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Self-reported Trauma Experiences Among Syrian Civilians in an Active War Zone

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ABSTRACT

Objective: The Syrian civil war produced at least 6.8 million internally displaced persons but estimates of the prevalence of war-related traumatic experiences among the civilian population in hard-to-reach areas of Syria are sparse. This study aimed to determine prevalence of these experiences, stratify the data by gender and age, and estimate probable post-traumatic stress disorder (PTSD) prevalence rates from self-reported symptoms.

Methods: This is an observational cohort study using the Harvard Trauma Questionnaire, Syrian version, with data collected in Northern Syria from a sample of 142 Syrian civilians ages 12-70, recruited by chain referral.

Results: In total, 109 adults (age (SD) = 33.1 (10.2); range: 18-70; 36 females) and 33 minors (age (SD) = 14.6 (1.7); range: 12-17; 3 females) participated in the study. War-related experiences included forced displacement, air strikes, head injury, and starvation. We estimate that 70% of adults and 85% of minors reported trauma symptom severity consistent with probable PTSD. Overall, 31% of the population experienced beatings to the head and 18% associated loss of consciousness. Adult males reported beatings to the head more frequently than females. Minors reported head injuries from explosions and other sources resulting in subsequent loss of consciousness more frequently than adults.

Conclusion: War-related experiences are common but vary in symptoms and causes by sex and age. This information may help international relief organizations planning mental health and neurological treatment approaches in a post-war Syria and be useful to mental health care professionals in host countries to appreciate the stratified trauma histories of Syrian refugees.

Keywords: Post-traumatic stress disorder, traumatic brain injury, war, trauma, Syria, internally displaced person

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INTRODUCTION

As of June 2023, the Syrian war caused approximately 5.6 million refugees and 6.8 million internally displaced people (IDP); an additional 3 million people live in besieged areas of the country.[1,2]

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Prior studies of trauma experiences among Syrian populations have primarily focused on refugees in Jordan, Lebanon, and Türkiye, and one sample of IDPs.[3-8]

Here, we present data from a civilian population during a period of ongoing military conflict in March of 2018 in Northern Syria. Our main goal was to capture the range of war-related experiences from this population, based on the Harvard Trauma Questionnaire (HTQ). The HTQ was originally developed to capture the experience of refugees from war-torn regions based on self-report and contains five sections: trauma events; short open-format essays; neurological trauma and starvation; trauma symptoms; and torture history.

Our goals were to determine the prevalence of war-related experiences, stratify the data by gender and age, and to estimate probable post-traumatic stress disorder (PTSD) prevalence rates from self-reported symptoms. Such information may become valuable in guiding international relief policy planning to meet future needs for mental health and neurological treatments in a post-war Syria. It may also be useful to mental health care professionals in host countries to appreciate the stratified trauma histories of Syrian refugees.

MATERIAL AND METHODS

Sample

Data were collected in March 2018 in and around Aleppo city, Al Bab and A'zaz districts, Aleppo governorate, Dana district and Idleb city, Idleb governorate, Deir-ez-Zor and Ar-Raqqa governorates. The data reported represent a collaboration between a Canadian-based non-governmental organization (NGO) and a civilian sample of 142 local medical professionals, residents, and internally displaced persons (IDPs) who expressed an urgent need to inform the outside world of their trauma experience. Approval for data collection was obtained from the Aleppo medical council and local authorities such as Elder councils. The informed consent procedure included a warning of the dangers of reprisals for participation and efforts to protect participants and staff, which included: De-identification of the questionnaires; physical destruction of the consent form and questionnaire after both were electronically scanned and transmitted as encrypted files to a computer located in Toronto followed by deletion of the electronic files from the local computer in the NGO's Syria office.

NGO staff consisted of four local medical professionals or civic leaders. Participants were initially recruited from among adult citizens visiting medical offices for a variety of physical non-emergency, non-life threating ailments (note that none of these participants made a medical visit seeking mental health treatment). Staff stated that participation was voluntary, and that medical services would be rendered regardless of the patient's decision to participate. Participants who were literate completed the (Arabic) version of the HTQ without assistance. Illiterate participants responded to the questionnaire items verbally, with NGO staff transcribing their responses onto the questionnaire. As patients shared their study participation experience with family members and close friends, these other individuals (which included minors) approached the staff with participation requests; approximately 80% of responses were obtained from patients visiting doctors' offices and 20% from their friends and family. The decision to include minors was made in consultation with citizens and at the urging of staff, who expressed an ethical obligation to give them a voice, provided that the request to participate was initiated by the minor. The age of 12 was chosen as a minimum inclusion criterion because local culture considers a person of this age to be an adult. There was no financial compensation for participation in this study. About 95% of participants were literate and completed questionnaires in their homes or in doctors' offices. The first author joined the project after data collection was completed and worked with de-identified data only. For this reason, the Institutional Review Board of the Stony Brook University made an exempt decision (Approval no: IRB2020-00361, Date: May 22, 2020).

Measurement Instrument

Participants completed a biographical questionnaire including date of birth, sex, and marital status. Some participants did not know their exact birth date and only reported birth year. For the purposes of calculating the age at the time of questionnaire completion, for these individuals the birth date was entered as July 2 (the halfway-mark of the nominal 365-day calendar year) of the given birth year.

Participants completed the Syrian version of the Harvard Trauma Questionnaire (HTQ), which is identical to the previously released Iraqi version,[9] except that questions about trauma events covered the time period between March 2011 to the time of data collection (March 2018). Previous uses of the HTQ included child and adolescent populations as young as 10 years of age.[10-13] The HTQ contains five parts: I, trauma events; II, two short open-format essay questions (which were translated by the second author, a native Syrian, and thematically coded by the first author); III, neurological trauma and starvation; IV, trauma symptoms; and V, torture history. A "DSM-IV PTSD score" was calculated from the average score of the first 16 items of Part IV of the HTQ (scoring according to Appendix D of HTQ), which were reported by participants on a 4-point scale (1 "not at all," 2 "a little," 3 "quite a bit," 4 "extremely") and which were derived from symptomatology of PTSD in the *Diagnostic and Statistical Manual for Mental Disorders*, Fourth Edition (*DSM-IV*).[14] A "total score" was calculated based on all 45 items under HTQ Part IV. Participants were classified as "symptomatic for PTSD" if the "DSM-IV" and/or "total" average score exceeded a value of 2.5, following the scoring methodology of Mollica and colleagues.[15] In addition, individual symptom items under HTQ Part IV were grouped into the four PTSD symptom clusters of the DSM-V "Reexperience," "Avoidance," "Arousal," and "Negative cognition and mood," following the scoring methodology of Farhood and colleagues.[16,17] The HTQ has been used extensively to identify PTSD symptoms in refugee populations across a diverse range of cultural backgrounds[18,19] (although cultural differences in response styles raise caution against direct cross-cultural comparisons, based on metric and scalar variance in the HTQ[19]), and has high reliability and internal consistency,[15,20] and test–retest reliability.[15,21]

Missing data were entered as empty cells and calculated frequencies were based on the number of given responses. For trauma experiences and torture history, participants had the opportunity to enter "other" and provide an account of the experience. These cases were entered as "1" ("experienced") into the datasheet. For trauma symptoms, which were reported on a scale of 1-4, some participants chose two values, in which case the mean of these two values was entered.

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences version 26.0 software (IBM Corp.; Armonk, NY, USA). Continuous variables were calculated as means and standard deviations in descriptive statistics and were entered into independent sample *t*-tests for inferential statistics. Categorical variables were calculated as frequencies, counts, and percentages, and were entered into Pearson's

chi-square (χ^2) tests for inferential statistics. Inferential statistics were two-tailed at the 0.05 significance level. Separate linear multiple regression models using binomial inputs from each participant for trauma events under Part I (with missing values replaced by the mean) were used as predictors, for these six respective outcome measures under Part IV: DSM-IV-based PTSD score, Total PTSD score, and the four symptom clusters "Reexperience," "Avoidance," "Arousal," and "Negative cognition and mood."

RESULTS

Table 1 lists biographical characteristics of the civilian population we sampled. The remainder of the results section follows the five parts of the organizational structure of the HTQ.

Part I: Trauma Events

Table 2 list trauma events for the overall sample, for adult males and females, and minors and adults (due to the small number of female minors, we did not conduct statistical analyses comparing minors as a function of sex). Overall, more than 90% of the population reported being forced to leave their hometown, witnessing the desecration or destruction of religious shrines, witnessing shelling, burning, or razing of residential areas, and being confined. On average, each binomial trauma event question had 1.07 missing responses (SD = 1.28) across the sample, but item 41 "sexually abused or raped" generated 7 missing responses, more than 4.5 standard deviations from the mean.

Part II: Personal Description

One hundred and one of 109 adults, and all 33 minors, answered at least one of the two free-form questions, which were written out in English and in Arabic. Question 1 asked: "Please indicate what you consider to be the most hurtful or terrifying events you have experienced. Please specify where and when these events occurred." Airstrikes were reported by 94% of adults and 73% of minors as the most terrifying events they experienced, and their essays made references to civilian targets such as hospitals, schools, markets, and private homes. Forced migration due to airstrikes was named as among the worst or most terrifying experiences by 70% of adults and 85% of minors. Question 2 asked: "Under your current living situation (i.e., refugee camp, country of resettlement, returned from exile, etc.) what is the worst event that has happened to you, if different from above? Please specify where and when these events occurred." Ninety-seven percent of adults and 51% of minors wrote about difficult living conditions associated with forced migration, which included lack of electricity, water, food, bread, fuel, security, job opportunities and the high cost of living.

Part III: Head Injury and Starvation

Table 3 lists the prevalence of head injury and starvation. Overall, 31% of the population experienced beatings to the head and 18% associated loss of consciousness, and 39% experienced starvation. Adult males reported beatings to the head and associated loss of consciousness significantly more frequently than did females (beatings: χ^2 (1, 109) = 13.0, $P < .001$; loss of consciousness: χ^2 (1, 109) = 9.25, $P = .002$), as well as starvation (χ^2 (1, 109) = 7.84, $P = .005$) and being near death from starvation (χ^2 (1, 109) = 5.43, $P = .02$). Loss of consciousness was reported to last from minutes to hours, up to 48 hours in one case. Minors reported significantly more frequently than adults head injuries from explosions (χ^2 (1, 142) = 14.07, $P < .001$) and other sources (e.g., shrapnel, bullet wounds, stabbing, burns; χ^2 (1, 142) = 5.32, $P = .021$) resulting in subsequent loss of consciousness (explosions: χ^2 (1, 142) = 16.97, $P < .001$; other sources: χ^2 (1, 142) = 3.93, $P = .048$).

Part IV: Trauma Symptoms

Table 4 lists the experienced level of bother in the week prior to the administration of the HTQ, which ranged on a scale from 1 ("not at all") to 4 ("extremely"). Overall, the population was highly traumatized, with 11 of 45 items scoring an average of "3" ("quite a bit") or higher, and an average calculated DSM-IV based PTSD score of 2.9. Adult males rated two symptoms significantly more bothersome than did females: avoiding thoughts ($\bar{x}$ (SD): M = 3.1 (1.0), F = 2.6 (1.0); t (106) = −2.41, $P = .018$; difference $\bar{x}$ (SD): −0.49 (.20), 95% CI: −0.88 to −.09) and feeling a need for revenge ($\bar{x}$ (SD): M = 3.1 (1.0), F = 2.6 (1.0); t (107) = −2.43, $P = .017$; difference $\bar{x}$ (SD): −0.61 (.25), 95% CI: −1.11 to −1.13). Calculated PTSD scores were significantly higher for minors than for adults, both based on DSM-IV criteria ($\bar{x}$ (SD): minors = 3.1 (0.5), adults = 2.8 (0.8); Levene's test for equality of variances F = 7.78, $P = .006$; t (79.01) = 2.09, $P = .039$; difference $\bar{x}$ (SD): 0.24 (0.11), 95% CI: 0.12 to 0.47) and based on Total trauma score ($\bar{x}$ (SD): minors = 2.9 (0.4), adults = 2.6 (0.7); Levene's test for equality of variances F = 14.5, $P < .001$; t (89.87) = 3.51, $P = .001$; difference $\bar{x}$ (SD): 0.34 (0.10), 95% CI: 0.15 to 0.54), and minors also had significantly higher PTSD-related avoidance symptom scores ($\bar{x}$ (SD): minors = 3.1 (0.6), adults = 2.7 (0.8); Levene's test for equality of variances F = 9.31, $P = .003$; t (77.98) = 3.08, $P = .003$; difference $\bar{x}$ (SD): 0.39 (0.13), 95% CI: 0.14 to 0.64). Minors scored significantly higher than did adults across 20 different trauma symptoms related to emotional and cognitive functions and shame.

Trauma Events Predicting PTSD-Related Trauma Symptoms

Trauma events significantly predicted DSM-IV based probable PTSD, F (43, 98) = 2.64, $P < .001$, adjusted $R^2 = .33$. Trauma events adding uniquely to the prediction at $P < .05$ included TE1 ("Oppressed

Table 1. Sample Demographics

	Overall			Adult			Minor		
	F	M	Total	F	M	Total	F	M	Total
N (%)	39 (27.5)	103 (72.5)	142 (100)	36 (32.7)	73 (67.3)	109 (100)	3 (9.1)	30 (90.9)	33 (100)
Mean age (SD)	33.3 (12.4)	27.2 (11.5)	28.8 (11.9)	34.7 (11.5)	32.3 (9.5)	33.1 (10.2)	15.3 (0.6)	14.5 (1.7)	14.6 (1.7)
Age range	15-70	12-65	12-70	18-70	18-65	18-70	15-16	12-17	12-17
Marital Status									
Single N	12	43	55	9	14	23	3	29	32
Married N	26	60	86	26	59	85	-	1	1
Divorced N	-	-	-	-	-	-	-	-	-
Widowed N	1	-	1	1	-	1	-	-	-

Table 2. Trauma Events Experienced by Participants

		Adults by sex			Age Cohort		
	Overall (N = 142)	**F**	**M**		**Minor**	**Adult**	
Trauma Event Item	Yes	Yes	Yes	Chi-square sig.	Yes	Yes	Chi-square sig.
TE1 Oppressed	75%	58%	78%	.032*	88%	72%	0.057
TE2 House search	60%	66%	61%	0.644	52%	63%	0.255
TE3 Searched	77%	65%	82%	0.047*	79%	77%	0.797
TE4 Looted	76%	78%	82%	0.583	61%	81%	.018*
TE5 Forced to leave	97%	100%	96%	0.217	97%	97%	0.933
TE6 Imprisoned	27%	14%	42%	.003*	9%	33%	.009*
TE7 Ill-health	65%	56%	58%	0.844	94%	57%	**.000***
TE8 Lacking food water	70%	67%	63%	0.708	91%	64%	.004*
TE9 Flee country	81%	81%	75%	0.519	94%	77%	.033*
TE10 Ancestral origin, religion, sect	67%	56%	63%	0.454	91%	61%	**.001***
TE11 Lack shelter	68%	58%	70%	0.232	75%	66%	0.34
TE12 Desecration	93%	94%	92%	0.616	94%	93%	0.833
TE13 Arrest leader	84%	86%	89%	0.657	72%	88%	.026*
TE14 Mass execution	53%	43%	49%	0.576	75%	47%	.005*
TE15 Shelling	96%	97%	99%	0.606	91%	98%	.043*
TE16 Chemical attacks	65%	67%	70%	0.735	50%	69%	0.051
TE17 Combat	77%	75%	86%	0.144	56%	83%	.002*
TE18 Physical injury	28%	14%	30%	0.065	38%	25%	0.157
TE19 Human shield	44%	39%	32%	0.444	78%	34%	**.000***
TE20 Physical injury family friend	74%	67%	74%	0.427	84%	72%	0.144
TE21 Corpses	65%	47%	72%	.011*	69%	64%	0.613
TE22 Confined	99%	100%	97%	0.316	100%	98%	0.433
TE23 Witness physical harm	80%	69%	85%	0.058	82%	80%	0.8
TE24 Witness rape	14%	6%	21%	0.048*	9%	16%	0.338
TE25 Witness torture	77%	56%	84%	.002*	88%	74%	0.102
TE26 Witness murder	78%	69%	75%	0.539	94%	73%	**.012***
TE27 Forced to inform	13%	6%	15%	0.15	15%	12%	0.626
TE28 Forced to destroy	5%	6%	6%	0.987	3%	6%	0.586
TE29 Forced to harm	1%	0%	3%	0.313	0%	2%	0.431
TE30 Murder family member	40%	37%	46%	0.394	30%	43%	0.193
TE31 Murder friend	76%	68%	83%	0.067	67%	78%	0.175
TE32 Forced to pay for bullet	42%	36%	29%	0.436	79%	31%	**.000***
TE33 Prohibited mourning	43%	17%	19%	0.75	0%	18%	.008*
TE34 Disappearance family	75%	42%	44%	0.83	42%	43%	0.944
TE35 Disappearance friend	30%	60%	82%	.013*	76%	75%	0.93
TE36 Family hostage	43%	28%	43%	0.137	6%	38%	**.001***
TE37 Friend hostage	38%	43%	58%	0.153	9%	53%	**.000***
TE38 Informed on	33%	19%	47%	.006*	39%	38%	0.854
TE39 Harmed	13%	8%	45%	**.000***	33%	33%	0.974
TE40 Kidnapped	4%	3%	22%	.010*	3%	16%	0.057
TE41 Raped	20%	3%	8%	0.333	0%	6%	0.163
TE42 Tortured	49%	6%	32%	.002*	9%	23%	0.091
TE43 Other	37%	44%	47%	0.786	56%	46%	0.403

P-values (shown in bold) reflect significance at Bonferroni-corrected levels.
N, number of individuals; F, female; M, male.
*The Chi-square statistic is significant at the .05 level.

Table 3. Head Injuries Experienced by Participants.

		Adults by Sex			Age Cohort		
	Overall (N = 142)	F	M		Minor	Adult	
Head Injury Item	% Yes	% Yes	% Yes	Chi-square sig.	% Yes	% Yes	Chi-square sig.
HI 1a Beatings head experienced	31%	6%	38%	**0.000***	42%	28%	0.105
HI 1b Loss consciousness	18%	0%	22%	**0.002***	27%	15%	0.096
HI 2a Suffocation experienced	7%	6%	10%	0.472	3%	8%	0.304
HI 2b Suffocation loss consciousness	1%	3%	1%	0.606	0%	2%	0.433
HI 3a Near drowning experienced	5%	0%	8%	0.077	3%	6%	0.565
HI 3b Near drowning loss consciousness	0%	0%	0%	-	0%	0%	-
HI 4a Injury to head from explosion experienced	18%	6%	14%	0.201	39%	11%	**0.000***
HI 4b Injury to head from explosion loss consciousness	9%	6%	3%	0.462	27%	4%	**0.000***
HI 5a Other injury to head experienced	15%	6%	14%	0.201	27%	11%	0.021*
HI 5b Other injury to head loss consciousness	4%	0%	3%	0.316	9%	2%	0.048*
HI 6a Starvation experienced	39%	17%	44%	.005*	52%	35%	0.085
HI 6b Starvation loss consciousness	1%	0%	1%	0.481	3%	1%	0.367
HI 6f Near death	8%	0%	14%	.020*	3%	9%	0.247

P-values (shown in bold) reflect significance at Bonferroni-corrected levels.
N, number of individuals; F, female; M, male.
*The chi-square statistic is significant at the .05 level.

because of ethnicity, religion, or sect"), TE8 ("Suffered from lack of food or clean water"), and TE20 ("Serious physical injury of family member or friend from a combat situation or landmine"). A similar model also significantly predicted Total probable PTSD, F (43, 98) = 3.63, p < .001, adjusted R^2 = .45. Trauma events adding uniquely to the prediction at p < .05 included TE1 and TE8 (TE32, "Forced to pay for the bullet used to kill a family member," added to the prediction at p = .05).

Trauma events significantly predicted the symptom cluster "Reexperience," F (43, 98) = 2.04, P = .002, adjusted R^2 = 0.24, with events adding uniquely to the prediction at P < .05 including TE1 and TE8. Similar analyses were significant for the symptom cluster "Avoidance," F (43, 98) = 3.32, P < .001, adjusted R^2 = 0.42, with significant trauma events being TE1, TE8, TE11 ("Lacked shelter"), TE32, and TE43 ("Other"). The symptom cluster "Arousal" was significant, F (43, 98) = 2.39, P < .001, adjusted R^2 = .30, with significant trauma events being TE1, TE5 ("Forced to leave your hometown"), and TE32. The symptom cluster "Negative cognition and mood" was significant, F (43, 98) = 2.51, P < .001, adjusted R^2 = .32, with significant trauma events being TE1, TE5, TE8, and TE20.

Part V: Torture History

A subset of the population (N = 55, including six minors as young as age 12) reported under Part I of the HTQ that they were imprisoned, kidnapped, or tortured. Table 5 lists the frequencies of experiences for this subset. Overall, the most common torture experiences were being forced to stand for long periods of time, being exposed to rain or cold, and being humiliated or exposed to dirty conditions leading to ill health. Adult males reported some torture experiences significantly more frequently than did females, such as being punched (χ^2 (1, 49) = 5.63, P = .018) or being beaten on the soles of their feet (χ^2 (1, 49) = 5.17, P = .023). Compared to minors, adults reported significantly more frequently to have been blindfolded (χ^2 (1, 53) = 4.93, P = .026) and chained (χ^2 (1, 53) = 4.23, P = .040), but minors reported significantly more frequently to have been used as forced labor (χ^2 (1, 54) = 6.01, P = .014). On average, each binomial torture history question had 1.47 missing responses (SD = 1.16), but item 31 "were you photographed (if answering "Yes" to the previous question: "forcibly arranged in various humiliating or sexually explicit positions)" generated 6 missing responses, about 4 standard deviations from the mean.

DISCUSSION

The current study paints a grim picture of the level of trauma experienced by a civilian population in times of war. Between the beginning of the civil war in 2011 and March 2018 (when these data were collected), 920,000 people had been displaced between January and April 2018 alone.[22] Consistent with these statistics, more than ninety percent of our sample reported being forced to leave their hometown. Whereas earlier prior studies recruited primarily among refugee populations and reported PTSD rates in the 30%-range, our sample of local citizens and IDPs living within a war zone had prevalence rates of probable PTSD around 70% for adults and 85% for minors (note that the HTQ is designed to calculate "probable DSM-based PTSD," based on the symptomatology of PTSD in the Diagnostic and Statistical Manual edition IV DSM-IV). These numbers are much higher than the 32% reported by Ibraheem and colleagues from their IDP sample.[8] The two studies differ in several ways. Geographically, our sample included regions not covered by the other study and reported trauma on a questionnaire rather than in a structured clinical interview, which may have facilitated disclosure of some experiences. Finally, our data collection occurred two years after Ibraheem et al., so that our elevated PTSD levels may be attributed to this additional period of war exposure. Our estimates of probable PTSD are in line with another study based on 721 Syrians living in Lebanon, Türkiye, and in Idlib that reported that 84% of participants had at least seven out of fifteen PTSD symptoms.[23] These two studies share a relatively recent data collection (i.e., reporting

Table 4. Trauma Symptoms

	Overall (N = 142)	Adults by Sex					Age Cohort				
		F		M			Minor		Adult		
Trauma Symptom Items	Mean (SD)	Mean	(SD)	Mean	(SD)	*t*-test sig.	Mean	(SD)	Mean	(SD)	*t*-test sig.
TS1 Recurrent thoughts	3.1 (0.8)	3.1	0.7	3.2	0.8	0.608	3.0	0.7	3.1	0.8	0.318 (L)
TS2 Feeling happening again	3.2 (0.9)	3.2	0.9	3.2	1.0	0.904	3.2	1.0	3.2	0.9	0.712
TS3 Nightmares	2.8 (1.0)	2.8	1.0	2.7	1.1	0.95	3.0	0.7	2.7	1.1	0.075 (L)
TS4 Detached	2.8 (1.2)	2.6	1.3	2.7	1.2	0.87	3.2	0.9	2.7	1.2	0.005* (L)
TS5 Unable emotions	2.6 (1.1)	2.3	1.0	2.5	1.2	0.433	3.1	0.8	2.5	1.1	**0.000* (L)**
TS6 Jumpy	2.8 (1.1)	2.8	1.0	2.7	1.2	0.751 (L)	3.3	0.8	2.7	1.1	0.003* (L)
TS7 Difficulty concentrating	2.9 (1.0)	2.8	0.9	2.8	1.2	0.841 (L)	3.4	0.7	2.8	1.1	**0.000* (L)**
TS8 Trouble sleeping	3.0 (1.0)	2.9	1.0	3.0	1.0	0.714	3.1	0.9	2.9	1.0	0.349
TS9 On guard	2.9 (1.0)	2.8	0.9	2.9	1.0	0.349	3.0	0.9	2.9	1.0	0.442
TS10 Irritable	3.1 (1.0)	3.1	1.0	3.1	1.0	0.931	3.0	0.8	3.1	1.0	0.6
TS11 Avoiding activities	3.0 (0.9)	2.8	0.8	3.1	1.1	0.217	3.2	0.8	3.0	1.0	0.424
TS12 Inability to remember	2.7 (1.0)	2.6	1.1	2.6	1.0	0.849	2.9	0.9	2.6	1.1	0.156 (L)
TS13 Less interest	2.6 (1.0)	2.6	0.9	2.8	1.2	0.395 (L)	2.4	0.9	2.7	1.1	0.099 (L)
TS14 No future	2.9 (1.1)	2.7	1.1	2.9	1.2	0.436	3.1	0.8	2.8	1.1	0.135 (L)
TS15 Avoiding thoughts	3.0 (0.9)	2.6	1.0	3.1	1.0	0.018*	3.2	0.7	2.9	1.0	0.044* (L)
TS16 Sudden reaction	3.1 (0.9)	2.9	0.9	3.2	0.9	0.207	3.0	0.7	3.1	0.9	0.611 (L)
TS17 Poor memory	2.6 (1.1)	2.4	1.2	2.5	1.1	0.786	2.9	0.9	2.5	1.1	0.062 (L)
TS18 Exhausted	2.9 (0.8)	2.8	0.8	3.0	0.9	0.16	2.8	0.7	2.9	0.9	0.444
TS19 Bodily pain	2.4 (1.1)	2.5	1.0	2.4	1.2	0.784	2.4	1.0	2.4	1.1	0.974
TS20 Less skills than before	2.9 (0.9)	2.8	1.0	3.0	1.0	0.325	2.9	0.7	2.9	1.0	0.72 (L)
TS21 Difficulty attention	2.6 (1.0)	2.4	1.1	2.6	1.1	0.328	3.0	0.6	2.5	1.1	**0.001* (L)**
TS22 Unable to make plans	2.7 (1.0)	2.8	0.9	2.5	1.1	0.185 (L)	3.1	0.7	2.6	1.1	0.002* (L)
TS23 Difficulty new situations	2.7 (1.0)	2.5	1.0	2.7	1.1	0.473	3.1	0.8	2.6	1.1	0.01* (L)
TS24 Only one	2.0 (1.0)	1.7	1.0	1.9	1.2	0.503	2.5	1.0	1.8	1.1	0.002*
TS25 Others don't understand	2.5 (1.0)	2.3	1.0	2.5	1.0	0.453	2.9	0.9	2.4	1.0	0.028* (L)
TS26 Feeling guilty	2.0 (1.2)	1.8	1.1	2.0	1.2	0.408	2.6	1.0	1.9	1.2	0.004*
TS27 Blaming yourself	2.0 (1.1)	1.8	1.1	1.8	1.0	0.881	2.9	0.9	1.8	1.0	**0.000* (L)**
TS28 Why god	1.8 (1.0)	1.8	0.9	1.8	1.0	0.901	1.9	1.2	1.8	1.0	0.46
TS29 Need for revenge	2.9 (1.2)	2.4	1.3	3.1	1.2	0.017*	3.0	1.0	2.9	1.3	0.58 (L)
TS30 Others hostile	2.1 (1.0)	2.0	0.9	2.0	1.0	0.946	2.6	0.8	2.0	1.0	**0.005***
TS31 Betrayed	2.5 (1.2)	2.4	1.1	2.5	1.3	0.887	2.7	1.1	2.5	1.2	0.402
TS32 No trust	2.8 (0.9)	2.7	0.8	2.7	1.1	0.896 (L)	3.0	0.6	2.7	1.0	0.041* (L)
TS33 No one to rely on	3.2 (1.0)	2.9	1.1	3.2	1.1	0.243	3.4	0.8	3.1	1.1	0.116 (L)
TS34 Hopelessness	2.6 (1.4)	2.1	1.2	2.6	1.7	0.095	3.2	0.9	2.4	1.5	**0.000* (L)**
TS35 Powerless	2.6 (1.1)	2.3	1.1	2.5	1.2	0.368	3.0	0.8	2.5	1.2	0.006* (L)
TS36 Ashamed	2.2 (1.2)	1.8	1.2	2.1	1.2	0.27	3.0	0.7	2.0	1.2	**0.000* (L)**
TS37 Humiliated	2.5 (1.2)	2.2	1.2	2.5	1.2	0.202	2.9	0.9	2.4	1.2	0.004* (L)
TS38 Jinx	1.9 (1.0)	1.8	1.1	1.6	1.0	0.384	2.5	0.9	1.7	1.0	**0.000***
TS39 Can't remember	2.1 (1.1)	2.0	1.1	1.9	1.2	0.633	2.8	0.8	1.9	1.1	**0.000* (L)**
TS40 Split into two people	2.1 (1.1)	1.9	1.0	2.1	1.2	0.4 (L)	2.4	0.7	2.0	1.1	0.038* (L)
Dayeg (ruminations, poor concentration, lack of initiative, boredom, sleep problems, tiredness, somatic complaints)	3.0 (1.0)	2.9	1.0	3.0	1.1	0.701	3.0	0.7	3.0	1.1	0.852 (L)

(*Continued*)

Table 4. Trauma Symptoms (Continued)

	Overall (N = 142)	Adults by Sex					Age Cohort				
		F		M			Minor		Adult		
Qalbak (sensation of heart being squeezed)	3.0 (1.1)	3.1	1.1	2.9	1.1	0.544	2.9	1.0	3.0	1.1	0.755
Asabi (irritability, nervousness, lack of patience, anger outbursts)	2.9 (1.1)	3.0	1.0	2.8	1.2	0.44 (L)	3.0	0.9	2.9	1.1	0.419 (L)
Nafsak deeyega (feeling of lightness in the chest and a choking sensation)	2.8 (1.1)	3.0	1.0	2.7	1.1	0.198 (L)	3.0	0.9	2.8	1.1	0.386 (L)
Nafseetak ta 'bana (tired soul)	3.3 (0.9)	3.4	0.9	3.2	1.0	0.473	3.4	0.7	3.3	1.0	0.48 (L)
DSM-IV PTSD score mean	2.9 (0.7)	2.8	0.7	2.9	0.8	0.584	3.1	0.5	2.8	0.8	0.039* (L)
Total PTSD score mean	2.7 (0.7)	2.5	0.7	2.6	0.7	0.529	2.9	0.4	2.6	0.7	**0.001* (L)**
PTSD reexperience mean	3.0 (0.7)	3.0	0.7	3.0	0.8	0.816	3.1	0.6	3.0	0.8	0.554 (L)
PTSD avoidance mean	2.8 (0.8)	2.6	0.8	2.8	0.8	0.252	3.1	0.6	2.7	0.8	0.003* (L)
PTSD arousal mean	3.0 (0.8)	2.9	0.8	2.9	0.8	0.794	3.1	0.7	2.9	0.8	0.198
PTSD neg cog and mood mean	2.9 (0.7)	2.8	0.7	2.9	0.8	0.305	3.0	0.4	2.9	0.8	0.279 (L)
						Chi-square sig.					
PTSD present		67%		71%		0.626	85%		70%		0.086

Trauma symptoms experienced by participants.
L, *t*-test sig. value based on Levene's test for equality of variances sig < 0.05; N, number of individuals; SD, standard deviation; F, female; M, male.
*The independent samples *t*-test is significant at the .05 level.

from a population with at least seven years of war exposure) and some degree of territorial overlap.

One limitation of the study is the small sample size, reflecting the difficulty of collecting data during hostile activities. Furthermore, the sample was obtained by chain referral, which, on the one hand, is a recommended method for sampling hard-to-reach populations.[24] On the other hand, the limitation of this recruitment method is potential sampling bias, which may lead to an overestimate of trauma reporting and PTSD. However, as we will discuss in the remainder of this section, the reported experiences of this sample are consistent with internationally verified events and objective analyses by human rights organizations and international investigative bodies. For example, 75% of our sample reported the disappearance of a family member, consistent with the disappearance of more than 90,000 people between the beginning of the civil war and August 2019.[25] One question that was omitted by more respondents than any other (by more than four standard deviations) referred to the experience of sexual abuse or rape. We speculate that not answering this question may reflect the stigma attached to such acts, which were commonly perpetrated against both male and female adults and children by government forces and their allies as well as by rebel groups, based on 454 interviews with survivors, witnesses, and medical staff by U.N. investigators.[26]

When asked about their most terrifying experience in a free-form format, 89% of our sample referred to air strikes, shelling, and bombings, and many included references to civilian targets such as hospitals, which have been a defining feature of the Syrian civil war. A confirmed example was the bombing of al-Quds hospital, a facility run by Médecins Sans Frontières and by the International Committee of the Red Cross (ICRC).[27] Some answers in our sample made references to internationally confirmed events, such as the Ma'arat Al-Nu'man market bombing in 2014,[28] the Al Salaam hospital bombing in January 2018,[29] and the chemical attack in Khan Sheikhoun in 2017.[30] Another described witnessing armed clashes between Al-Nusra Front and ISIS in Saraqeb in 2015, which is also consistent with an independent analysis.[31]

Sixty-five percent of our sample reported the use of chemical weapons. This is consistent with international investigations by Human Rights Watch (HRW) and a joint committee of the UN and the Organization for the Prohibition of Chemical Weapons, named "The Investigative Mechanism."[32] Specific chemical attacks in the region in which participants from our sample lived at the time were reported for Hama, Khan Sheikhoun, and Ltamenah.[30]

The experiences reported by minors are also consistent with international reports. For example, minors reported significantly more frequently than did adults to have been suffering from lack of food or water and suffering from ill health, and UNICEF included Syria among its top 5 countries for emergency appeal.[33] Minors also reported significantly more frequently than did adults to have been used as human shields and to have been forced to pay for a bullet used to kill a family member. Fifty-six percent of minors reported being exposed to combat situations. Fifteen percent of minors reported being used as informants. Among those who reported being imprisoned, kidnapped, or tortured, four out of five (one missing answer) reported being used as forced labor. Taken together, this pattern of reported experiences is consistent with an analysis by the US Department of State on human trafficking in Syria,[34] which states: "The recruitment and use of children in combat in Syria remains commonplace, and since the beginning of 2018 international observers reported a continuation in incidents of recruitment and use by armed groups. Syrian government forces, pro-regime militias, and armed non-state actors […] recruit and use boys and girls as child soldiers. Jabhat al-Nusra and ISIS also have used children as human shields, suicide bombers, snipers, and executioners. Militants also use children for

Table 5. Torture History

	Overall (N = 55)	Adults by sex			Age Cohort		
		F (N = 7)	M (N = 42)		Minor (N = 6)	Adult (N = 49)	
Torture History Item	Yes	Yes	Yes	Chi-square sig.	Yes	Yes	Chi-square sig.
TH1 False confession	37%	29%	43%	0.488	0%	40%	0.07
TH2 Humiliated	72%	71%	68%	0.869	100%	69%	0.14
TH3 Blindfolded	47%	29%	56%	0.178	0%	52%	.026*
TH4 Forced to stand	74%	71%	78%	0.7	40%	77%	0.07
TH5 Chained	43%	29%	51%	0.268	0%	48%	.040*
TH6 Placed in sack	26%	14%	32%	0.349	0%	29%	0.16
TH7 Isolation	30%	14%	37%	0.247	0%	33%	0.12
TH8 Deprived of sleep	58%	57%	54%	0.864	100%	54%	0.08
TH9 Noise	70%	86%	63%	0.247	100%	67%	0.12
TH10 Heat	60%	86%	51%	0.089	100%	56%	0.06
TH11 Rain cold	74%	71%	73%	0.924	80%	73%	0.73
TH12 Deprived of food	60%	29%	61%	0.11	100%	56%	0.09
TH13 Dirty	72%	71%	69%	0.899	100%	69%	0.15
TH14 Prevented from urinating defecating	30%	0%	38%	0.047*	0%	33%	0.13
TH15 Deprived medical care	65%	57%	62%	0.811	100%	61%	0.08
TH16 Prohibited prayer	50%	14%	60%	.026*	20%	53%	0.16
TH17 Forced labor	31%	43%	24%	0.291	80%	27%	.014*
TH18 Suspended from rod	26%	0%	33%	0.071	0%	29%	0.17
TH19 Stretched	24%	0%	31%	0.086	0%	27%	0.19
TH20 Punched	37%	0%	48%	0.018*	0%	41%	0.07
TH21 Beaten on soles	35%	0%	45%	.023*	0%	39%	0.08
TH22 Head submerged	15%	0%	19%	0.207	0%	16%	0.33
TH23 Burned	22%	0%	29%	0.104	0%	24%	0.21
TH24 Electrocuted	20%	0%	26%	0.124	0%	22%	0.24
TH25 Fingernails	7%	0%	10%	0.394	0%	8%	0.51
TH26 Forehead branded	4%	0%	5%	0.551	0%	4%	0.64
TH27 Body parts mutilated	2%	0%	2%	0.68	0%	2%	0.75
TH28 Mock execution	24%	0%	26%	0.124	40%	22%	0.38
TH29 Forced to undress	25%	0%	33%	0.071	0%	29%	0.13
TH30 Forcibly arranged	22%	0%	29%	0.104	0%	24%	0.17
TH31 Photographed	14%	0%	16%	0.252	20%	14%	0.70
TH32 Witness to rape	25%	0%	33%	0.071	0%	29%	0.13
TH33 Forced to rape	2%	0%	2%	0.68	0%	2%	0.72
TH34 Raped	9%	0%	12%	0.335	0%	10%	0.41
TH35 Other	12%	0%	16%	0.394	0%	14%	0.33

Legend: Torture history experienced by participants. N, number of individuals; F, female; M, male.
*The Chi-square statistic is significant at the .05 level.
No p-values reflect significance at Bonferroni-corrected levels.

forced labor and as informants, exposing them to retaliation and extreme punishment."[34]

Based on self-reported trauma symptoms, we estimate rates of 85% probable PTSD among minors. This prevalence rate is much higher than other studies that used the HTQ to determine PTSD rates in populations of minors from other conflict regions,[10,11] and higher than the 12%-45% reported for Syrian refugee and IDP minors.[35,36] Comparing locations and year of data collection, we suggest that our higher prevalence rate reflects the fact that minors were still in an active war zone at the time of data collection and had been exposed to military conflict for up to seven years at that time.

Our study also documents the frequency of self-reported head injury, which for the overall population was reported by 31% for beatings to the head and 18% from exposure to explosions. These

numbers are in line with other observations of head trauma in refugee and asylum-seeking cohorts,[37] which, we discovered, varied by age and sex. Among adults, males reported beatings to the head and associated loss of consciousness significantly more frequently than did females. Among the overall population, minors reported head injuries from explosions and other sources and associated loss of consciousness significantly more frequently than did adults. These data suggest that future relief operations may need to tailor diagnosis and treatment of head injuries to specific patient populations.[38] For example, beatings to the head may result in intracerebral hemorrhage, but concussive exposure may cause damage to the blood-brain barrier and to white matter fiber tracks, leading to the activation of cellular and molecular repair mechanisms associated with neuroinflammation.[39]

In conclusion, we report here results of war trauma experiences from a civilian population, which played an active role as collaborators in reporting and collecting the data. The small sample size is a limitation of the study and its generalizability, although the reported experiences are well validated by external and objective reporting sources. We plan to continue data collection to expand the sample size and to develop a longitudinal cohort. Such work will help us to draw causal inferences that will inform our understanding of vulnerability, resilience, and treatment options for PTSD, and other mental health and neurological conditions. Our findings may be useful to international relief organizations to address the mental health needs in a post-war Syria and may also be of value to mental health practitioners in host countries to be sensitive to the stratified trauma experiences of Syrian refugees.

Ethics Committee Approval: Approval for data collection was obtained locally from the Aleppo Medical Council and Elder Councils. The first author joined the project after data collection was completed and worked with de-identified data only. For this reason, the Institutional Review Board of the Stony Brook University made an exempt decision (Approval no: IRB2020-00361, Date: May 22, 2020).

Informed Consent: Written informed consent was obtained from all individuals who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.C.; Design – M.C.; Supervision – T.C.; Resource – M.C.; Materials – M.C.; Data Collection and/or Processing – M.C., B.A.; Analysis and/or Interpretation – T.C.; Literature Search – T.C.; Writing – T.C.; Critical Review – T.C., M.C.

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