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Prevalence and Associated Factors of PTSD Among Displaced Children and Adolescents

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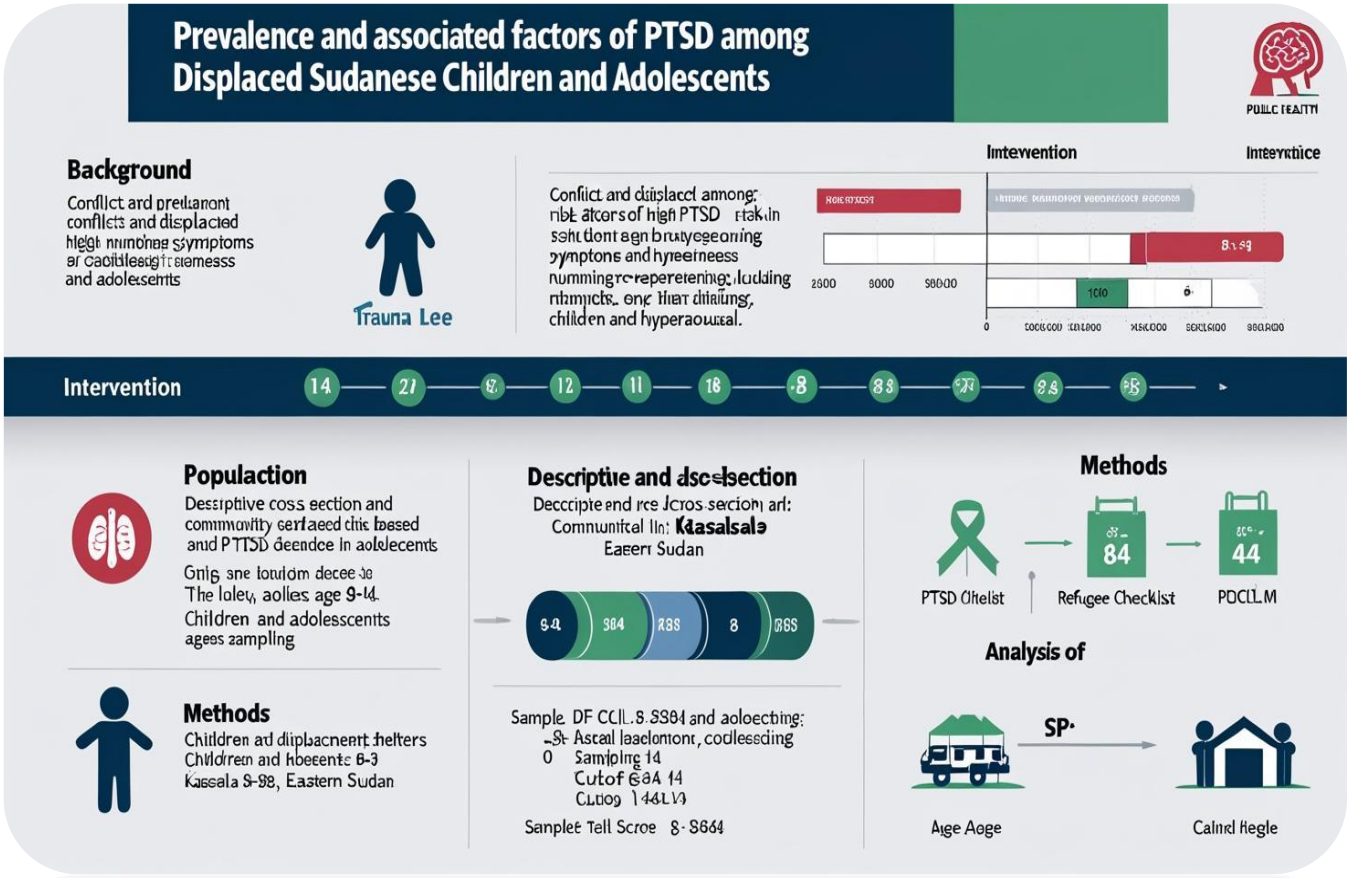
Visual Abstract



Abstract

Background:

POSt-Traumatic Stress Disorder (PTSD) is a significant mental health concern among children and adolescents from displaced areas, often stemming from exposure to war, conflict, and forced migration. These experiences disrupt normal development and increase vulnerability to psychological distress. Studies have shown that displaced youth frequently exhibit symptoms such as re-experiencing trauma, emotional numbness, and hyperarousal, underscoring the need to address PTSD in this population to foster resilience and improve long-term mental health outcomes.

Objective: To determine the prevalence of PTSD and its associated factors among Sudanese children and adolescents living in displacement shelters in Kassala, Eastern Sudan.
Methods: A descriptive cross-sectional community-based study was conducted in Kassala displacement shelters targeting Sudanese children and adolescents aged 8–18 years. A sample of 384 participants was selected by simple random sampling. Data were collected through structured, closed-ended interviews using a PTSD checklist (PCL-M). PTSD was assessed with a cutoff score of 44. Data were analyzed with SPSS 28.0, using descriptive statistics and chi-square tests for associations.

Results: Of the 384 participants (mean age ~13 years), 52.6% were female and 92.0% were of low socioeconomic status. Most originated from Khartoum State (70.0%). The mean PTSD checklist score was 52.3 (SD = 8.7). PTSD prevalence was **50.8%**, using the cutoff score of 44. Younger age and lower education level were significantly associated with higher PTSD prevalence ($p < 0.05$). No significant association was found between PTSD and socioeconomic status ($p = 0.78$).
Conclusion: There is a high prevalence of PTSD among displaced Sudanese children and adolescents in Kassala shelters, reflecting the heavy psychological toll of conflict on youth. Younger children and those with less education were more likely to have PTSD, indicating the need for targeted mental health interventions for these groups. Although socioeconomic status was not significantly linked to PTSD in this study, the overall findings highlight the importance of addressing mental health challenges among displaced youth to promote resilience and well-being.

Keywords:
Post-Traumatic Stress Disorder (PTSD); Displacement; Children and Adolescents; Sudan; Conflict; Mental Health; Prevalence; Risk Factors; Kassala; PCL-M Checklist.

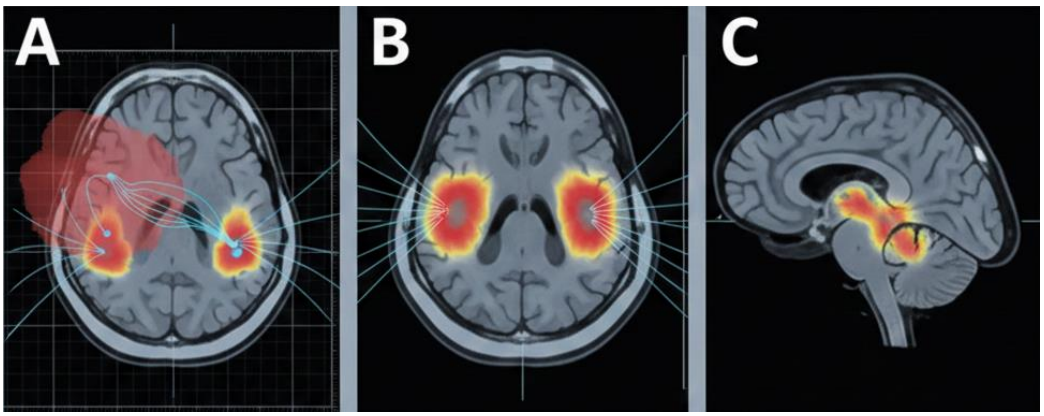


Figure 1. Radiologic-Inspired Illustrationof Neurobiological Stress Patterns Associated With PTSD in Displaced Children and Adolescents

Figure Caption

This conceptual image uses MRI/CT-style visualization to symbolically represent brain regions commonly implicated in post-traumatic stress disorder, including areas associated with hyperarousal, emotional memory, and stress processing. Letter labels (A–F) denote diagram elements without identifying real anatomical structures. The illustration does not depict any real patient but serves as a visual abstraction of the neurobiological burden of trauma among displaced Sudanese children and adolescents.

Introduction

PTSD is a trauma-related disorder that causes individuals to experience recurrent, intrusive memories and dissociative reactions after exposure to a traumatic event[1]. Worldwide, children growing up in unstable or violent environments are particularly vulnerable to developmental and mental health problems [2]. PTSD in children and adolescents can result from exposure to abuse, severe danger, or interpersonal violence, leading to long-term emotional and behavioral disorders[3]. In conflict zones, trauma such as home demolition, witnessing injury or death of family members, or bombardment creates feelings of unsafety and interferes with daily functioning[4]. Other compounding factors like poverty and deprivation in war settings have also been linked to mental health disorders in low-resource countries[5]. The core symptom clusters of PTSD include intrusive re-experiencing of the trauma, avoidance of trauma reminders, hyperarousal persisting for over one month, and negative alterations in mood and cognition[6]. Although many symptoms can occur, key diagnostic features are reliving the trauma in the present, a persistent sense of current threat, and avoidance of reminders of the traumatic event[7][8]. PTSD can affect individuals

long after the precipitating event; for instance, approximately 8 million people are estimated to suffer from PTSD annually, and stress-related mental illnesses rank among the leading causes of disability globally[9]. The World Health Organization recognizes political violence as a major public health threat, especially for children and adolescents. A meta-analysis by Agbaria et al. reported an overall PTSD prevalence of about 36% among conflict-exposed children and adolescents[6], highlighting the immense psychological burden in war-torn settings. Diagnosing PTSD in children poses unique challenges due to developmental differences in symptom expression, but criteria have been adapted to pediatric populations[10]. Cohen and Scheeringa have noted both the challenges and promising advances in diagnosing PTSD in children[11]. Despite extensive global research on trauma, there is a paucity of published data on PTSD among displaced youths in Sudan. This study addresses this gap by examining PTSD prevalence and associated factors among displaced Sudanese children and adolescents in Kassala, aiming to inform targeted mental health interventions for this vulnerable group.

Literature Review

Prevalence of PTSD in Conflict-Affected Youth: Multiple studies highlight the substantial PTSD burden among children and adolescents in war and displacement contexts. Tamir et al. reported a PTSD prevalence of 40.8% in war-affected youths in northwest Ethiopia, with risk factors including insufficient social support and chronic medical conditions[12]. In Nepal, Rawal et al. found that even 15 years after insurgency, a significant proportion of former child soldiers and veterans suffered from PTSD, though they observed no association of PTSD with age or education level[13]. In Ethiopia's Amhara region, Biset et al. documented PTSD symptoms in over one-third of conflict-exposed children (36.45%), with about one in eight children developing a severe form of PTSD[14]. In war-torn Syria, Kakaje et al. noted approximately 53% of school students met PTSD criteria after years of conflict[15]. By contrast, Shahini and Shala observed that about 11% of Kosovo war veterans continued to experience PTSD nearly eight years post-conflict, indicating lingering effects even in adulthood[16]. A systematic review by Tesfaye et al. pooled data from displaced populations across Africa and found an alarmingly high PTSD prevalence (~51%), with female gender, multiple traumatic events, and lack of medical care identified as significant risk factors[17]. Even outside active war zones, vulnerable groups show high PTSD rates: for example, Melese et al. reported 37.3% PTSD prevalence among Eritrean refugee youth, influenced by factors such as prolonged displacement, lack of basic needs, and exposure to violence[18]. These findings underline that children and adolescents in conflict and post-conflict environments are at greatly elevated risk of PTSD.

Risk and Protective Factors: Across diverse settings, certain factors consistently emerge as influencing PTSD development in young people. Exposure to interpersonal trauma (e.g. maltreatment or sexual abuse) markedly raises PTSD risk, as evidenced by Wolfe et al.'s work on child abuse survivors[3]. Chronic or repeated trauma has a cumulative effect: Foy et al. noted that multiple traumatic experiences and proximal etiologic factors contribute significantly to PTSD in children[19]. Socioeconomic and cultural contexts also play a role. El-Khodary et al. found that among Palestinian youth, demographic and socioeconomic factors (like poverty and displacement status) modulated PTSD outcomes[4]. Marsella and Christopher have emphasized ethnocultural considerations in how children respond to disasters and conflict, noting that cultural context can shape symptom expression and coping[20]. On a positive note, supportive environments and interventions can mitigate PTSD impact. Gkintoni et al. conducted

a systematic review demonstrating the clinical efficacy of various psychotherapeutic interventions for PTSD in children and adolescents[21], indicating that evidence-based treatments can significantly improve outcomes even in resource-limited settings. Overall, the literature suggests that while conflict-exposed youth globally show high PTSD prevalence, factors such as gender, social support, cumulative trauma, and cultural context influence the severity and manifestation of PTSD. This body of research provides a foundation for examining the situation of displaced Sudanese children and adolescents and for identifying which factors are most salient in this context.

Methods

Study Design and Setting: This study was a descriptive cross-sectional survey conducted in community displacement shelters in Kassala, Eastern Sudan. Kassala has become a refuge for many families displaced by conflict (notably the war that began in April 2023), providing a relevant setting to investigate PTSD among displaced youth.

Study Population: The target population comprised internally displaced Sudanese children and adolescents aged 8–18 years residing in Kassala's displacement shelters. Inclusion criteria were Sudanese boys and girls in the specified age range who had been displaced from conflict-affected areas. Children with known psychiatric disorders or whose families had known psychiatric history were excluded to avoid confounding mental health conditions.

Sample Size and Sampling: A sample size of 384 was determined using the formula for a single proportion: n = (Z^2 * P * Q) / (D^2), assuming 95% confidence (Z = 1.96), an expected prevalence P = 0.5 (to maximize sample size), Q = 1–P, and a 5% margin of error (D = 0.05). This yielded n ≈ 384[22][23]. Participants were selected by simple random sampling from the eligible population in the shelters, ensuring each child had an equal chance of inclusion.

Data Collection: Data were collected through structured, close-ended interviews administered by the researcher. A questionnaire was used to record demographic information (age, gender, education level, socioeconomic status, and place of origin) and to assess PTSD symptoms. PTSD was measured using the PTSD Checklist – Military Version (PCL-M), adapted for the civilian context of displaced youth. The PCL-M consists of 17 items corresponding to PTSD symptoms (intrusion, avoidance/numbing, and hyperarousal), rated on a 5-point Likert scale from 1 ("Not at all") to 5 ("Extremely"). Interviews were conducted in privacy after obtaining informed consent from a parent or guardian.

Variables: The study's independent variables included age (categorized into 4 groups), gender, educational level (none, primary, secondary, or employed out-of-school youth), socioeconomic status (classified as low or moderate, as no high-income participants were present), and family support (qualitatively noted). The dependent variable was PTSD status, determined by the PCL-M score. A cutoff score of 44 (recommended for general populations) was used to classify participants as PTSD-positive or PTSD-negative.

Data Analysis: Data were entered and analyzed using IBM SPSS version 28. Descriptive statistics were generated for all variables. Categorical data were summarized as frequencies and percentages, and are presented in tables and figures. Continuous data (PCL-M scores) were summarized using mean and standard deviation. To examine associations between PTSD prevalence and participant characteristics, bivariate analyses were performed: chi-square tests for categorical factors (age group, gender, education, socioeconomic status) and t-tests for any continuous variables (not applicable beyond

the PTSD scores). The significance level was set at $p < 0.05$ for all tests. Results are presented in contingency tables (cross-tabulations) for key factors with their chi-square values and p-values.

Ethical Considerations: Ethical approval for the study was obtained from the Sudan Medical Specialization Board's ethics committee. Permission was also granted by local authorities managing the displacement shelters. Informed consent was secured from the parents or legal guardians of participating children, and assent was obtained from the children/adolescents themselves. Interviews were conducted with sensitivity to the potentially traumatic nature of questions, and participants were assured that they could skip any question or discontinue at any time. Confidentiality of responses was maintained; no personal identifiers appear in the dataset, and data were used solely for research purposes. Children identified as having severe psychological distress were referred to available counseling services in Kassala.

Results

Demographic Characteristics: The study included 384 displaced children and adolescents aged 8 to 18 years. Table 1 and Figure 1 summarize the age distribution of participants. The largest age group was 11–13 years (32.6% of the sample), followed by 14–16 years (29.9%). Younger children aged 8–10 years made up 19.5%, and older teens 17–18 years constituted 18.0%. This distribution indicates a balanced representation across childhood and adolescence, with slightly more early adolescents in the sample.

Table (1): The distribution of the study participants according to their age - years (n = 384 internally displaced children in displaced areas in Kassala state, Sudan 2024)

Age group	Frequency	Percentage (%)
8 - 10 years	75	19.5
11 - 13 years	125	32.6
14 - 16 years	115	29.9
17 - 18 years	69	18.0
Total	384	100

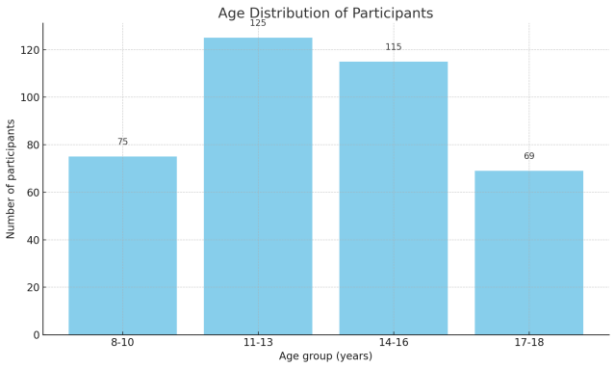


Figure 1: The distribution of the study participants according to their age (years) (n = 384 internally displaced children in Kassala state, Sudan, 2024).

Table 2 and Figure 2 show the gender breakdown. There were 202 females (52.6%) and 182 males (47.4%), yielding a female-to-male ratio of about 1.1:1. This slight female predominance reflects the composition of the displaced community sampled.

Table (2): The distribution of the study participants according to their gender (n = 384 internally displaced children in displaced areas in Kassala state, Sudan 2024)

Gender	Frequency	Percentage (%)
Male	182	47.4
Female	202	52.6
Total	**384**	**100**

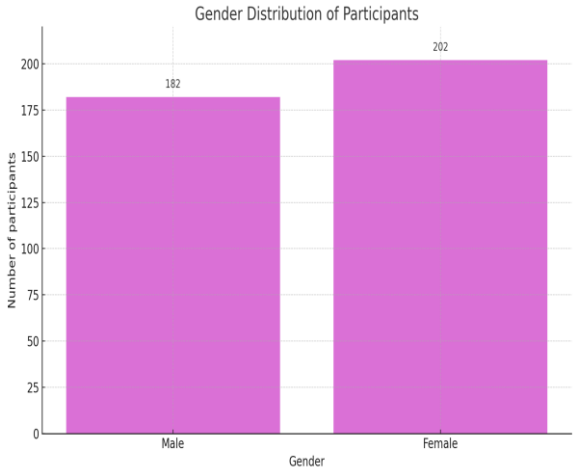


Figure 2: The distribution of the study participants according to their gender (n = 384 internally displaced children in Kassala state, Sudan, 2024).

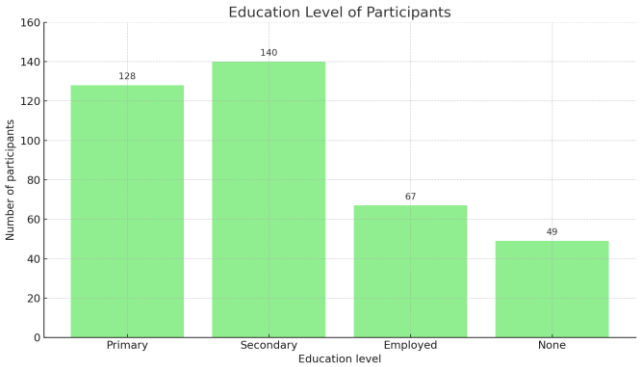


Figure 3: The distribution of the study participants according to their education level (n = 384 internally displaced children in Kassala state, Sudan, 2024).

In terms of educational status (Table 3, Figure 3), over two-thirds of participants were in school. Specifically, 33.3% were attending primary school and 36.5% were in secondary school at the time of study. A smaller portion (17.4%) were classified as "employed" (indicating adolescents who had left school for work), and 12.8% had no formal education. The educational distribution highlights that the majority were school-aged and engaged in schooling, with a minority having interrupted or no education (likely due to displacement and conflict).

Nearly all participants came from economically disadvantaged backgrounds. As shown in Table 4, 92.0% of the children were from families of low socioeconomic status, with only 8.0% in a moderate status and none in a high socioeconomic bracket. Table 4 Figure 4 illustrates this stark predominance of low socioeconomic status among the sample, underlining the severe economic hardships faced by displaced families.

Table (3): The distribution of the study participants according to their education level (n = 384 internally displaced children in displaced areas in Kassala state, Sudan 2024)

Education level	***Frequency***	***Percentage (%)***
Primary school	128	33.3
Secondary school	140	36.5
Employed	67	17.4
None	49	12.8
Total	**384**	**100**

Table (4): The distribution of the study participants according to their socioeconomic status (n = 384 internally displaced children in displaced areas in Kassala state, Sudan 2024)

Socioeconomic Status	**Frequency (n)**	**Percentage (%)**
Low	353	92.0
Moderate	31	8.0
Total	**384**	**100**

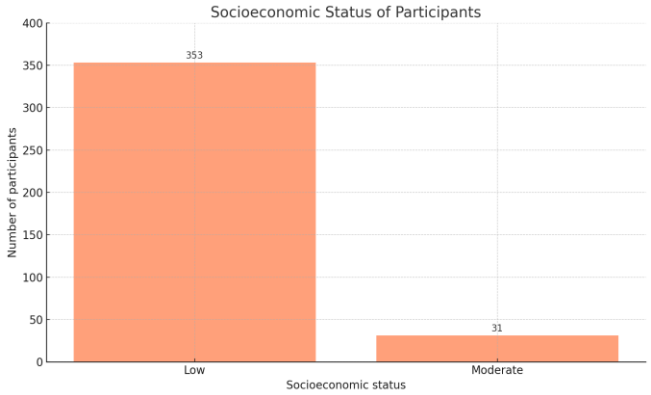


Figure 4: The distribution of the study participants according to their socioeconomic status (n = 384 internally displaced children in Kassala state, Sudan, 2024).

The geographical origin of the children (Table 5) was heavily skewed toward certain conflict-affected regions. The majority (70.0%) originated from **Khartoum State**, reflecting displacement from the capital region during conflict. The next most common origins were Al-Gazira State (15.1%) and Sinnar State (9.1%), with a smaller representation from North Kordofan (3.9%). About 1.9% came from various other regions. Figure 5 shows the dominance of Khartoum as the home region for these displaced youths, followed by smaller contributions from adjacent central states. This concentration suggests that the conflict and displacement events leading to the Kassala shelter population particularly affected families from central Sudan.

Table (5): The distribution of the study participants according to their origin (n = 384 internally displaced children in displaced areas in Kassala state, Sudan 2024)

Origin	Frequency	Percentage (%)
Khartoum State	269	70.0
Gazira State	58	15.1
Sinnar State	35	9.1
North Kordofan State	15	3.9
Others	7	1.9
Total	**384**	**100**

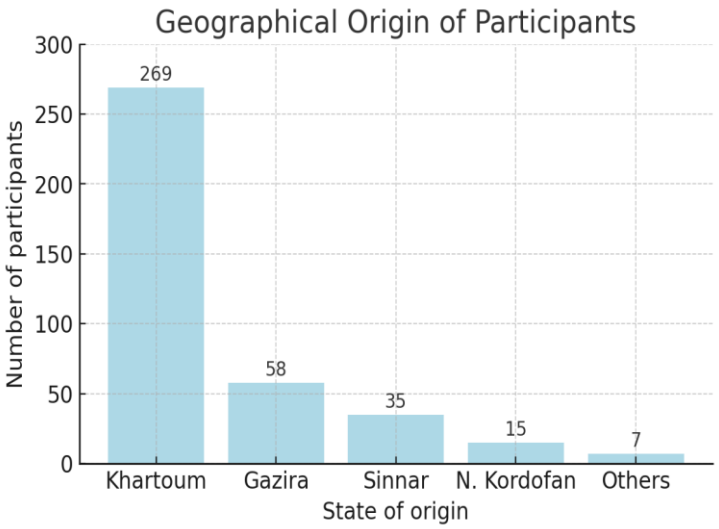


Figure 5: The distribution of the study participants according to their origin (state of origin in Sudan) (n = 384 internally displaced children in Kassala state, Sudan, 2024).

Post-Traumatic Stress Disorder (PTSD)

Assessment: All participants were assessed for PTSD symptoms using the PCL-M checklist. Table 6 presents the distribution of responses for each of the 17 PTSD symptom criteria. In general, a substantial number of children reported experiencing many of these symptoms at least at a moderate level. For instance, **68.8%** of participants indicated "moderately" or more for **physical reactions** (e.g. heart pounding, difficulty breathing) when reminded of trauma (item 5).

Avoidance and numbing symptoms were also prevalent: **46.8%** of children at least moderately tried to avoid thoughts or feelings about the trauma (item 6), and **47.9%** avoided activities or places that reminded them of it (item 7). Memory trouble related to trauma (item 8) was reported by about 60% at some level, with 29.2% "moderately" and above. Notably, **50.6%** of participants had lost interest in activities they once enjoyed (item 9 at "moderately" or more), and **60.7%** felt distant or cut off from others at least "a little bit" (item 10; 28.6% at "moderately" or higher). Emotional numbing (item 11) was marked as moderate or higher by 46.8%. A sense of foreshortened future (item 12) was present to at least a moderate degree in 47.4%. Hyperarousal symptoms were also common: difficulty sleeping (item 13) at moderate or more in 50.0% of children; irritability or anger outbursts (item 14) in 48.7% at least moderately; difficulty concentrating (item 15) in 49.2%; being super-alert or watchful (item 16) in 50.7%; and being easily startled (item 17) in 48.7% at least moderately . This detailed symptom patterns indicate that a wide range of PTSD-related symptoms were experienced by many participants, with avoidance/numbing and hyperarousal symptoms particularly prominent alongside the intrusive re-experiencing symptoms. . These

Table 6: Distribution of responses to PTSD-related symptoms (n = 384)

No.	Symptom (past month)	Not at all (1)	A little bit (2)	Moderately (3)	Quite a bit (4)	Extremely (5)
1	Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?	50 (13.0%)	92 (24.0%)	106 (27.6%)	78 (20.3%)	58 (15.1%)
2	Repeated, disturbing dreams of a stressful experience from the past?	58 (15.1%)	85 (22.1%)	102 (26.6%)	85 (22.1%)	54 (14.1%)
3	Suddenly acting or feeling as if a stressful experience were happening again (as if reliving it)?	45 (11.7%)	88 (22.9%)	115 (29.9%)	72 (18.8%)	64 (16.7%)
4	Feeling very upset when something reminded you of a stressful experience?	52 (13.5%)	95 (24.7%)	108 (28.1%)	81 (21.1%)	48 (12.5%)
5	Having physical reactions (e.g., heart pounding, trouble breathing) when reminded of the trauma?	40 (10.4%)	80 (20.8%)	120 (31.3%)	85 (22.1%)	59 (15.4%)
6	Avoid thinking or talking about a stressful experience or related feelings?	70 (18.2%)	95 (24.7%)	100 (26.0%)	65 (16.9%)	54 (14.1%)
7	Avoid activities or situations that remind you of the experience?	58 (15.1%)	88 (22.9%)	105 (27.3%)	74 (19.3%)	59 (15.4%)
8	Trouble remembering important parts of the experience?	62 (16.1%)	90 (23.4%)	112 (29.2%)	65 (16.9%)	55 (14.3%)
9	Loss of interest in things you used to enjoy?	50 (13.0%)	85 (22.1%)	120 (31.3%)	74 (19.3%)	55 (14.3%)

10	Feeling distant or cut off from other people?	56 (14.6%)	95 (24.7%)	110 (28.6%)	72 (18.8%)	51 (13.3%)
11	Feeling emotionally numb or unable to have loving feelings for those close to you?	60 (15.6%)	90 (23.4%)	100 (26.0%)	80 (20.8%)	54 (14.1%)
12	Feeling as if your future will somehow be cut short?	65 (16.9%)	82 (21.4%)	112 (29.2%)	70 (18.2%)	55 (14.3%)
13	Trouble falling or staying asleep?	45 (11.7%)	95 (24.7%)	110 (28.6%)	82 (21.4%)	52 (13.5%)
14	Feeling irritable or having angry outbursts?	52 (13.5%)	90 (23.4%)	112 (29.2%)	75 (19.5%)	55 (14.3%)
15	Having difficulty concentrating?	48 (12.5%)	88 (22.9%)	115 (29.9%)	74 (19.3%)	59 (15.4%)
16	Being “super alert” or watchful on guard?	50 (13.0%)	82 (21.4%)	115 (29.9%)	80 (20.8%)	57 (14.8%)
17	Feeling jumpy or easily startled?	55 (14.3%)	90 (23.4%)	110 (28.6%)	77 (20.1%)	52 (13.5%)

Using the responses above, a total PTSD severity score was calculated for each participant (possible range 17–85). Table 7 provides summary statistics for these PCL-M scores. The **mean PTSD score** was **52.3** (SD = 8.7), with observed scores ranging from a minimum of 35 to a maximum of 72. This mean is well above the standard cutoff of 44, already suggesting substantial symptomatology in the sample.

Table 7: Descriptive Statistics of PCL-M Scores (n = 384)

Statistic	Value
Mean Score	52.3
Standard Deviation (SD)	8.7
Minimum Score	35
Maximum Score	72

Applying the cutoff score of 44 to classify PTSD, exactly half of the participants screened positive for PTSD. Table 8 shows the **PTSD classification** results: 195 children (50.8%) had scores ≥44 and were considered **Positive for PTSD**, while 189 (49.2%) were **Negative for PTSD**. Figure 6 illustrates this near-equal split. Despite the sample's extreme experiences, it is notable that about half did not meet the PTSD threshold (though many of those still reported some symptoms below cutoff). Nonetheless, a **50.8% PTSD prevalence** indicates that PTSD affected roughly every second child in these shelters.

Table 8: PTSD Classification of Participants (n = 384)

PTSD Classification	Frequency (n)	Percentage (%)
Positive for PTSD	195	50.8%
Negative for PTSD	189	49.2%
Total	**384**	**100%**

Note: A PCL-M score ≥44 was used as the cutoff indicative of PTSD in the general population.

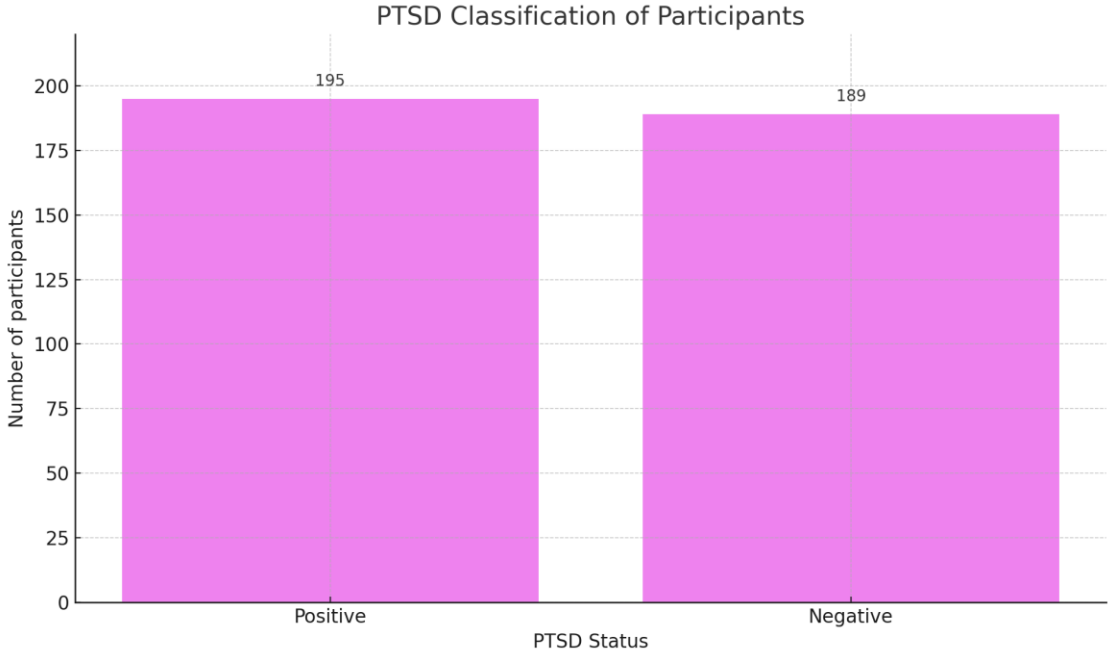


Figure 6: PTSD classification of participants (positive vs. negative) based on PCL-M cutoff score of 44 (n = 384).

Factors Associated with PTSD: We examined which demographic factors were significantly associated with being classified as PTSD-positive. Table 9 presents the cross-tabulation of PTSD status by age group. There was a clear and significant trend: younger children exhibited higher PTSD rates. Among children aged 8–10 years, **60.0%** were PTSD-positive, and this proportion was similarly high at **64.0%** in the 11–13 year group. In contrast, the PTSD-positive rate dropped to 43.5% for the 14–16 year group and further to 29.0% for the 17–18 year-olds. The chi-square test was highly significant ($\chi^2 = 26.86$, $p < 0.00001$), confirming that **age group had a significant association with PTSD prevalence** – younger participants were markedly more likely to meet PTSD criteria.

Table 9: Cross-tabulation of PTSD Status by Age Group

Age Group (years)	Positive for PTSD (n, % within group)	Negative for PTSD (n, % within group)	Total (n, %)
8–10	45 (60.0%)	30 (40.0%)	75 (100%)
11–13	80 (64.0%)	45 (36.0%)	125 (100%)
14–16	50 (43.5%)	65 (56.5%)	115 (100%)
17–18	20 (29.0%)	49 (71.0%)	69 (100%)
Total	**195 (50.8%)**	**189 (49.2%)**	**384 (100%)**

Chi-square statistic = 26.8577, p < 0.00001 (significant at p < 0.05).

Table 10 shows PTSD status by gender. PTSD prevalence was somewhat higher in females (54.5% of girls vs. 46.7% of boys), but this difference was not statistically significant ($\chi^2 = 2.302$, $p = 0.129$). Thus, **gender was not a significant factor** in PTSD occurrence in this sample, although there was a trend toward females being more affected.

Table 10: Cross-tabulation of PTSD Status by Gender

Gender	Positive for PTSD (n, % within gender)	Negative for PTSD (n, % within gender)	Total (n, %)
Male	85 (46.7%)	97 (53.3%)	182 (100%)
Female	110 (54.5%)	92 (45.5%)	202 (100%)
Total	**195 (50.8%)**	**189 (49.2%)**	**384 (100%)**

Chi-square statistic = 2.302, p = 0.129 (not significant at p < 0.05)

A strong association emerged between **education level** and PTSD (Table 11). Participants with only primary education had the highest PTSD rate at 62.5%, followed by those in secondary school (50.0%). Among out-of-school employed youths, 44.8% had PTSD, and notably, among those with no formal education, the PTSD prevalence was 30.6% (lower than other groups). The differences were significant ($\chi^2 = 16.01$, $p = 0.0011$). It appears that children currently in school (especially primary level) were at greater risk of PTSD, whereas those with no education had the lowest observed PTSD rate – possibly reflecting age differences (many with no education were the oldest teens) or resilience factors. Overall, **lower educational attainment was significantly linked to higher PTSD prevalence** in our sample.

Table 11: Cross-tabulation of PTSD Status by Education Level

Education Level	Positive for PTSD (n, % within level)	Negative for PTSD (n, % within level)	Total (n, %)
Primary school	80 (62.5%)	48 (37.5%)	128 (100%)
Secondary school	70 (50.0%)	70 (50.0%)	140 (100%)
Employed (out-of-school)	30 (44.8%)	37 (55.2%)	67 (100%)
None (no formal education)	15 (30.6%)	34 (69.4%)	49 (100%)
Total	**195 (50.8%)**	**189 (49.2%)**	**384 (100%)**

Chi-square statistic = 16.0088, p = 0.001129 (significant at $p < 0.05$).

Finally, Table 12 examines PTSD by socioeconomic status. PTSD prevalence was essentially the same among children from low-SES backgrounds (50.0%) and those from moderate-SES families (48.4%). The association was not significant ($\chi^2 = 0.0773$, $p = 0.781$). **Socioeconomic status did not show a significant impact** on PTSD rates in this cohort – possibly because nearly all participants were of low status, making for a very imbalanced comparison.

Table 12: Cross-tabulation of PTSD Status by Socioeconomic Status

Socioeconomic Status	Positive for PTSD (n, % within status)	Negative for PTSD (n, % within status)	Total (n, %)
Low	180 (50.0%)	173 (50.0%)	353 (92.0%)
Moderate	15 (48.4%)	16 (51.6%)	31 (8.0%)
Total	**195 (50.8%)**	**189 (49.2%)**	**384 (100%)**

Chi-square statistic = 0.0773, $p = 0.780939$ (not significant at $p < 0.05$).
In summary, the results demonstrate a very high prevalence of PTSD (about half of the children) in this displaced Sudanese youth population. Younger age and lower education were clearly associated with higher PTSD rates, whereas gender and socioeconomic status did not show

significant effects. These findings will be further interpreted in the context of existing literature in the following section.

Discussion

This study revealed an alarmingly high prevalence of PTSD (50.8%) among displaced Sudanese children and adolescents in Kassala. This figure reflects the profound psychological impact of war and displacement on young individuals. Our findings both mirror and diverge from PTSD prevalence rates reported in other conflict-affected populations, offering insight into how context and demographics influence PTSD outcomes.

The PTSD prevalence in our cohort is comparable to reports from similarly conflict-ridden environments. For instance, Kakaje et al. found a PTSD prevalence of 53% among Syrian school students after nine years of ongoing conflict[15]. The Syrian youth, like our Sudanese participants, have endured protracted war and instability; Kakaje's study also noted widespread anger and mental health problems accompanying the high PTSD rates. The similarity between the Syrian and our Sudanese findings underscores how prolonged conflict and displacement consistently lead to elevated PTSD levels in children. In both cases, half or more of the youth exhibit significant trauma symptoms, highlighting a convergent outcome of war trauma across different cultures. One difference is that the Syrian study was school-based and included both displaced and non-displaced students, whereas our study focused exclusively on displaced individuals. Displacement may concentrate trauma exposure, but even broader conflict-affected youth samples show high PTSD rates. The slight difference in prevalence (53% vs. 50.8%) might be attributable to variations in trauma intensity or sampling, but overall the figures are closely aligned.

In contrast, studies from some other regions report lower PTSD prevalence, though still substantial. In Ethiopia, Tamir et al. found PTSD in 40.8% of pediatric patients who had experienced physical trauma during unrest[12]. This Ethiopian prevalence, while high, is about 10 percentage points lower than ours. One possible explanation is the nature of trauma: Tamir's study involved physically injured children (perhaps from accidents or isolated incidents in conflict), whereas our participants have lived through continuous

conflict, multiple displacements, and pervasive insecurity. The cumulative trauma and chronic stress in our displaced sample could drive PTSD rates higher. Additionally, differences in social support may play a role; *Tamir et al.* noted that lack of social support and chronic medical conditions contributed to PTSD in their Ethiopian sample. Our population predominantly came from low socioeconomic backgrounds and likely had limited support in the displacement setting. As *Hauff et al.* reported in a South Sudan study, *socioeconomic disadvantage and multiple traumatic events were associated with PTSD* and comorbid depression[24][25]. Indeed, in war-torn South Sudan (Greater Bahr el Ghazal region), *Ayazi, Hauff, and colleagues* found **28%** had PTSD alone, and an additional ~9.5% had PTSD with depression[26]. While that prevalence (28%) is lower than ours, their study included general community members post-conflict, not only displaced children. Notably, they highlighted that those with comorbid PTSD-depression had more trauma exposure and socioeconomic hardship[25]. Our study's displaced youth likely share many risk factors with South Sudan's hardest-hit groups (e.g., extreme trauma exposure, poverty), which could explain our higher PTSD figure relative to South Sudan's general population finding. It suggests that **displaced children represent a particularly vulnerable subset**, even compared to other war-affected groups.

Our results showed a significant association between **younger age and higher PTSD prevalence**. This aligns with observations from disaster contexts. *Green et al.* studied children's responses to disasters and noted that younger children can exhibit stronger PTSD symptoms, potentially due to less developed coping mechanisms[27]. In our study, children under 14 had PTSD rates around 60%, much higher than the ~29% in the oldest teens. *Murali et al.* emphasize the importance of recognizing PTSD in children and adapting clinical assessment appropriately[28]. Younger children might express distress differently (e.g., more somatic complaints or behavioral issues) and are often more dependent on caregivers, so displacement (with potential loss of supportive structures) can hit them harder. It's also possible that many of the older adolescents in our sample were those who took on adult responsibilities or had found ways to cope (some were employed), potentially buffering them. Our finding is consistent with *Kar et al.*'s work following natural disasters, which indicated children and adolescents suffer psychological

consequences, but interventions and social support are key for recovery[29]. Younger children in our displaced camps likely need specialized psychosocial support to address their heightened vulnerability to PTSD.

We observed no significant gender difference in PTSD prevalence (though females had a non-significant higher rate). This is somewhat surprising, as literature often finds females at higher risk of PTSD after trauma. For example, in global meta-analyses and many conflict studies (including Ayazi's South Sudan research), *female gender is a risk factor for PTSD*[30]. The lack of a clear gender effect in our study could be due to the uniformly high trauma exposure when trauma is nearly universal and severe, gender might not differentiate outcomes as strongly. However, it's notable that girls in our study still had a PTSD rate ~8 points higher than boys (54.5% vs 46.7%). *Ainamani et al.* in Uganda found that being female was associated specifically with PTSD (while being male was more linked to depression) in maltreated youth[2]. *Farhood et al.*, examining war-traumatized Lebanese civilians, also reported higher PTSD symptoms in women alongside other psychiatric morbidity[31]. In our context, cultural factors might influence symptom reporting boys may under-report due to social expectations, or girls may face specific trauma types (e.g., gender-based violence) not captured in detail in our survey. Although not statistically significant here, the trend suggests that **female adolescents might require particular attention** in displacement trauma interventions, aligning with global observations of greater PTSD risk in females.

One of our most striking findings was the **inverse relationship between education level and PTSD prevalence**. Children in primary school had the highest PTSD rates, whereas those with no formal education (mostly older teens) had the lowest. Part of this may be an age effect in disguise (younger children are in primary school). It may also reflect that those in school are still in a dependent role and perhaps more affected by the disruption of conflict on their development and routine. *Rawal et al.* studied Nepali ex-combatants and intriguingly found no association between PTSD and education, or age, among adult veterans[13]. Our findings differ in that regard, likely because our sample is younger and still in the process of education, whereas Rawal's sample had largely completed their education by the time of assessment. *Shahini and Shala*'s study on Kosovo

veterans (who mostly would have finished education before war) similarly found PTSD prevalence (~11%) that did not vary with educational attainment[16]. In our displaced youth, missing out on education could both be a consequence of trauma and a contributor to psychological distress. However, the lower PTSD in those with no education in our sample is intriguing – possibly, this group comprised older adolescents who left school to work or marry, and they may have developed resilience or feel less psychological impact in certain ways (or perhaps they underreport symptoms). More likely, though, this small group's lower PTSD percentage could be due to the fact that being out-of-school might coincide with being less exposed to certain traumas (for example, some no-education youths might have been in safer rural areas before displacement). The overall takeaway is that **school-aged children are at serious risk**, and schools in displacement settings need to be leveraged as access points for mental health support. Studies like *El-Khodary et al.* in Palestine emphasize considering demographic factors (like school disruption) when addressing PTSD[4]. Keeping children in school or providing educational activities in shelters may offer structure and a sense of normalcy that can be protective against PTSD.

Socioeconomic status did not significantly impact PTSD rates in our sample, likely because almost everyone was impoverished due to displacement. In other contexts, poverty is often correlated with higher PTSD risk[5]. *Tesfaye et al.*'s systematic review of IDPs in Africa identified low income as a risk factor for PTSD[32]. *Hauff et al.* (Ayazi et al. 2012) also found socioeconomic disadvantage predicted PTSD-depression comorbidity[25]. In our study, the uniformity of low SES made it hard to detect any difference — virtually the entire sample was experiencing poverty and instability, and moderate differences in income (moderate vs low, none were high) did not translate into measurable PTSD differences. This suggests that in acute displacement crises, trauma exposure levels out the field – everyone is at risk regardless of prior socioeconomic status. It's possible that any slight advantages a "moderate" SES family might have (like a bit more savings or education) were insufficient to buffer the severe trauma of war and displacement. Our finding reinforces that humanitarian mental health interventions should target all

displaced children, not only those from the poorest backgrounds, since even relatively better-off families in displacement are still vulnerable.

Comparing our results to other conflict studies highlights both common trends and context-specific outcomes. For example, *Farhood et al.* in Lebanon reported a 29.3% PTSD prevalence among civilians years after a war[31], significantly lower than our 50.8%. The Lebanese study took place in a general population long after active conflict, whereas our study is amid ongoing crisis with internally displaced individuals. The disparity underscores that displaced populations show higher PTSD rates than general post-conflict populations, likely due to cumulative trauma and continued instability. Indeed, Farhood's work was done 10 years post-conflict with a populace that had resettled, which may explain lower PTSD prevalence compared to our acute-phase displaced sample. This pattern is echoed by *Morina et al.* (2018) who found that refugees and IDPs often have higher PTSD rates than non-displaced war survivors, partly due to the stresses of displacement and loss of community.

The high prevalence of PTSD and its concentration in younger, school-age children in our study signal an urgent need for interventions. Traumatised children are at risk of long-term developmental issues, impairments in learning, and future mental health problems. As *Gkintoni et al.*'s review demonstrates, there are effective therapies (such as trauma-focused cognitive-behavioral therapy) for PTSD in youth[21]. Implementing such interventions in displacement camps could significantly alleviate distress. Moreover, the lack of significant gender and SES differences implies interventions should be broad-based, covering all children rather than only subgroups. However, given the slightly higher PTSD in girls and the known vulnerabilities of adolescent girls in conflict settings, programs should ensure accessibility and cultural appropriateness for girls (e.g., female counselors, safe spaces).

Our findings also point to the importance of education and community support as protective factors. *Patel (2020)* has highlighted that cultural and community contexts influence trauma impact and recovery[33]. In Kassala's shelters, strengthening community bonds, providing routine (through schooling or structured activities), and

involving families in interventions could improve outcomes. *Murali et al.* noted the need for proper recognition and clinical assessment of PTSD in children*[34]* – training primary healthcare workers and teachers in the camps to recognize PTSD symptoms could facilitate early referral and support.

In comparing with literature, it's encouraging that some children did not meet PTSD criteria despite severe adversity. Resilience factors (strong family attachment, faith, coping skills) might be at play. Future research could explore why nearly half the children coped without full PTSD – understanding resilience in this context could inform interventions to help the others. Additionally, while we used a well-validated checklist, clinical interviews might provide a deeper understanding of how PTSD manifests in this cultural context. Studies such as *Gilmoor et al.*'s cross-cultural review caution that PTSD symptoms and expression can vary in non-Western contexts*[35]*. Thus, integrating culturally sensitive approaches in diagnosis and therapy is crucial.

Limitations: It is important to note that our study was cross-sectional and relied on a screening instrument (PCL-M) rather than clinical diagnosis. Some children might have transient distress that improves over time or conversely, some might develop PTSD later (as PTSD symptoms can be delayed). Also, recall bias and the young age of participants may affect the accuracy of some responses (especially among the 8–10-year-olds). We attempted to mitigate this by conducting interviews in a child-friendly manner, but complete accuracy cannot be guaranteed. Another limitation is the lack of a control or comparison group (e.g., non-displaced children); this limits our ability to attribute PTSD entirely to displacement versus other pre-existing factors. Nonetheless, given the extremely high prevalence observed, it is evident that conflict and displacement have had a major impact.

In conclusion, our study's discussion highlights that displaced Sudanese children are enduring a heavy PTSD burden, consistent with findings from other conflict zones like Syria and Ethiopia. Age and education were key factors, suggesting that **younger displaced children need urgent mental health support and continuity of education**. While many findings resonate with global research (e.g., high PTSD in conflict, risk in females and those

with more trauma), the unique context of Sudan's recent conflict underscores the necessity of local intervention strategies. The discussion emphasizes a holistic approach: combining trauma-focused clinical interventions (as evidenced by Gkintoni's review) with community and educational support (echoing Patel and others) to foster resilience and recovery among these youth.

Conclusion

PTSD is highly prevalent among Sudanese children and adolescents living in displacement shelters in Kassala, reflecting the profound psychological toll of conflict and forced migration on young individuals. This study found that approximately half of the displaced children screened positive for PTSD, indicating a critical need for mental health interventions in this population. Younger age emerged as a significant risk factor for PTSD – children under 14 were considerably more likely to exhibit PTSD symptoms than older teenagers. Similarly, lower educational attainment was associated with higher PTSD prevalence, suggesting that disruption of schooling and developmental routines contributes to psychological vulnerability. In contrast, gender and socioeconomic status did not show significant differences in PTSD rates in this uniformly traumatized cohort, implying that the severity of displacement-related trauma affected boys and girls, and children of all economic backgrounds, in a relatively equal manner.

These findings underscore that mental health initiatives in displacement settings should prioritize children and early adolescents, integrating trauma-informed care within child-friendly services. There is a need to establish psychosocial support programs in the shelters – for example, training teachers and community volunteers to identify and provide basic support to children with PTSD symptoms, and referring severe cases for professional counseling or therapy. Maintaining or re-establishing education and routine is also critical: providing schooling or structured daily activities in the camps can serve as a protective factor and aid in recovery, as children with some sense of normalcy and purpose may cope better with trauma.

In summary, the high PTSD prevalence among displaced Sudanese youth highlights an urgent public health challenge. Addressing this issue is not only about alleviating current suffering but also about safeguarding the future of a generation that has already been deeply scarred by conflict. Focused mental health interventions – culturally sensitive, age-appropriate, and accessible – are essential to help these children process their trauma, build resilience, and regain a sense of security. With the cessation of conflict and appropriate support, many of these young survivors have the potential to recover and lead healthy, productive lives. Ensuring that support is provided is a crucial step toward that outcome.

Recommendations

Based on the findings of this study, the following recommendations are proposed to stakeholders and practitioners working with displaced children and adolescents in conflict-affected regions:

- Integrate Mental Health Services in Displacement Camps: Humanitarian agencies and health authorities should establish regular screening and counseling services for PTSD and other mental health issues in displacement settings. Deploying mental health professionals (or trained paraprofessionals) to camps can facilitate early identification and treatment of children showing trauma-related distress.

- Trauma-Focused Interventions: Implement evidence-based, child-friendly trauma therapy programs. For example, trauma-focused cognitive-behavioral therapy (TF-CBT) and group therapy sessions have been effective in similar contexts*[21]*. Gkintoni et al. found psychotherapeutic interventions to be clinically efficacious for PTSD in youth, so adapting these interventions for the local culture and language in Kassala would likely benefit affected children.

- Strengthen Educational and Recreational Programs: Since maintaining education was associated with better outcomes, it is recommended to create or reinforce educational opportunities within the camps. Establish temporary learning spaces or informal schools to keep children engaged in learning. Alongside academics, provide

structured play, sports, and arts activities – these can act as therapeutic outlets and normalize children's daily life.

- Capacity Building for Local Caregivers and Teachers: Train teachers, community volunteers, and healthcare workers in basic psychosocial support and trauma awareness. For instance, workshops can be conducted to help these frontline individuals recognize PTSD symptoms and provide psychological first aid. Murali et al. emphasized proper recognition of childhood PTSD; building local capacity ensures a sustainable support system even when external experts are not present.

- Focus on Younger Children and Caregiver Support: Given younger children are especially vulnerable to PTSD, implement programs targeted at early childhood and primary school-age kids. This could include parent-child interaction therapy sessions or caregiver training so that parents can better support their children's emotional needs. Strengthening the caregiver-child bond and educating parents about trauma can help mitigate children's symptoms at home.

- Ensure Gender-Sensitive Approaches: Even though gender differences were not statistically significant, international evidence suggests girls may face particular risks (including gender-based violence). Programs should ensure safe spaces for girls, female counselors available for those who prefer them, and activities that empower both girls and boys. Monitoring and addressing any gender-specific issues (such as harassment in camps) is also important.

- Community and Cultural Engagement: Design mental health interventions that are culturally appropriate. Engage community and religious leaders to raise awareness that PTSD symptoms are a treatable consequence of trauma rather than a personal failing. Culturally sensitive approaches – for example, incorporating storytelling, traditional rituals, or community-healing events – may encourage participation and reduce stigma around seeking help*[33]*.

- **Longitudinal Follow-Up and Research:** Establish a system for **follow-up** of the children identified with PTSD. Many may require long-term support. Moreover, further research should be

conducted to evaluate the effectiveness of interventions implemented and to study factors contributing to resilience in this group. Continuous monitoring will help adapt programs to better suit the children's evolving needs.

By taking these steps, stakeholders can work towards reducing the mental health burden identified in this study. Such efforts are vital for preventing chronic PTSD and helping displaced Sudanese children and adolescents recover from trauma, build resilience, and eventually reintegrate into society as healthy young adults.

Author Contributions

Khulood Mohammed[1]: Conceived and designed the study; developed the methodology; supervised data collection; contributed to manuscript drafting.

Ammar Suliman[2]* (*Corresponding Author*) : Performed data analysis; interpreted the results; contributed to literature review and critical revision of the manuscript.

Sharif Ahmed[3]Coordinated the research process; oversaw quality assurance; finalized the manuscript for submission; acted as the point of contact for journal correspondence.

Nosaiba Aljack[4]: Managed references; contributed to data collection tools and ethical documentation; participated in manuscript editing and formatting.

All authors read and approved the final version of the manuscript.

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Conflict of Interest

The authors declare **no conflict of interest** related to this study.

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