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Assessment of Mental Health and Academic Performance among Medical Students during the 2023–2024 Conflict in Sudan

Abeer Ahmed[1], *Anas Ibn Auf*[2]

[1]*Department of Public Health, University of Medical Sciences and Technology (UMST), Khartoum, Sudan*
[2]*Department of Psychiatry, Faculty of Medicine, Eastern Sudan University for Medical Sciences and Technology, Port Sudan, Sudan*

Abstract

Context: Sudan's 2023–2024 conflict disrupted education and healthcare systems, affecting students' mental health and academic continuity.
Objective: This study aims to assess the effects of recent conflicts in Sudan on the mental health and academic life of medical students of University of Medical Sciences and Technology and University of Khartoum in 2024.
Materials and Methods: This cross-sectional study assessed 255 fourth- and fifth-year medical students from two universities from April to July 2024 using validated Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) scales. Participants completed online surveys evaluating depression, anxiety, and academic performance during peak conflict months. Data were analyzed using SPSS version 27, with descriptive statistics for continuous and categorical variables, group comparisons via chi-square and t-tests, and multivariable logistic regression to identify predictors of mental health outcomes, adjusting for age, gender, and institution, with significance set at $P<0.05$.
Results: The prevalence of depressive symptoms reached 42.4% (mild: 26.6%, moderate: 11.5%, severe: 4.3%), with anxiety symptoms present in 81.2% of respondents (mild: 55.2%, moderate: 21.9%, severe: 4.1%). Female students demonstrated significantly higher depression rates than males (OR=2.3, 95% CI 1.4-3.8, $P=0.012$). Academically, 51.8% reported conflict-induced performance declines, primarily due to motivation loss (77.5%) and concentration difficulties (53.5%). Both depression and anxiety were significantly more prevalent among students with GPAs below 3.0 ($P<0.001$, $P=0.015$).
Conclusion: Sudanese medical students are experiencing mental health crisis levels during active conflict, with severe academic consequences. These findings underscore the need for urgent, context-specific support systems in war-affected medical schools.

Keywords: Medical education; Armed Conflicts, Psychological Trauma, Depression, Sudan

Introduction:

Sudan, a low-income country in Northeast Africa, has long faced economic hardship and a fragile healthcare infrastructure. With only 0.09 psychiatrists per 100,000 people and minimal mental health resources, the nation was ill-equipped to face the devastating psychological toll of the 2023 armed conflict.[1] The conflict has significantly disrupted daily life, with students, particularly those in the medical field, bearing a disproportionate burden due to displacement, exposure to trauma, and disrupted academic environments.[2] Medical students often engage in clinical training during crises, making them uniquely vulnerable to trauma, anxiety, and depressive symptoms.

Corresponding Author:
Anas Ibn Auf
3359 - Al Qumariyyah Dist. Unit No 4, At Taif 26523 – 6712. Kingdom of Saudi Arabia.
anasibnauf@hotmail.com

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Exposure to violence and gun-related trauma is a recognized risk factor for psychological distress, especially among young adults. Studies show that even witnessing a single violent incident can lead to acute stress and post-traumatic stress disorder (PTSD), particularly when prior instability exists.3 The 2023 Sudan conflict has had far-reaching psychological effects, with early estimates indicating high rates of depression (33.7%), anxiety (22.4%), PTSD (13.6%), and insomnia (59.5%) among medical students in the country.[4] These findings are consistent with evidence from other conflict-affected regions, such as Syria and Ethiopia, where students reported high levels of mental distress linked to war, displacement, and financial insecurity.[5,6]

Medical training is inherently stressful, and the additional burden of conflict can magnify its psychological impact. Studies have shown that mental health symptoms often emerge or worsen during medical school, with depression and anxiety particularly common among students facing academic and social stressors.[7] Furthermore, mental distress can negatively affect academic performance, concentration, and motivation, with long-term consequences for both students and the health systems they will eventually serve.[8] In the context of Sudan, where infrastructure damage and insecurity have further hindered educational continuity, medical students' academic performance is under threat.

Despite extensive literature on medical student mental health globally, data from conflict-affected regions in Africa remain limited, with only a small number of studies emerging from specific contexts such as Sudan.[4] Understanding how ongoing conflict impacts Sudanese medical students' mental well-being and academic outcomes is critical for guiding targeted interventions. Such research not only informs institutional support strategies but also highlights the resilience and vulnerabilities of future healthcare providers in low-resource, high-risk settings.[9]

This study aims to assess the prevalence of anxiety and depression among medical students at the University of Medical Sciences and Technology and the University of Khartoum during the 2023–2024 conflict in Sudan. Additionally, it seeks to evaluate the impact of psychological distress on academic performance, and to identify sociodemographic factors associated with these outcomes. Findings from this research may help inform mental health interventions and academic support strategies tailored to medical students in crisis settings.

Material and Methods:

This study employed a facility-based, descriptive, cross-sectional observational design. It was conducted at two of Sudan's leading academic institutions: the University of Medical Sciences and Technology (UMST) and the University of Khartoum (U of K). The University of Khartoum, established in 1902 as Gordon Memorial College and attaining university status in 1956, is the oldest and largest public university in Sudan. It has long been recognized as a premier academic institution both nationally and regionally. UMST, a private co-educational university located in the Riyadh district of Khartoum, was established in 1995 and attained full university status in 2007. It has grown significantly, now comprising 14 faculties and enrolling a diverse student population, including a substantial proportion of international students.[10,11] These two universities were selected for their academic prominence and the diversity of their student bodies, making them ideal sites for evaluating the mental health and academic outcomes of medical students during the ongoing conflict.

The study population consisted of fourth- and fifth-year medical students from both universities. Students in advanced years were targeted because of their advanced clinical training and the demanding nature of their academic responsibilities, which may heighten vulnerability to mental health challenges. Inclusion criteria were enrollment in the fourth or fifth year of study and willingness to participate in the study. Students in the first, second, or third year of study and those who declined participation were excluded.

Given the logistical challenges posed by the ongoing armed conflict in Sudan, particularly in Khartoum, a non-probability convenience sampling technique was utilized. A formal a priori sample size calculation was not feasible due to the absence of reliable sampling frames and the unstable security situation during the study period. Therefore, the final sample size was determined pragmatically,

based on the number of eligible fourth- and fifth-year medical students who were accessible and willing to participate during the data collection period (April–July 2024). A total of 255 students were included, which is comparable to or larger than sample sizes used in similar studies conducted in conflict-affected settings.

The questionnaire was composed of three parts. The first section covered demographic and academic performance information, including age, gender, academic institution, and self-reported academic performance. The second section assessed depressive symptoms using the Patient Health Questionnaire-9 (PHQ-9), a widely validated screening tool that measures the severity of depressive symptoms based on DSM-IV criteria. The third section evaluated anxiety symptoms using the Generalized Anxiety Disorder 7-item (GAD-7) scale, which has been validated as a general measure of anxiety and is commonly used in both clinical and research settings. The PHQ-9 scores each of the nine DSM-IV criteria on a scale from 0 ("not at all") to 3 ("nearly every day"), while the GAD-7 measures key symptoms of anxiety including nervousness, excessive worry, irritability, restlessness, and difficulty relaxing.[12,13] The primary dependent variables were the scores from the PHQ-9 and GAD-7 scales. Independent variables included socio-demographic characteristics such as age, gender, academic year, and institution, as well as academic performance indicators.

Academic performance was assessed using self-reported academic indicators collected through the questionnaire. These included cumulative grade point average (GPA), categorized as 2.0–3.0 and ≥3.1, the number of failed subjects, and self-rated academic performance (excellent, very good, good, moderate, poor, very poor). In addition, participants were asked whether the ongoing conflict had affected their academic performance and to specify the type of impact, including difficulties with concentration, loss of motivation, and absenteeism.

Data were exported from Google Forms into Microsoft Excel and subsequently analyzed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics were presented as frequencies and percentages. Chi-square tests were used to evaluate associations between categorical variables. A significance level of $P < 0.05$ was adopted for all statistical analyses.

Ethical approval was obtained from the UMST Research Ethics Committee. Electronic informed consent was obtained from all participants prior to data collection. Participation was voluntary, and anonymity and confidentiality were strictly maintained. The data collection process was designed to avoid any disruption to participants' academic activities or personal well-being.

Results:

A total of 255 students participated in this study from University of Medical Sciences and Technology and University of Khartoum. Sixty percent of participants were female, and 40% were male. The commonest age group was found to be 20-23 years (45.5%), followed by 24-26 years

Table 1. Sociodemographic and Academic Characteristics of the Participants (N = 255)

Variable		Category	Frequency (n)	Percentage (%)
Sociodemographic Characteristics	Gender	Male	102	40.0
		Female	153	60.0
	Age Group (years)	< 20	29	11.4
		20–23	116	45.5
		24–26	71	27.8
		> 26	39	15.3
	University	UMST	150	58.8
		University of Khartoum	105	41.2
Academic Information	Academic Year	Fourth Year	119	46.7
		Fifth Year	136	53.3
	GPA	2.0 – 3.0	118	46.3
		3.1 and above	137	53.7
	Number of failed subjects	None	131	51.4
		One	42	16.5
		Two	44	17.2
		Three or more	38	14.9
	Self-rated academic performance	Excellent	28	11.0
		Very Good	43	16.9
		Good	76	29.8
		Moderate	72	28.2
		Poor	31	12.2
		Very Poor	5	1.9
Mental Health & Academic Impact	Perceived impact of conflict on mental health	Yes	176	69.0
		No	79	31.0
	Perceived impact of conflict on academic performance	Yes	132	51.8
		No	123	48.2
	Perceived impact of negative emotions on academic performance	Yes	142	55.7
		No	113	44.3
	Type of academic impact	Inability to focus	76	53.5
		Lack of motivation to study	110	77.5
		Absences of lectures	58	40.8
		Others	13	9.2

(27.8%). The majority (58.8%) participated from University of Medical Sciences and Technology, while (41.2%) participated from University of Khartoum. The commonest academic year was fifth year (53.3%), followed by fourth year (46.7%) as shown in table 1.

The majority of students (69%) stated that the recent conflicts in Sudan have affected their mental health, while (31%) denied it. (51.8%) of students revealed that the recent conflicts in Sudan have affected their academic performance, while (48.2%) denied it. The majority (53.7%) had GPAs of 3.1 or more, while (46.3%) had GPAs of 2.0-3.0. The majority of students (51.4%) have not failed in any subject, while (17.2%) failed in two subjects, followed by one subject (16.5%). (29.8%) rated their academic performance as good, followed by moderate (28.2%) as shown in table 1.

The PHQ-9 results revealed that common depressive symptoms among students included low energy (32.9% felt tired more than half the days, plus 11.8% felt that nearly every day) and sleep disturbances (15.3% experienced them nearly every day). Notably, 31.4% of students reported having thoughts of self-harm or feeling better off dead, combining responses from 'several days,' 'more than half the days,' and 'nearly every day' (table 2). GAD-7 responses indicated widespread anxiety symptoms, with 38.8% reporting excessive worry on more than half the days, 13.3% experiencing it nearly every day, and 32.5% frequently feeling afraid as if something terrible might happen (table 2).

The prevalence of depression was found to be (42.4%), with mild depression (26.6%) being the most common form of depression, followed by moderate depression (11.5%) and lastly severe depression (4.3%), while (57.6%) did not have depression (Table 3). The same table also shows that the majority of students (55.2%) had mild anxiety, followed by moderate anxiety, then minimal anxiety (18.8%), and lastly, severe anxiety (4.1%). Significant associations were found between depression levels and gender, age and GPA (P -value = 0.012, 0.0002, and < 0.001, respectively) as shown in table 4. Furthermore, significant associations were found between anxiety levels and gender, age university, and GPA (P -value = 0.012,

Table 2. Distribution of PHQ-9 Depression Symptoms and GAD-7 Anxiety Symptoms among Participants (N = 255)

PHQ-9 Item	**Not at all** N (%)	**Several days** N (%)	**More than half the day** N (%)	**Nearly every day** N (%)
Little interest or pleasure in doing things	93 (36.5)	101 (39.6)	36 (14.1)	25 (9.8)
Feeling down, depressed, or hopeless	99 (38.8)	94 (36.9)	41 (16.1)	21 (8.2)
Trouble falling/staying asleep or sleeping too much	55 (21.6)	109 (42.7)	52 (20.4)	39 (15.3)
Feeling tired or having little energy	53 (20.8)	88 (34.5)	84 (32.9)	30 (11.8)
Poor appetite or overeating	14 (5.5)	113 (44.3)	76 (29.8)	52 (20.4)
Feeling bad about yourself or that you are a failure or let others down	78 (30.6)	83 (32.5)	55 (21.6)	39 (15.3)
Trouble concentrating (e.g., reading/watching TV)	121 (47.5)	85 (33.3)	27 (10.6)	22 (8.6)
Moving or speaking slowly or being fidgety/restless	187 (73.3)	42 (16.5)	16 (6.3)	10 (3.9)
Thoughts of being better off dead or self-harm	175 (68.6)	65 (25.5)	8 (3.1)	7 (2.8)
GAD-7 Item	**Not at all N(%)**	**Several days N(%)**	**More than half the days N(%)**	**Nearly every day N(%)**
Feeling nervous, anxious, or on edge	49 (19.2)	81 (31.8)	74 (29.0)	51 (20.0)
Not being able to stop or control worrying	57 (22.4)	82 (32.2)	67 (26.3)	49 (19.2)
Worrying too much about different things	31 (12.2)	91 (35.7)	99 (38.8)	34 (13.3)
Trouble relaxing	78 (30.6)	65 (25.5)	63 (24.7)	49 (19.2)
Being so restless that it is hard to sit still	103 (40.4)	77 (30.2)	54 (21.2)	21 (8.2)
Becoming easily annoyed or irritable	33 (12.9)	77 (30.2)	79 (31.0)	66 (25.9)
Feeling afraid as if something awful might happen	35 (13.7)	62 (24.3)	75 (29.4)	83 (32.5)

Table 3. Levels of Depression and Anxiety among Participants (N = 255)

Scale	**Severity Level**	**Frequency (n)**	**Percentage (%)**
PHQ-9 (Depression)	None	147	57.6
	Mild	68	26.6
	Moderate	29	11.5
	Severe	11	4.3
GAD-7 (Anxiety)	None	48	18.8
	Mild	141	55.2
	Moderate	56	21.9
	Severe	10	4.1
Total		255	100

Table 4: The association between depression levels and sociodemographic characteristics of students

Variables	Category	No depression: N (%)	Depression†: N (%)	*P*-value
Gender	Male (n=102)	69 (67.6)	33 (32.4)	0.012*
	Female (n=153)	78 (51.1)	75 (48.9)	
Age	16–18 years (n=29)	12 (41.4)	17 (58.6)	< 0.001*
	19–21 years (n=116)	84 (72.4)	32 (27.6)	
	22–24 years (n=71)	34 (47.8)	37 (52.2)	
	>24 years (n=39)	17 (43.6)	22 (56.4)	
University	UMST (n=150)	92 (61.4)	58 (38.6)	0.143
	Khartoum (n=105)	55 (52.2)	50 (47.8)	
Academic year	Fourth (n=119)	74 (62.0)	45 (38.0)	0.200
	Fifth (n=136)	73 (53.8)	63 (46.2)	
GPA	2.0–3.0 (n=118)	50 (42.4)	68 (57.6)	< 0.001*
	3.1+ (n=137)	97 (70.7)	40 (29.3)	

* Statistically significant (P < 0.05)
†Depression refers to the combined categories of mild, moderate, and severe depression.

0.00001, 0.037, and 0.015, respectively) as shown in table 5.

Table 5: The association between anxiety levels and sociodemographic characteristics of students

Variables	Category	Minimal anxiety N (%)	Mild anxiety N (%)	Moderate anxiety N (%)	Severe anxiety N (%)	*P*-value
Gender	Male (n=102)	27 (26.5)	45 (44.1)	26 (25.5)	4 (3.9)	0.012*
	Female (n=153)	21 (13.7)	96 (62.7)	30 (19.6)	6 (3.9)	
Age	16–18 years (n=29)	9 (31.0)	12 (41.4)	7 (24.1)	1 (3.4)	< 0.001*
	19–21 years (n=116)	16 (13.8)	91 (78.4)	7 (6.0)	2 (1.7)	
	22–24 years (n=71)	11 (15.5)	30 (42.3)	27 (38.0)	3 (4.2)	
	>24 years (n=39)	11 (28.2)	8 (20.5)	16 (41.0)	4 (10.3)	
University	UMST (n=150)	19 (12.7)	89 (59.3)	36 (24.0)	6 (4.0)	0.037*
	Khartoum (n=105)	29 (27.6)	52 (49.5)	20 (19.0)	4 (3.8)	
Academic year	Fourth (n=119)	24 (20.2)	62 (52.1)	28 (23.5)	5 (4.2)	0.763
	Fifth (n=136)	24 (17.6)	78 (57.4)	28 (20.6)	6 (4.4)	
GPA	2.0–3.0 (n=118)	13 (11.0)	67 (56.8)	31 (26.3)	7 (5.9)	0.015*
	3.1+ (n=137)	35 (25.5)	73 (53.3)	25 (18.2)	4 (2.9)	

* Statistically significant (P < 0.05)

Discussion

The present study demonstrated a high prevalence of depression and anxiety symptoms among Sudanese medical students during the ongoing conflict, emphasizing the significant psychological burden faced by this population. The findings are consistent with those of previous studies conducted in Sudan and other conflict-affected settings. For instance, studies conducted during the ongoing war in Sudan reported comparable rates of psychological distress among medical students, including high prevalence rates of depression and anxiety among displaced and exposed students.[4,14,15] The prevalence observed is also consistent with data from Ethiopia and Syria, albeit slightly lower, suggesting that students in unstable or crisis-affected environments are particularly vulnerable to mental health issues.[16,17] Additionally, findings from several studies reinforce the idea that stressors related to academic pressure and social instability can compound psychological vulnerability, even in more stable contexts.[18,19,20]

The association between gender and mental health outcomes is notable, with females reporting significantly higher levels of both depression and anxiety. This trend is consistent with findings across diverse cultural and geographical settings, including Syria and Ethiopia, where female students exhibited increased susceptibility to psychological distress.[16,17,18] Biological, social, and cultural factors likely contribute to these disparities, including heightened emotional responsiveness, societal expectations, and limited access to coping mechanisms.

Younger students in our sample demonstrated higher rates of anxiety, a finding that echoes observations in earlier studies from Sudan and other countries.[4,17] This may reflect a relative lack of psychological resilience or exposure to new and unfamiliar academic and environmental stressors among students. Interestingly, academic year and university affiliation were not significantly associated with depression or anxiety, diverging from some international studies that reported such associations.[4,21,22] The absence of these relationships in the present study may be due to the overriding influence of conflict-related stressors, which could overshadow typical academic stress patterns.

The inverse relationship between GPA and psychological symptoms underscores the potential impact of mental health on academic performance. Students with lower GPAs reported higher rates of depression and anxiety, suggesting a bidirectional relationship where psychological distress impairs academic functioning and poor academic outcomes, in turn, exacerbate mental health challenges. This relationship has been consistently documented in various settings, including among students facing war-related displacement or insecurity.[17,18,23]

Although findings were broadly consistent with previous literature, some discrepancies warrant further discussion. For example, the higher anxiety levels compared to depression observed in this study differ from trends in some non-conflict settings, where depression tends to be more prevalent. This may reflect the acute and unpredictable nature of wartime threats, which provoke heightened vigilance and worry.

This study's strengths include a substantial sample size and the use of validated screening tools. However, several limitations should be acknowledged. The use of convenience sampling and an online questionnaire limits the generalizability of findings and introduces potential bias, as participation may have been influenced by access to digital devices and internet connectivity. Moreover, the lack of data regarding participants'

current residence and displacement status limits the ability to contextualize psychological responses in terms of environmental exposure. The cross-sectional design also precludes causal inference, and the reliance on self-reported measures may have led to over- or underestimation of symptom severity. Despite these limitations, the findings underscore the urgent need for targeted psychological support for medical students in conflict-affected areas. Institutions should consider implementing structured mental health programs, including remote counseling services and resilience-building workshops, to mitigate the psychological impact of prolonged instability. Future research should explore longitudinal trends and incorporate qualitative approaches to better understand the lived experiences of students in such contexts.

This study concludes that the majority of Sudanese medical students believe they were psychologically affected by the ongoing war. High levels of depression and anxiety were observed, with significant associations identified between these symptoms and variables such as gender, age, GPA, and university. These findings not only highlight the psychological toll of the conflict but also indicate a detrimental impact on academic performance. The disruption to education and training poses a serious challenge to the development of future healthcare professionals. These results underscore the urgent need for context-specific mental health interventions and long-term strategies to support students in conflict-affected environments.

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Authors' contributions: Author 1 conceptualized the study, designed the methodology, collected data, and drafted the manuscript. Author 2 helped in conceptualizing the study, revising the methodology, supervised data collection, and helped in drafting the manuscript. Statistical analysis was conducted collaboratively by the authors. All authors contributed to data interpretation, critically revised the manuscript for important intellectual content, and approved the final version of the manuscript.

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