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# A Systematic Review and Meta-Analysis of Depression Prevalence amongst Nigerian Students Pursuing Higher Education

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## Introduction

Depression is characterized as alterations in thinking, mood, or behaviours associated with distress and/or impaired function. It remains one of the most prevalent health disorders of the 21st century, placing a considerable economic and social burden on both individuals bearing the disease and society at large [1]. While depression prevalence is inversely correlated with indicators of national health such as GDP/GDP per capita, it remains one of the most undiagnosed disorders in many developing countries, largely due to lack of data and poor healthcare infrastructure to diagnose reliably [2,3]. To reduce global mental health inequity and improve the demographic and economic transition of developing countries, it is important to estimate the prevalence of depression and determine the factors related to undiagnosed depression. West Africa is particularly at greater risk, as studies have reported up to 30-80% of mentally ill individuals in this region lack the resource or access to mental health services [4-6].

To this end, Nigeria in particular is important to examine, as it remains the most populous West African nation, and the fastest growing economy in Africa [7]. Studies have found that depression prevalence information is limited in this region, due to cited factors of poor mental health education, unregulated healthcare infrastructure, tendency for patients to describe somatic symptoms, and stigma towards individuals with mental disorders by both patients and physicians [8,9]. The few studies available that have examined depression have been so in groups of psychiatric clinics, student athletes, geriatric attending clinics, postpartum women, and outpatient clinics [10-14]. To date, there has yet been a comprehensive assessment of depression prevalence of higher education Nigerian students.

Higher education, defined as education after post-secondary, is a critical development phase for youth, and a period where mental health is particular vulnerable [15]. Higher education students are often aged between 18-24, a period where individuals undergo role transitions and identity formation, increasing the potential for depression. There is evidence to suggest that transition in this period may be particularly difficult for Nigerian youth, due to factors related to a feeling of career hopelessness, distrust in academic institutions, unavailable learning materials, poverty, and consequentially disrupted peer relationships [16]. Thus, this study aims to estimate the prevalence of depression in Nigeria amongst higher educational students.

## Methods

The protocol and data extraction forms were designed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis: the PRISMA Statement [17,18]. The following six databases were systematically searched using a comparable search strategy, with adapted terms for each database: PubMed, MEDLINE (OVID), CINAHL (EBSCOHost), PsychINFO (OVID), Web of Science (Web of Knowledge), and the Cochrane Library. The search terms used were: (depression or depress or mood or mental or affective) and (college student or university student or undergraduate or post-secondary) or (Nigeria).

Full text, published, peer reviewed studies in English conducted on a post-secondary Nigerian population, including medical, pharmacy, or veterinary, and that reported a prevalence level for Major Depressive Disorder or depressive symptoms, were included. Studies that examined a sub-group of the Nigerian population did not provide sufficient information for a prevalence to be calculated, or those without a prevalence estimate, were excluded. Retrieved articles were exported to Zotero and duplicates were searched by a research assistant and removed. Two reviewers independently reviewed all titles. After title review, the two reviewers were randomly provided selected abstracts. Full-text publications for data extraction were chosen if the two reviewers agreed that the publication met inclusion and exclusion criteria. A third reviewer was used to independently assess abstracts and full-text review if there were discrepancies between the two reviewers. Data extraction was conducted by both reviewers. References of included articles were scanned for potentially relevant papers, with similar procedures of those papers for inclusion and exclusion. Grey literature was not sourced.

The Agency for Healthcare Research and Quality (AHRQ) was used to assess for bias [19]. The criteria included eligibility criteria, sample size (≥ 500 *vs.* <500), and whether eligibility criteria or participation rate was reported. Scores ranged from 0 to 4, with higher scores representing a lower risk of bias.

R was used to calculate pooled estimates of depression prevalence by method of measurement. A random-effects model was used, and proportions were logit transformed prior to pooling. Pooling was done through a generalized linear mixed-effects model, and restricted maximum likelihood was used to estimate $\tau_2$. Knapp-Hartung adjustments were included for calculating the confidence intervals around pooled effects.

Subgroup analyses were conducted to examine effects of field of study, age, gender, whether participants smoked, or whether participants drank alcohol, on the prevalence of depression. Random-effects meta regression models were performed to examine subgroup differences using sample size as a covariate. The I2 statistic was used to assess heterogeneity among studies, with an I2 value of 25% considered low, 50% considered medium, and 75% considered high [20]. Forest plots for overall and within subgroups were made to represent the overall and individual study estimates. Publication bias was performed using Egger's regression method to determine biased publication of high prevalence estimates amongst small-sampled studies.

## Results

A total of 18 papers were included in this review. Figure 1 shows the PRISMA flow diagram

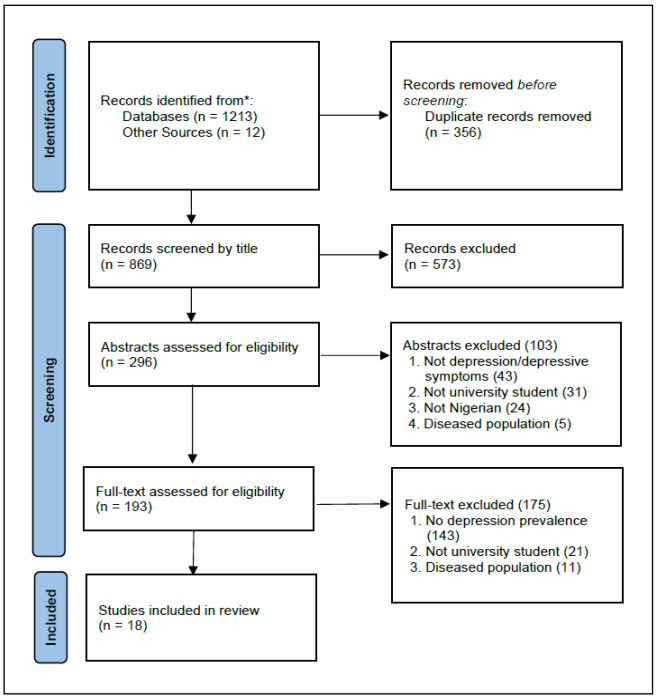


**Figure 1:** Flow diagram detailing process and outcome of study selection.

### Demographic data

Mean age of students across the 18 studies were from 19.09 and 26.3 years. All studies recruited participants from post-secondary educational programs at a Nigerian university. 5 of the studies were directed towards general university students, while the remaining studies evaluated either medical, pharmacy, dental, or veterinary students. All of the studies recruited participants from a Nigerian accredited university. The regional locations of the study populations are as follow: 3 studies from northwest Nigeria, 5 studies from Southeast, 2 studies from south-south, 5 studies from southwest, and 2 that collected participants from more than one region.

Multiple instruments were used to assess depression. 2 studies used Beck Depression Inventory (BDI), 3 studies used the Depression Anxiety Stress Scale (DASS), 3 studies used the Hospital Anxiety and Depression Scale (HADS), 2 studies used the Mini-International Neuropsychiatric Interview (MINI), 3 studies used the Patient Health Questionnaire (PHQ-9), and 2 studies used Zung's Self-Rating Depression Scale (SDS).

### Prevalence of depression

The pooled prevalence of depression amongst post-secondary Nigerian studies was 26% (95% CI 0.18, 0.36) based on a random-effects model. This result reflected high heterogeneity (I2=97%, $\tau_2$=0.9512). The prevelance of depression ranged from 4.0% to 71.3% in individual studies and is presented in a forest plot in Figure 2.

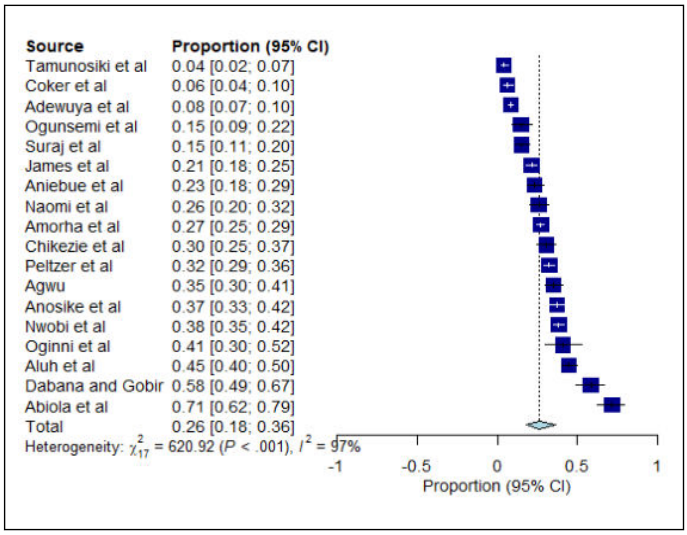


**Figure 2:** Forest plot summarizing 18 studies assessing depression prevalence amongst higher-educational Nigerian students (n=8125). 95% CI=95% Confidence Interval.

Due to the significant heterogeneity observed in the included studies, meta-regressions against publication year, percentage of students married, percentage of male students, and mean age were conducted (Table 1).

| Covariate | Coefficient | S.E. | 95% CI | t-value | P |
|---|---|---|---|---|---|
| % male | 0.0053 | 0.0259 | (-0.0498, 0.0605) | 0.2964 | 0.8393 |
| Mean age | -0.2209 | 0.1447 | (-0.5361, 0.0943) | -1.5217 | 0.1527 |
| Year of publication | -0.0134 | 0.1082 | (-0.2545, 0.2276) | -0.1242 | 0.9036 |
| % of students married | 0.0361 | 0.0474 | (-0.0644, 0.1365) | 0.7613 | 0.4576 |

**Table 1:** Meta-regression analysis against quantitative factors.

Subgroup analyses conducted based on Nigerian geographic region showed differences, with the prevalence of depression in the Northwestern region being the highest at 45.9% followed by the South-South region (33%), Southeastern (22.1%) and Southwestern region (18.1%). However, these differences were not statistically significant. The prevalence of depression between general undergraduate students compared to students in health-professional programs was 31.6% and 24.0% respectively. Results of subgroup analyses are shown in Table 2.

| Factors | Studies (n) | 95% CI | P value |
|---|---|---|---|
| Region | | | 0.1317 |
| Northwest | 3 | 0.4587 [0.0473; 0.9354] | |
| Southwestern | 6 | 0.1809 [0.0829; 0.3506] | |
| Southeastern | 5 | 0.2209 [0.0786; 0.4851] | |
| South-south | 2 | 0.3296 [0.1324; 0.6129] | |
| Multi-region | 2 | 0.3182 [0.0035; 0.9842] | |
| Type of student | | | 0.4349 |
| General | 5 | 0.3163 [0.1308; 0.5872] | |
| Health | 13 | 0.2398 [0.1468; 0.3663] | |

**Table 2:** Results of subgroup analyses for depression prevalence based on categorical factors.

## Bias

9 of the 18 studies had a score of 1, indicating a high risk of bias. 13 of the studies had a sample size less than 500. 9 of the studies used non-random sampling, and all studies sampled participants from university campuses. Of the 6 Nigerian regions, only the northwest, south-south, southeast, and southwest were represented. Sample sizes ranged from 81 to 1482 participants, with percentage of male participants ranging from 30.2% to 66.1%. Assessment and visualization of the funnel plot and Egger's test did not find any significant bias with respect to small-study effects (P=0.51).

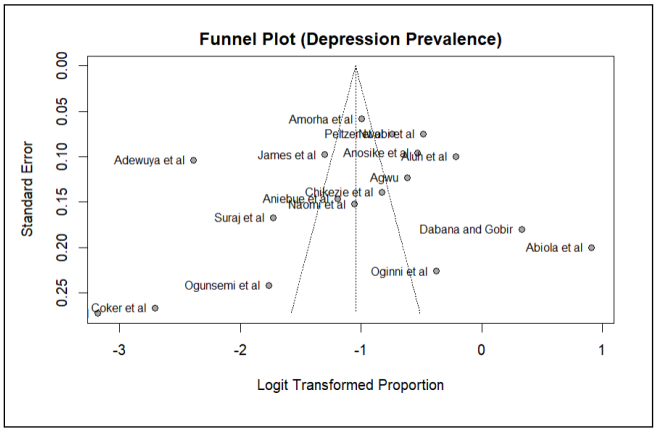


**Figure 3:** Symmetrical funnel plot.

## Discussion

This is the first study to examine the prevalence of depression amongst post-secondary students in Nigeria. While there was

variation in the estimate for the prevalence of depression due to differing measures used, our finding is that the prevalence of depression amongst post-secondary Nigerian students is high. Depression did not seem to vary significantly between the different regions, or whether an individual was married. Depression prevalence was lower in older participants, though differences were not significant.

Previous meta-analyses examining depression prevalence amongst post-secondary students have reported between 30.6% and 35.7%, while for health-related specialties such as medical or pharmacy report rates between 27.2% and 40.9%, with Africa having the highest rate of depressive symptoms [21-25]. Our results are comparable to other pooled estimates of depression found in West Africa. A previous 2015 study conducted in Ghana reported a depression prevalence of 39.2% amongst university students, while a 2018 global meta-analysis found a pooled depression prevalence of 24% in low-income countries [26,27].

Our results are consistent with previous studies that show post-secondary and professional students are at a higher risk of depression compared to that of the general population [23,24]. This may be attributed to the fact that students in university may undergo frequent examinations that lead to higher stress and anxiety. We found no difference between depression prevalence amongst majors within post-secondary, despite previous studies suggesting medical students experience greater depressive symptoms compared to students of other subjects [28,23]. This discrepancy in findings could be explained by the fact that often times, students in liberal arts have uncertain career directions and must study a broader range of subjects, leading to lower well-being and greater anxiety over employment. Furthermore, certain studies have reported higher depression prevalence amongst female students [29]. In our meta-regressions, gender did not have a significant effect on depression prevalence, which is corroborated with previous reviews of post-secondary students [24,26]. This may be due to increased opportunity and reduced barriers for females entering higher education.

Limitations should be considered when interpreting the findings of this study. First, a substantial amount of the heterogeneity among the studies remained unexplained by the variables examined. Factors not taken into account include institutional culture, funding, timing, and university environment, which could have contributed to risk of depressive symptoms. Secondly, a wide range of diagnostic tools were used, which could contribute to the heterogeneity. For instance, across the 18 studies examined, 7 different assessment tools were used to determine depression prevalence. Thirdly, our analysis was done on papers that chose to publish aggregated data. This led to only obtaining data from certain regions in Nigeria where academic resources are presently concentrated. Thus, for future studies a multicentre prospective design with a single measure of depression would provide a better estimate of depression prevalence. Finally, due to the cross-sectional nature of findings, cause-and-effect relationships cannot be readily established.

With recent government initiatives in 2018 that aim to rapidly expand undergraduate enrolment in Nigerian universities by 2023; this review serves to summarize mental health and depression research over the past 20 years within the nation. Our findings underline the importance of implementing strategies that help post-secondary students reduce anxiety and depressive symptoms as they transition to adulthood during their time in university.

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