



HAL
open science

Prevalence and correlates of depressive symptoms among undergraduate health science students at the University of Parakou, Benin

Antoine Gbessemehlan, Rafath Rafiou Taffa, Cédric Galera, Maëlen Guerchet,
Thierry Adoukonou

► To cite this version:

Antoine Gbessemehlan, Rafath Rafiou Taffa, Cédric Galera, Maëlen Guerchet, Thierry Adoukonou. Prevalence and correlates of depressive symptoms among undergraduate health science students at the University of Parakou, Benin. *Journal of Epidemiology and Population Health*, 2024, 72 (4), pp.202525. <10.1016/j.jep.2024.202525>. <ird-04571665>

HAL Id: ird-04571665

<https://ird.hal.science/ird-04571665v1>

Submitted on 29 May 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Prevalence and correlates of depressive symptoms among undergraduate health science students at the University of Parakou, Benin.

Antoine GBESSEMEHLAN, PhD^{a,b*}; Rafath RAFIOU TAFFA, Bsc^b; Cédric GALERA, MD, PhD^{a,c}; Maëlienn GUERCHET, PhD^d; Thierry ADOUKONOU, MD, PhD^{b,e}

^aUniversity of Bordeaux, INSERM UMR 1219, Bordeaux Population Health Research Center, 33000 Bordeaux, France

^bUniversity of Parakou, ENATSE - National School of Public Health and Epidemiology, Parakou, Benin

^cDepartment of child and adolescent psychiatry, Charles Perrens Hospital, 33076, Bordeaux, France

^dInserm U1094, IRD UMR270, Univ. Limoges, CHU Limoges, EpiMaCT - Epidemiology of chronic diseases in tropical zone, Institute of Epidemiology and Tropical Neurology, OmegaHealth, Limoges, France

^eUniversity of Parakou, Department of Neurology, Parakou, Benin

*Corresponding Author: Antoine GBESSEMEHLAN, PhD ;

E-mail: sgbessemehlan@yahoo.fr

Words counts: Abstract: 257...; Main text: 2924...

Abstract

Objectives: Research on psychological distress in African students is scarce. This study aimed at exploring the epidemiology (prevalence and correlates) of depressive symptoms among undergraduate health sciences students at the University of Parakou (Benin).

Methods: We conducted a cross-sectional survey from June to July 2022 at the University of Parakou, the second-largest university in the Republic of Benin. Depressive symptoms were assessed using the Patient Health Questionnaire depression scale (PHQ-9). Information on several independent factors was collected and their associations with depressive symptoms were investigated using logistic regression models.

Results: Data from 560 students were analyzed (mean age: 21.3 ± 2.3 years, 60% were male, and 50.4% were registered in the first year of study). The overall prevalence of depressive symptoms was 39.1% [95% CI: 35.2%-43.1%]. Moderate and severe depressive symptoms were observed in 15.3% and 1.8% of participants, respectively. In the multivariable model, being aged 21-23 (adjusted Odds Ratio=1.8, p-value: 0.007), a female (aOR=1.5, p-value: 0.050), a medical student (aOR=2.9, p-value: <0.001), a public health student (aOR=3.6, p-value: <0.001), belonging to households with higher incomes (aOR= 2.4, p<0.001), and experiencing stress (aOR=1.5, p-value: 0.048) independently

increased the probability of having depressive symptoms. However, having support from close relatives (aOR= 0.5, p-value: 0.026) was associated with a lower probability of depressive symptoms.

Conclusions: Our findings revealed a high prevalence of depressive symptoms among undergraduate health science students. Given the correlates identified, actions to promote coping skills in stress and encourage more parental support may be real avenues likely to help reduce the frequency and consequences of depressive symptoms.

Keywords: Depression, Epidemiology, Health students, Sub-Saharan Africa.

Introduction

The period between post-adolescence and adulthood is often characterized by the acquisition of theoretical and practical knowledge that can be used to build a better professional life. For many young adults, this period corresponds to their university years. Given the change in the educational environment occurring during this critical period of life, university students are likely to experience disrupted supportive relationships and various psychological disorders [1–5]. In addition, during this period, students are often faced with multiple issues (e.g. worries about their studies, finances, relationships, etc.) which are sources of stress [6,7]. Due to their impact on students' academic performance and well-being, psychological disorders have become major mental health issues in this young population as evidenced by the implementation of intervention/programs targeting mental health problems among university students [8–11].

Depression is one of the most common psychological distress displayed by students, with a particularly high prevalence among health science students [12–14]. Compared to other academic fields, health science studies require a high density of knowledge acquisition, good coping skills, and resilience. These demands could make students more vulnerable to depressive symptoms [12,14]. Indeed, a meta-analysis estimated the overall pooled prevalence of

depression among medical students at 27.0% (95% confidence interval [CI]: 24.7%-29.5%) [12]. Regional disparities were reported, with the lowest pooled prevalence obtained in the Western Pacific region (18.9%; 95% CI: 11.7%-29.0%), whereas the highest pooled estimate was recorded in Africa (40.9%; 95% CI: 28.8%-54.4%) [12]. In Africa, research on depression among students is emerging [15–18] but remains limited among health science students [19,20]. In Benin, only one study has explored the magnitude of depressive symptoms among medical students in the south of the country [21]. To improve knowledge on this disorder in Africa and specifically in Benin, we conducted the present study in the second biggest university of Benin. The objective was to investigate the epidemiology (prevalence and associated factors) of depressive symptoms among undergraduate health sciences students at the University of Parakou.

1. Methods

1.1. Study setting and participants.

A cross-sectional survey was conducted from June to July 2022 at the University of Parakou in the Republic of Benin (West Africa). The city of Parakou is located in the northeast of the country, 416 kilometers away from the economic capital (Cotonou). The study population consisted of first-, second- and third-year students registered in one of the three health sciences departments of the University: the school of Medicine, the School of Nursing and Midwifery, and the School of Public Health and Epidemiology (ENATSE). Data were collected using an electronic self-administered questionnaire designed in French on the KoBoCollect application (version 1.30.1). Students were invited to use their smartphones or computers to access the questionnaire online or offline. Only students who were present during the survey period and had given their consent after reading the study information note were enrolled and had access all study questions. No information on the identity (name, student number etc.) of the participants was collected. It should be emphasized that the survey period (June to July) is a sensitive one, as it coincides with exam (preparation) months for some students and the last courses for others. Students are more likely to experience psychosocial health problems during

these months. This research was carried out in accordance with the latest version of the Declaration of Helsinki. The research protocol was submitted to ENATSE's pedagogical coordination committee for review and approval.

1.2. Dependent variable: Depressive symptoms

Depressive symptoms were assessed using the French version of the Patient Health Questionnaire depression scale (PHQ-9), which comprised 9 items coded from 0 to 3, producing a total score ranging from 0 to 27 [22]. This scale assesses the level of depressive symptoms in the two weeks preceding the survey. The higher the score, the greater the symptoms are. According to the scale, a score ≥ 5 was retained to indicate the presence of depressive symptoms [22]. To have more detail about the intensity of depressive symptoms we defined the following subgroups: mild (score 5-9), moderate (score 10-19) and severe (score 20-27).

1.3. Independent variables

Sociodemographic data such as age, sex (male/female), academic departments (nursing; public health; medicine), year of study (1st, 2nd, 3rd), and monthly parents' incomes ($< \$83$ vs. $\geq \$83$; \$83 is the guaranteed minimum interprofessional wage in Benin in 2022, with a GDP per capita of \$1,302.9) were

included. Perceived stress symptoms (yes if, score ≥ 6 and no, if score < 6) were assessed using the validated French version of Perceived Stress Scale (PSS-4) [23,24]. Participants were also asked whether they could count on support from friends/lovers and parents if needed (yes/no).

1.4. Statistical analysis

Participants' characteristics were described (counts and percentages) and compared according to their health department and the presence of depressive symptoms using the chi-square test. The significance level retained was $p < 0.05$. To identify factors associated with depressive symptoms, all variables with a p-value below 0.20 in the univariable logistic regression model were included in the multivariable model. Odds ratios and their confidence intervals (CI) were reported to illustrate the strength and significance of associations. The goodness-of-fit for the multivariable logistic regression model was assessed using the Hosmer-Lemeshow test. All analyses were performed using R software, version R-4.1.2.

Results

In total 586 students participated to the study. Among them 26 were minors (age <18 years) and were excluded from analyses. Of the remaining 560, the mean age was 21.3 ± 2.3 years, with the oldest participant being 28 years old. Participants were predominantly male (60.0%), aged between 18 and 20 (43.4%), enrolled in their first year of study (50.4%) and studying medicine (55.4%) (Table 1). Most students did not present stress symptoms (53.8%) and more frequently reported being able to count on the support of close relatives (84.3%), but less so on friends/lovers (63.2%) (Table 1).

Comparing the characteristics of the students according to their health department, we observed that regardless of the health discipline, males and first-year students participated significantly more in the survey, especially those in public health (Table 1). Other differences were also noted. Medical students were more likely to report stress symptoms (61.6%) than their public health (28.8%) and nursing (25.9%) counterparts. Except for public health students (22.0%), the other participants reported more often that they belonged to households with a higher income (66.7% in medicine and 66.2 % in nursing). We also observed that, although the proportion was significantly lower among nursing students, most participants reported that they could count on the

support of their parents (91.9% in public health, 86.5% in medicine, and 73.4% in nursing). (Table 1) [INSERT TABLE 1 HERE]

In the total sample, the distribution of depression severity levels was as follows: mild (21.9% [95% CI: 18.5% - 25.4%]), moderate (15.3% [95% CI: 12.4% - 18.3%]) and severe (1.8% [95% CI: 0.6% - 2.9%]). Thus, the global prevalence of depressive symptoms (score ≥ 5) was 39.1% [95% CI: 35.1% - 43.1%].

Depressive symptoms (score ≥ 5) were significantly higher among female (45.5% vs. 34.8% for male), medicine students (46.5% vs. 36.9% among public health students and 24.5% among nurses), and those who reported stress symptoms (49.8% vs. 29.9%). In addition, prevalence of depressive symptoms was higher among students whose parents had higher incomes (47.2% vs. 28.1%) and among those who reported being able to count on support from friends/lovers (45.6% vs. 35.3%). However, no significant differences were observed in the distribution of depressive symptoms according to age, year of study, and possible parental support (all $p > 0.05$). (Table 2) [INSERT TABLE 2 HERE]

In the univariable regression analysis (Table 3), all variables had a p-value < 0.2 and were then included in the multivariable model. Results showed that being aged 21-23 (adjusted OR=1.7 [95% CI: 1.2 - 2.7]), female (aOR=1.4 [95% CI: 1.0 - 2.1]), studying medicine (aOR=2.9 [95% CI: 1.8 - 4.9]), and public health

(aOR=3.6 [95% CI: 1.8 - 7.0]), belonging to households with higher incomes (aOR= 2.3 [95% CI: 1.5 - 3.6]), and experience stress (aOR=1.5 [95% CI: 1.0 - 2.3]) independently increased the odds of having depressive symptoms. Only the possibility to count on the support from parents (aOR= 0.5 [95% CI: 0.3 - 0.9]) was associated with a lower probability of experiencing depressive symptoms. Being able to rely on friends/lovers for support was no longer significant in the adjusted model. The Hosmer-Lemeshow test showed that the model fit was good (p=0.5). [INSERT TABLE 3 HERE]

2. Discussion

This work, which expands the literature on depressive symptoms among students in Africa, revealed a high prevalence (39.1%) of these symptoms among undergraduate health sciences students in the second largest university in Benin.

Similarly, studies from South Africa and Kenya reported respectively a 36.4% and 35.7% prevalence of depressive symptoms among medical students [19,25]. However, other studies have also reported a higher prevalence, 55.9% in southern Benin [21] and 45.1% of moderate and severe depressive symptoms among medical student in Egypt [26]. Beyond the differences in instruments (Beck Depression Inventory vs. PHQ-9), discrepancies in the composition of the sample study may have played a role in the estimates [21,26]. For example, these studies included students beyond the first third years of study [21,26], and recruited students in pharmacy, social work, physiotherapy, and nutrition [21]. As a result, varying prevalence of depressive symptoms were reported (60% in physiotherapy, 57% in nutrition, 58% in medicine, 44% in pharmacy) [21]. This wider range of profiles potentially had an impact on the overall estimate, hence comparing the estimates reported between these studies requires caution. Nevertheless, high frequencies of depressive symptoms were reported

regardless of the disciplines and academic years, highlighting the huge magnitude of this disorder among health sciences students in Africa.

We found that the relation between advanced age and depression was not stable. Indeed, only students aged between 21 and 23 years were significantly more likely to have depressive symptoms. In literature evidence on the relationship between age and depressive symptoms in health science students seems inconsistent so far [16,20,27]. Our result could be related to the delay in academic progress from some students. Indeed, at age 21, students are usually in their last year of undergraduate studies. In our sample, 57% (317/560) of our participants were aged 21 and over, while only 18% (102/560) were registered in their third year. This academic delay often reflects poor academic performance or late enrollment at school, which may affect self-esteem, create social pressure and consequently, could heighten the risk of depressive symptoms, especially among 21–23 year olds. However, being aged 24 or older was not associated with depression. This result may indicate that after the crucial 21-23 age group, some older students may have acquired/developed strategies to cope better with stressful events that may lead to a depressive state. As an illustration, students aged 24 or older reported fewer depressive symptoms (32% compared to 37% for 18-20 year olds and 47% for 21-23 year olds).

Despite the predominance of male in our study sample, significantly higher odds and prevalence of depressive symptoms were found in female (45.5% vs. 34.8% for male). This trend is consistent with other studies in students [16,20,26,27]. Arguments about individual or combined actions of biological (e.g. genetic), psychosocial (e.g. adverse experiences, vulnerability to stressful life events, low coping skills), and environmental factors are raised in the literature to explain this sex gap [28–30]. Our results expand the evidence on the potential role of the university environment in sex gaps in depressive symptoms. Other hypotheses could also explain the lower prevalence of depressive symptoms in men that we observed. First, it has been suggested in the literature that societal expectations regarding masculinity ideals lead some men to perceive depression as a "weakness" and therefore develop strategies that include denying "weakness" and "closure" [31]. This is a reality in African cultures. Second, men would be more likely to experience some specific symptoms of depression, such as anger attacks/aggression, substance abuse, and risk-taking behavior [32]. The absence of these specific symptoms in most traditional depression assessment scales may also be an explanation for the over-prevalence of depression usually observed in women. This hypothesis deserves to be explored in the African population, especially in young people.

Students from the school of Medicine were the most affected by depressive symptoms (46.5% of participants). Although our sample was predominantly composed of medicine students (55%), we believe that the high levels of psychological distress generated by the difficulty of succeeding in the first three years of medical school may explain this association. Indeed, at the University of Parakou, every year, nearly 3 out of 4 students are fail or repeat the first year (statistics from the Department of Medicine). In the current study, students in Public Health and Epidemiology also had a significantly higher probability of reporting depressive symptoms compared to nursing school students. Education in the School of Public Health in University of Parakou requires important background in statistics. Moreover, unlike the Nursing School, an important proportion of the teachers in the Medicine and Public Health schools in Parakou live and work in southern Benin and therefore come on assignment for a maximum of two weeks to provide all their annual teaching program. These critical contexts could increase the stress among those students which would explain the association observed between perceived stress and depressive symptoms among our participants. It should be noted that this environment is not unique to Benin, in sub-Saharan African countries most teachers live and work in the capital cities and therefore go to teach in

universities located in remote areas of the country, or sometimes outside their own country when there are few specialists in the field.

Despite this highly vulnerable environment, being able to count on one's parents significantly reduced the probability of reporting depressive symptoms. This suggests that parental support would be a significant avenue of action for reducing of the magnitude and consequences of depressive symptoms in this particularly vulnerable population.

In contrast with research showing that students with insufficient income are more likely to present depressive symptoms [15,33], we observed that students whose parents had higher incomes were more likely to present depressive symptoms. Parental income level is an important marker of student income, even if it is not closely related. In our study, nearly 6 out of 10 students reported that their parents had a monthly income at least equal to the minimum wage. While this income cutoff could seem low, in Benin as in many sub-Saharan countries, most of the inhabitants work in informal sectors and have unstable monthly incomes. Furthermore, most medical students come from households whose socio-economic status is relatively better than that of the general population. Most of Parakou's health science students (especially those in medicine) come from southern Benin, as they were not able to register in the more expensive and more selective health science school in Cotonou, the

economic capital. As a result, most of these students experience their first years of life away from parents and relatives. Furthermore, they are discovering a new challenging educational environment (e.g. a 100-300 students lecture hall, leaving home early to secure a seat) which requires more autonomy (e.g. taking notes during lectures, handling its finances). Our findings suggest that students from families with low incomes may be more resilient and cope better with these changes. However, more specific research on the topic in sub-Saharan Africa is needed to explore this hypothesis.

Limitations and strengths

This study has several limitations. Firstly, our sample was somewhat heterogeneous and, as we observed, the prevalence of depressive symptoms and student characteristics differed significantly according to their health department. In addition, we cannot exclude the possibility that the period of the survey and the specific characteristics of each health science discipline (e.g. number of students per class, course density, type of courses, etc.) may have influenced the observed magnitude of this psychological distress among students. Secondly, our study was cross-sectional, meaning that no causal link with the factors identified can be established. Thirdly, as the information collected was self-reported, we cannot rule out the potential presence of social desirability in our data. Students may have over or underestimated some

responses. However, we believe that the use of an online survey and the absence of collecting identifying information significantly reduced this risk. Fourthly, other factors such as substance use, sleep disorders, and stressful life events, known to be associated with depression, were not assessed in this research. Knowledge on these factors and psychological disorders in the students in sub-Saharan Africa is still limited, particularly in Benin, and deserves to be explored in future research. Despite these limitations, our study has several strengths including the use of the PHQ-9 self-administered questionnaire, a validated tool translated into several languages to assess depressive symptoms, which is widely used in clinical practice and population-based studies. In addition, this research was conducted at Benin's second largest university and included students from all three of the university's medical studies departments, providing a more comprehensive overview of the magnitude of depressive symptoms among undergraduate health science students in Parakou. Furthermore, it is one of the rare studies of mental health issues among health science students in the West African region.

3. Conclusion

This preliminary research revealed a high prevalence of depressive symptoms among health sciences students. Some of the associated factors such as perceived stress and parental support are modifiable and represent real targets for action that could contribute to reduce the frequency of these symptoms and prevent their consequences. Psychological interventions aimed at fostering students' resilience, or initiatives such as the creation of on-campus counseling units to provide support to students in distress, are strongly encouraged.

Author Contributions

AG: Conceptualization, methodology, data collection, data curation, formal analysis, data visualization, original draft preparation, draft reviewing & editing

RRT: Methodology, data collection, data curation

CG : Draft reviewing for intellectual content & editing

MG : Draft reviewing for intellectual content & editing

TA: Conceptualization, methodology, validation, supervision, draft reviewing & editing

Final approval of the submitted version: All authors.

Acknowledgments: We would like to thank all the students who took part in the survey and wish them every success.

Conflict of interest statement: The authors report no competing interests to declare.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data Availability: The database and all material used for this study can be made available to the corresponding author upon reasonable request.

References

- [1] Benner AD, Boyle AE, Bakhtiari F. Understanding Students' Transition to High School: Demographic Variation and the Role of Supportive Relationships. *J Youth Adolesc* 2017;46:2129–42. <https://doi.org/10.1007/s10964-017-0716-2>.
- [2] Worsley JD, Harrison P, Corcoran R. Bridging the Gap: Exploring the Unique Transition From Home, School or College Into University. *Front Public Health* 2021;9.
- [3] Pacheco JP, Giacomini HT, Tam WW, Ribeiro TB, Arab C, Bezerra IM, et al. Mental health problems among medical students in Brazil: a systematic review and meta-analysis. *Braz J Psychiatry* 2017;39:369–78. <https://doi.org/10.1590/1516-4446-2017-2223>.
- [4] Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students: A Systematic Review and Meta-Analysis. *JAMA* 2016;316:2214–36. <https://doi.org/10.1001/jama.2016.17324>.
- [5] Li W, Zhao Z, Chen D, Peng Y, Lu Z. Prevalence and associated factors of depression and anxiety symptoms among college students: a systematic review and meta-analysis. *J Child Psychol Psychiatry* 2022;63:1222–30. <https://doi.org/10.1111/jcpp.13606>.
- [6] Kadhum M, Ayinde OO, Wilkes C, Chumakov E, Dahanayake D, Ashrafi A, et al. Wellbeing, burnout and substance use amongst medical students: A summary of results from nine countries. *Int J Soc Psychiatry* 2022;68:1218–22. <https://doi.org/10.1177/00207640221094955>.
- [7] Ayinde OO, Akinuoye ER, Molodynski A, Battrick O, Gureje O. A descriptive study of mental health and burnout among Nigerian medical students. *Int J*

Soc Psychiatry 2022;68:1223–31.
<https://doi.org/10.1177/00207640211057706>.

- [8] Rith-Najarian LR, Boustani MM, Chorpita BF. A systematic review of prevention programs targeting depression, anxiety, and stress in university students. *J Affect Disord* 2019;257:568–84. <https://doi.org/10.1016/j.jad.2019.06.035>.
- [9] Harrer M, Adam SH, Baumeister H, Cuijpers P, Karyotaki E, Auerbach RP, et al. Internet interventions for mental health in university students: A systematic review and meta-analysis. *Int J Methods Psychiatr Res* 2019;28:e1759. <https://doi.org/10.1002/mpr.1759>.
- [10] Huang J, Nigatu YT, Smail-Crevier R, Zhang X, Wang J. Interventions for common mental health problems among university and college students: A systematic review and meta-analysis of randomized controlled trials. *J Psychiatr Res* 2018;107:1–10. <https://doi.org/10.1016/j.jpsychires.2018.09.018>.
- [11] Ma A, Rj J, Mf G, S K. Reducing stress, anxiety and depression in undergraduate nursing students: Systematic review. *Nurse Educ Today* 2021;102. <https://doi.org/10.1016/j.nedt.2021.104877>.
- [12] Tam W, Lo K, Pacheco J. Prevalence of depressive symptoms among medical students: overview of systematic reviews. *Med Educ* 2019;53:345–54. <https://doi.org/10.1111/medu.13770>.
- [13] Silva V, Costa P, Pereira I, Faria R, Salgueira AP, Costa MJ, et al. Depression in medical students: insights from a longitudinal study. *BMC Med Educ* 2017;17:184. <https://doi.org/10.1186/s12909-017-1006-0>.
- [14] Puthran R, Zhang MWB, Tam WW, Ho RC. Prevalence of depression amongst medical students: a meta-analysis. *Med Educ* 2016;50:456–68. <https://doi.org/10.1111/medu.12962>.

- [15] Croock J, Mpinganjira MG, Gathoo K, Bulmer R, Lautenberg S, Dlamini Q, et al. Probable depression and its correlates among undergraduate students in Johannesburg, South Africa. *Front Psychiatry* 2023;14.
- [16] Nakie G, Segon T, Melkam M, Desalegn GT, Zeleke TA. Prevalence and associated factors of depression, anxiety, and stress among high school students in, Northwest Ethiopia, 2021. *BMC Psychiatry* 2022;22:739. <https://doi.org/10.1186/s12888-022-04393-1>.
- [17] Lugata S, Elinisa M, Doshi B, Kashuta RA, Hango S, Mallosa WJ, et al. Symptoms and predictors of depression among university students in the Kilimanjaro region of Tanzania: a cross-sectional study. *J Ment Health* 2021;30:255–62. <https://doi.org/10.1080/09638237.2020.1793129>.
- [18] Kaggwa MM, Najjuka SM, Bongomin F, Mamun MA, Griffiths MD. Prevalence of depression in Uganda: A systematic review and meta-analysis. *PLOS ONE* 2022;17:e0276552. <https://doi.org/10.1371/journal.pone.0276552>.
- [19] Walt S van der, Mabaso WS, Davids EL, Vries PJ de. The burden of depression and anxiety among medical students in South Africa: A cross-sectional survey at the University of Cape Town. *S Afr Med J* 2019;110:69–76.
- [20] Ngasa SN, Sama C-B, Dzekem BS, Nforchu KN, Tindong M, Aroke D, et al. Prevalence and factors associated with depression among medical students in Cameroon: a cross-sectional study. *BMC Psychiatry* 2017;17:216. <https://doi.org/10.1186/s12888-017-1382-3>.
- [21] Klikpo TEE, Anagonou L, Gansou GM, Kpozehouen A, Kpadonou EF, Hougbe JE. Déterminants de la Dépression chez les Étudiants de la Faculté des Sciences de la Santé de Cotonou. *Health Sci Dis* 2020;21.

- [22] Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. *J Gen Intern Med* 2001;16:606–13. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>.
- [23] Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24:385–96.
- [24] Lesage F-X, Berjot S, Deschamps F. Psychometric properties of the French versions of the Perceived Stress Scale. *Int J Occup Med Environ Health* 2012;25. <https://doi.org/10.2478/s13382-012-0024-8>.
- [25] Othieno CJ, Okoth RO, Peltzer K, Pengpid S, Malla LO. Depression among university students in Kenya: Prevalence and sociodemographic correlates. *J Affect Disord* 2014;165:120–5. <https://doi.org/10.1016/j.jad.2014.04.070>.
- [26] Elsayy WIH, Sherif AAR, Attia MSED, Nimr NAE-. Depression among medical students in Alexandria, Egypt. *Afr Health Sci* 2020;20:1416–25. <https://doi.org/10.4314/ahs.v20i3.47>.
- [27] Brenneisen Mayer F, Souza Santos I, Silveira PSP, Itaquí Lopes MH, de Souza ARND, Campos EP, et al. Factors associated to depression and anxiety in medical students: a multicenter study. *BMC Med Educ* 2016;16:282. <https://doi.org/10.1186/s12909-016-0791-1>.
- [28] Piccinelli M, Wilkinson G. Gender differences in depression: Critical review. *Br J Psychiatry* 2000;177:486–92. <https://doi.org/10.1192/bjp.177.6.486>.
- [29] Kuehner C. Why is depression more common among women than among men? *Lancet Psychiatry* 2017;4:146–58. [https://doi.org/10.1016/S2215-0366\(16\)30263-2](https://doi.org/10.1016/S2215-0366(16)30263-2).
- [30] Zhao L, Han G, Zhao Y, Jin Y, Ge T, Yang W, et al. Gender Differences in Depression: Evidence From Genetics. *Front Genet* 2020;11.
- [31] Krumm S, Checchia C, Koesters M, Kilian R, Becker T. Men’s Views on Depression: A Systematic Review and Metasynthesis of Qualitative

Research. Psychopathology 2017;50:107–24.
<https://doi.org/10.1159/000455256>.

[32] Martin LA, Neighbors HW, Griffith DM. The Experience of Symptoms of Depression in Men vs Women: Analysis of the National Comorbidity Survey Replication. JAMA Psychiatry 2013;70:1100–6.
<https://doi.org/10.1001/jamapsychiatry.2013.1985>.

[33] Roh M-S, Jeon HJ, Kim H, Han SK, Hahm B-J. The Prevalence and Impact of Depression Among Medical Students: A Nationwide Cross-Sectional Study in South Korea. Acad Med 2010;85:1384.
<https://doi.org/10.1097/ACM.0b013e3181df5e43>.

Table 1: Characteristics of participants according to the Health Department of students surveyed in Parakou, 2022

Characteristics	Overall sample (n=560) n (%)	Health Departments			p- value
		Medicine (n=310)	Public Health (n=198)	Nursing (n=139)	
Age (in years)					<0.001
18 - 20	243 (43.4)	145 (46.8)	62 (55.9)	36 (25.9)	
21 - 23	193 (34.5)	99 (31.9)	39 (35.1)	55 (39.6)	
≥ 24	124 (22.1)	66 (21.3)	10 (9.0)	48 (34.5)	
Sex					0.092
Male	336 (60.0)	186 (60.0)	75 (67.6)	75 (54.0)	
Female	224 (40.0)	124 (40.0)	36 (32.4)	64 (46.0)	
Study year					<0.001
First	282 (50.4)	133 (42.9)	80 (72.1)	69 (49.6)	
Second	176 (31.4)	108 (34.8)	8 (7.2)	60 (43.2)	
Third	102 (18.2)	69 (22.3)	23 (20.7)	10 (7.2)	
Monthly parents' incomes (in \$)*					<0.001
< 83	235 (42.2)	103 (33.3)	85 (78.0)	47 (33.8)	
≥ 83	322 (57.8)	206 (66.7)	24 (22.0)	92 (66.2)	
Perceived stress symptoms					<0.001
Yes (score ≥6)	259 ⁺ (46.2)	191 (61.6)	32 (28.8)	36 (25.9)	
No (score <6)	301 (53.8)	119 (38.4)	79 (71.2)	103 (74.1)	
Can count on one's parents for support					<0.001
Yes	472 (84.3)	268 (86.5)	102 (91.9)	102 (73.4)	
No	88 (15.7)	42 (13.5)	9 (8.1)	37 (26.6)	
Can count on its friends/lover' support					0.674
Yes	206 (36.8)	113 (36.5)	38 (34.2)	55 (39.6)	
No	354 (63.2)	197 (63.5)	73 (65.8)	84 (60.4)	

*3 missing data on variable ; ⁺including 41 participants who have a score ≥9.

Table 2: Participants' characteristics according to the presence of depressive symptoms among undergraduate university students in Parakou, 2022.

Characteristics	Depressive symptoms		p-value
	Yes (n=219)	No (n=341)	
Age (in years)			0.017
18 - 20	90 (37.0)	153 (63.0)	
21 - 23	90 (46.6)	103 (53.4)	
≥ 24	39 (31.5)	85 (68.5)	
Sex			0.011
Male	117 (34.8)	219 (65.2)	
Female	102 (45.5)	122 (54.5)	
Health academic departments			<0.001
Nursing	34 (24.5)	105 (75.5)	
Public Health	41 (36.9)	70 (63.1)	
Medicine	144 (46.5)	166 (53.5)	
Study year			0.752
First	106 (37.6)	176 (62.4)	
Second	71 (40.3)	105 (59.7)	
Third	42 (41.2)	60 (58.8)	
Monthly parents' incomes (in \$)*			<0.001
< 83	66 (28.1)	169 (71.9)	
≥ 83	152 (47.2)	170 (52.8)	
Perceived stress symptoms			<0.001
Yes (score ≥6)	129 (49.8)	130 (50.2)	
No (score <6)	90 (29.9)	211 (70.1)	
Can count on one's parents for support			0.117
Yes	178 (37.7)	294 (62.3)	
No	41 (46.6)	47 (53.4)	
Can count on its friends/lover' support			0.016
Yes	94 (45.6)	112 (54.4)	
No	125 (35.3)	229 (64.7)	

*3 missing data on variable

Table 3: Factors associated with depressive symptoms among undergraduate university students in Parakou, 2022.

Characteristics	Univariable model		Multivariable model*	
	Crude OR (95% CI)	p-value of Wald's test	Adjusted OR (95% CI)	p-value of Wald's test
Age (in years)		0.018 ⁺		0.024 ⁺
18 - 20	1			
21 - 23	1.49 (1.01 - 2.18)		1.78 (1.17 - 2.71)	0.007
≥ 24	0.78 (0.49 - 1.24)		1.34 (0.79 - 2.28)	0.282
Sex		0.011		0.050
Female vs. Male	1.56 (1.11 - 2.21)		1.46 (1.00 - 2.14)	
Academic departments		<0.001 ⁺		<0.001 ⁺
Nursing	1		1	
Public Health	1.81 (1.05 - 3.12)		3.62 (1.87 - 7.01)	<0.001
Medicine	2.68 (1.71 - 4.19)		2.99 (1.81 - 4.95)	<0.001
Parents' incomes (in dollars)		<0.001		<0.001
≥ 83 vs. < 83	2.29 (1.60 - 3.28)		2.35 (1.51 - 3.65)	
Perceived stress symptoms		<0.001		0.040
Yes (score ≥6) vs. No (score <6)	2.33 (1.64 - 3.29)		1.54 (1.02 - 2.32)	
Can count on one's parents for support		0.118		0.026
Yes vs. no	0.69 (0.44 - 1.10)		0.55 (0.32 - 0.93)	
Can count on its friends/lover' support		0.016		0.135
Yes vs. no	1.54 (1.08 - 2.18)		1.35 (0.91 - 1.99)	

OR: Odds Ratio; CI: Confidence Interval; *All variables were present in the multivariable model. ⁺p-value of likelihood ratio test. The p-value of the Hosmer-Lemeshow test = 0.548.

