Alfadul *et al. BMC Psychiatry* (2026) 26:217
https://doi.org/10.1186/s12888-026-07843-2

BMC Psychiatry

RESEARCH Open Access

Mental health disorders among Sudanese medical students amid the 2023 conflict: prevalence, predictors, and implications

Esraa S. A. Alfadul[1,2*], Salma S. Alrawa[1], Badria Tebaig[1*], Andrew Molodynski[3] and Abdelgadir Hussein M. Osman[4]

Abstract

Background The ongoing military conflict in Sudan since 2023 has disrupted both medical education and the healthcare system, likely adversely affecting the mental health of medical students.

Purpose This study investigates the prevalence of anxiety, depression, post-traumatic stress disorder (PTSD) and possible predictive factors in Sudanese medical students during the April 2023 military conflict.

Cross-sectional Studies were included among the faces of Sudanese medical students in conflict-affected regions. Participants completed an online questionnaire covering demographics, education, coping strategies, and mental health using the Hospital Anxiety and Depression Scale (HADS) and Posttraumatic Stress Checklist (PCL-5).

Results In our large sample of 4185 medical students, very high rates of anxiety (61.98%), depression (65.5%), and PTSD (36.7%) were reported. Medical students without plans for continuation of education exhibited significantly higher levels of anxiety and depression compared to their counterparts ($p < 0.001$). An increased age is associated with higher levels of anxiety (estimate: 0.14, 95%CI: 0.08 to 0.19), depression (estimate: 0.11, 95%CI: 0.06 to 0.16), and PTSD (estimate: 0.35, 95%CI: 0.16 to 0.55). Males exhibit significantly lower levels of anxiety (estimate: −2.1, 95%CI: −2.4 to −1.8), depression (estimate: −0.59, 95%CI:-0.86 to −0.33), and PTSD (estimate: −6.1, 95%CI:-7.2 to −4.9) compared to females. Perceived below-average financial status before conflict significantly increases anxiety (estimate: 0.69, 95%CI: 0.19 to 1.2), depression (estimate: 0.82, 95%CI: 0.38 to 1.3), and PTSD (estimate: 3.2, 95%CI: 1.3 to 5.0). Experiences of sexual abuse, physical abuse, death of a family member, and financial damage are strongly associated with increased anxiety, depression, and PTSD. Attending public medical school is associated with lower anxiety (estimate: −0.74, 95%CI: −1.0 to −0.45), depression (estimate: −0.76, 95%CI: −1.0 to −0.51), and TSD (estimate: −1.6, 95%CI: −2.6 to −0.54) compared to private school attendance.

Conclusion Our study found high rates of mental health conditions and distress among Sudanese medical students during the ongoing conflict. Associated factors include demographic factors, personal economic stability, coping strategies, and trauma. Urgent interventions are vital to target the factors mentioned above. Prioritising students'

*Correspondence:
Esraa S. A. Alfadul
Esraaalfadul.uofk@gmail.com
Badria Tebaig
badriaeet@gmail.com

Full list of author information is available at the end of the article

mental well-being is critical for their resilience and to support their contributions to post-conflict nation-building efforts.

Keywords Anxiety, Depression, PTSD, Conflict, Medical students, Developing countries

Introduction

The Middle East has been unstable for decades, with long and unresolved conflicts [1]. Many countries in the African region suffer from prolonged conflicts and civil strife. In April 2023, an armed conflict started between the Sudanese Armed Forces (SAF) and the paramilitary Rapid Support Forces (RSF) in the capital, Khartoum and many other states. This ongoing conflict has left thousands of people dead, tens of thousands more injured, and 10 million displaced, according to figures from the United Nations [2]. Sudan's medical education system was particularly affected, with teaching hospitals, universities, and training pathways abruptly disrupted.

Conflict situations have a catastrophic impact on the mental health and well-being of people in affected nations. According to the World Health Organisation (WHO), 10% of people who experience traumatic events will have serious mental health problems, and 22% of people living in conflict areas have depression, anxiety, PTSD, bipolar disorder, and/or schizophrenia [3].

While the psychological impact of war is universal, medical students represent a distinct sub-population with unique vulnerabilities. Previous studies suggest that perfectionistic tendencies [4] and the intense physical, mental, and emotional demands of medical training [5] contribute to a higher baseline vulnerability to mental health problems compared to the general public. Unlike students in many other disciplines, medical students face early clinical responsibility, and anxiety related to interrupted clinical competence and future licensure [6] which may amplify psychological distress during armed conflict.

Disruptions of civic activity during violent insecurity lead to the delay, reduction, or cessation of educational programs and affect those still studying or about to graduate [7]. In Sudan, repeated closures of universities and teaching hospitals have resulted in prolonged uncertainty regarding graduation timelines, internship placement, and postgraduate training opportunities for medical students [8].

Available Sudanese data already indicate a substantial mental health burden among medical students. The overall prevalence of psychiatric morbidity among medical students at the Faculty of Medicine, University of Khartoum, during the war was 56% [9]. During the COVID-19 lockdown, the prevalence rates of depression, anxiety, and stress among Sudanese medical students were 75%, 55.3%, and 51.8%, respectively [10]. More recently, during the ongoing conflict, the prevalence of PTSD among Sudanese individuals was recorded at 36.6% [11]. However, these studies were either conducted prior to the current conflict, focused on single outcomes, or did not comprehensively examine the mental health of large numbers of medical students during active large-scale armed violence. Consequently, the compounded impact of war-related trauma, educational interruption, and professional uncertainty on medical students remains poorly understood. To address this gap, our study aimed to investigate the prevalence of anxiety, depression, and PTSD among Sudanese medical students during the ongoing conflict and to identify associated factors.

Methods

Study design and settings

This cross-sectional study was conducted among Sudanese medical students who studied at the university for one year in areas affected by the ongoing Sudanese military conflict.

The armed conflict commenced on April 15, 2023 and is ongoing. The study was conducted between July 13 and July 22, 2023. The main areas affected by the conflict are Khartoum state and its three main cities (Khartoum, Omdurman, and Bahri) and the western region, which includes Nyala, El-Obied, Al-Fashir, and Al-Genina.

Khartoum State hosts seven public and forty-eight private universities. The western region has eight public and private universities serving medical and nonmedical students.

Participants

The study population consisted of medical students aged 18 years or older enrolled in universities in conflict-affected areas. Students with very poor internet access, and those whose original residence was outside the conflict area (even if their universities were in the conflict areas) were excluded from the study. We used a non-probability sampling technique for data collection. An online survey using Google Forms was disseminated via social networks of medical students from the targeted universities. The estimated number of medical students in target universities was 36,450. We collaborated with a group of medical students to ensure the distribution of the questionnaire via invitations on social networks. We received 4185 responses from students who filled out the questionnaire voluntarily and anonymously. This amounts to an 11.5% overall response rate.

Data collection tool

An online questionnaire was designed and tested through revisions by consultant psychiatrists and medical education experts. Screening tools for anxiety, depression, and PTSD in English and Arabic were used. The rest of the questionnaire was written in English, translated into Arabic, and reviewed by experts. The items requiring translation were sociodemographic and educational context questions. Bilingual experts reviewed the translations, and a pilot test with 30 students ensured the questionnaire's clarity, relevance, effectiveness and cultural appropriateness. Validated Arabic versions were used for standardized scales (HADS and PCL-5). To ensure data quality, the online survey allowed a single submission per account, and all questionnaire items were mandatory. Responses were screened for completeness and consistency prior to analysis.

The questionnaire consists of four sections:

1. Sociodemographic characteristics and experience during the nine years, such as changes in residence, experiencing financial, physical, sexual and death-related damage, access to water, electricity and internet network stability, following of conflict news, and preventive measures against distress.
2. Medical education factors include difficulties that medical education faces, plans made by medical schools to continue education, and students' suggestions for possible solutions. We also asked about motives to study medicine, thoughts of dropping out of medical school and alternative plans, any intention to emigrate after graduation.
3. The Assessment of anxiety and depression using the Arabic version of the Hospital Anxiety and Depression Scale (HADS), designed by Zigmond and Snaith as a self-assessment tool in 1983 [12]. It consists of 14 items. Seven of the items indicate anxiety, and the remainder indicate depression. The original test authors defined three ranges for both scales: 0–7 (non-cases), 8–10 (borderline cases), and 11–21 (cases). The HADS-D and HADS-A cutoffs of ≥ 8 have been shown to have a sensitivity of 0.82 and a specificity of 0.74 [13].
4. Measurement of PTSD using the DSM-5 Posttraumatic Stress Checklist (PCL-5), a 20-item self-report psychometric tool developed to measure and evaluate PTSD symptoms [14]. A cutoff score of ≥ 33 indicates the presence of probable PTSD.

Statistical analysis plan

Data were extracted in an Excel sheet, cleaned, and imported into R software version 4.2.2. The normality of distribution was tested using the Kolmogorov–Smirnov test. Median and interquartile ranges were used to describe continuous variables, and frequencies with percentages for categorical variables. All questionnaire items were mandatory in the online survey, and responses were screened for completeness prior to analysis; all responses were complete and included in the final sample. The Pearson chi-square test was used to identify the association between medical schools' plans to change their courses and depression and anxiety. Anxiety, depression, and PTSD were primarily analyzed as continuous outcomes using multiple linear regression models to assess the associated factors. Covariates were selected a priori based on theoretical relevance and existing literature on mental health among medical students and conflict-affected populations. No automated or purely data-driven variable selection procedures were used. For sensitivity analysis, logistic regression models were additionally performed (Supplementary Tables 1, 2, 3). Multicollinearity was assessed using variance inflation factors. A p-value less than 0.05 was considered significant.

Results

The study included 4185 participants with a median age of 21 years (IQR 20–23 years). Most students were females (67%), never married (96%), and from private institutions (56%). More than half of medical schools are in Khartoum (56%). The post-conflict residence distribution showed that 45% of the students were displaced to a safer state, 18% remained in conflict areas, and 37% were outside Sudan (Table 1).

Due to the conflict, 62% suffered financially, and 12% had lost a first-degree relative. Key barriers to continuing medical education during the conflict were internet issues (67%), poor planning by medical schools (61%), safety concerns (61%), and mental health issues (48%) (Supplementary Table 4).

Main coping mechanisms included religious habits (51%) and spending time with friends, families and neighbors (50%). Over half of the students reported that their schools had no plans for continuity (54%), while many considered transferring (58%) or dropping out (30%). A significant proportion of students thought about leaving Sudan after graduation, witMany64% to lean more towards leaving (Supplementary Table 4).

The mean HADS-depression score was 9.06 ± 4.12 (95%CI: 8.935 to 9.185) and a median of 9. HADS-anxiety scores had a mean of 9.20 ± 4.85 (95%CI: 9.053 to 9.347) and a median of 9. The PCL-5 score had a mean of 27.4 ± 17.7 (95%CI: 26.864 to 27.936) and a median of 26. Percentages of students experiencing pathological or borderline depression, anxiety, and PTSD are provided in Fig. 1.

Among students with anxiety, 57% reported that their medical schools did not make plans to continue their education, while 43% reported that they did (X^2

Table 1 Demographic and educational characteristics of medical students in conflict area

Characteristic	N = 4,185[1]
Age	21.00 (20.00, 23.00)
Gender	
Female	2,817 (67%)
Male	1,368 (33%)
Marital status	
Never married	4,000 (96%)
Married	161 (3.8%)
Divorced	13 (0.3%)
Widowed	11 (0.3%)
Type of medical school	
Private	2,361 a (56%)
Public	1,824 (44%)
Displacement	
No	760 (18%)
Yes	3,425 (82%)
Residence after the conflict	
In a safer state	1,879 (45%)
In the conflict area	760 (18%)
Outside Sudan	1,546 (37%)
Perceived financial status before the conflict	
Above the average	1,114 (27%)
Average	2,691 (64%)
Below the average	380 (9.1%)

[1]Median (IQR); n (%)

Table 2 The association between medical schools' plans to continue medical education and the mental health of medical students

	Medical school made plans to continue education			
Characteristic	**No, N = 2,244[1]**	**Yes, N = 1,941[1]**	**Test statistic**	**p-value[2]**
Anxiety			25.51	**< 0.001**
Non-case	774 (34.49%)	817 (42.09%)		
Case	1,470 (65.51%)	1,124 (57.91%)		
Depression			25.70	**< 0.001**
Non-case	696 (31.02%)	747 (38.49%)		
Case	1,548 (68.98%)	1,194 (61.51%)		

[1]n (%)

[2]Pearson's Chi-squared test

Pearson = 25.51, $p < 0.001$). Similarly, for students with depression, 56% indicated that their medical schools did not make plans to continue their education, compared to 44% who said their schools did (X^2 Pearson = 25.70, $p < 0.001$) (Table 2).

Each year increase in age was associated with 0.14 increase in anxiety level (95% CI: 0.08 to 0.19). Being a male (estimate: −2.1; 95% CI: −2.4 to −1.8) or public school student (estimate: −0.74; 95% CI: −1.0 to −0.45),

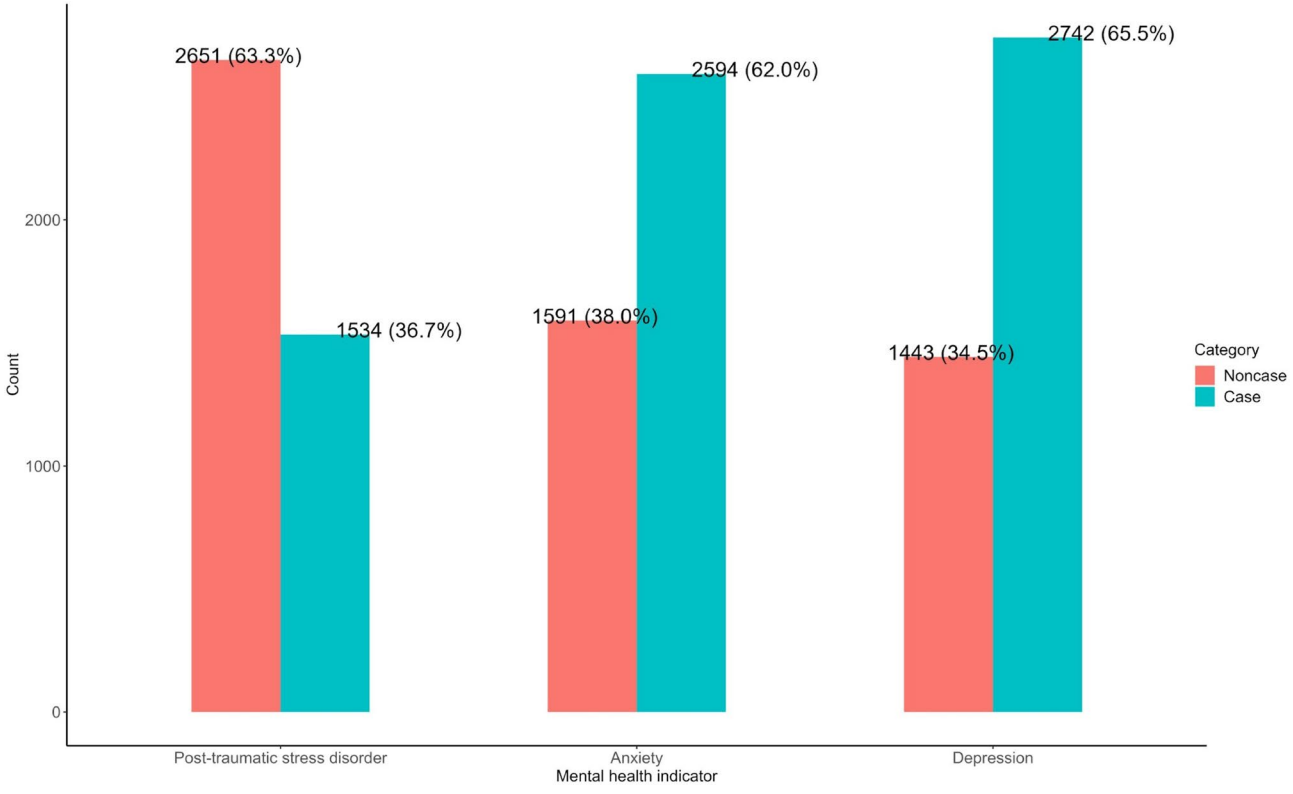

Fig. 1 Prevalence of anxiety, depression and posttraumatic stress disorders

or residing in a safer state (estimate: −0.95; 95% CI: −1.3 to −0.55) or outside Sudan (estimate: −1.0; 95% CI: −1.4 to −0.62) was associated with lower anxiety.

Divorced individuals (estimate: 3.2; 95% CI: 0.67 to 5.7), who Perceived financial status before the conflict as below-average financial status (estimate: 0.69; 95% CI: 0.19 to 1.2) or experience of sexual abuse (estimate: 1.5; 95% CI: 0.13 to 2.8), physical abuse (estimate: 0.86; 95% CI: 0.31 to 1.4), death of a family member (estimate: 1.7; 95% CI: 1.2 to 2.1), and financial damage (estimate: 1.2; 95% CI: 0.90 to 1.50) was significantly associated with increased anxiety (Table 3).

Each year increase in age was associated with 0.11 increase in depression (95% CI: 0.06 to 0.16). Male students (estimate: −0.59; 95% CI: −0.86 to −0.33), public school students (estimate: −0.76; 95% CI: −1.0 to −0.51), those living abroad (estimate: −1.1; 95% CI: −1.4 to −0.7) had lower depression levels. Higher depression was significantly associated with perceiving financial status as below average before the conflict (estimate: 0.82; 95% CI: 0.38 to 1.3), and experiencing physical abuse (estimate: 0.57; 95% CI: 0.10 to 1.0), sexual abuse (estimate: 1.5; 95% CI: −0.37 to 2.7), family death (estimate: 0.90; 95% CI: 0.51 to 1.3), and financial damage (estimate: 1.0; 95% CI: 0.79 to 1.3) (Table 4).

Table 3 Factors associated with anxiety among medical students during the conflict

Characteristic	Beta	95% CI[1]	p-value
Gender			
Female	Reference		
Male	−2.1	−2.4, −1.8	**<0.001**
Age	0.14	0.08, 0.19	**<0.001**
Marital status			
Single	Reference		
Divorced	3.2	0.67, 5.7	**0.013**
Married	0.64	−0.12, 1.4	0.10
Widowed	0.6	−1.2, 4.3	0.3
Type of medical school			
Private	Reference		
Public	−0.74	−1.0, −0.45	**<0.001**
Residence after the conflict			
In the conflict area	Reference		
In a safer state	−0.95	−1.3, −0.55	**<0.001**
Outside Sudan	−1.0	−1.4, −0.62	**<0.001**
Perceived financial status before the conflict			
Average	Reference		
Above the average	−0.05	−0.37, 0.28	0.8
Below the average	0.69	0.19, 1.2	**0.007**
Sexual abuse			
No	Reference		
Yes	1.5	0.13, 2.8	**0.032**
Physical abuse			
No	Reference		
Yes	0.86	0.31, 1.4	**0.002**
Death			
No	Reference		
Yes	1.7	1.2, 2.1	**<0.001**
Financial damage			
No	Reference		
Yes	1.2	0.90, 1.5	**<0.001**

[1]CI = Confidence Interval

Each year increase in age was associated with a 0.35 increase in PTSD level (95% CI: 0.16 to 0.55). Males (estimate: −6.1, 95% CI: −7.2 to −4.9), public school students (estimate: −1.6, 95% CI: −2.6 to −0.54), and those residing in safer states (estimate: −1.9, 95% CI: −3.3 to −0.43) had significantly lower PTSD levels.

Increased PTSD was significantly associated with perceiving financial status as below average before the conflict (estimate: 3.2, 95% CI: 1.3 to 5.0), experiencing the death of a family member (estimate: 6.8, 95% CI: 5.2 to 8.5), and financial damage (estimate: 5.9, 95% CI: 4.9 to 7.0) (Table 5).

Discussion

This study showed a high prevalence of anxiety, depression, and PTSD among Sudanese medical students affected by the 2023 Sudanese Armed Conflict. We discussed the factors which are positively or negatively associated with these levels.

Most participants were female who never married, and most were at private medical schools. The conflict led to significant changes in the student's living arrangements, with a considerable proportion relocating to safer states and residing with first-degree relatives. They were concerned about the conflict's progress and relied on TV and social media platforms to follow matters, a practice acknowledged in the Russian-Ukrainian war [15].

The prevalence of anxiety in our study population was 62.0%, higher than the global estimate for medical students (33.8%) and the pooled prevalence of 30.7% reported in conflict-affected populations [4, 16]. It also exceeds the prevalence previously reported among medical students in Sudan (33.7%) and in Syria (35.1%) [17, 18]. Depression was similarly highly prevalent (65.5%), markedly higher than international estimates for medical students (28.0%) and for populations exposed to war (28.9%) [16, 19], as well as higher than the reported prevalence among African medical students (38.8%) [20]. Nonetheless, it is comparable to the 60.6% reported in Syria [18]. The prevalence of post-traumatic stress disorder (PTSD) in our study was 36.7%, exceeding the global pooled estimate during conflict (23.5%) [16], and substantially higher than the 13.6% reported among interns and medical students early in the conflict [21]. This higher prevalence may reflect both the earlier timing of data collection in our study (July) compared with Abdulhamid et al. (September) and differences in assessment

Table 4 Factors associated with depression among medical students during the conflict

Characteristic	Beta	95% CI[1]	p-value
Gender			
Female	Reference		
Male	−0.59	−0.86, −0.33	**< 0.001**
Age	0.11	0.06, 0.16	**< 0.001**
Marital status			
Single	Reference		
Divorced	0.60	−1.6, 2.8	0.6
Married	0.27	−0.40, 0.93	0.4
Widowed	0.54	−1.8, 2.9	0.7
Type of medical school			
Private	Reference		
Public	−0.76	−1.0, −0.51	**< 0.001**
Residence after the conflict			
In the conflict area	Reference		
In a safer state	−0.15	−0.48, 0.19	0.4
Outside Sudan	−1.1	−1.4, −0.7	**< 0.001**
Perceived financial status before the conflict			
Average	Reference		
Above the average	−0.02	−0.30, 0.26	0.9
Below the average	0.82	0.38, 1.3	**< 0.001**
Sexual abuse			
No	Reference		
Yes	1.5	0.37, 2.7	**0.010**
Physical abuse			
No	Reference		
Yes	0.57	0.10, 1.0	**0.018**
Death			
No	Reference		
Yes	0.90	0.51, 1.3	**< 0.001**
Financial damage			
No	Reference		
Yes	1.0	0.79, 1.3	**< 0.001**

Table 5 Factors associated with post-traumatic stress disorder among medical students during the conflict

Characteristic	Beta	95% CI[1]	p-value
Gender			
Female	Reference		
Male	−6.1	−7.2, −4.9	**< 0.001**
Age	0.35	0.16, 0.55	**< 0.001**
Marital status			
Single	Reference		
Divorced	−1.1	−10, 8.2	0.8
Married	−1.2	−4.0, 1.6	0.4
Widowed	3.1	−6.9, 13	0.5
Type of medical school			
Private	Reference		
Public	−1.6	−2.6, −0.54	**0.003**
Resto consider			
In conflict area	Reference		
In a safer state	−1.9	−3.3, −0.43	**0.011**
Outside Sudan	−0.78	−2.3, 0.72	0.3
Perceived financial status before the conflict			
Average	Reference		
Above the average	0.92	−0.27, 2.1	0.13
Below the average	3.2	1.3, 5.0	**< 0.001**
Sexual abuse			
No	Reference		
Yes	2.2	−2.7, 7.1	0.4
Physical abuse			
No	Reference		
Yes	1.8	−0.25, 3.8	0.085
Death			
No	Reference		
Yes	6.8	5.2, 8.5	**< 0.001**
Financial damage			
No	Reference		
Yes	5.9	4.9, 7.0	**< 0.001**

[1]CI = Confidence Interval

instruments (PCL-5 versus the International Trauma Questionnaire). Nevertheless, we acknowledge the limited baseline data on mental health among Sudanese medical students and emphasize the need for longitudinal studies to quantify the impact of evolving sociopolitical crises on this population.

Financial instability emerged as a significant issue during the conflict, with many students experiencing losses. Death of relatives or financial damage during the conflict was significantly associated with experiencing symptoms of mental health disorders. These findings indicate that the economic impact of the conflict had detrimental effects on the student's mental health, possibly amplifying stress and anxiety.

The three studied mental disorders were significantly associated with age and increased as it advanced. This aligns with findings from other studies [22, 23] and is commonly attributed to the pressures of employment and finance [23]. Gender differences were evident, with female respondents reporting higher levels of anxiety and depression. This aligns with previous research suggesting a higher vulnerability of females to mental distress [24]. Attending private universities and experiencing financial difficulties were associated with higher anxiety and depression, possibly due to financial indebtedness [25].

Students whose medical schools did not make plans for continuing education reported higher levels of stress and depression, highlighting the importance of providing clear educational pathways and advice during times of crisis. Such uncertainty about the future may have worsened distress among students. This, in turn, could lead some to consider dropping out of medical school or leaving Sudan after graduation, but we can only speculate here. Interestingly, 14% of students became more determined to remain in Sudan and build the country. This group, like those determined to leave Sudan, had higher levels of anxiety and depression compared to students

who did not foresee or report a likely change in plans after the conflict. A qualitative exploration of this phenomenon would be helpful. Medical schools face various challenges in maintaining the continuity of medical education, with potential solutions including partnerships with local or international universities and the utilization of online learning platforms [26]. The implementation of online education faces multiple obstacles, such as the stability and speed of internet connectivity and the consistency of electrical power supply [26, 27].

The most beneficial coping strategies reported in this study were religious habits, spending time with friends, families and neighbors, and reading books and having online courses. Over half of the students relied on religious habits to lessen their suffering. More than 90% of Sudanese are Muslims [28]. It was reported that spiritually modified cognitive therapy results in a faster improvement in anxiety and depression when compared to therapy that is not modified in Muslim communities [29]. Spirituality and engagement in religious behaviour should be encouraged among religious individuals at times of distress. Recognizing the importance of social connections within the community is essential for designing interventions that address culturally relevant concerns.

Students still living in the conflict area were more likely to report symptoms of PTSD. Persistent environmental stressors or trauma exposure are known to activate subclinical symptoms of PTSD [30]. The clearest traumatic experiences linked with PTSD in our study were the death of one of the first-degree relatives and financial damage.

Strengths

This is one of the few studies in the Middle East that assess the impact of conflict on medical students more widely. We used standardized tools (HADS, PCL-5) that are both reliable and valid. A range of sociodemographic and situational factors were considered in the questionnaire, including those specifically looking at the potential effects of conflict. The anonymity of the questionnaire limited the response bias.

Limitations

This study has several important limitations that should be considered when interpreting the findings. First, the cross-sectional design prevents establishing causal relationships. Second, the use of non-probability sampling and reliance on internet access may have introduced selection bias, as students with limited internet connectivity were likely underrepresented. Additionally, the response rate of 11.5% raises concerns about representativeness, and the findings should therefore be interpreted with caution. Furthermore, although validated Arabic versions of HADS and PCL-5 were used, the lack of formal psychometric validation in Sudanese samples may affect the precision of prevalence estimates and symptom interpretation. Elevated scores on these instruments indicate probable caseness and psychological distress, rather than psychiatric diagnoses. In the context of ongoing armed conflict, such scores are likely to capture a spectrum ranging from diagnosable mental disorders to acute stress responses. Nevertheless, irrespective of diagnostic status, elevated symptom levels are associated with functional impairment. As such, these findings represent a public health and educational concern that warrants intervention even in the absence of diagnostic confirmation. Additionally, this study used an online survey, which may have introduced selection bias. Students with reliable internet access or who were residing in safer areas were more likely to participate, while those in regions with active conflict, displacement, or limited connectivity may have been underrepresented. Consequently, the prevalence of anxiety, depression, and PTSD could be under- or overestimated. For example, students in safer areas might report lower distress due to reduced exposure to traumatic events, but they might also experience higher distress if they were more engaged with conflict-related news via social media [31]. Therefore, caution is warranted when generalizing these findings to all medical students in Sudan, and future studies should consider mixed recruitment strategies, including in-person or telephone surveys, to improve representativeness.

Despite these limitations, the study collected thousands of responses from medical students across Sudan, which provides valuable insights into this population.

Recommendations

To quote an authoritative title in this field:

"Ultimately, a population recovers from war not as aid recipients or patients but as active citizens. Structural poverty, landlessness, and lack of viable jobs too often retard this rebuilding of lives" [32].

Ending the conflict is the most effective way to reduce psychological harm, but this is beyond the control of universities. Meanwhile, universities and health authorities can implement practical measures to support medical students despite ongoing conflict. To maintain educational continuity, universities could adopt flexible academic calendars, adjust assessment deadlines, offer online or hybrid teaching where infrastructure allows, and partner with safer regional institutions for clinical rotations, strategies used effectively in other conflict settings [33, 34]. Routine mental health screening using brief validated tools can identify students in distress, with stepwise support provided through peer networks, faculty mentoring, online counseling, and referral to specialists when needed [35]. Faculty training in psychological

first aid and trauma-informed teaching can strengthen support at the institutional level. Ministries can facilitate these efforts by ensuring funding for digital infrastructure, coordinating between universities, and providing guidance for contingency planning. Culturally relevant coping strategies, such as religious practices, social support, and self-directed learning, should be encouraged to enhance resilience. Even partial implementation of these measures may help reduce psychological distress and protect academic progression during conflict.

Conclusion

We found high levels of depression, anxiety, and PTSD among Sudanese medical students. Higher levels of depression and anxiety were associated with increased age, female gender, attending private universities, experiencing financial damage, physical abuse or death of a first-degree relative, and future uncertainty caused by lack of plans to continue medical education. PTSD was associated with being female, older age, being from a private medical school, and residing in a conflict area with lower than average perceived economic status. Other factors were financial damage and the death of a first-degree relative. The most useful coping mechanisms reported were religious habits, reading books and spending time with others. These findings support targeted, evidence-based interventions to protect student mental health in conflict settings. Practical measures include routine mental health screening using validated tools, structured clinical assessments for those at risk, peer support and mentorship programs, tele-mental health and online counseling services, and faculty training in psychological first aid and trauma-informed education. Encouraging culturally and contextually appropriate coping strategies, such as religious practices and social connectedness, may further enhance resilience. Implementing these measures can help maintain academic performance, reduce attrition, and safeguard the sustainability of the healthcare workforce during times of crisis.

Supplementary information

The online version contains supplementary material available at https://doi.org/10.1186/s12888-026-07843-2.

Supplementary Material 1

Acknowledgements

We acknowledge Dr. Afzal Javed, Dr Nazish Imran, Dr Waqar Azeem for reviewing the manuscript and improving the quality of the study. We thank Prof. Kamil Shaaban, Prof. Samir Shaheen, Dr. Ashraf Yahia, and Dr. Elfatih Malik for reviewing the questionnaire and improving the study's quality. The acknowledgment extends to the team of data collectors: Tasnim Omer Mohamed Elawad, Bara'a Adam Haroun Osman, Sakina Moawia Taha Mohamed, Nafisa Salim MohammedAlhassan Mohammed, SHIMA ABDUIRAHIM IBRAHIM JAD-ALSEED, ALIAA FAISAL HUSSAIN ALAMIN, Omsalama Essam Ali, Almonzala Bashir Abdelrazek Mohammed, MAKIA HUSSEIN MAKAWI MOHAMED, ISLAM DAMBAS, Sana Suliman Aboda Suliman, Roaa Nasir Salaheldin Osman, Rawan Terab Alawad Mohammed, Salma M Nageeb, Salma Mohamednageeb Ahmed, Solwan Ahmed Matar Hamed, Sayda Abbas Elbushra Mohamed, Shaima Abdelrahman Tagelsir Bashir, MARAM MOHAMMEDALAMIN ELTAHIR ALI, Nibras saifeldin hassan seadahmed, AYAT YOUSIF MOHAMMED MOHAMMED SAEED, Mazen Wael Khamis, MAZIN SIRAGELDIN ABDELMAHMOUD ABUELHASSAN, Alaa Ashraf Khaleel, Samah Omer Ahmed Alabbas, Samar Yousif Mohamed Awadallah, Hadeel Haider Younis Mohammed, Ahmed Osman Mohammed Mohammed Ahmed, Ahmed isam aldeen altoom Mohammed.

Author contributions

ESA, SA and BT designed the study and drafted the manuscript. ESA, BT and SA prepared the interview guides and managed the data collection process. ESA analyzed the data and interpreted the results. AHO and AM supervised and critically revised the work for intellectual content. All authors contributed to the writing, review, and editing and agreed on the final manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

Data will be shared upon reasonable request to the corresponding author.

Declarations

Ethical approval

The study was approved by the University of Gezira, Faculty of Medicine, Health Sector Ethical Review Committee (IRB no: 16–23). The study was performed in line with the principles of the Helsinki Declaration.

Consent to participate

Informed consent was obtained from all individual participants included in the study. No personally identifiable information was collected, responses were anonymous, and data were stored securely with restricted access.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Faculty of Medicine, University of Khartoum, Al Qasr Avenue, P.O. Box 11111, Khartoum, Sudan
[2]Station Of Medical Essentials (SOME) Institution, Khartoum, Sudan
[3]Oxford Health NHS Foundation Trust and Oxford University, Oxford, UK
[4]Department of Psychiatry, Faculty of Medicine, University of Khartoum, Khartoum, Sudan

Received: 30 October 2023 / Accepted: 20 January 2026
Published online: 31 January 2026

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