Academic performance and depression among medical students in conflict zones of the Democratic Republic of the Congo: a university-based cross-sectional study

Performance académique et dépression parmi les étudiants en faculté de médecine dans les zones à conflit de la République Démocratique du Congo : une étude transversale conduite en milieu universitaire

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Abbreviations
BDII: Beck Depression Inventory-II
DRC: Democratic Republic of Congo

Résumé

Contexte et objectif. La poursuite de la formation médicale est une des causes de dépression chez les étudiants, qui augmente avec le nombre d'années d'études. Cette étude visait à explorer l'association entre la performance académique et la dépression chez les étudiants de médecine. *Méthodes*. Une étude pilote transversale a été menée auprès des étudiants inscrits de quatrième à septième années de la faculté de médecine de l'Université de Goma. Des modèles de régression logistique multivariée ont été réalisés pour explorer l'association entre la performance académique et la dépression en utilisant Beck Depression Inventory-II (BDI-II). *Résultats*. Quatre cent nonante sept étudiants ont été interviewés. La prévalence de la dépression parmi les étudiants a été de 60 %. Elle était plus grave chez 10,6 % des participants. Ceux d'entre eux qui n'ont jamais redoublé une année universitaire étaient 1,22 fois plus susceptibles de souffrir de dépression que ceux ayant déjà redoublé une année universitaire au cours de leur formation médicale. Avoir des antécédents de maux de tête chroniques et consommer de l'alcool étaient associés avec la dépression, tandis que le fait d'être en dernière année de formation médicale était plutôt protecteur de la dépression. *Conclusion*. Six sur dix étudiants présentent une dépression dans le parcours académique. Nos résultats ont démontré que la dépression était plus prononcée chez les étudiants qui n'avaient jamais répété une classe. Il est judicieux d'envisager des interventions éducatives ciblant le bien-être mental des tous les étudiants sans tenir compte uniquement de leur performance académique dans leur parcours scolaire.

Summary

Context and objective. Pursuing medical training is a well-established cause of depression in students, which increases with the number of years of study. This study aimed to explore the association between academic performance and depression among students. *Methods*. A pilot cross-sectional study was conducted among students enrolled in the fourth- to seventh-year faculty of Medicine at the University of Goma, Democratic Republic of Congo (DRC). Multivariate logistic regression models were performed to explore the association between academic performance and depression using the Beck Depression Inventory-II (BDI-II). *Results*. In total, 497 students were interviewed. The prevalence of depression was 60 % with 10.6 % of participants having severe depression. Participants who never repeated an academic year were 1.22 times more likely to have depression compared to those who had ever repeated an academic year during their medical training. Having a history of chronic headaches and using alcohol were the factors associated with depression, while being in the last year of medical training showed a protective effect on depression in medical students. *Conclusion*. Depression is highly prevalent among fourth- to seventh-year medical students enrolled at the University of Goma. Depression is more likely to be reported in medical students who never repeated an academic year in their academic journey. The present study emphasizes a need of educational interventions targeting the student's mental health well-being regardless their academic performance during the previous academic years.

Keywords: Academic performance, Democratic

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Introduction

Pursuing medical training is a well-established cause of adverse health outcomes, including depression leading to impaired academic performance, substance use, and school dropout among medical students. Depression is three to four times more common in medical students than in the general population [1], with its prevalence rate ranging between 21.8 % and 80.7 % across studies [2–5]. Despite research indicates suggesting an increase in the prevalence rates of depression in medical students according to the year of study [6–8], especially in sub-Saharan African countries [9-10], the academic performance during the previous academic years can be associated with depression. Moreover, the prevalence rates of depression in medical students vary during the academic year, with low rates (4 %) at the beginning and a high proportion (20 %) at the end of the academic year [11]. To date, there is a paucity of data on the burden of depression in Congolese medical students attending universities in conflict zones of the Demographic Republic of Congo (DRC), where the medical training is carried out over seven years, during which the first three years of studies are mainly centered on the biomedical sciences, whereas from the fourth to the seventh years of studies, the training focus is on clinical practices combined with theoretical teaching. Factors associated with depression in students pursuing medical training vary across studies and include the low socioeconomic status of parents and tutors [12], academic workload [13], and financial constraints [13-16]. Other research revealed that medical students with chronic medical illnesses are at high risk of depression [10], substance consumption, and academic performance [17-18]. While studies indicated that the majority of medical students reported the initiation of alcohol use due to stress during their training [19], with a negative impact on the academic achievement of continuing medical students, defined in terms of repeats, retakes, school droop, or missing course work or lectures [4,20], there has been no university-based study associating academic performance with depression among fourth- to seventh-year medical students in the DRC. Given that existing studies have focused on the overall medical student population; data is lacking on how prevalent depression is among medical students who have completed the biomedical sciences part of the undergraduate training. This survey is intended to provide preliminary data able to inform the design of design-specific contextual interventions targeting the wellbeing of medical students during their training in low-income countries and in the DRC. This study aimed to understand the association between academic achievement and depression among fourth- to seventh-year students registered at a public university located in conflict zones in the DRC.

Methods

Study design

This was cross-sectional study employing a quantitative approach.

Study Setting

This study involved all fourth- to seventh-year medical students registered in the academic year 2021-2022 at the Faculty of Medicine of the University of Goma, in North-Kivu province in eastern DRC. The University of Goma is a public university that organizes undergraduate and postgraduate training in the medical field according to DRC policies on the organization of learning in tertiary institutions. The faculty of Medicine has an average of 1500 students. This faculty was selected as a study site since it is one of the universities that has a large number of students and receives the majority of those students who have failed from the neighboring universities located in North Kivu and South Kivu, in the eastern part of the DRC, with the potential to indicate an overview of depression among fourth- to seventh-year medical students in these regions.

Participants

We enrolled medical students aged 18 and over who had registered for the academic year 2021–2022. We included adult medical students enrolled in fourth to seventh years of medical study at the Faculty of Medicine at the University of Goma, attending the lecture scheduled in one of the fourth- to seventh-years of undergraduate medical study, and providing written informed consent. Exclusions were students who did not attend campus during the study period and those with mental disorders or any neurocognitive symptoms that could affect their ability to provide informed consent (Figure 1).
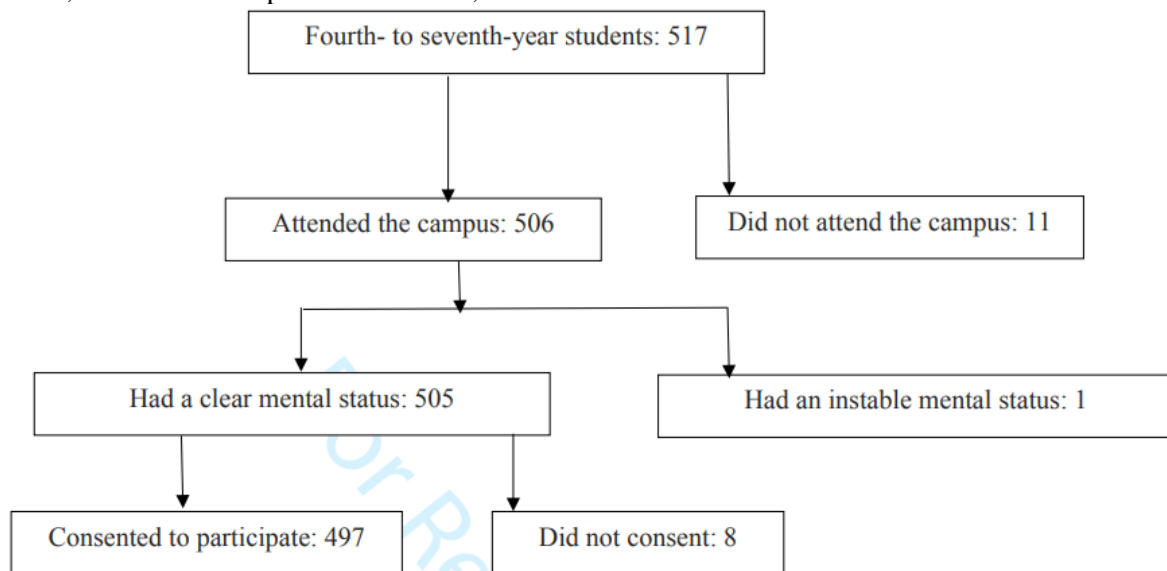

Figure 1: Participants flow chart

Sample size determination

We determined the sample size using the modified Daniel's formula (21) using the prevalence of prevalence of a study conducted in Sudan (53%) (22), a design effect of 1, assumed for simple random sampling, an overall minimal rate of 90% to adjust the sample size for non-response, and a precision of 2% (d, relative standard error). At a 95% confidence level (z = 1.96) and a sampling error of 10% for stratum-specific estimates, the minimal sample size (n) f or this study was 407 participants. In order to achieve, the study objectives, we collected data from all the fourth- to seventh- medicals students who were attending the course during our data collection, making the final sample at 497 participants.

Procedures

Purposive sampling was used to select participants who had an equal chance of participating in the study. This study was population-based involving all fourth- to seventh-year medical undergraduate students at the University of Goma, a registered university in the DRC, which was approached for permission to include its students in our study via a letter sent to its Vice Chancellor. Once permission was granted, undergraduate medical students were approached in their respective classes, explaining to them the objectives and procedures of the survey, and then they were invited to participate

after getting their informed consent. Students were also asked to give consent to obtain their academic performance data directly from the universities at the end of each academic year of registration. Data collection was performed without personal identifiers. The student list was used for the appropriate data collection process in each class, and survey data were collected without personal identifiers. Participants were administered a questionnaire by trained research assistants fluent in French. Two research assistants, supervised by the first author, collected data using consecutive recruitment and face-to-face interviews conducted between September 8 and 19, 2022. To avoid psychological distress related to the examination period, data were collected three months before the planned examination period.

Study measures

This survey was well-designed for socio-demographic characteristics, academic performance, and the Beck Depression Inventory-II.

The independent variables included information on socio-demographic factors including age, sex, marital status, year of study, people with whom the participants stay with, alcohol and cigarette consumption. For the academic factors including the academic performance, we collected data on having repeated an academic year during the training, having retakes or repeats during the previous academic year, year of study, failure to pay tuition, the individual motivating the choice of medical course and the presence or absence of emotional disturbance during the examination.

The outcome variable was depression, assessed using the Beck Depression Inventory-II (BDI-II), developed in 1996 from the Beck Depression Inventory. It has 21 items, using a 4-point Likert scale for all the items. It has a score range of 0 to 63. A cumulative BDI score is obtained by summing up the participant's responses. On two items (16 and 18), seven options indicate either an increase or decrease in appetite and sleep. The 21-item, self-administered questionnaire was scored on a scale of 0 to 3, increasing the severity of each symptom of depression. The total score of 0–13 was considered a minimal range; between 14 and 19, it was mild depression; from 20 to 28, moderate depression; and from 29 to 63, it was severe depression (23). The BDI used in our study has good internal consistency with a Cronbach's alpha of 0.70 and test-retest reliability in population studies (24).

All included items were selected based on their ability to capture adequate information to achieve the study objectives. The data collection tools were pretested among five fourth- to seventh-year medical students of the Catholic University of Bukavu (DRC), and the data collection tools were granted reliability, accuracy, and validation.

Quality control

Questionnaires were checked for completeness, pretested on five fourth to seventh years of medical study at the Faculty of Medicine of the Evangelical University of Africa, located in South Kivu province in the eastern DRC. For accuracy, two research assistants and the first author assessed the questionnaire.

Data analysis

Collected data was quantitative in nature and was analyzed using STATA version 14.0 software for Windows 10. Descriptive statistics were summarized as proportions or percentages for categorical variables and means, standard deviations, medians, or interquartile ranges for continuous variables. Inferential analyses were performed to determine the association between depression and academic performance. We fitted multiple logistic regression models to determine factors associated with depression.

Ethics considerations

We received approval from the Research Ethical Committee of the University of Goma (UNIGOM/CEM/009/2022). All procedures contributing to this work comply with the ethical standards of the DRC, the institutional committee on human experimentation, and the Helsinki Declaration of 1975, as revised in 2008. We obtained a written informed consent from the participants

Results

Socio-demographic characteristics of study participants

In total, we enrolled 497 participants among whom more than half were aged between 18 and 25 years old (72.2%) with a mean age of 19.2 (SD: 5.7). Majority of participants were male (63.4%), single (96%), lived with family members (62.2%), with moderate interaction (56%) (Table 1). There were more participants with depression in the category that indicates having a chronic illness and being female compared to those who did not. The association between gender and having a chronic illness, and depression was statistically significant ($p <0.001$), respectively.

Table 1. Baseline characteristics of study participants

| Variables | N=497 (%) | Depression | | p-value |
		Present (N=322)	Absent (N=175)	
Age (years) mean (SD)	19.2 ± 5.7			<0.001
18-25	359 (72.2)	280 (87)	79 (45.1)	
26-30	131 (26.4)	38 (11.8)	93 (53.1)	
>30	7 (1.4)	4 (1.2)	3 (1.7)	
Gender				0.006
Female	182 (36.6)	132 (41)	50 (28.6)	
Male	315 (63.4)	190 (59)	125 (71.4)	
Marital status				0.018
Single	477 (96)	308 (96.7)	169 (96.6)	
Married	17 (3.4)	12 (3.7)	5 (2.9)	
Divorced	3 (0.6)	2 (0.6)	1 (0.5)	
People with whom the participant stays with				<0.001
Alone	143 (28.8)	63 (19.6)	80 (45.7)	
Living with family members	309 (62.2)	235 (73)	74 (42.3)	
Living with classmates	45 (9)	24 (7.4%)	21 (12)	
Being an orphan				0.411
Yes	117 (23.5)	88 (27.3)	29 (16.6)	
No	380 (76.5)	243 (75.7)	146 (83.4)	
Substance uses				0.019
Alcohol	128 (25.8)	53 (16.5)	75 (42.3)	
Cannabis	12 (2.4)	6 (1.9)	6 (3.4)	
No substance	357 (71.8)	263 (81.7)	94 (53.7)	
Frequency of social interaction				0.312
Regular	156 (31.4)	107 (33.2)	49 (28)	
Moderate	281 (56.5)	176 (54.7)	105 (60)	
Mild	60 (12.1)	39 (12.1)	21 (12)	
Having a chronic illness				<0.001
Yes	256 (79.5)	122 (37.9)	134 (76.6)	
No	66 (20.5)	200 (62.1)	47 (23.4)	

Prevalence of depression among fourth- and seventh-year medical students

In general, three hundred twenty-two participants (64.8 %) had depression (Figure 2), among whom 124 participants (50.9%) had moderate

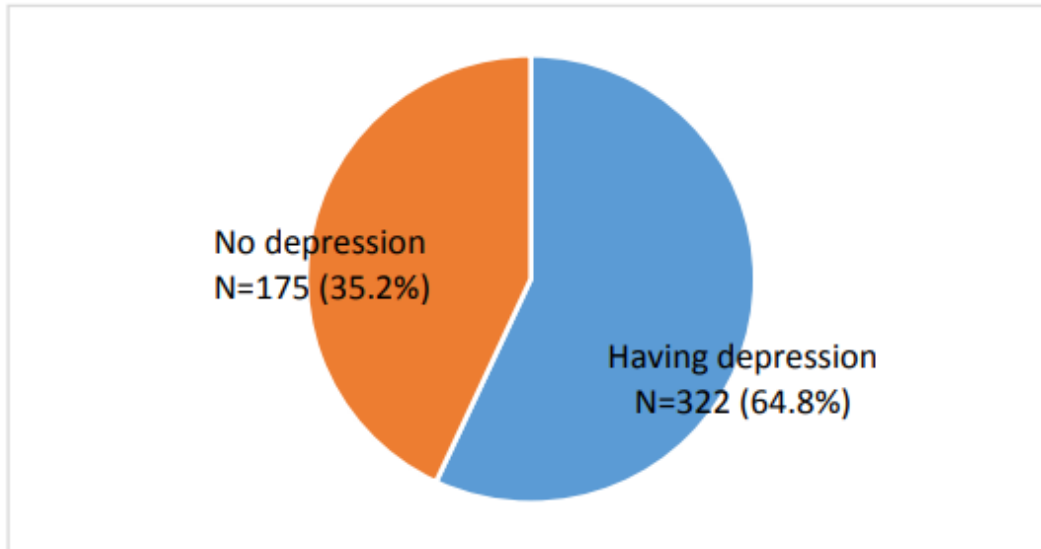depression, while 34 participants (10.6 %) had severe depression (Figure 3).

Figure 2. Prevalence of depression among fourth to seventh-year medical students
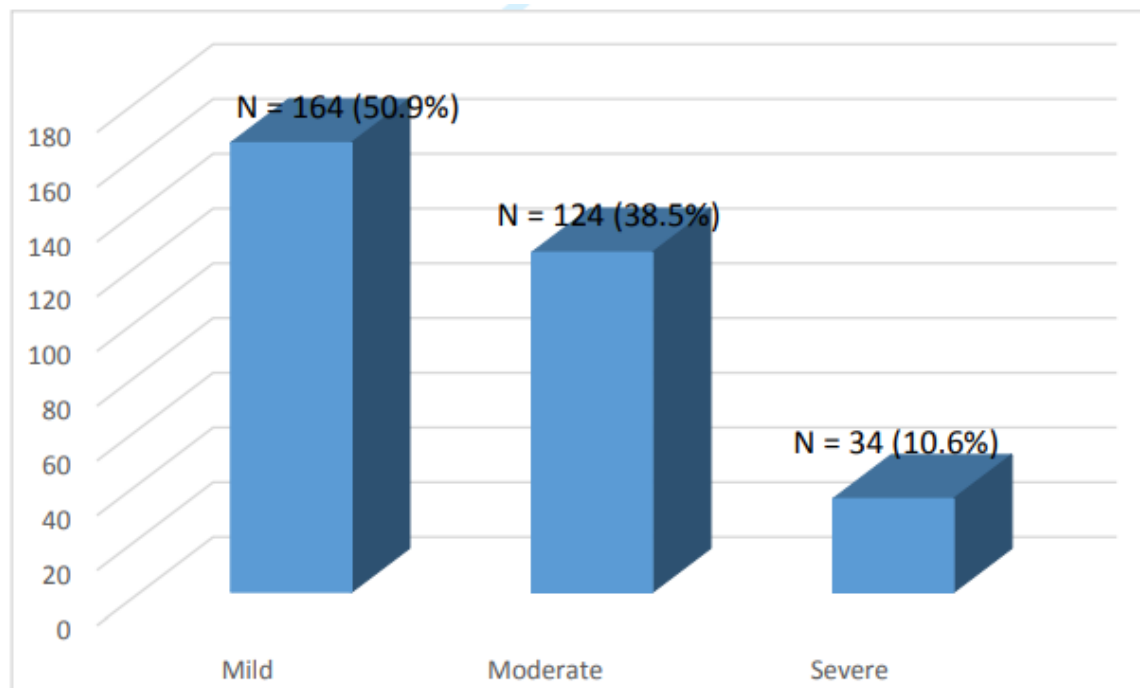

Figure 3. Patterns of depression among study participants

We found that the majority of respondents with depression reported moderate interaction with their relatives (54.7%), lived with family members (73%), and did not use any substance (81.7%) (Table 1).
Academic patterns of study participants with depression

The majority of respondents with depression never repeated an academic year (89.8%), never failed to pay tuition (61.8 %), and reported passing the previous class after retaking a course unit (79.8%) (Table 2).

Table 2. Distribution of study participants according to academic factors

Variables	Depression		
	All participants	Present	Absent
	N=497 (%)	n=322 (%)	n=175 (%)
Year of study			
Fourth-year	189 (38.0)	152 (47.2)	37 (21.1)
Fifth-year	130 (26.2)	75 (23.3)	55 (31.4)
Sixth-year	74 (14.9)	56 (17.4)	18 (10.3)
Seventh-year	104 (20.9)	39 (12.1)	65 (37.2)
Having repeated an academic year			
No	370 (74.5)	289 (89.8)	81 (46.3)
Yes	127 (25.5)	33 (10.2)	94 (53.7)
Failing to pay tuition			
No	285 (57.3)	199 (61.8)	86 (49.1)
Yes	212 (42.7)	123 (38.2)	89 (50.9)
Who motivates the choice to studying the medical field			
Personal motivation	442 (88.9)	281 (87.2)	161 (92)
Family advice	38 (7.7)	24 (7.5)	14 (8)
Random after being a specific choice	17 (20.9)	17 (5.3)	0
Having an emotional disturbance during the examination period			
Yes	450 (90.5)	291 (90.4)	159 (90.6)
No	47 (9.5)	31 (9.6)	16 (9.1)
Having repeated the previous academic year			
Failure	15 (3)	10 (3.1)	5 (2.8)
Passing the class during the first examination	140 (28.2)	55 (17.1)	85 (48.6)
Passing the class during the second examination	342 (68.8)	257 (79.8)	85 (48.6)

Factors associated with depression

Table 3 display the determinants of depression among studied population.
Table 3. Association between academic performance and depression

	Bivariate analysis			Multivariate analysis		
	cOR	P-value	95 % CI	aOR	P-value	95 % CI
Age (years)						
18-25	0.74	0.885	0.44-0.99	0.56	0.642	0.34-0.98
26-30	1.86	0.205	1.35-2.54	1.76	0.186	1.22-2.44
>30	1			1		
Gender						
Female	1			1		
Male	0.95	0.652	0.39-1.48	0.93	0.63	0.32-1.35
Marital status						
Single	**6.86**	**0.042**	**1.14-44.25**	**5.78**	**0.049***	**1.01-33.07**
Married	1.73	0.354	0.92-3.21	1.42	0.163	0.87-2.32
Divorced	1			1		
People with whom the participant stays with						
Alone	2.65	0.904	0.88-4.01	1.84	0.360	0.86-3.92
Living with family members	4.53	0.720	3.5-11.4	4.10	0.201	2.26-74
Living with classmates	1			1		
Substance use						
Alcohol	**2.11**	**0.014**	**1.32-4.28**	**1.89**	**0.014***	**1.13-3.17**
Cannabis	1			1		
No substance	1.88	0.142	0.77-2.59	1.43	0.152	0.362.74
Year of study						
Fourth-year	0.77	0.518	0.43-1.65	0.60	0.065	0.25-1.64
Fifth-year	1.95	0.829	1.55-6.72	1.84	0.537	1.42-11.62
Sixth-year	1			1		
Seventh-year	**0.65**	**0.032**	**0.53-0.89**	**0.31**	**0.006***	**0.14-0.72**
Having repeated an academic year						
No	**2.01**	**0.051**	**1.75-2.54**	**1.22**	**0.013***	**1.12-1.95**
Yes	1			1		
Failing to pay tuition						
No	1.67	0.723	0.88-1.92	1.19	0.434	0.77-1.85
Yes	1			1		

Having an emotional disturbance during the examination period						
Yes	0.81	0.112	1.27-1.99	0.37	**0.001***	1.01-1.70
No	1			1		
Having a chronic illness						
Yes	3.59	0.034	2.01-5.87	2.37	**<0.001***	1.50-3.74
No	1			1		

At multivariate analysis, we found that the odds of fourth- to seventh-year medical students who never repeated an academic year were much more likely to have depression that those who did not (AOR: 1.22, 95% CI: 1.12-1.95, p = 0.013). We also found that the odds of fourth- to seventh-year medical students having a history of chronic headaches were much more likely to have depression that those who did not (AOR: 2.37; 95% CI = 1.50-3.54; p < 0.001). The odds of fourth- to seventh-year medical students who were single were much more likely to have depression that those who did not (AOR: 5.78, 95% CI: 1.01-33.07, p = 0.049). The odds of fourth- to seventh-year medical students who were using alcohol much more likely to have depression that those who did not (AOR: 2.11, 95% CI: 1.13–3.17, p = 0.014). Moreover, the odds of fourth- to seventh-year medical students who ever experienced emotional change during the examination period were less likely to have depression than those who did not (AOR: 0.37, 95% CI: 1.01–1.70, p = 0.001). We also found that the odds of fourth- to seventh-year medical students who were in the seventh year of medical training were less likely to be depressed compared to those who did not (AOR: 0.31; 95% CI = 0.14-0.72; p = 0.006).

Discussion

This study established whether poor academic performance is associated with depression among continuing medical students registered in their fourth- to seventh-years of undergraduate study. We found that 64.8% of fourth- to seventh-year medical students had depression, which was severe in 10.9% of cases. We also found that fourth- to seventh-year medical students who never repeated an academic year were 1.22 times more likely to be depressed compared to those who had ever repeated an academic year during their medical training. The independent factors associated with depression in fourth- to seventh-year medical students were the year of study,

marital status, a positive history of chronic illness, and alcohol use. To our knowledge, our study provides the first data highlighting depression among fourth- to seventh-year medical undergraduates attending universities in conflict zones in the DRC.

The finding indicating that depression was highly prevalent among fourth- to seventh-year medical students aligns with other research conducted in sub-Saharan countries (22,26). Depression has various prevalence rates among medical students across studies, depending on methodological variations and the study population. Its higher prevalence might be explained by the inclusion of continuing students. Our finding showing that one in ten fourth- to seventh-year medical students had severe depression supports existing studies (4). Being a medical student is among the predisposing factors for depression, especially with the increasing length of study.

We found that one in four of the participants reported using alcohol and cannabis and living with their classmates. This result is in line with a recent study conducted in Uganda (25). Medical students, overwhelmed by the lectures and course work, had limited interaction with family members, who are key members of their social support network. The nature of the interaction is leading their classmates to have a high risk of maladaptive behaviors such as alcohol consumption and campus prostitution (22,27). Our results showed that fourth- to seventh-year medical students who never repeated an academic year were more likely to be depressed. Conversely to studies which reported mental health problems in students with poor academic performance, our results revealed that depression is more likely reported in medical students who never repeated an academic year in their academic journey, indicating depression doesn't correlate with poor academic performance in fourth- to seventh-year medical students. This highlights the burden of psychological distress,

expressed in term of anxious and depressive symptoms in students with normal progression during the training. The challenges are triggered by the fear of failure, academic pressure, and financial constraints. Psychosocial factors are causes of social withdrawal and involvement in high-risk behaviors such as substance abuse, gender-based violence, and suicidal behaviors as coping mechanisms. Consequently, these challenges impair academic performance, leading to school dropout, depression, and anxiety, along with suicidal thoughts, attempts, and completions over time among students.

Another consideration of our findings is that participants in the seventh year of medical training were more likely to be depressed compared to other students. This finding supports the study of Phomprasith et al. (2022), showing that being in the last year of medical training is linked to significant stress due to the academic curriculum combining both hospital and school activities during the learning of medical courses (20) Medical students in their last year of training are usually involved in clinical learning under close supervision, which strongly correlates with depression (28). Also, we found that being single was more likely to be associated with depression among fourth- to seventh-year medical students. Single medical students lack enough psychosocial support and are usually exposed to additional stress linked to medical training and daily living activities (29).

Consistent with other research (5), our findings demonstrated that fourth- to seventh-year medical students with a history of chronic illness were at high risk of depression compared to those who did not. A medical illness predicted poor quality of life among medical and non-medical students, as reported in previous studies (30-31). In addition, the findings showing that fourth- to seventh-year medical students using alcohol were more likely to have depression support existing evidence (26-27). Alcohol is commonly used as self-medication by students facing several academic challenges. The high rate of depression revealed by our study could explain the related proportion of alcohol consumption among students living in low-income countries affected by conflict zones with a lack of health workers (32).

Student's strengths

This study is the first documented study carried out in the Democratic Republic of the Congo. Its findings are an additional update to the knowledge on depression among continuous medical students in university located in conflict zones.

Students limitations

When interpreting our findings, the main limitations should be considered, such as the cross-sectional design, the university-based sample, the lack of a control group, and the use of self-reported questionnaires. Another limitation is that data collection used tools not yet validated in the DRC's context. However, the instrument validation was conducted during the pre-test of the data collection tools. Hence, a study on the adaptation of data collection tools in university settings is recommended to ensure their validity in the DRC. Another limitation is that our sample was recruited from a single institution. However, a large sample in a university receiving studies from several districts and nationalities was assumed to mitigate this limitation.

Conclusion

Depression is highly prevalent among fourth- to seventh-year medical students enrolled at the University of Goma (DRC). Our results show that depression is more likely reported in medical students who never repeated an academic year in their academic journey, indicating depression doesn't correlate with poor academic performance in fourth- to seventh-year medical students. Moreover, the findings demonstrate that the majority of participants with depression never failed to pay tuition and ever had a retake during previous semester. Therefore, there is a need of educational interventions targeting the student's mental health well-being regardless their academic performance during the previous academic years.

Competing interests

The authors declare that they have no competing interests.

Availability of Data and Materials

All the data collected or analyzed during the current study are also available from the corresponding author upon reasonable request.

Consent to publication

Not applicable

Authors' Contributions

CKKM, RWI, BMNV, ONT, MKB and ZSK conceived and designed the study. CKKM, RWI, BMNV and MKB collected data. CKKM, RWI, BMNV, and ONT analyzed the data and drafted the manuscript. CKKM, BMNV and ZSK reviewed the manuscript for the accuracy of its technical and intellectual content. All authors approved the final version of the manuscript.

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