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REVIEW ARTICLE

# Prevalence of Depression and Academic Performance among Medical Students: A Systematic Review

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## ABSTRACT

**Background:** Depression is the single largest contributor to global disability and disease burden. Medical students are considered a vulnerable group because they have to deal with stressors specific to medical education. Psychological morbidity in medical students represents a neglected public health problem and holds major implications for health services and mental health policymaking.

**Aim:** To ascertain the prevalence of depression and its impact on academic performance among medical students.

**Design:** A systematic review

**Data sources:** Systematic search for worldwide published literature from PubMed, PsycINFO, EMBASE, Google Scholar, EMBASE, Science Direct, BioMed Central and Medline databases

**Study eligibility criteria:** Studies included in this review reported the methods and/or measures for the prevalence of depression and academic performance among medical students

**Data extraction:** Data extraction was undertaken by the first reviewer, and checked by a second reviewer. All identified papers were critically appraised independently by both reviewers. Information was extracted from each included study (including author, title, year and setting of study). These data abstraction forms were reviewed and eligible papers entered into the meta-analysis.

**Result:** Out of a total of 2,236 publications retrieved, after examining the titles, abstracts (if abstract was unavailable, the article was nevertheless counted) and the reference lists for related articles, only 14 studies satisfied all the inclusion criteria. Non-English articles (French 1, Japanese 1, Mexican 1, Korean 2) were excluded to save time and cost.

**Conclusion:** Moderate and severe depression showed a high prevalence among medical students. The presence mental health services for university students and medical students in particular is important. Efforts of professors in charge of preparing the exams should be directed towards making the oral and clinical exams more transparent.

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## Introduction

Globally, 4.4% of the population is living with depression [1]. Depression is the single largest contributor to global disability and among the leading causes of years lived with disability (7.5% of all years lived with disability in 2015), with more than 80% of the disease burden occurred in low- and middle-income countries [2]. Depression, also known as major depressive disorder, is a mental disorder characterized by low mood for at least 2 weeks [3]. It is often accompanied by low self-esteem, loss of interest in normally enjoyable activities, low energy, decrease or increase in appetite, insomnia or hypersomnia, psychomotor agitation or retardation, and diminished concentration or indecisiveness [1]. According to the World Health Organization depression is one of the major causes of non-fatal disease burden worldwide [1]. Finally, it is well known that people with depression make more frequent use of health services and stay absent from their work more often, which has substantial economic ramifications.

### MEDICINE GROUP

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University life marks a critical transitional period for students, during which some students move away from family and home for the first time and lose the traditional adult supervision and the traditional social support. University life represents a time when students face a whole lot of pressure and challenges while trying to integrate course works with research projects. In addition, some students might have to deal with financial difficulties during this period. These changes have been recognized as risk factors for developing depression, which is associated with several severe problems in students, notably academic achievement, suicidal ideation, substance abuse, and acute infectious illnesses [4].

Research indicates that there is a negative relationship between depression and academic achievement, that is, when depression is high, academic achievement is low and vice versa. For example, Hysenbegasi, et al. [5] conducted a study in Western Michigan University and found that depression has a strong impact on academic productivity among the students. According to their study, of the 121 depressed students who were diagnosed in the campus health center, 14.64% had missed a great number of classes, 5.45% missed assignments, and 1.36% and 0.74% of them missed examinations and dropped a number of courses [6]

Depression among medical students has increasingly become a concern for medical educators globally [7]. In a recent study, up to 27.2% of medical students had depression globally [7]. Puthran, et al. [8] also found out that depression affects about a third of medical students worldwide. Studies have documented a higher prevalence of depression among medical students than in the general population and age-matched peers [9]. In 2013, a systemic review reported that the prevalence rates of depression among medical students ranged from 10% to 85% with a weighted mean prevalence of 30.6%. Studies from sub-Saharan Africa have also documented a high prevalence of depression among medical students [10]. Aniebue, et al. [11] reported a prevalence of 23.3% among Nigerian undergraduate medical students.

Depression among medical students has been associated more with female gender [12]. In East Africa, a high prevalence of depression among university students was reported [13]. Othieno, et al. [14] found that 41.3% of general undergraduate students at the University of Nairobi, Kenya was depressed. Medical students, however, did not have as high prevalence of depression in this study (13.3%) [10,13].

Study from Egypt in 2015 documented the high rate of prevalence in depression, which was estimated to be 3.5% [1]. High rates of depression and psychological morbidity were reported among medical students as compared to the general population in a study [15]. In 2013, a systemic review reported that the prevalence rates of depression among medical students ranged from 10% to 85% with a weighted mean prevalence of 30.6% [16]. Studies reported that the prevalence of depression among medical and university

students in the UAE, Saudi Arabia and Oman ranged from 22.2% to 48.2% [17].

Medical students are considered a vulnerable group because they have to deal with stressors specific to medical education in addition to normal everyday life stressors. Medical education is perceived as stressful due to academic demands, frequent exams and research works, time pressure, too much workload in the form of big content and wide scope syllabus that needs to be covered, increased psychological pressure, getting behind in work and inability to cope [18]. Other factors include stigma associated with poor academic performance, and pressures due to competitive nature of medical education in students with excellent academic performance [19].

Depression has a massive impact on the student's quality of life. On the personal level, it causes college dropout, impaired ability to work efficiently, deterioration in relationships, substance abuse, attrition from the profession and increased suicidal tendency [20]. Depression adversely affects patient care, relationship with the staff members and eventually the culture of the medical profession [20]. Psychological morbidity in medical students represents a neglected public health problem and holds major implications for health services and mental health policymaking. In terms of life quality, understanding the impact of this neglected public health phenomenon on one's educational attainment and prospective occupational success is very important [21].

## Methods

A systematic review of literature was used as the methodology in the study. Which is referred to as a systematic and rigorous method of amalgamating and synthesizing recent research to form a body of empirical knowledge from which decisions may be made. In the methods, the Preferred Reporting Items for Systematic Reviews (PRISMA) statement for conducting and reporting the study was used [22,23]. Data were extracted in a standardized manner and the quality of studies was critically appraised using a recognized criterion- Critical Appraisal Skills Programme [24] and Best Evidence Topics [25].

A systematic literature review of PubMed, PsycINFO, EMBASE, Google Scholar, EMBASE, Science Direct, BioMed Central and Medline databases was carried out to identify peer reviewed studies, published between 1990 and 2021, reporting on depression among medical students. Searches used the keywords depression, depressive symptoms, depressive disorders, prevalence, medical students, university students, students, adolescents and/or young adults were used in the searches. Additional articles were identified through the reference lists of the retrieved articles and previous review studies. Inclusion criteria were that: 1) the study sample included exclusively students in higher

education and/or medical students; 2) the study included aim to estimate the prevalence of depression and; 3) the study reported prevalence rates. The exclusion criteria were 1) the study did not report response rate; 2) clinical trials studies; 3) failure to report a separate prevalence rate for depression; and. 4) Studies reported in non-English language. Demographic data, sample size, diagnostic instrument used and prevalence data on students' depression were abstracted.

Searches were limited to articles published in the last three decades yielding a total of 2,293 citations. After examining the titles, abstracts (if abstract was unavailable, the article was nevertheless counted) and the reference lists for related articles, 94 articles were retrieved, including five Non-English articles (French 1, Japanese 1, Mexican 1, Korean 2) and 89 English language studies were examined thoroughly. Non-English articles were excluded to save time and cost. After careful reading of these articles, an additional 70 articles were excluded as a result of the following justifications: the study population was non-university adolescents or young adults (13), studies evaluating treatment of depression and/or clinical trials and either not reporting prevalence rate and/or response rate (14), studies not reporting response rate and/or prevalence (23), no separate prevalence rate for depression (8), studies did not aim to establish prevalence (12). The remaining 14 articles were included and were evaluated for quality. Prevalence rates across studies were calculated as weighted means using RevMan software which takes into account variation in cut-off used [26]. The prevalence rate per study was multiplied by the corresponding sample size and divided by the total sample size to give a weighted prevalence of depression.

### Data extraction

A data extraction table was developed to acquire relevant information from the final included studies appropriately [27]. Data were extracted using a standardized and pre-piloted data extraction form. Data extraction was undertaken by the first reviewer, and checked by a second reviewer. All identified papers were critically appraised independently by both reviewers. Disagreements were resolved through discussion. Appraisal was guided by a checklist assessing clarity of aim and research questions. Information was extracted from each included study (including author, title, year and setting of study, methods of sample selection, sample size, study type, age, STROBE score, and prevalence). These data abstraction forms were reviewed and eligible papers were entered into the meta-analysis.

### Data synthesis

The results of clinically and statistically homogeneous studies were meta-analyzed using the Review Manager software [26]. For any outcomes for which the included

studies were not sufficiently homogeneous, or for which insufficient data were found for meta-analysis, a narrative synthesis was presented.

### Sensitivity analysis

Sensitivity analyses were conducted to assess the effect of risk of bias in the included studies, comparing studies rated at high or low risk of bias for each assessed item.

### Risk of bias

The risk of bias was low as they were two reviewers in the study, though Language bias might have occurred as non-English studies were excluded.

### Result

Out of a total of 2,236 publications retrieved, after examining the titles, abstracts (if abstract was unavailable, the article was nevertheless counted) and the reference lists for related articles, only 14 studies satisfied all the inclusion criteria. Non-English articles (French 1, Japanese 1, Mexican 1, Korean 2) were excluded to save time and cost. Figure 1 shows the study selection process and the reasons for exclusion.

### Discussion

According to the review, the average depression prevalence is 30.6%, a higher rate than the 9% found in the general population rates of the US (range 6-12%) [28]. Moreover, a community-based cross-national survey of depression prevalence carried out in 10 countries in North America, Latin America, Europe, and Asia and using the Composite International Diagnostic (CIDI), reported a mean prevalence of 9.8%, again much lower than the weighted mean in this systematic review of studies confined to student populations [29]. Another community-based study carried out in Australia to track the changes in depression prevalence over 10 years period found that the prevalence was 10.3% in 2008 [30].

Previous studies on young adult populations also found a lower prevalence compared with the current results (10.8-22%) [31]. This might be due to the fact that students experienced more stresses concerning their futures and employment or that they were less satisfied with their studies. It might also indicate that being a student is one of the factors that predispose to depression (separation from home and lack of family support) [32]. However, a large cross-sectional study of a representative sample carried out in the USA as part of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) could not detect any significant difference in the prevalence of depression between college students (7.85%) and their matched non-college attendants (7.79%) using the DSM-IV diagnostic

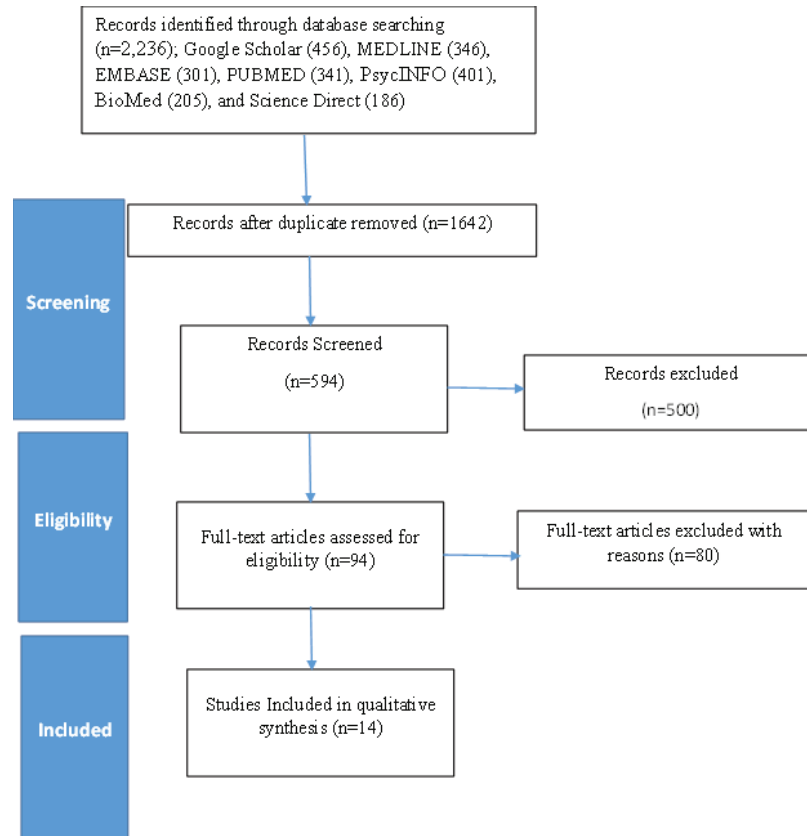


Figure 1 PRISMA flow chart of the systematic review process.

criteria [33]. It has been suggested that rates of depression in medical students have increased over time [31,34]. A growing concern has been expressed about university students' mental health [34].

The Beck Depression Inventory (BDI) was most frequently reported outcome measure and although rates based on BDI were lower than those based on the 10-item screening questionnaire CES-D-10 or the Patient Health Questionnaire (PHQ) [35-38]. The European Outcome of Depression International Network (ODIN) used the BDI to explore the prevalence of depression in representative sample of the general population in five European countries (UK, Spain, Netherlands, Norway, and Greece). The overall prevalence of depression was estimated at 8.6%, with 10.05% of females' affected and 6.61% of males [39].

Similarly, community studies adopting the PHQ-9 to screen for depression also found prevalence rates of 4.2-9.2% [40,41]. Furthermore, a comparison of two studies of the prevalence of depression in Egyptian samples using the Zagazig Depression Scale (ZDS) [42,43] found a much lower rate in the general population (26%), [42] compared to university students 71% [43]. This was supported by another using a Comparable Scale (CDS), which found only a 9% prevalence of depression in the general population [44].

Gender difference in vulnerability to depression was evident both in general population [45] and in university students [46]. Although the difference was statistically significant, it was not large. This was supported by a study which concluded that gender differences are markedly evident in the prevalence rate for major depression but less so for minor depression, and this relation persisted across all age groups [45]. Many could argue that these high figures reflect an extreme dose of normality as the majority of university student are emerging from the hormonal and psychosocial chaos of adolescence into adulthood and that there is an inflation of figures, but in the current review, the researcher included studies that that used well validated tools.

The use of screening tools such as the PHQ may pick up psychological distress rather than clinical depression and so may inflate rates of disorder. They may also miss young people with an atypical presentation of depression. In view of the high mean rate of depression found in this systematic review of studies which have used well established depression scales it is important to validate these measures in student populations. Also, as a screening tool there is the possibility of fallacies (positive or negative) and this should be considered when interpreting the results. The above indicated that each measure should be tested for validity and reliability in this vulnerable group before its implementation

for depression screening.

Alternatively, a well-validated and reliable tool for depression screening among medical students, as a distinguish group in the community, should be developed and validated cross-culturally to avoid any diagnostic bias and to enable the researcher to identify the depression probability among the studied group accurately. An earlier review of depression among US and Canadian Medical students has been published [7]. It was part of a more extensive review that also investigated the other sources of psychiatric distress such as anxiety.

A similar search technique to this review was used but the older review did not include a quality assessment of the selected articles and had a more limited scope, including only students in medical faculties. Of the 40 included studies, 23 articles evaluated depression among medical students, of those only 10 studies reported depression prevalence, in which a slightly lower overall prevalence rate of 22.3% was reported compared to the 25.6% found in our review. This difference is probably due to the fact that most of the studies included in the review were excluded from our review due to failure to meet one or more of the more stringent inclusion criteria for example studies were published before 1990 or response rates were not reported [7]. The majority of studies identified were carried out in the West (68%), and only two studies of those included used data from developing Arabic countries. This may reflect both a publishing bias and a general lack of research in developing countries which is unfortunate given the potentially higher vulnerability to depression in people in less economically developed countries due to financial struggles and the poorer quality of health care [47].

Mental health studies have suggested that medical education may have an inevitable negative effect on mental health and increase the risk of depression [7]. As a result, many Medical Schools adopt screening programs for depression for all 1<sup>st</sup> year students, which is not the case in other faculties. In the current review we could not find any evidence of increased risk of depression in studies recruiting medical students only, but controversially we found that studies with more heterogeneous student samples had a higher weighted mean (36%) compared to medical student studies (26%). This may be due to the fact that medical students are well-acquainted with mental disorders and they are exposed to mental cases and learn how to deal with these disorders. We also feel that the frequent recruitment of medical students in psychological studies was due to the accessibility of students and good response rates. It is well-known that probability sampling strengthened the external validity (generalizability) of the study results, conclusions and inferences, however it is time-consuming, costly and requires a level of skill [48].

In this review, it was noticed that articles adopting

probability sampling reported a substantially higher prevalence of depression compared to studies using less rigorous sampling (35% vs. 29%), perhaps because those suffering from depression are less likely to volunteer in studies using a convenience sample. This suggests that many studies may underestimate the prevalence of depression in university samples. It was also concluded that there was an inverse relationship between prevalence on one hand and sample size and response rate on the other. As sample size and response rate are crucial for any prevalence study, special attention should be drawn to their determination and reporting [49].

This review encountered several limitations. The major limitation was the possibility of missing studies not directly reporting on depressive prevalence (i.e. studies examining the prevalence of general distress and using measures that screen for depression as one of the elements of general distress e.g. the General Health Questionnaire of Symptom Checklist (SCL-90).

Additionally, the comorbidity of anxiety and depression may lead to over-estimation of the prevalence rates in the studied papers. Publication bias is the main drawback in any systematic review where it is proposed that extreme results are more likely to be published especially in highly respected journals so conclusions exclusively based on published studies [50], therefore, can be misleading. Secondly, the average prevalence of depression in the current review (30.6%) may have been attenuated by including some studies that reporting only rates of major depressive disorder rather than minor depressive states.

Another limitation is that a limited number of studies were included in this review as many studies reported the prevalence of depression but did not report a response rate. This is important because the lower the response rate, the less valid (for both external and internal validity) the study as differences between non-respondents and respondents may exist (non-response bias) in other perspectives than just their willingness to take part in a survey [51-53]. Excluding articles reanalyzing data from the same database could be considered a strength since it avoids including the same data many times. At the same time researcher may have not been aware of this double counting. Finally, any systematic review is affected by the weaknesses and limitations of the included studies themselves such as small sizes and poor response rates. Although all studies used validated measures only one used a clinical interview. Relying on self-report of symptoms is likely to impact on the sensitivity and specificity of the classification of depression.

A study conducted by Tesera, et al. [54] on the potential effect of depression on academic outcomes of students in higher educational institutions of northwest Ethiopia [54]. Depressive symptoms were assessed using a locally validated version of Patient Health Questionnaire (PHQ-9)

at a cut off 5-9 and 10 or more indicating mild and major depressive symptoms, respectively. The types of substances that students experienced in the last three months were assessed. Multivariable linear regression was carried out to examine whether depressive symptoms predicted academic outcomes (cumulative GPA and perceived difficulties in learning process). Higher PHQ-9 scores were reported by 71.4% (30% mild and 41.4% major levels) of the students. Increment in depression ( $\beta = 0.296$ ), anxiety score ( $\beta = 0.119$ ), substance use ( $\beta = 0.169$ ) and stressful life events ( $\beta = 0.306$ ) scores were positively correlated with perceived difficulties in learning. Each increment in self-efficacy score ( $\beta = 0.006$ ) was positively associated with semester GPA. However, PHQ-9 score did not independently associate with semester GPA ( $\beta = -0.001$ ). Depressive symptoms were associated with perceived difficulties in learning. Future follow-up studies and intervention strategies are needed to demonstrate causality.

Furthermore, Wafaa, et al. [55] conducted a study on depression among medical students in Alexandria, Egypt [55]. Depression is a common illness worldwide with high rate among medical students. The objectives were to estimate the prevalence of depression among medical students in Alexandria, and identify its correlates. The study was conducted from May 2016 till August 2016 among medical students at the Faculty of Medicine, Alexandria University, Egypt. A cross-sectional design was used. Students (both males and females) from the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> academic years, currently studying in Alexandria University for at least six months were included in the study. The sample size was calculated using Epi-Info 7 based on a prevalence of depression among medical students of 57.9%, 11 and a confidence limit of 5%. The minimum required sample size at 95% confidence level was 374, and was rounded to 390. Using a systematic random sampling technique, 390 students attending 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> academic years were included. Data was collected using the Arabic version of the BDI-II and a predesigned structured self-administered questionnaire, including questions about the students' personal and social characteristics and academic environment. Results: Moderate and severe depression accounted for 27.9% and 17.2%, respectively. Logistic regression analysis results showed that the independent predictors for moderate and severe depression were female gender, the presence of mental illness, not having someone to talk to when under stress, experiencing stressful life event(s) during the previous 6 months, not being satisfied with the socioeconomic level, reporting that the surrounding environment is not suitable for studying, not specifying a grade to achieve, and extreme dissatisfaction with the student's result. In conclusion, prevalence of moderate and severe depression was high among medical students, calling for actions to help those students and to prevent new cases.

Lastly, Diana, et al. [56] explored a work on prevalence of depression among university students. The aim of the study

was to estimate the prevalence of depression among Iranian university students using meta-analysis method. The search strategy, selection of publications, and the reporting of results for the review on methods were conducted in accordance with the PRISMA guidelines. Literatures on the depression among student were acquired through searching Scientific Information Databases (SID), Global Medical Article Limberly (Medlib), Iranian Biomedical Journal (Iran Medex), Iranian Journal Database (Magiran), and international databases including PubMed/Medline, Scopus and ISI Web of Knowledge.

The search strategy was limited to the Persian and/or English language and articles published up until February 2012 were considered. All publications with medical subject headings (MeSh) and keywords in title, abstract, and text for words including student depression were investigated. Iranian scientific databases were searched only using the keyword "student depression," as these databases do not distinguish synonyms from each other and do not allow sensitive search operation using linking terms such as "AND," "OR" or "NOT." Consequently, this single keyword search was the most practical option. Data was analyzed using meta-analysis (random-effects model). Heterogeneity of studies was assessed using the *I*<sup>2</sup> index. Data was analyzed using STATA software Ver.10. Per the results, in 35 studies conducted in Iran from 1995 to 2012 with sample size of 9743, prevalence of depression in the university students was estimated to be 33%. These findings are supported by other studies done among medical students [8,11,56-58]. The prevalence of depression among boys was estimated to be 28%, among girls 23%, single students 39%, and married students 20%. Meta regression model showed that the trend of depression among Iranian students was flat. In conclusions, depression is common in university students with no preponderance between males and females and depression in single students is higher than married ones.

## Conclusion and Recommendations

Moderate and severe depression showed a high prevalence among medical students and severely impacts on academic performance. Female gender, the presence of mental illness, not having someone to talk to when under stress, experiencing stressful life event(s) during the previous 6 months, not being satisfied with the socioeconomic level, reporting that the surrounding environment is not suitable for studying, not specifying a grade to achieve, and extreme dissatisfaction with the student's result were the independent predictors for moderate and severe depression.

The presence mental health services for university students and medical students in particular is important. Also, establishing stress management courses early from the start of the medical education should be a priority. Efforts of instructors and facilitators in charge of preparing

the exams should be directed towards making the oral and clinical exams to be held with more transparency, where all students should receive equal chances. Resources should be directed towards the renovation of university dorms and providing halls suitable for studying. Raising awareness regarding depression and other mental health problems among university students is important to help students seek professional help when needed. Screening for psychiatric disorders in general, and depression in particular should be included in the general checkup the students receive before joining the faculty, and on regular basis (at the start of new academic year and at the end of each academic year).

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