

Research Article

# Psychological Impact of War on Medical Students at Alzaeim Alazhari University, Khartoum/ Sudan 2024

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## Abstract

**Introduction:** Sudan war was started in April 2023, resulted in displacement of more than 10 million people and negatively impacted the psychological status of Sudanese population. This study aimed to determine the effect of war on the psychological status of Alzaeim Alazhari university (AAU) medical students. **Methodology:** Descriptive cross-sectional study was conducted on a purposive convenience sample of 201 medical students. DASS 21 score was used to measure depression, anxiety, and stress disorders among medical students. Frequency tables, Chi-squared ( $\chi^2$ ) tests and binary logistic regression analysis were used to identify the determinants of depression, anxiety and stress among medical students surveyed. All statistical tests were considered significant when  $p$ -value < 0.05. **Results:** More than half of the participants (56.7%) were females, aged 24 years or older (53.2%). Regarding the places to which participants were displaced due to the war, out of 181 participants (49.7%) reported that they were displaced to other cities in Sudan, while the remaining (50.3%) were displaced outside the country. Based on DASS-21 score, significant prevalence of depression (67.6%), anxiety (58.2%), and stress (53.2%) were identified among the participants. Gender ( $p$  value=0.001) and place of displacement ( $p$  value=0.007) were found to be strong determinants of depression. Females were 11.2 times more likely to exhibit depression, 14.4 times to suffer from anxiety and 12.9 times to have stress than males. Displacement outside Sudan affects the probability of developing depression by 7.3 times and stress by 4.7 times. Displacement to another city in Sudan found to affect the probability of exposure to stress by 4.3 times. **Conclusion:** War and displacement resulted in a high prevalence of depression, anxiety and stress among medical students. Females were more likely to experience depression and anxiety. Displacement and effects on the economic status play an important role in the deterioration of the psychological status. Efforts must be directed to decrease the burden of war on the medical students including psychological and financial support. Updated medical schools' curricula in Sudan as a coping strategy to suit the new situation after war are recommended.

## Keywords

Psychological, Impact, War, Medical Students, Depression, Anxiety, Stress Disorder, Displacement, Sudan

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## 1. Introduction

Sudan witnessed instability, poverty, and conflict, especially in the peripheries, before the war that began in April 2023 in the Sudanese capital, Khartoum. The war led to the displacement of approximately 9,052,822 persons according to the International Organization for Migration Displacement Tracking Matrix (IOM DTM) [1, 2].

According to the international rescue committee, the war erupted on 15<sup>th</sup> April 2023, has impacted other regions of the country including the states of Darfur, Kordofan and Gezira. Between April 2023 and August 2024, at least 15,500 people were killed and more than 10 million were displaced within the country, making it the largest displacement crisis globally. More than 12 million people have fled their homes, taking refuge inside and outside the country, with children representing about half of the people displaced [2]. The expansion of the conflict in Gezira State, the “breadbasket” of Sudan, has displaced more than 500,000 people and exacerbated the food crisis in the country. Meanwhile, the looting of businesses, markets and humanitarian aid warehouses contributes to food shortages [2].

In addition to displacement, war takes its toll on soldiers and civilians alike, both physically and emotionally. Physical consequences of war include injury, illness, disability, sexual violence and death [3]. The emotional effects include post-traumatic stress disorder (PTSD), depression, and anxiety. The terror and horror that war violence brings disrupts lives, tears apart relationships and families, and leaves individuals and communities in a state of emotional turmoil [1].

Psychosocial impact on medical students in conflict zones is profound, often leading to a spectrum of mental health disorders, including PTSD, depression, and anxiety [1, 4]. There are 71 medical faculties in Sudan spread throughout the country, including about 40 medical faculties in Khartoum state, which includes the faculty of medicine at Alzaim Alazhari University (AAU) [5, 6]. Thousands of students join every year, from Sudanese and other nationalities such as Syrians, Yemenis, Palestinians, Jordanians, Egyptians and Nigerians [7].

In general medical students are under risk of psychological problems for many reasons, such as mentally and emotionally demanding medical school programs, financial burden, high workload student abuse (which is defined as verbal or physical abuses to students during their academic career), and sleep deprivation [1, 8]. Additionally, exposure to sick and dead people can have a negative impact on their mental health, putting them at the risk of depression and anxiety [8, 9].

Depression is responsible for the greatest amount of disability worldwide, demonstrated by depressed mood most days and sometimes all day; markedly decreased interest or pleasure, reduced energy as associated with appetite and weight loss, insomnia, feelings of guilt or low self-esteem, and poor concentration [10-12]. Anxiety is worry and tension that leads to physical changes such as high blood pressure. Both depression and anxiety lead to stress that interferes with normal life [8, 10].

The war, since started in April 2023, exposed most of Sudanese people to physical and psychological trauma on daily basis and this put additional distress on medical students as exposure to violence, displacement, loss of relatives or colleagues, social disruptions and disruptions to medical education [1].

Moreover, students in Sudan have been suffering from psychological pressure since 2019, due to instability and political unrest that led to the closure of all educational institutions and the cessation of the educational process. This is in addition to the negative impact of the Covid-19 pandemic, and the ongoing war [13].

Recognizing that medical students, like the rest of society, are vulnerable to emotional and mental health challenges resulting from war, this study aimed to identify the psychological impact of the war on medical students at AAU. This is considered necessary to identify programs and areas of intervention needed to address and mitigate the adverse psychological impacts of the war.

## 2. Methodology

### 2.1. Study Design and Population

Descriptive cross-sectional study was conducted from November 2023 to April 2024 on a purposive convenience sample of 201 medical students. The study population consisted of AAU medical students who had smart phones and good access to the internet during the data collection period. Data were collected using pre-tested and pre-coded questionnaires to collect the required information. A pilot study was conducted, and the questionnaire was modified accordingly.

### 2.2. Statistical Analysis

The statistical package for social sciences (SPSS 23) was used to summarize the data numerically (mean, standard deviation, median) and graphically (frequency tables). Associations between categorical variables were determined through the Chi-squared ( $\chi^2$ ) tests. A binary logistic regression analysis was used to identify the determinants of depression, anxiety and stress among medical students surveyed. All statistical tests were considered significant when  $p$ -value < 0.05.

### 2.3. The Scoring System

Depression Anxiety and Stress Scale (DASS) 21 score was used to measure depression, anxiety, and stress disorders among the surveyed medical students [14]. The score is composed of 21 questions, these items are also arranged into subscales; depression, anxiety, and stress; with 7 items for each subscale.

The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement,

anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, being easily upset/agitated, irritable/over-reactive, and impatient. Scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items. Each subclass's score equals the sum of seven corresponding questions. The sum scores are multiplied by 2 to match the original scale score in DASS-42. Each subscale score ranges from 0 to 42. For depression, scores below 9 are considered 'normal', 10–13 are 'mild', 14–20 are 'moderate', 21–27 are 'severe' and scores greater than 28 are considered 'extremely severe'. Scores below 7 on the anxiety subscale meet 'normal' category, while 8–9 are considered 'mild', 10–14 are considered 'moderate', 15–19 are considered 'severe' and scores above 20 are considered 'extremely severe'. Stress scores below 14 meet 'normal' status, scores between 15 and 18 indicate 'mild' stress, 19–25 correlate with 'moderate' stress, 26–33 are 'severe' stress, and scores greater than 34 meet 'extremely severe' stress [14].

#### *Ethical approval and consent to participate.*

Ethical approval was granted from Alzaiem Alazhari University Institutional Review Board (IRB) and the Sudan Ministry of health (MOH). Written informed consent was taken from each participant with assurance of confidentiality and all rights.

### 3. Results

A total of 201 medical students participated in the study. More than half of the participants (114, 56.7%) were females, aged 24 years or older (107, 53.2%). Most of the medical students (197, 98.0%) were single. Regarding the year of the study, most of them (128, 63.7%) were final medical students (in the fifth year). Most of the participants (198, 98.5%) were Sudanese, as shown in Table 1.

**Table 1.** Demographic characteristics of the participants, (n = 201).

Variables	Frequency	Percent (%)
Gender:		
Female	114	56.7
Male	87	43.3
Age groups:		
18 -20 years	24	11.9
21 – 23 years	70	34.8
24 years or more	107	53.2
Marital status:		
Single	197	98.0

Variables	Frequency	Percent (%)
Married	4	2.0
Year of study:		
First year	7	3.5
Second year	15	7.5
Third year	12	6.0
Fourth year	39	19.4
Fifth year	128	63.7
Nationality:		
Sudanese	198	98.5
Non-Sudanese	3	1.5

Investigation related to the original residence in Sudan revealed that more than half of the medical students (118, 59.6%) were originally living in Khartoum state, while the rest of (80, 40.4%) were living in other states. Most of the participants (170, 85.9%) reported that the states where they live were affected by the war.

Regarding the places to which participants were displaced due to the war, out of 181 participants (90, 49.7%) reported that they were displaced to other cities in Sudan, while the remaining participants (91, 50.3%) were displaced outside the country. Only (51, 25.4%) of participants reported having experienced physical harm either to themselves or to first-degree family members, Table 2.

The Investigation on the impact of war on the monthly income of participants' families showed that the war had a negative impact on the monthly income of most of the participants' families (153, 76.1%). As presented in Figure 1, for those families, the change in monthly income ranged between a slight, moderate and severe, and a complete cessation, with percentages reaching (8%), (26.9%), (17.9%) and (23.4%) of the respondents, respectively. About (20.4%) of the respondents noted that their families' monthly income was not affected by the war, while about (3.5%) reported that their families' monthly income had increased.

**Table 2.** Distribution of participants according to their place of residence, place of displacement and the impact of war, (n = 198).

Variables	Frequency	Percent (%)
Residence in Sudan:		
Khartoum state	118	59.6
Other states	80	40.4
Was your home state affected by the war?		
Yes	170	85.9

Variables	Frequency	Percent (%)
No	28	14.1
Place of displacement after war (n = 181):		
Another city in Sudan	90	49.7
Outside Sudan	91	50.3
Physical damage to self or to first-degree family member (n = 201):		
Yes	51	25.4
No	150	74.6
Has your family's monthly income been affected by the war?		
Yes	160	79.6
No	41	20.4

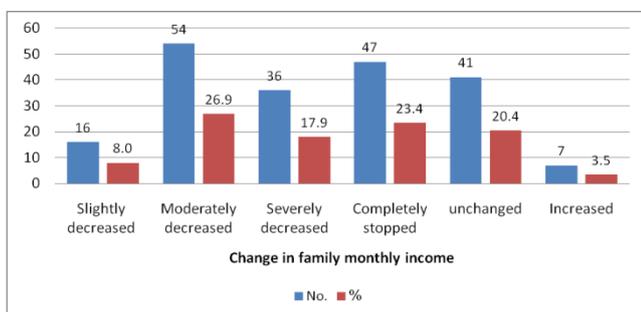


Figure 1. Distribution of participants according to changes in family monthly income due to the war (n = 201).

Based on DASS-21 score, significant prevalence of symptoms of depression, anxiety, and stress were identified among the study participants. As presented in Figure 2, (136, 67.6%) of the participants experienced depression, (117, 58.2%) had anxiety and (107, 53.2%) were diagnosed with stress disorder. The severity of psychological distress and symptoms was assessed according to depression, anxiety and stress Scale (DASS-21). The distribution of respondents within each of the five categories of DASS subscales is presented in Table 3. About (67.6%) of the respondents were identified as symptomatic of depression, distributed equally between those with mild and moderate cases of depression, (33.8%) and those with severe and extremely severe cases of depression (33.8%). For the (58.2%) who were identified as symptomatic of anxiety, (23.9%) were with mild and moderate cases, while (34.3%) with severe and extremely severe

cases of anxiety. As for the (53.2%) of the respondents who were identified as suffering from symptoms of stress, (28.8%) were suffering from mild and moderate cases, while (24.4%) were suffering from severe and extremely severe cases of stress.

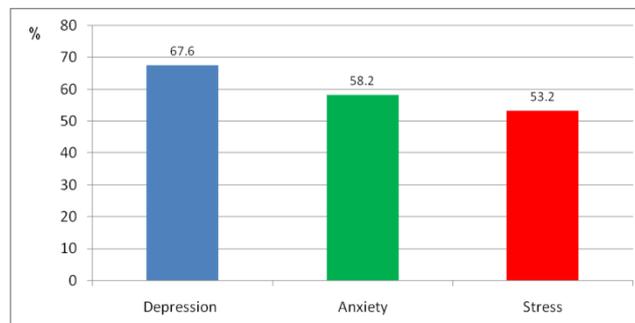


Figure 2. Prevalence of depression, anxiety and stress among participants according to the DASS-21 score, (n = 201).

Table 3. Distribution of the participants according to the prevalence of psychological distress based on the categorization of their DASS-21 subscale scores, (n = 201).

	Depression		Anxiety		Stress	
	N	%	N	%	N	%
Normal	65	32.3	84	41.8	94	46.8
Mild	28	13.9	18	9.0	30	14.9
Moderate	40	19.9	30	14.9	28	13.9
Sever	23	11.4	22	10.9	33	16.4
Extremely sever	45	22.4	47	23.4	16	8.0

Cross tabulation between depression and the demographic characteristics of the participants revealed a significant association with gender and place of displacement, *p value* = 0.000 and 0.0007 respectively. Anxiety revealed a significant association with gender and the physical damage, *p value* = 0.000 and 0.0027 respectively. Stress revealed a significant association with gender and place of displacement, *p value* = 0.000 and 0.0008 respectively, Table 4. War effect on monthly income revealed no significant association when tested in cross tabulation with depression, anxiety and stress, *p value* = 0.077, 0.313 and 0.019 respectively, Table 4.

**Table 4.** Cross tabulation between depression, anxiety and stress and the demographic characteristics of the participants, (n = 201).

Variables	Depression			Anxiety			Stress		
	No	Yes	<i>P value</i>	No	Yes	<i>P value</i>	No	Yes	<i>P value</i>
Gender:									
Female	25	89	0.000	34	80	0.000	40	74	0.000
Male	40	47		50	37		54	33	
Marital status:									
Married	0	4	0.207	0	4	0.112	1	3	0.361
Single	65	132		84	113		93	104	
Has your home state been affected by the war?									
No	11	20	0.415	13	18	0.568	16	15	0.347
Yes	54	116		71	99		78	92	
Place of displacement (n = 181):									
Another city in Sudan	38	52	0.007	41	49	0.239	49	41	0.008
Outside Sudan	19	72		33	58		32	59	
Physical damage to self or first-degree family member:									
No	53	97	0.082	69	81	0.027	77	73	0.019
Yes	12	39		15	36		17	34	
Has your family's monthly income been affected by the war?									
No	9	32	0.077	19	22	0.313	18	23	0.407
Yes	56	104		65	95		76	84	

The results of binary logistic regression identifying the determinants of depression, anxiety, and psychological stress are presented in Table 5. Gender and place of displacement were the only significant factors found to be strong determinants of depression and stress, with *p* value (0.001) and (0.007), respectively. Females were 11.2 times more likely to exhibit depression than males. Displacement outside Sudan affects the probability of developing depression by 7.3 times. It was found that anxiety incidences were only associated with

gender as a strong determinant, *p* value = (0.00). Females were 14.4 times more likely to suffer from anxiety than males. Moreover, gender and place of displacement were found to be strong determinants of stress. For gender variable, *p* value was (0.00), with females being 12.9 times more likely to experience stress than males. Displacement to another city in Sudan found to affect the probability of exposure to stress by 4.3 times, while displacement outside Sudan found to affect the probability of exposure to stress by 4.7 times, Table 5.

**Table 5.** Summary of the binary logistic regression presenting factors influencing depression, anxiety and stress among the participants, (n = 201).

Variables	<i>P value</i>	Odd ratio	C. I
Depression:			
Gender:			
Male (ref.)			
Female	0.001	11.213	2.926
Place of displacement:			

Variables	P value	Odd ratio	C. I
Another city in Sudan	0.135	2.237	0.441
Outside Sudan	0.007	7.299	0.392
Physical damage	0.393	1.333	0.635
Anxiety:			
Gender:			
Male (ref.)			
Female	0.000	14.399	3.161
Place of displacement:			
Another city in Sudan	0.457	0.553	0.677
Outside Sudan	0.453	0.564	0.786
Physical damage	0.060	3.549	0.502
Stress:			
Gender:			
Male (ref.)			
Female	0.000	12.915	2.998
Place of displacement:			
Another city in Sudan	0.039	4.271	0.327
Outside Sudan	0.030	4.683	0.501
Physical damage	0.071	3.255	0.523

## 4. Discussion

The aim of this study was to identify the psychological impact of the war on medical students at AAU based on students' socio-demographic and psychological distress variables. Results of the study revealed high prevalence of depression (67.6%), anxiety (58.2%) and stress (53.2%). These results were similar to Al Saadi *et al.* results as they reported high prevalence of depression (60.6%), anxiety (35.1%) and stress (52.6%) [10]. Similarly, other study that assessed the mental health and coping strategies after war reported high prevalence of depression (46.8%) and anxiety (54.1%) [15].

Another study in Sudan that was conducted at the beginning of war reported lower level of psychological distress among medical students (33.7% depression, 22.4% anxiety and 13.6% stress) [1]. These differences can be justified by the fact that our study was done after one year of the war. This long duration might be the reason behind the deterioration of the psychological status of the medical students.

According to the DAAS-21 score psychological distress categorization, 22.4% had severe depression, 23.4% had severe anxiety and 16.4% had severe stress. These results were similar to Mohamed *et al.* results [16].

In our study females were more likely to have depression, anxiety and stress. Similarly, Al Saadi *et al.* reported high prevalence of depression among females [10]. Another study reported that females were more likely than males to experience psychological distress [17].

Our study revealed that displacement outside Sudan increase the risk of depression and stress when compared with displacement to another city in Sudan. This can be explained by two factors, most of the students who were displaced to other cities in Sudan went to live with their relatives and in their original rural areas that they used to live there. From the other hand, displacement outside Sudan is considered cost effective and surrounded by some risks and instability. Kakaje *et al.* reported that the displacement was to half of the participants and 27.6% were displaced more than three times [18].

## 5. Conclusion

Medical students at AAU suffer from a high rate of psychological disorders including depression, anxiety and stress. The psychological status of medical students was found to be deteriorated by the long duration and continuation of war. Females were more susceptible to the psychological disorders than men. Displacement and effects on the economic situa-

tions play an important role in the deterioration of the medical students' psychological status. Efforts must be directed to decrease the burden and effect of war on the medical students. It recommended to update the medical schools' curricula in Sudan as a coping strategy to suit the new situation after war, aiming to decrease the stress and burden of war among the medical students. Financial and psychological and emotional support programs are needed to be established for displaced medical students in Sudan. Further studies about the effect of war on medical students and Sudanese population are needed to address the burden and effect of war. Other exposed groups including children, women, elderly and disabled need to be assessed.

## 6. Study Limitations

The online data collection has limited the accessibility of the survey to the medical student with available internet connection and smart phones in areas of displacement inside and outside Sudan. The data was collected online due to difficulty to conduct direct interviews due to war situation inside Sudan.

## Abbreviations

AAU	Alzaim Alazhari University
DAAS	Depression Anxiety and Stress Scale
IOM DTM	International Organization for Migration Displacement Tracking Matrix
IRB	Institutional Review Board
MOH	Ministry of Health
PTSD	Post-traumatic Stress Disorder
SPSS	Statistical Package for Social Sciences

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## Consent for Publication

Not applicable.

## Clinical Trial Number

Not applicable.

## Author Contributions

**Hiba Salah Abdelgadir:** Conceptualization, Data curation, Formal Analysis, Methodology, Supervision, Writing – orig-

inal draft, Writing – review & editing

**Leena Lotfi Mohamed:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing – original draft

**Lina Moawia Babiker:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing – original draft

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**Hind Salah Abdelgadir:** Formal Analysis, Methodology, Supervision, Writing – review & editing

**Mosab Abdelgader Ahmed:** Formal Analysis, Methodology, Supervision, Writing – review & editing

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## Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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## Research Fields

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