

TRAUMA REENACTMENT AND WAR-ASSOCIATED FACTORS IN WAR-AFFECTED POPULATION IN BOSNIA AND HERZEGOVINA: CROSS-SECTIONAL STUDY ON THE IMPACT OF WAR IN UKRAINE ON MENTAL HEALTH

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Summary

Background: This study aimed to assess the impact of the war in Ukraine on the mental health of individuals who had previously experienced the war in Bosnia and Herzegovina.

Subjects and methods: A total of 649 respondents aged 35 and above, who were either directly recruited or indirectly affected as civilians during the war in Bosnia and Herzegovina, participated in this cross-sectional survey. The World Health Organization's Impact Event Scale (IES) and Self-Reporting Questionnaire (SRQ) were used to measure the impact of war events in Bosnia and Herzegovina and Ukraine on the respondents and to assess their mental health, respectively.

Results: The findings demonstrate a significant association between war events in Ukraine and the reactivation of post-traumatic stress disorder (PTSD) symptoms in individuals previously exposed to the war in Bosnia and Herzegovina (Beta = 0.318, $p < 0.001$).

Conclusion: The results highlight the significant influence of the war in Ukraine on the reactivation of PTSD symptoms in individuals with prior exposure to the war in Bosnia and Herzegovina. Additionally, considering the various risk factors associated with PTSD reactivation, this study provides insights into the broader impact of war activities, including factors beyond the specific conflict in Ukraine.

Keywords: War-affected population, reactivation of PTSD, mental health impact of war

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INTRODUCTION

Individuals who have experienced trauma as a result of war operations constitute a vulnerable population at risk of developing various psychosomatic disorders. The occurrence of trauma reenactment, influenced by retraumatization and revictimization, has been extensively documented (Levy 1998). Particularly noteworthy are the connections established between traumatic events and the reenactment of trauma, especially those experienced during childhood (Penning & Collings 2014). Trauma itself carries a risk for the development of various psychological and psychiatric impairments (Mahtur et al. 2022), impacting the emotions and cognitive abilities of individuals exposed to it, particularly among females (Giaunoli & Popa 2017).

Despite extensive research on post-traumatic stress disorder (PTSD), limited attention has been given to the

impact of the war in Bosnia and Herzegovina between 1992 and 1995. Hasanović and Herenda (2008) reported a prevalence of PTSD ranging from 10.3% in war-exposed individuals to as high as 28.3% (Klarić et al. 2007). The substantial percentage of individuals affected by PTSD represents a significant public health concern, given the enduring effects on the well-being of the exposed population. Moreover, recent studies have provided evidence supporting the existence of trauma-induced alterations in the human genome (Jawaid et al. 2018; Jawaid et al. 2021; Thumfart et al. 2022).

The ongoing war in Ukraine has brought forth an evident mental health crisis, affecting both individuals and entire nations (Jawaid et al. 2022). Accordingly, the objective of this study was to investigate the impact of the Ukrainian conflict on the mental well-being of individuals who had previously experienced the war in Bosnia and Herzegovina.

SUBJECTS AND METHODS

Participants

A total of 646 participants were included in this research study. The selection of respondents was conducted through random sampling and divided into two distinct groups: (1) individuals who experienced direct exposure to the war in Bosnia and Herzegovina, specifically those who were mobilized by the army during the conflict, and (2) individuals who were indirectly exposed to war activities, comprising civilians who were not enlisted in the military. The inclusion criteria for the study were as follows: (i) participants aged 35 years or older, and (ii) individuals who were present in Bosnia and Herzegovina during the war, either through direct or indirect exposure. The research encompassed members from all involved parties, representing diverse nationalities and religious backgrounds from the Zenica-Doboj and Central-Bosnia cantons.

Study design

The research was conducted cross-sectionally, and was based on an anonymous questionnaire. The sample size was determined based on the recommendations of Charan & Biswas (2011) for cross-sectional studies. The number of participants (n) was calculated using the formula $n = Z^2 * P(1-P)/d^2$, where $Z = 1.96$ at a confidence level of 95%, $P =$ an estimated prevalence of 50% for an unknown sample population, and $d =$ an acceptable error margin of 5%. Data on the population size were obtained from the 1991 census according to the official report of the State Agency for Statistics of Bosnia and Herzegovina. Based on the obtained data, a sufficient sample size of 384 was determined, meeting the criteria for sampling.

The questionnaires were distributed to individuals who had been recruited during the war using both online and paper-based methods. The targeted participants were members of the Association for War Veterans and Combatants in the Zenica-Doboj and Central-Bosnia cantons. Prior to joining these associations, individuals were required to provide valid documentation or a certificate issued by the Federal Ministry for Veterans and Disabled Persons of the Defense-Liberation War as proof of their involvement. In the case of the Zenica and Travnik Health Centers, respondents who held participation certificates in the war (directly exposed) were selected for the survey. For individuals indirectly exposed to war activities, the survey took place at the Zenica and Travnik Health Centers, and their civilian status was verified

through medical records. The online form was distributed using the non-commercial Google Forms platform. The survey process started on March 14, 2022, and ended on December 22, 2022. The total number of completed questionnaires was 692, of which 47 were excluded due to incompletely filled questionnaires.

Questionnaire development

The questionnaire development process involved collaboration with psychologists and psychiatrists and consisted of four sections. The first section gathered socio-demographic information such as age, gender, residential environment, educational and employment status. Additionally, it included questions related to war experiences, including the form of exposure to war actions, financial losses, migration, loss of a close person, and physical trauma. Ethical permission for the study was obtained from the Primary Health Care Center in Zenica (Ref. no: OU-01.1-99-44413/23 on March 2, 2023).

The second section of the questionnaire aimed to assess the impact of the war in Bosnia and Herzegovina on the respondents, while the third section focused on the impact of the war in Ukraine. Both sections utilized the World Health Organization's (WHO) Impact Event Scale (IES), a self-report questionnaire consisting of 22 items. Respondents rated their experiences on a Likert scale ranging from 0 to 4, where 0 indicated "never" and 4 represented "very often." The IES is a recognized measure of post-traumatic stress disorder (PTSD) symptoms, specifically designed to evaluate subjective responses to specific traumatic events in adult and elderly populations. Previous studies conducted in the Bosnian language demonstrated satisfactory reliability, with a reported Cronbach's Alpha of 0.80 (Mooren et al. 2003). Reliability analyses were conducted for both assessments, yielding a Cronbach's Alpha of 0.94 for the impact of the war in Bosnia and Herzegovina and 0.89 for the impact of the war in Ukraine.

The fourth section of the questionnaire aimed to assess the mental status of the participants using the Self-Report Questionnaire (SRQ). Developed by the World Health Organization (Sartorius & Janca 1996), the SRQ consisted of 24 items with response options of "Yes" (assigned a numerical value of 1) or "No" (assigned a numerical value of 0). It is commonly employed to evaluate the presence of psychiatric symptoms in primary health-care settings, with a value of 7 or lower indicating the absence of symptoms. The SRQ questionnaire has been previously utilized in the Bosnian language (Plomecka et al. 2021), and in this study, it demonstrated excellent reliability with a Cronbach's Alpha of 0.92.

Statistical analysis

The statistical analysis was conducted using IBM SPSS software (version 26.0, Statistical Package for the Social Sciences, Chicago, Illinois, USA). Prior to analysis, a database was created in Microsoft Excel (version 2016, Microsoft Corporation, Redmond, Washington, USA). The normality of distribution for the observed variables was assessed using the Kolmogorov-Smirnov test. As deviations from normal distribution were observed, non-parametric tests were employed. To examine statistically significant differences in categorical variables, the Chi-square test (χ^2) was utilized. For continuous variables, differences were assessed using the Mann-Whitney U test. Furthermore, a correlation analysis was conducted using the non-parametric Spearman's rank correlation coefficient. The significance level was set at ≤ 0.05 . Data visualization was performed using GraphPad Prism software (version 9.0, GraphPad Software, Inc., Boston, Massachusetts, USA).

RESULTS

Sociodemographic data

The majority of respondents (54.2%) fell into the age category of 50-54 years when completing the questionnaire ($p < 0.001$). Males constituted the larger proportion of the sample (81.2%) ($p < 0.001$). In the group of respondents directly recruited into the army during the war in Bosnia and Herzegovina, males were predominant (81.2%), whereas in the indirectly exposed population, females constituted the majority. Urban living environment was more prevalent among respondents (71.0%) compared to rural areas (29.0%) ($p < 0.001$). The primary level of education was secondary school (68.7%), followed by a bachelor's degree or completed first cycle studies (13.0%). A notable finding was the higher representation of respondents with completed secondary and elementary school compared to those with university education ($p < 0.001$). Significant differences were observed between the examined groups, as none of the subjects directly exposed to the war reported attending postdoctoral studies. Additionally, indirectly exposed respondents reported a higher percentage representation in bachelor's, master's, and doctoral studies. A concerning observation is the high percentage of unemployed respondents

(28.9%), particularly among those indirectly exposed to the war (31.8%). On the other hand, employees were primarily associated with the public sector (26.0%), and 9.1% of respondents were retired at the time of the survey ($p < 0.001$).

The questionnaire included factors related to the war experience of respondents in Bosnia and Herzegovina during the period from 1992 to 1995, in addition to sociodemographic data. As shown in Table 1, a significant proportion of respondents experienced substantial financial losses during the war (52.2%) ($p = 0.271$). 20.7% had to change their place of residence due to the war, with a higher prevalence observed among those indirectly exposed to the war ($p < 0.001$). The loss of a close person, such as a family member or relative, was reported by 41.5% of the respondents, with a higher percentage observed in the group directly exposed to the war (49.0%). A majority of respondents who were not recruited into the army did not experience the loss of a close person (63.3%) ($p < 0.001$). Physical traumas were predominantly reported among the recruited subjects, with 34.4% of respondents from this group having experienced some form of physical trauma. In contrast, no such consequences of the war in Bosnia and Herzegovina were reported among the civilian group ($p < 0.001$). Statistically significant differences were found for all factors related to war activities in Bosnia and Herzegovina, except for financial loss.

The mean score for the impact of war conditions in Bosnia and Herzegovina, as measured by the IES (B&H), was significantly higher in the directly exposed group with a value of 34.2, compared to the indirectly exposed group with a value of 16.0 ($p < 0.001$). Similarly, the impact of war events in Ukraine on the population exposed to war actions in Bosnia and Herzegovina was significantly greater than the impact on the indirectly exposed group ($p < 0.001$). The mean score for the IES (Ukraine) was 32.6 in the directly exposed group, while it was significantly lower in the group of non-recruited subjects during the war in Bosnia and Herzegovina, with a mean score of 19.3. Furthermore, significant differences were observed in the self-reporting questionnaire scores between the actively participating army respondents and the civilian population ($p < 0.001$). Violin plots (Fig. 1. A & B) visually illustrate these pronounced differences in the estimated values for the impact of the war in Bosnia and Herzegovina and Ukraine on the recruited respondents group compared to the non-recruited group. Additionally, differences in SRQ scores were also observed among the examined groups (Fig. 1. C).

Table 1. Sociodemographic and war-associated characteristics of participants

Variable	Directly exposed	Indirectly exposed	Total	χ^2	p
Age				477.8	<0.001
35-39	10 (3.9)	105 (27.1)	115 (17.8)		
40-44	26 (10.0)	74 (19.1)	100 (15.5)		
50-54	141 (54.2)	125 (32.3)	266 (41.2)		
60-64	26 (10.0)	61 (15.8)	87 (13.5)		
65-69	11 (4.2)	6 (1.6)	17 (2.6)		
70-75	23 (8.8)	10 (2.6)	33 (5.1)		
>75	22 (8.5)	6 (1.6)	28 (4.3)		
Gender				411.6	<0.001
Male	211 (81.2)	168 (43.4)	425 (65.8)		
Female	49 (18.8)	215 (55.6)	217 (33.6)		
Non-binary	0 (0.0)	4 (1.0)	4 (0.6)		
Residential environment				83.3	<0.001
Rural	75 (29.0)	132 (34.1)	207 (32.0)		
Urban	184 (71.0)	255 (65.9)	439 (68.0)		
Education				2037.0	<0.001
None	7 (2.7)	2 (0.5)	9 (1.4)		
Elementary school	59 (22.8)	32 (8.3)	91 (14.1)		
Secondary school	153 (59.1)	291 (75.2)	444 (68.7)		
Bachelor	34 (13.1)	50 (12.9)	84 (13.0)		
Master	2 (0.8)	4 (1.0)	6 (0.9)		
PhD	4 (1.5)	4 (1.0)	8 (1.2)		
Post PhD	0 (0.0)	4 (1.0)	4 (0.6)		
Employment					
Unemployed	57 (22.0)	123 (31.8)	180 (28.9)	76.6	<0.001
Self-employed	57 (22.0)	40 (10.3)	97 (15.0)		
Public sector	59 (22.8)	109 (28.2)	168 (26.0)		
Private sector	43 (16.6)	97 (25.1)	140 (21.7)		
Retired	43 (16.6)	18 (4.7)	61 (9.4)		
Financial loss				1.2	0.271
Yes	123 (47.5)	214 (55.3)	337 (52.2)		
No	136 (52.3)	173 (44.7)	309 (47.8)		
Migrations				221.2	<0.001
Yes	62 (23.9)	72 (18.6)	134 (20.7)		
No	197 (76.1)	315 (81.4)	512 (79.3)		
Loss of a close person				18.7	<0.001
Yes	127 (49.0)	141 (36.4)	268 (41.5)		
No	132 (51.0)	246 (63.3)	378 (58.5)		
Physical trauma				339.5	<0.001
Yes	89 (34.4)	0 (0.0)	89 (13.8)		
No	170 (65.6)	387 (100.0)	557 (86.2)		
Total	259 (40.1)	387 (59.9)	646 (100.0)		

Table 2. Descriptive statistics and Mann Whitney U test for IES (B&H), IES (Ukraine) and SRQ

Variable	Total	Directly exposed	Indirectly exposed	U	p
	Mean ± (Min – Max)	Mean ± (Min – Max)	Mean ± (Min – Max)		
IES (B&H)	25.8 ± 18.0 (0.0 – 81.0)	34.2 ± 17.4 (2.0 – 81.0)	16.0 ± 16.1 (0.0 – 58.0)	27690.0	<0.001
IES (Ukraine)	24.6 ± 13.0 (0.0 – 72.0)	32.6 ± 13.3 (7.0 – 72.0)	19.3 ± 9.8 (0.0 – 52.0)	38247.5	<0.001
SRQ	10.4 ± 4.98 (0.0 – 22.0)	13.1 ± 5.1 (0.0 – 22.0)	8.6 ± 4.0 (0.0 – 18.0)	24504.5	<0.001

Table 3. The linear regression for the dependent variable: Exposure to war (indirectly = 1 & directly = 2)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p value
	B	SE	Beta		
Constant	0.424	.043		9.930	<0.001
IES (B&H)	0.010	.001	0.354	11.800	<0.001
IES (Ukraine)	0.012	.001	0.318	10.470	<0.001
SRQ	0.042	.003	0.423	14.300	<0.001

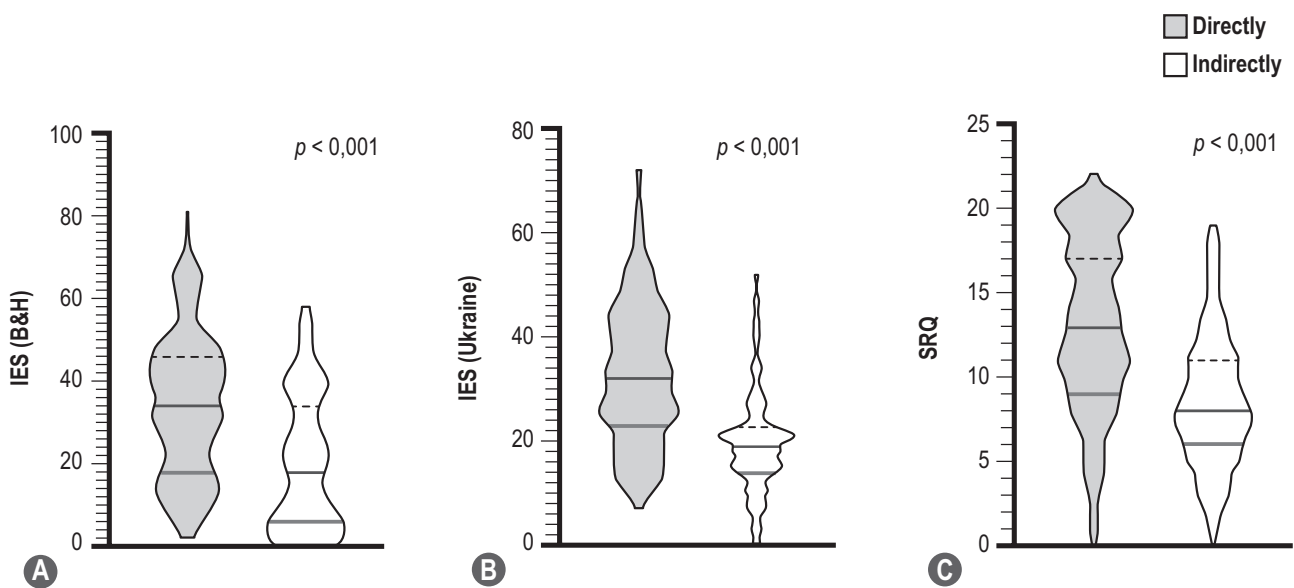


Figure 1. Violin plots for measured scales: A – IES (B&H); B – IES (Ukraine); C – SRQ.

Impact of war in Ukraine on PTSD severity and mental status of previously exposed population

Regression analysis was conducted to assess the relationship between the severity of PTSD symptoms and the exposure to war events, using the IES (B&H), IES (Ukraine), and SRQ as predictors (Table 3). The findings demonstrate a significant association between exposure to war events in Bosnia and Herzegovina and the increase in PTSD symptoms among the examined groups

(Beta = 0.354, $p < 0.001$). Notably, a connection is also observed between the impact of war events in Ukraine (IES-Ukraine) and the group previously exposed to war activities in Bosnia and Herzegovina (Beta = 0.318, $p < 0.001$). The results in Table 3 suggest the possibility of trauma reenactment within the population that was directly exposed to the war. Furthermore, a deterioration in mental well-being attributed to the war in Bosnia and Herzegovina is evident in the directly exposed population, as indicated by the SRQ results (Beta = 0.423, $p < 0.001$).

Correlation between sociodemographic characteristics and war-associated factors with mental status and PTSD severity

A correlation analysis (Table 4) revealed significant positive correlations between sociodemographic characteristics (age, gender, residential environment, educational status, and employment) and the impact of the war in Bosnia and Herzegovina ($p < 0.01$). Specifically, it was found that increasing age had a positive correlation with higher values on the Impact Event Scale (IES), indicating a greater impact of the war events. Males were found to have a stronger association with war-related impact compared to females. Urban residency, higher educational attainment, and unemployment were also found to be associated with increased war-related impact. Furthermore, all war-associated factors (exposure to war, financial loss, migration, loss of a loved one, and physical trauma) showed significant positive correlations with the impact of the war in Bosnia and Herzegovina and were positively correlated with the respondents' mental state (SRQ) ($p < 0.01$).

Table 4. Correlation between sociodemographic characteristics and war-associated factors with SRQ, IES (B&H) and IES (Ukraine).

Variable	IES (B&H)	IES (Ukraine)	SRQ
Age	0.490**	150**	0.147**
Gender	0.569**	0.181**	0.190**
Residential environment	0.131**	0.031	0.255**
Education	0.197**	0.011	0.172**
Employment	0.126**	0.088*	0.083**
Exposure	0.380**	0.483**	0.435**
Financial loss	0.254**	0.106**	0.182**
Migration	0.301**	0.073	0.244**
Loss of close person	0.413**	0.015	0.180**
Psychical trauma	0.194**	0.169**	0.207**

Legend: ** – correlation is significant at < 0.01 (two-tailed).

DISCUSSION

The study findings provide empirical support for the presence of reenactment trauma among individuals directly involved in the army during the war in Bosnia and Herzegovina. The predominance of male participants in

the recruited army group is consistent with previous research (Turner et al. 2007; Marmar et al. 2015).

Sociodemographic factors have been found to be associated with PTSD. Fel et al. (2022) have highlighted that PTSD is not solely a consequence of exposure to wartime circumstances but is also influenced by financial and social factors. Similar findings have been reported by Gaviria et al. (2016). In the Bosnian and Herzegovinian sample, a statistically significant correlation was observed between socio-demographic variables such as age, gender, level of education, and employment status, and the impact of the war in Bosnia and Herzegovina on the participants. Furthermore, a correlation was identified between age, gender, and employment status and the impact of the ongoing war in Ukraine on the research participants. Chudzicka-Czupala et al. (2023) have indicated that female gender, pre-existing psychiatric conditions, coping avoidance, and self-rated mental health are risk factors associated with the occurrence of anxiety, depression, stress, and PTSD. Their study findings support the notion that sociodemographic characteristics of the participants may influence the origin, progression, or reenactment of trauma, as observed in samples from Poland, Ukraine, and Taiwan populations (Chudzicka-Czupala et al. 2023).

War-related factors exhibit positive correlations not only with the war in Bosnia and Herzegovina but also with the conflict in Ukraine. El Zouki et al. (2022) assert that the financial crisis and the loss of loved ones are interconnected and influential factors in the onset of PTSD, aligning with the findings of this study. Furthermore, Jovanović et al. (2010) have demonstrated the association between physical trauma and the development of PTSD. Massag et al. (2023) propose a potential link between sociodemographic characteristics and mental health impairment among Germans affected by the war in Ukraine, emphasizing the significance of economic status. Migration, resulting from the war, emerges as a crucial factor, with approximately one-fifth of participants reporting forced migration during the war in Bosnia and Herzegovina. Fino et al. (2020) conclude that PTSD resulting from refugee experiences contributes to increased psychiatric morbidity, and the psychological consequences of war can persist even years after migration. In the context of technological advancements and information accessibility, alongside migrations, the role of media in war-related mental health impairment becomes essential. Su et al. (2022) highlight the presence of media-induced war trauma as a consequence of the war in Ukraine.

The primary objective of this study was to investigate the impact of war events in Ukraine on the mental state

of the exposed group of respondents. Regression analysis revealed the influence of war operations in Ukraine on individuals previously recruited into the army in Bosnia and Herzegovina during the war. PTSD resulting from war trauma can be reactivated due to stressful events experienced by this vulnerable group. Jakovljević et al. (2012) highlight the relationship between negative life events, psychotrauma, and various illnesses. Furthermore, PTSD has been associated with the development of metabolic syndrome (Babić et al. 2007), cardiovascular diseases (Šagud et al. 2017), epigenetically conditioned diseases (Jakovljević 2019), depression (Jakšić et al. 2020), neuroticism (Jakšić et al. 2012), and borderline personality disorder (Stopyra et al. 2023).

The possible limitation of this study is its geographic restriction to the Zenica-Doboj and Central-Bosnia cantons, which may limit generalizability. Further research with a larger and more diverse sample is needed to validate the findings and obtain more comprehensive data.

CONCLUSION

Direct exposure to war poses a significant risk for long-term psychological and psychiatric consequences. This study highlights the reenactment of trauma in individuals previously directly exposed to the war in Bosnia and Herzegovina. Based on the findings of the research, it is advisable for practitioners to enhance their awareness regarding the potential impact of conflict events in Ukraine on individuals who have previously experienced the war in Bosnia and Herzegovina. It is recommended to

conduct comprehensive assessments to identify specific war-related experiences in both contexts, and implement trauma-informed care strategies to establish a safe and supportive environment. Treatment interventions should address both the initial trauma from the previous conflict and the subsequent effects of the war in Ukraine. Collaborative efforts among practitioners from various disciplines are essential to deliver comprehensive care, while providing psychoeducation and support to individuals and their families. Long-term monitoring is also suggested to detect changes in symptoms and provide sustained assistance.

Ethical Considerations: Does this study include human subjects? YES

Authors confirmed the compliance with all relevant ethical regulations.

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