predicting disorder prevalence if at least 10 primary studies were available for each level of dichotomous variables, as per current suggestions (Borenstein et al., 2009). For variables with more than two levels (e.g., gender distribution, study periods, income levels), a minimum of 10 studies for at least two levels was required. Meta-regressions were also conducted incorporating an additional factor for the pandemic, and further analyses explored interactions between the factors. Subgroup analyses were reported when either both factors were significant without interaction, or when a significant interaction was found.

For depression, anxiety, and sleep problems, prevalence summaries were reported according to severity, whereas for the remaining outcomes, all data from primary studies were combined into a single pooled effect, as severity categorization was usually not reported in the primary studies. Hence, pooled prevalence reflected the combination of severities across existing studies.

4. Results

4.1. Study selection

The literature search yielded 14,655 results, with 5742 duplicates. After title/abstract screening, 152 articles underwent full-text review, resulting in 62 eligible meta-analyses (eResults) covering twelve mental disorder symptoms (ten referring to mental disorders and two mental disorder-related outcomes). Included meta-analyses comprised 1655 primary studies, yielding 2151 prevalence data points with a combined

sample size of 8706,185 individuals. Fig. 1 illustrates the PRISMA flow diagram. Table 1 provides detailed information for the included meta-analyses. The 90 excluded meta-analyses, with reasons for exclusion, are listed in eTable 3 and 4.

4.2. Study characteristics and outcomes

Most of the meta-analyses provided prevalence data on symptoms of depression (k = 952), anxiety (k = 433), and sleep disorders (k = 163). Additional data on the meta-analyses, including the pooled rate reported for each outcome can be found in Fig. 2, eFigure 1, eTables 5 and 6. eTable 7 lists the instruments used to assess symptoms of mental disorders across primary studies. According to the AMSTAR-2 assessment, 35 % of the included meta-analyses were rated as low quality, while 65 % were deemed critically low. The median number of critical domains was 2 (range: 1–5) (eTable 8). Common sources of bias included the absence of a list of excluded studies (98 %) and the lack of a protocol (63 %). Other prevalent biases involved insufficient justification for study design selection (73 %) and inadequate evaluation (69 %) and discussion (69 %) of risk of bias.

4.3. Depression

Nine hundred fifty-two primary studies included in 34 meta-analyses reported the prevalence of symptoms of depression among 2108,813 university students. Prevalence of mild depression symptoms was 35.41 % (CI=33.9–36.93; k = 816; I^2=99.68 %). Moderate symptoms were reported by 24.54 % (CI=21.27–27.96; k = 127; I^2=99.79) of the students, whereas severe symptoms by 13.42 % (CI=8.03–19.92; k = 9; I^2=99.79 %).

Prevalence rates of depression symptoms were significantly higher in the post-pandemic period (Fig. 3). An effect of country income, which additionally interacted with the pandemic, was also found. Before the pandemic, low and lower-middle-income countries had higher prevalence of symptoms than upper-middle or high-income countries. However, our results showed higher prevalences after the pandemic for students of more developed countries. Additional information in eFigure 2 and eTable 9.

4.4. Anxiety

Twenty-two meta-analyses including 433 primary studies were analyzed, encompassing a total of 1579,780 participants. 40.21 % (CI=37.39–43.07; k = 296; I^2=99.87 %) of students reported mild anxiety symptoms, 28.18 % (CI=24.86–31.61; k = 128; I^2=99.68 %) moderate, and 16.78 % (CI=7.21–29.29; k = 9; I^2=99.7 %) severe symptoms (Fig. 4).

There was no evidence for an effect of COVID-19 on anxiety in our data (eFigure 3). However, our results show that the effects of COVID-19 interacted with other factors, namely country economic status and percentage of women. Before the pandemic, countries with low and lower-middle-income showed a higher prevalence of symptoms. Studies conducted after the pandemic showed higher prevalence rates in high-income countries. There was also a complex relation between the percentage of women in a study, whether it had been carried pre or post-pandemic, and its reported prevalence of anxiety. Before the pandemic, studies with a higher percentage of women showed higher rates of severe anxiety symptoms. After the pandemic, prevalences were similar across groups.

4.5. Sleep disorders

Ten meta-analyses, including 163 primary studies, examined the prevalence of sleep disorders in a sample of 203,713 students. 41.09 % of the students report mild symptoms (CI=35.7–46.58; k = 91; I^2=99.71 %), 23.3 % (CI=20.78–25.92; k = 71; I^2=98.84 %) moderate,
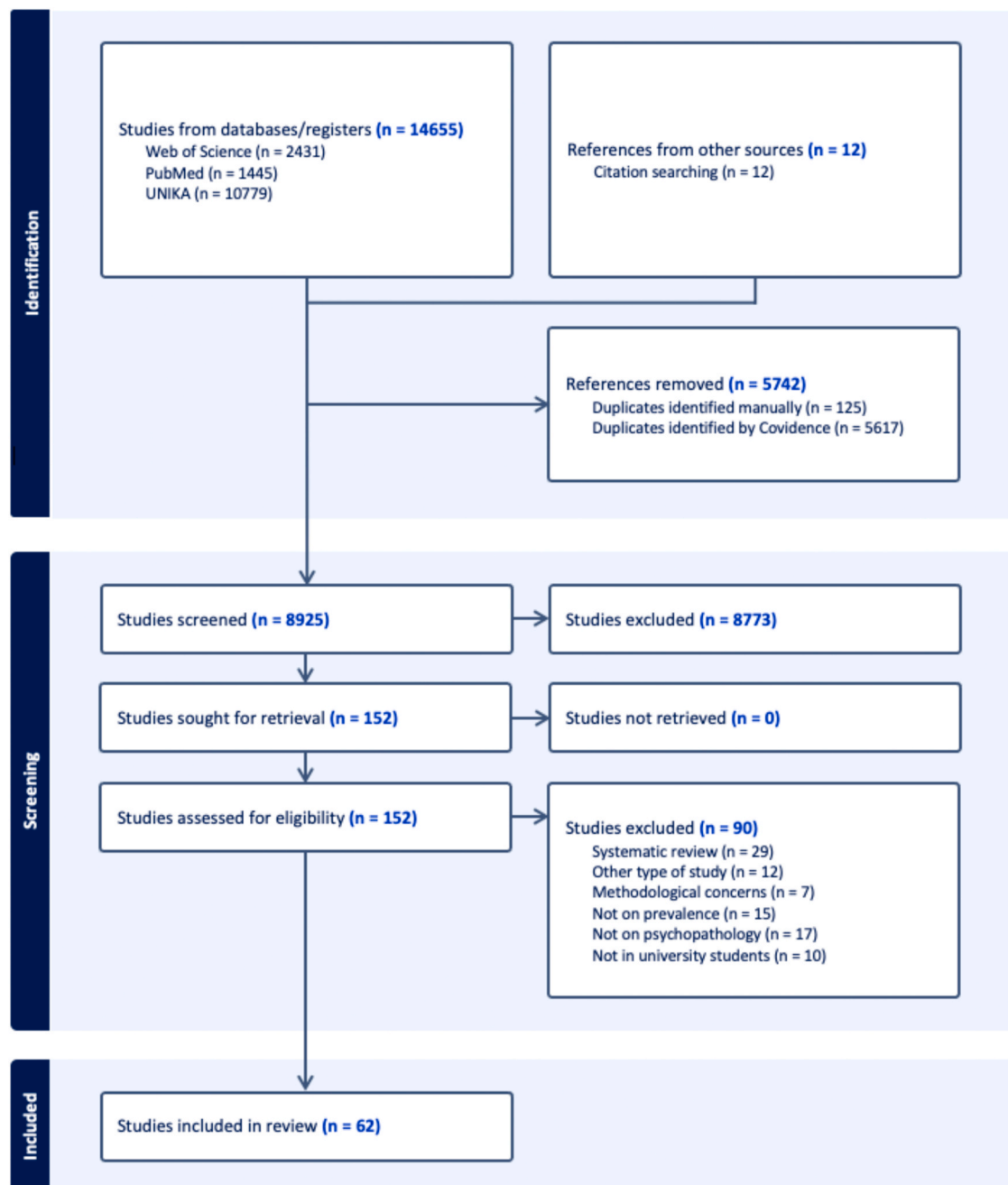
Fig. 1. PRISMA study selection flowchart.

and 13.02 % (CI=10.96–15.22; k = 1) severe symptoms. A significantly higher prevalence of sleep problems was found after the pandemic in females and healthcare-related degree students (eFigures 4 and 5). Moreover, a single meta-analysis indicated that 36.18 % (CI=28.45–44.28; k = 28; n = 10,122; I^2=98.54 %) of healthcare students experienced excessive daytime sleepiness during the pandemic.

4.6. Symptoms of other disorders

Fig. 2 reports prevalence rates of symptoms (in most cases mild) of eating disorders (17.94 %; CI=15.79–20.20; k = 134; n = 147,333; I^2=98.86 %; eFigures 6 and 7); gambling disorder (6.59 %; CI=5.52–7.75; k=75; n=2,236; I^2=94.89 %; eFigure 8); post-traumatic stress disorder (25.13 %; CI=20.55–30.02; k = 46; n = 108,898; I^2=99.68 %; eFigures 9 and 10); borderline personality disorder

(10.07 %; CI=7.74–12.66; k = 43; n = 26,353; I^2=97.54 %); hypochondria (27.24 %; CI=16.55–39.46; k = 7; n = 6217; I^2=99 %); internet gaming disorder (6.84 %; CI=3.15–11.77; k = 6; n = 2236; I^2=93.78 %); and premenstrual syndrome (56.59 %, CI=45.94–66.95; k = 13; n = 5617; I^2=98.45 %). Results from the meta-regressions are provided in supplementary material (eResults). Prevalence of dissociative disorder, as reported in the original meta-analysis is 6.7 % (Kate et al., 2020).

4.7. Mental disorder related outcomes (stress and suicide)

Prevalence of stress was 36.34 % (CI=29.36–43.62; k = 58; n = 43,027; I^2=99.58 %). Data on suicide are reported according to four categories (eFigure 11): ideation in the past 12 months (10.76 %; CI=9.53–12.06; k = 95; n = 809,986; I^2=99.63 %); lifetime ideation
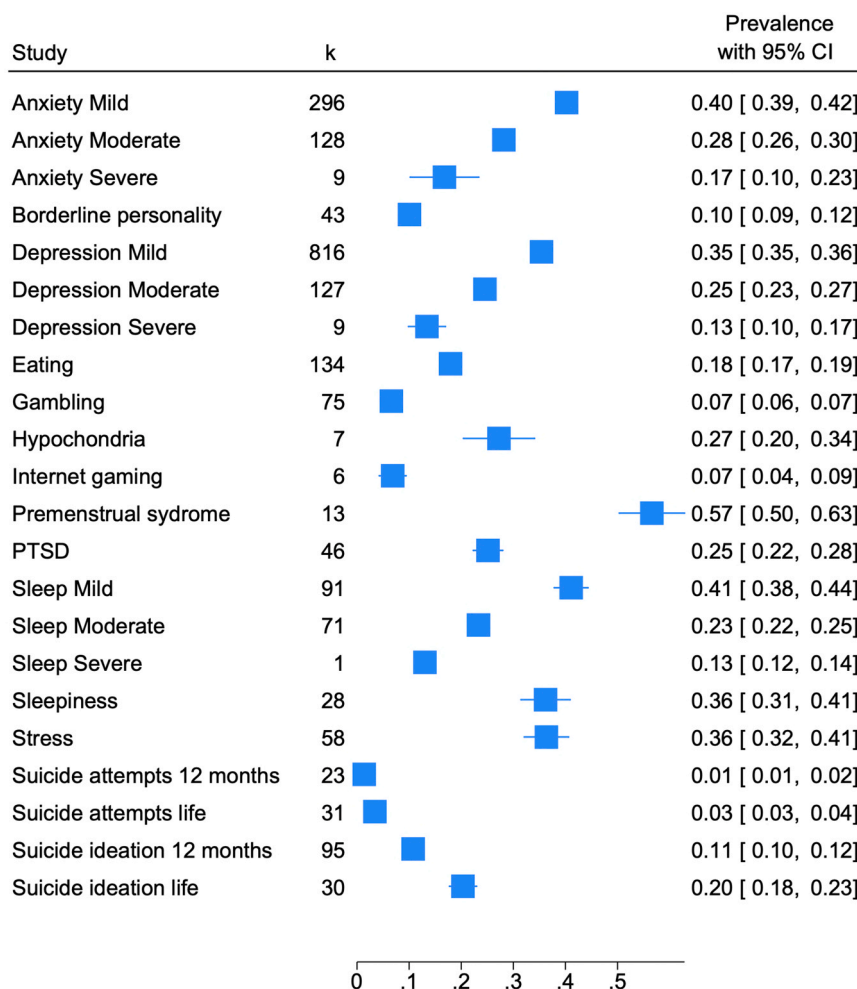
Study	k	Prevalence with 95% CI
Anxiety Mild	296	0.40 [0.39, 0.42]
Anxiety Moderate	128	0.28 [0.26, 0.30]
Anxiety Severe	9	0.17 [0.10, 0.23]
Borderline personality	43	0.10 [0.09, 0.12]
Depression Mild	816	0.35 [0.35, 0.36]
Depression Moderate	127	0.25 [0.23, 0.27]
Depression Severe	9	0.13 [0.10, 0.17]
Eating	134	0.18 [0.17, 0.19]
Gambling	75	0.07 [0.06, 0.07]
Hypochondria	7	0.27 [0.20, 0.34]
Internet gaming	6	0.07 [0.04, 0.09]
Premenstrual sydrome	13	0.57 [0.50, 0.63]
PTSD	46	0.25 [0.22, 0.28]
Sleep Mild	91	0.41 [0.38, 0.44]
Sleep Moderate	71	0.23 [0.22, 0.25]
Sleep Severe	1	0.13 [0.12, 0.14]
Sleepiness	28	0.36 [0.31, 0.41]
Stress	58	0.36 [0.32, 0.41]
Suicide attempts 12 months	23	0.01 [0.01, 0.02]
Suicide attempts life	31	0.03 [0.03, 0.04]
Suicide ideation 12 months	95	0.11 [0.10, 0.12]
Suicide ideation life	30	0.20 [0.18, 0.23]

Fig. 2. Forest plot of the main effect with confidence intervals of every mental disorder symptom.

(20.33 %; CI=16.15–24.86; k = 30; n = 470,397; I²=99.84 %); suicide attempt in the past 12 months (1.37 %; CI=0.67–2.29; k = 23; n = 604,300; I²=99.78 %); and lifetime suicide attempt (3.44 %; CI=2.48–4.54; k = 31; n = 467,495; I²=99.37 %).

5. Discussion

This study aimed to address a significant gap in the literature by conducting the first umbrella review of meta-analyses reporting prevalence data on a wide range of mental disorder symptoms in university students, while also examining factors that may be associated with these rates, including the impact of the COVID-19 pandemic. Prior to this review, studies on the prevalence of mental disorder symptoms among university students were largely limited to specific regions or academic disciplines. By synthesizing data from 62 meta-analyses, comprising 1,655 primary studies and over 8.7 million participants, we provide the first global estimate of the prevalence of these symptoms.

For many years there has been a steady increase in the prevalence of mental disorders among young adults due to multiple factors, as indicated for instance by studies from the United States (Brunette et al., 2023) or Great Britain (Gagné et al., 2022). However, this increase has been further aggravated by the pandemic. Our results highlight the significant impact that the COVID-19 crisis had on the mental health of university students and shows how other variables relate to mental health and interacted with the pandemic.

Depression and anxiety, often comorbid, exhibited the highest prevalence rates (Sansone and Sansone, 2010). In this review, 13.42 %

and 16.78 % of students reported severe depression symptoms and anxiety, respectively. These findings are particularly concerning due to the adverse effects of depression and anxiety on students' academic performance, well-being, and mental health (Batra et al., 2021; Tan et al., 2023). Our results add to existing literature across several populations showing higher prevalence of depression symptoms during and after the pandemic (Ettman et al., 2020; Solla et al., 2023).

Regarding anxiety, while some studies observed increased symptoms during the pandemic, others, including this review, found no significant differences (Kefeli and Akkus, 2023; Shah et al., 2021; Tan et al., 2023). In fact, longitudinal studies have revealed that some individuals with higher levels of anxiety before the pandemic may have experienced a decrease in their symptoms afterwards (Bendau et al., 2021; McLoughlin et al., 2023). This improvement could be attributed to reduced social pressure, fewer interactions, and greater control over their environment, which may have provided a temporary sense of relief for those prone to anxiety. These findings suggest that the pandemic's impact on anxiety levels may not have been universally negative and may have varied depending on individual circumstances. This inconsistency highlights the need for further research to understand the varying impacts across populations and contexts. Our results also suggest that COVID-19 interacted with factors such as gender, degree type and countries' economic status differently across disorders. For anxiety specifically, pre-pandemic studies with a higher percentage of women reported higher rates, but post-pandemic, prevalence rates were similar across genders.

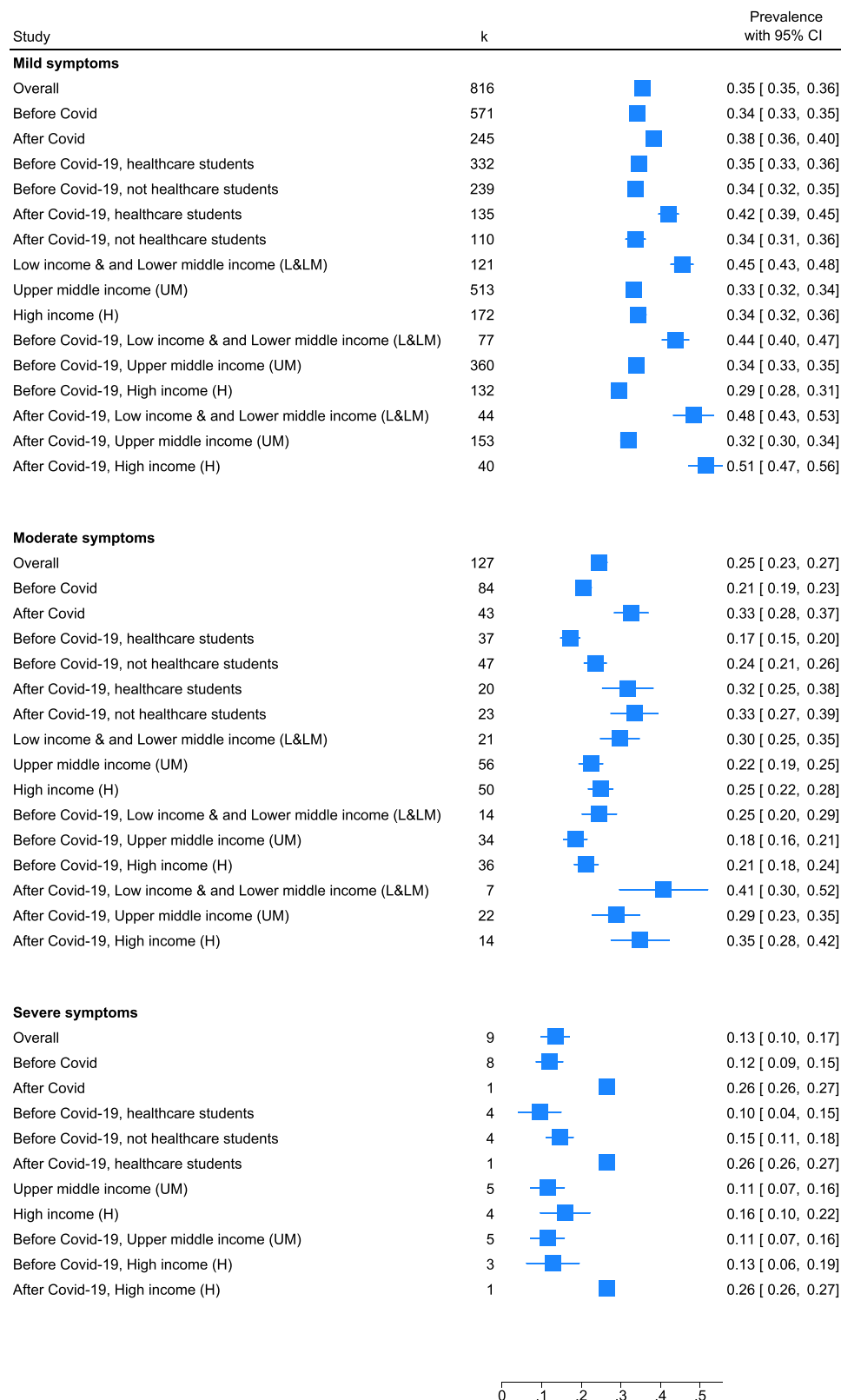We also found significant differences between healthcare students

Study	k	Prevalence with 95% CI
Mild symptoms		
Overall	816	0.35 [0.35, 0.36]
Before Covid	571	0.34 [0.33, 0.35]
After Covid	245	0.38 [0.36, 0.40]
Before Covid-19, healthcare students	332	0.35 [0.33, 0.36]
Before Covid-19, not healthcare students	239	0.34 [0.32, 0.35]
After Covid-19, healthcare students	135	0.42 [0.39, 0.45]
After Covid-19, not healthcare students	110	0.34 [0.31, 0.36]
Low income & and Lower middle income (L&LM)	121	0.45 [0.43, 0.48]
Upper middle income (UM)	513	0.33 [0.32, 0.34]
High income (H)	172	0.34 [0.32, 0.36]
Before Covid-19, Low income & and Lower middle income (L&LM)	77	0.44 [0.40, 0.47]
Before Covid-19, Upper middle income (UM)	360	0.34 [0.33, 0.35]
Before Covid-19, High income (H)	132	0.29 [0.28, 0.31]
After Covid-19, Low income & and Lower middle income (L&LM)	44	0.48 [0.43, 0.53]
After Covid-19, Upper middle income (UM)	153	0.32 [0.30, 0.34]
After Covid-19, High income (H)	40	0.51 [0.47, 0.56]
Moderate symptoms		
Overall	127	0.25 [0.23, 0.27]
Before Covid	84	0.21 [0.19, 0.23]
After Covid	43	0.33 [0.28, 0.37]
Before Covid-19, healthcare students	37	0.17 [0.15, 0.20]
Before Covid-19, not healthcare students	47	0.24 [0.21, 0.26]
After Covid-19, healthcare students	20	0.32 [0.25, 0.38]
After Covid-19, not healthcare students	23	0.33 [0.27, 0.39]
Low income & and Lower middle income (L&LM)	21	0.30 [0.25, 0.35]
Upper middle income (UM)	56	0.22 [0.19, 0.25]
High income (H)	50	0.25 [0.22, 0.28]
Before Covid-19, Low income & and Lower middle income (L&LM)	14	0.25 [0.20, 0.29]
Before Covid-19, Upper middle income (UM)	34	0.18 [0.16, 0.21]
Before Covid-19, High income (H)	36	0.21 [0.18, 0.24]
After Covid-19, Low income & and Lower middle income (L&LM)	7	0.41 [0.30, 0.52]
After Covid-19, Upper middle income (UM)	22	0.29 [0.23, 0.35]
After Covid-19, High income (H)	14	0.35 [0.28, 0.42]
Severe symptoms		
Overall	9	0.13 [0.10, 0.17]
Before Covid	8	0.12 [0.09, 0.15]
After Covid	1	0.26 [0.26, 0.27]
Before Covid-19, healthcare students	4	0.10 [0.04, 0.15]
Before Covid-19, not healthcare students	4	0.15 [0.11, 0.18]
After Covid-19, healthcare students	1	0.26 [0.26, 0.27]
Upper middle income (UM)	5	0.11 [0.07, 0.16]
High income (H)	4	0.16 [0.10, 0.22]
Before Covid-19, Upper middle income (UM)	5	0.11 [0.07, 0.16]
Before Covid-19, High income (H)	3	0.13 [0.06, 0.19]
After Covid-19, High income (H)	1	0.26 [0.26, 0.27]

0   .1   .2   .3   .4   .5

Fig. 3. Depression in students, sub-group analyses with confidence intervals.

and students from other fields. Healthcare students exhibit higher rates of depression, sleep-disorder symptoms and suicidal ideation, a trend that intensified with the onset of the pandemic (Mulyadi et al., 2021; Peng et al., 2023; Rotenstein et al., 2016; Santabárbara et al., 2021). This discrepancy likely derives from the distinct stressors faced by healthcare students, including greater exposure to healthcare-related challenges during the pandemic. Conversely, non-healthcare students showed more symptoms of eating disorders, contrary to some prior research (Fekih-Romdhane et al., 2022; Jahrami et al., 2019). Better knowledge of medical and nutritional facts could work as a protective
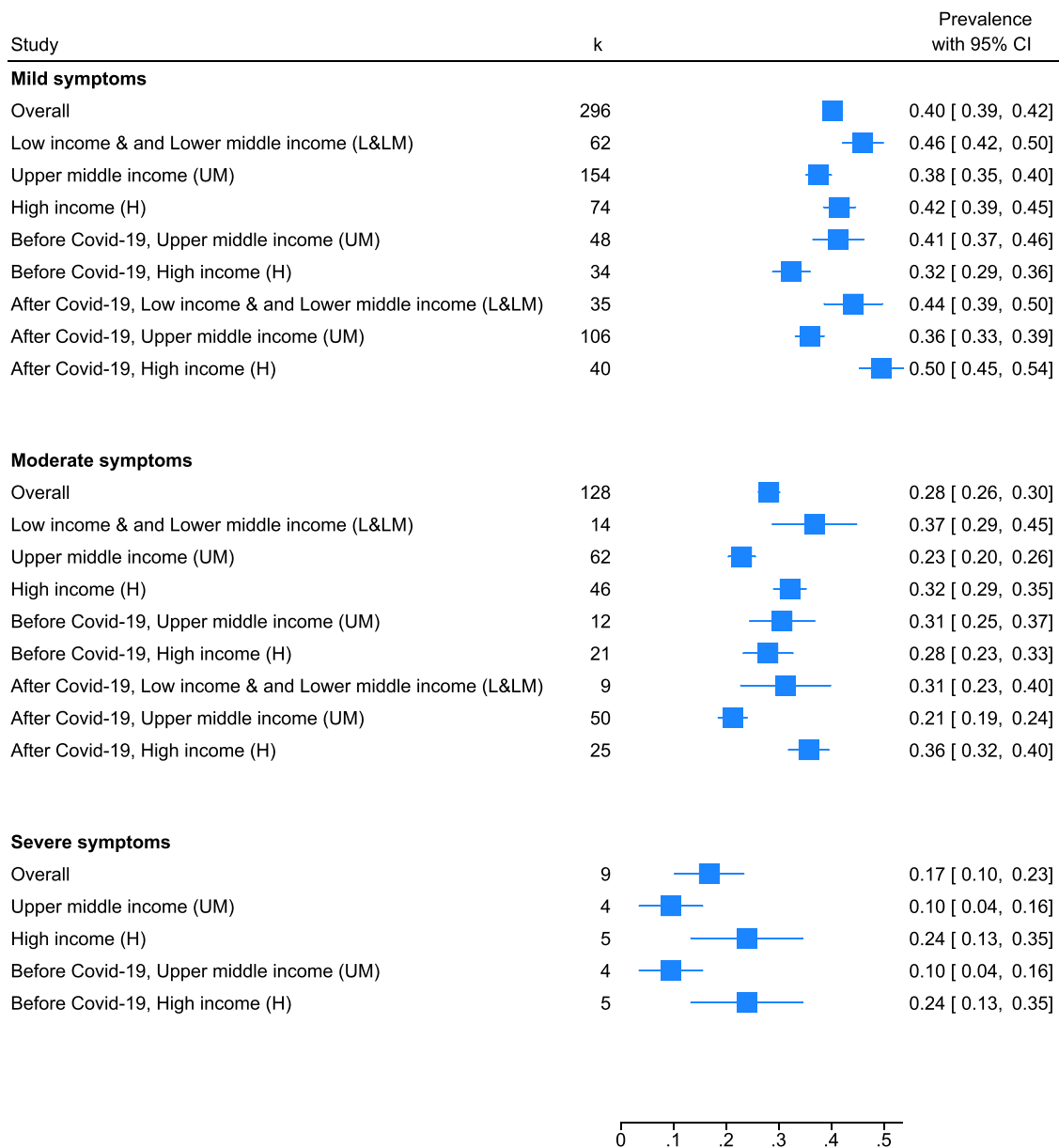
Study	k	Prevalence with 95% CI
Mild symptoms		
Overall	296	0.40 [0.39, 0.42]
Low income & and Lower middle income (L&LM)	62	0.46 [0.42, 0.50]
Upper middle income (UM)	154	0.38 [0.35, 0.40]
High income (H)	74	0.42 [0.39, 0.45]
Before Covid-19, Upper middle income (UM)	48	0.41 [0.37, 0.46]
Before Covid-19, High income (H)	34	0.32 [0.29, 0.36]
After Covid-19, Low income & and Lower middle income (L&LM)	35	0.44 [0.39, 0.50]
After Covid-19, Upper middle income (UM)	106	0.36 [0.33, 0.39]
After Covid-19, High income (H)	40	0.50 [0.45, 0.54]
Moderate symptoms		
Overall	128	0.28 [0.26, 0.30]
Low income & and Lower middle income (L&LM)	14	0.37 [0.29, 0.45]
Upper middle income (UM)	62	0.23 [0.20, 0.26]
High income (H)	46	0.32 [0.29, 0.35]
Before Covid-19, Upper middle income (UM)	12	0.31 [0.25, 0.37]
Before Covid-19, High income (H)	21	0.28 [0.23, 0.33]
After Covid-19, Low income & and Lower middle income (L&LM)	9	0.31 [0.23, 0.40]
After Covid-19, Upper middle income (UM)	50	0.21 [0.19, 0.24]
After Covid-19, High income (H)	25	0.36 [0.32, 0.40]
Severe symptoms		
Overall	9	0.17 [0.10, 0.23]
Upper middle income (UM)	4	0.10 [0.04, 0.16]
High income (H)	5	0.24 [0.13, 0.35]
Before Covid-19, Upper middle income (UM)	4	0.10 [0.04, 0.16]
Before Covid-19, High income (H)	5	0.24 [0.13, 0.35]

Fig. 4. Anxiety sub-group analyses with confidence intervals.

factor in this regard.

Regarding gender-based patterns, the presence of more symptoms of anxiety, sleep disorders, and lifetime suicide attempts and less gambling symptoms in studies involving a higher proportion of women aligns with the well-documented greater likelihood of internalizing behaviors in females (Blinn-Pike et al., 2007; Boyd et al., 2015; Kinrys and Wygant, 2005; Rosenfield and Mouzon, 2013).

Mental health outcomes among university students vary significantly across countries with different income levels, reflecting the interplay between socioeconomic contexts and mental health. Pre-pandemic data show that students in lower-income countries reported more symptoms of depression, anxiety, post-traumatic stress disorder (PTSD), and suicide attempts, likely linked to financial instability, limited mental health resources, and other stressors. In contrast, higher rates of sleep and eating disorders in high-income countries prior to the pandemic suggest challenges related to lifestyle factors, cultural expectations, or societal pressures, such as academic demands and unhealthy coping mechanisms like disordered eating. Also, sleep disorders have been associated with negative lifestyles such as excessive screen use (Wacks and Weinstein,

2021), gambling (Zortéa, 2025) or substance abuse (Phiri et al., 2023), which can further contribute to psychological distress, impaired academic performance, and reduced overall well-being among university students.

The findings of this umbrella review should be interpreted considering both its strengths and limitations. A key strength lies in its comprehensive and exhaustive examination of the available literature. Unlike most umbrella reviews, we did not simply report estimates form meta-analyses only, but also retrieve missing data from primary studies, providing a richer dataset. Moreover, we combined data from primary studies across the different meta-analyses. Since the overlap in the included studies across meta-analyses was minimal, this allowed for a more globally representative estimation of prevalence. Additionally, meta-analyses related to other mental health outcomes beyond symptoms of established mental disorders, such as stress or suicide, were also included. Overall, this broad scope offers valuable insights into the mental health of university students, extending previous research, which often focused on a single disorder or country (Ibrahim et al., 2013; Sheldon et al., 2021; Storrie et al., 2010).

Despite including all relevant meta-analyses to ensure reliable prevalence estimates, some limitations remain. For instance, since we did not analyze the primary studies directly and instead relied on the terminology used in the meta-analyses, it was not possible to determine whether some of the included symptoms, such as those related to sleep or stress, were identified as primary conditions or secondary to other disorders. Due to possible publication bias, primary studies with non-significant results may have not been included in the meta-analyses that we analyzed. Moreover, meta-analyses on certain conditions such as bipolar disorder or schizophrenia, were unavailable, and the limited focus on graduate students hindered comparisons with undergraduates. Additionally, although symptoms of at-risk states and neuro-developmental disorders were included in our search strategy, we did not identify any meta-analyses specifically addressing their frequency or continuity across development, particularly within university populations. This absence may be due to the developmental nature of these disorders, which are typically studied in earlier life stages. Nonetheless, this represents a relevant gap in the literature and highlights an important area for future research.

High heterogeneity across the included studies posed a key challenge, driven by variations in sample characteristics (e.g., student numbers, gender ratios, socio-economic conditions) and screening tools. Although subgroup analyses and meta-regression were conducted to explore sources of heterogeneity, this remained high. A significant source of heterogeneity was the use of self-reported measures, which varied in psychometric properties and cut-off points, even when using the same tools. These discrepancies hinder comparability across studies. To address this, we reclassified symptoms in three severity categories based on cut-off points. However, most measures relied on symptom inventories or screening tools rather than clinical interviews, which may affect findings. Future research should prioritize diverse populations, especially graduate students, and adopt more robust mental health assessments to guide targeted interventions for university students worldwide. Finally, underrepresentation of certain regions limits the generalizability of the findings.

Despite these limitations, this umbrella review provides the largest evidence synthesis of the global prevalence of mental disorder symptoms among university students, addressing gaps in the existing literature and being a unique resource, which should inform clinicians, policymakers, and guideline developers. This review also contributes to the discussion on DSM-5 conditions requiring further study, as we included symptoms such as suicidality and gaming disorders within this category. Additional studies on these conditions are essential as, unlike well-established disorders, they currently lack sufficient empirical evidence, and clearly defined treatment guidelines. In the case of suicidal ideation or behavior, further research is particularly important given its potential co-occurrence with disorders such as depression or post-traumatic stress disorder, and its association with severe, potentially life-threatening outcomes.

By identifying the most prevalent disorders, their trends over time, and related outcomes, this review can guide the development of targeted prevention strategies tailored to specific subgroups of this population such as international students or PhD students. Additionally, our findings can enhance early identification efforts by highlighting key screening tools and identifying specific academic programs or fields of study that may pose a higher risk of vulnerability. These insights can support policymakers in designing evidence-based interventions, optimizing the use of resources, and integrating mental health services within university settings to improve overall student well-being.

6. Conclusion

Given the increasing concern regarding the mental health of university students, this umbrella review serves as valuable and unique evidence base on the psychological distress experienced by this population.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.neubiorev.2025.106244.

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