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Risk Factors for Posttraumatic Stress Disorder in Trauma Patients from Bullfighting-Related Events in Spain

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Abstract

Background: Unintentional Trauma injuries are one of the leading causes of posttraumatic stress disorder development. However, screening for this condition is not typically included in routine medical care. Research on posttraumatic stress disorder after unintentional injuries sustained during entertainment activities involving risk, has been scarce. This study aimed to analyze the proportion of posttraumatic stress disorder and its risk factors in patients with trauma injuries sustained during bullfighting-related events in Spain. **Methods**: Two hundred and seventy-four patients were evaluated to determine the presence of posttraumatic stress disorder at least one month after the injury. Data about sociodemographic variables, injury circumstances, characteristics of the injury, and treatments were collected by the surgery team on-site or collected during the follow-up assessment. Diagnosis of posttraumatic stress disorder was made by a trained clinician using a structured clinical interview based on DSM criteria. **Results:** The estimated proportion of was 25.18% (95% CI: 20.18%, 30.18%). Residing in areas with a bullfighting tradition, female gender, referral to a medical center, hospitalization, events involving fighting bulls, and having been injured by the crowd were significant predictors. **Limitations:** The short-term follow-up and the inability to evaluate some predictors of interest, including the body site of the injury, the presence of disfigurement, and comorbid anxiety and depression, were noted. **Conclusion:** Posttraumatic stress disorder could have a high prevalence in individuals injured in these types of events, especially in women, those who are not familiar with the situation, and those who require medical attention. These results highlight the need for routine screening for posttraumatic stress disorder in individuals with trauma injuries for early symptom management.

Keywords: Posttraumatic stress disorder; trauma patients; predictors; bullfighting

Introduction

Traumatic unintentional injuries affect millions of people worldwide every year and are one of the leading causes of disability and death (Badhiwala et al., 2019; DiMaggio et al., 2016). However, traumatic unintentional injuries not only cause physical damage but also frequently lead to psychological sequelae that are typically overlooked by routine healthcare services (Meneses et al., 2021). Post-traumatic stress disorder (PTSD) is characterized by intrusions, avoidance, and negative cognitive and affective alterations following direct or indirect exposure to a traumatic event (American Psychiatric Association – APA –, 2013). Rates of PTSD among injury survivors are considerably elevated, with up to 45% of patients experiencing PTSD within the first year following the incident (Barker-Collo et al., 2013; Bell et al., 2018; Zatzick et al., 2003).

It is well-known that there is an association between PTSD and unintentional traumatic injuries, such as the occurred in traffic accidents (Fekadu et al., 2019), natural disasters (Beaglehole et al., 2018), war (Hoppen & Morina, 2019), and interpersonal violence (Bailey et al., 2019). These events are unexpected and unwanted for people who suffer from them. By contrast, there are other risky situations in which people voluntarily engage for fun or entertainment. These kinds of activities involve significant risks and attract people seeking sensations and exciting experiences.

Bullfighting-related events (BREs) are defined as folk celebrations that include activities with fighting bulls or cows (generally, bull runs or some variations such as leaping over the animals). BREs are part of traditional Spanish culture, with more than 18,000 BREs celebrated by year (Culture and Sports Ministry, 2021). These events are also held in Portugal, France and various Latin American countries. Every year, hundreds of people are injured in BREs, either due to accidents caused by animals,

environmental elements, or overcrowding, and these individuals are considered polytraumatized patients (Cozcolluela-Cabrejas et al., 2019). Bullfighting is a voluntary activity that implies a risk for the individual who practices it. Bullfighting professionals are trained and psychologically prepared to assume the intrinsic risks of their activity. On the contrary, participants in BREs are people from the general public who either actively engage (e.g. ran with the bulls) or simply act as observers of the event. Unlike professionals of bullfighting, people participating in BREs are not prepared to put their personal safety, and sometimes their lives, at risk.

Given the unique characteristics of trauma patients injured in BREs (non-professional people involved in a voluntary leisure risk activity) and the absence of scientific literature in this field (PTSD in people injured by animals, or in leisure activities), the main goals of this research were to examine the proportion and severity of PTSD in trauma patients injured in BREs and to explore risk factors of PTSD related to sociodemographic variables, accident circumstances, injury characteristics, and treatment received.

Method

Participants

Participants in this study were 274 individuals from the general population who had sustained trauma injuries during BREs celebrated in three different towns (Blanca, Moratalla, and Cehegín) of the Community of Murcia (Spain) between 2010 and 2021. They were attended by a surgical team led by the first author which is hired by the councils of towns where the events were celebrated. Inclusion criteria were: a) having suffered an injury directly related to participation in the event and b) being over 12 years old. Patients who were considered incapable of completing the required evaluation for the study due to language or cognitive level were excluded. The total sample

comprised of 240 males (87.6%) and 34 females (12.4%). The age range varied from 13 to 86 years (Mean±SD = 32.24±15.46), with 33 (12.04%) participants being under 18 years old, 220 (80.29%) falling between 18 and 59 years old, and 21 (7.66%) aged between 60 and 82 years. The majority of the participants were Spanish (n = 271, 98.9%), with the remaining three participants being Latin American (1.1%). Sixty-nine participants were diagnosed with PTSD according to DSM-IV (APA, 1994) or DSM-5 (APA, 2013), and the Severity Scale for Symptoms of Post-traumatic Stress Disorder (EGS, Echeburúa et al., 1997), whereas 205 did not meet the diagnostic criteria. The complete list of demographic characteristics for each group is presented in Table 1.

Table 1. Results of descriptive and bivariate analysis for sociodemographic variables

Variables	PTSD (n = 69)	No PTSD (n = 205)		
	Mean (SD)	Mean (SD)	*t*	*p*
Age	30.59 (13.46)	32.80 (16.08)	- 6.13	.540
	n (%)	*n* (%)	X^2	*p*
Age Group				
Young	29 (42.00)	84 (41.00)	.484	.785
Adult	38 (55.10)	111 (54.10)		
Elder	2 (2.9)	10 (4.90)		
Younger than 18				
No	57 (82.6)	184 (89.80)	2.499	.135
Yes	12 (17.4)	21 (10.20)		
Gender				
Male	50 (20.83)	190 (79.17)	19.417	<.001
Female	19 (55.89)	15 (44.11)		
Residing in area with bullfighting tradition				
No	35 (53.85)	30 (46.15)	37.16	<.001
Yes	34 (16.27)	175 (83.73)		
Previous injuries in BREs				
No	51 (73.90)	78 (62)	3.245	.081
Yes	18 (26.10)	127 (38)		

Study Variables

Data collection included several clusters of potential predictors of PTSD. Sociodemographic variables were years of age, gender (male/female), place of residence (variable used to classify participants according to residence in area with or without BREs tradition), previous injuries in BREs (yes/no). Variables related to injury circumstances were the type of animal participating in the event (cows/fighting bulls), origin of the injury (animal/crowd/environment). Characteristics of the injury were injury with fracture (yes/no), polytrauma (yes/no), physical complications (yes/no), and sequelae (yes/no). Variables related to the treatment received were analgesics (yes/no), antibiotics (yes/no), surgery (yes/no), orthopedic treatment (yes/no), referral to a medical center (yes/no) and hospitalization (yes/no). Demographic information, injury circumstances, injury characteristics, and initial intervention procedures were collected on-site. Information regarding patient progress, hospital interventions, PTSD diagnosis, and severity were gathered during a follow-up appointment and some data about treatment received by patients who were referred to medical centers were occasionally retrieved from databases.

Measures

Severity Scale for Symptoms of Post-traumatic Stress Disorder (EGS; Echeburúa et al., 1997; 2016). This is a 17-item clinician rating scale based on DSM-IV diagnostic criteria. Items are rated according to a Likert scale from 0 (*never/nothing*) to 3 (*more than 5 times a week/a lot*). Symptoms are considered present when they are rated with 2 or more points. The EGS comprehends three dimensions: Reexperiencing, Behavioral/Cognitive Avoidance, and Physiological Activation. A total score of 15 demonstrated a sensitivity of 100% and a specificity of 97.3% (Echeburúa et al., 1997). Echeburúa et al. (2016) developed the revised version (EGS-R) based on the DSM-5

criteria. In this study, the cut-off points and subscales of the first version of EGS were used to analyze the severity of PTSD symptoms.

Procedures

This was a prospective study designed to explore posttraumatic stress disorder in this specific population. Demographic information, injury circumstances, injury characteristics, and initial intervention procedures were collected on-site by the surgical team. At least one month after the injury (the follow-up time ranged from 1 to 3 months, with a mean ± SD of 1.44 ± .79) patients who met the inclusion criteria were contacted to offer the study participation. Information regarding patient progress, hospital interventions, and PTSD diagnosis and severity were gathered during a follow-up appointment for the 274 patients who consented to study participation. A trained clinician administered the EGS and confirmed the diagnosis of PTSD based on the score of the EGS and DSM criteria. All study procedures were reviewed and approved by the ethical committee of the Clinical University Hospital Virgen de la Arrixaca in Murcia. Patients who received a diagnosis of PTSD or clinically significant symptoms were offered referral to psychiatric/psychological services.

Data Analysis

Descriptive analysis was performed separately for each group, including all study variables. The proportion of patients with PTSD and its 95% confidence interval were estimated. Bivariate analyses were conducted to test the association between PTSD diagnosis and sociodemographic variables, variables related to injury circumstances, characteristics of the injury, and treatments received. Specifically, Chi-squared tests were used to analyze the association between diagnosis and qualitative variables, and T-tests were performed to compare group values on quantitative variables. To examine the

relative weight of each predictor after controlling for all other predictors, a multivariate stepwise logistic regression analysis was performed, including all independent variables significantly associated with PTSD diagnosis in the bivariate analyses, and the PTSD diagnosis as the dependent variable. All tests were computed with a two-tailed alpha of .05 for statistical significance. The analyses were performed on the Statistical Package for the Social Sciences (SPSS) version 27. The G*Power software (Faul et al., 2007) was employed to calculate the study's statistical power. The results indicated that, with the given sample size (n = 276) and a significance level of $\alpha = .05$, our study demonstrated a statistical power of .90, enabling the detection of effects with an odds ratio (OR) greater than or equal to 1.5 in logistic regression.

Results

The estimated proportion of PTSD in trauma patients injured in BREs was 25.18% (95% CI: 20.18%, 30.18%). The total severity score on EGS differed significantly (t = 27.18, $p < .000$) between patients with PTSD diagnosis (16.88 ± 4.33) and patients without PTSD (1.50 ± 3.14). Similarly, scores on Reexperiencing (PTSD: 5.32±2.11, No PTSD: .60±1.21, t = 17.60, $p < .000$), Behavioral/Cognitive Avoidance (PTSD: 5.05±1.56, No PTSD: .17±.57, t = 25.60, $p < .000$), and Physiological Activation (PTSD: 6.42±1.91, No PTSD: .72±1.52, t = 22.49, $p < .000$) presented significant differences between groups.

The bivariate analysis of predictors of PTSD is presented in Tables 1 and 2. There were no significant differences between groups in the mean age, and in the number of participants of each age group under 18, and with previous injuries in BREs. Female gender (OR = 4.81, 95% CI: 2.29, 10.14) and residing in areas without a bullfighting tradition (OR = 6.00, 95% CI: 3.26, 11.06) were significantly related to a PTSD diagnosis. Regarding injury circumstances, BREs with bulls (OR = 2.22, 95% CI: 1.15, 4.27),

injuries caused by the crowd (OR = 1.99, 95% CI: 1.08, 3.68), and injuries caused by environmental elements (OR = .43, 95% CI: .23, .83) were significantly associated with PTSD. Except for the proportion of polytraumatized patients, all remaining variables related to the injury were significantly associated with a PTSD diagnosis, injury with fracture (OR = 3.70, 95% CI: 1.50, 9.14), physical complications (OR = 4.99, 95% CI: 2.65, 9.37), and sequelae (OR = 2.74, 95% CI: 1.40, 5.37). All variables related to the treatment received were significantly associated with a PTSD diagnosis, analgesic treatment (OR = 2.73, 95% CI: 1.52, 4.90), antibiotics (OR = 2.79, 95% CI: 1.40, 5.57), orthopedic treatment (OR = 2.32, 95% CI: 1.33, 4.05), surgery (OR = 1.83, 95% CI: 1.02, 3.26), referral to a medical center (OR = 5.52, 95% CI: 3.07, 9.92), and hospitalization (OR = 8.40, 95% CI: 3.98, 17.69).

Table 2. Results of descriptive and bivariate analysis for predictors related to injury circumstances, injury characteristics, and treatments received

Variables related to the injury circumstances				
	PTSD (*n* = 69)	No PTSD (*n* = 205)		
	n (%)	*n* (%)	X^2	*p*
Type of animal				
Fighting bulls	50 (22.22)	175 (77.78)	5.852	.016
Cows	19 (38.78)	30 (61.22)		
Origin of injury				
Animal	33 (26.83)	90 (73.17)	8.439	.015
Crowd	22 (36.07)	39 (63.93)		
Environment	14 (15.56)	76 (84.44)		
Characteristics of the injury				
Injury with fracture				
No	58(84.06)	195 (95.13)	8.930	.003
Yes	11(15.94.14)	10 (4.87)		
Polytrauma				
No	44 (25.14)	131 (74.86)	.000	.984
Yes	25 (25.25)	74 (74.75)		

Physical complications	40 (18.26)	179 (81.74)	27.711	<.001
No	29 (52.72)	26 (47.28)		
Yes				
Sequelae				
No	50 (21.74)	180 (78.26)	9.013	.003
Yes	19 (43.18)	25 (56.82)		
Variables related to treatments received				
Analgesics				
No	40 (19.8)	162 (80.2)	11.812	.001
Yes	29 (40.28)	43 (59.72)		
Antibiotics				
No	51 (21.89)	182 (78.11)	8.968	.003
Yes	18 (43.9)	23 (56.1)		
Surgery				
No	34 (19.32)	142 (80.68)	8.982	.003
Yes	35 (35.71)	63 (64.29)		
Orthopedic treatment				
No	43 (21.94)	153 (78.06)	3.845	.050
Yes	26 (33.33)	52 (66.67)		
Derivation				
Home	24 (13.56)	153 (86.44)	35.851	<.001
Medical center	45(46.39)	52 (53.61)		
Hospitalization				
No	44 (18.64)	192 (81.36)	38.612	<.001
Yes	25 (65.79)	13 (34.21)		

Given the relationship between injury characteristics and treatments received, a first multiple logistic regression model was computed including these two clusters of predictors. Only referral to a medical center and hospitalization remained as significant predictors of PTSD, whereas the injury with fracture (β = .65, *Wald* = 1.07, p = .300), physical complications (β = .71, *Wald* = 2.30, p = .130), sequelae (β = .74, *Wald* = 1.83, p = .176), and the administration of analgesic treatment (β = .03, *Wald* =.01, p = .944),

antibiotics (β =.24, *Wald* =.13, p = .715), and orthopedic treatment (β = .23, *Wald* = .38, p = .536) were no longer significant predictors.

In the second multiple logistic regression analysis, referral to a medical center and hospitalization were introduced along with demographics and injury circumstances. Results showed that all predictors were significant except for injury caused by environmental elements, which became non-significant (β = -.30, *Wald* = .39, p = .530).

The final model including all significant predictors, is shown in Table 3. The most influential predictor was the place of residence, presenting a significantly higher risk of developing PTSD participants from areas with no tradition of BREs. The second most relevant predictor of developing PTSD was female gender, followed by treatment-related predictors, referral to a medical center, and hospitalization. The presence of bulls at the event and injuries originated by the crowd were predictors with a lower relative weight. This model accounted for 38.4% of the variance and accurately classified 86.1% of participants.

Table 3. Stepwise logistic regression model to predict PTSD among trauma patients injured in BREs

Variables	β	SE	Wald value	*df*	*p*	*OR*	*95% CI*	
Referral to a medical center (yes)	2.28	.49	21.89	1	.000	9.74	3.75	25.28
Hospitalization (yes)	2.12	.54	15.58	1	.000	8.34	2.91	23.89
Gender (female)	2.69	.58	21.37	1	.000	14.69	4.70	45.91
Residing in area with bullfighting tradition (no)	2.97	.49	36.36	1	.000	19.56	7.44	51.43
Type of animal (fighting bulls)	1.43	.46	9.71	1	.002	4.17	1.70	10.23

Injury with the origin in the crowd (yes)	1.32	.45	8.53	1	.004	3.74	1.54	9.07
Constant	1.66	1.07	2.42	1	.120			

Discussion

This is the first study examining the presence, severity, and predictors of PTSD in trauma patients injured in BREs. To our knowledge, there are no studies investigating PTSD in trauma patients injured in risky leisure activities with animals. Our results have revealed a PTSD rate of 25.18% between 1 and 3 months after the injury. This rate is high and similar to that reported in studies with trauma patients after injuries in various situations. Warren et al. (2014) reported a prevalence of PTSD of 25.4% in 118 trauma patients at six months, while Bell et al. (2018) observed rates of 26.6% at 1 month, 27.8% at 2 months, and 29.8% at 4 months after injury. Severity scores for PTSD differed significantly between patients with and without PTSD, for both the total score and the Reexperiencing, Avoidance, and Activation subscales. These scores reflected lower severity than those reported for PTSD patients in other studies using the EGS (Echeburúa et al., 1997; Amor et al., 2002). This fact could be due to the different traumatic situations experienced by participants or the longer follow-up assessments performed in other studies.

The strongest predictor of PTSD in these patients was being from an area without a bullfighting tradition. In this sense, Mineca and Zimbardo (2006) suggest that "psychological readiness" for a traumatic situation acquired by an individual in a specific background has a protective effect on developing PTSD. The authors mention the psychological readiness for torture of political activists in comparison to ordinary citizens (Başoğlu et al., 1997). According to these authors, psychological readiness could reduce the perception of uncontrollability and unpredictability during traumatic

situations. As it has been described, people attending BREs are not professionals in bullfighting, and in general, they are not psychologically prepared to experience life-threatening situations. Psychological readiness in people living in areas with a bullfighting tradition could be built upon prior experiences with injuries in BREs, greater knowledge about how these situations could be handled, greater expectations about the occurrence of injuries, etc. On the other hand, people from areas without bullfighting tradition may have experienced the accident as much more uncontrollable and unpredictable, which are consistent predictors of PTSD in animal models (Foa et al., 1992). The study also found that female patients, were more likely to have PTSD. This is consistent with previous research that has found females to be at a greater risk for PTSD (Christiansen & Berke, 2020).

Although certain characteristics of the injury and treatments received were significant in the bivariate analysis, at the multivariate level, injury with fracture, physical complications, and sequelae, as well as most of the medical interventions, became non-significant predictors. Only referral to a medical center and hospitalization remained significant predictors. These predictors exhibited lower relative importance than patient sociodemographic variables for the development of PTSD. This finding suggests that injury severity may not be a decisive factor in the development of PTSD, and that psychosocial characteristics of patients may be more relevant. Some studies (Baecher et al., 2018; Sandweiss et al., 2011) have found that injury severity score is associated with the presence of PTSD, but many others have reported no such relationship (Brasel et al., 2010; Herrera-Escobar et al., 2018; Quale et al., 2009).

Other significant predictors were related to the circumstances of the injury, with an increased risk of PTSD in BREs with bulls and when the injury was caused by the crowd. It is possible that these accidents were perceived as more violent than accidents

caused by environmental elements. The mechanism of injury may have influenced the development of PTSD symptoms in other studies. For example, injuries associated with intentional or interpersonal violence led to poorer post-traumatic adjustment than fortuitous mechanisms such as falls (Herrera-Escobar et al., 2018).

These results need to be interpreted with consideration of some limitations. First, patients were only assessed in one follow-up within the first three months after the injury, which makes it impossible to extend our findings to the long-term development of PTSD. Second, due to the specificity of the sample, data collection for the study had to be carried out over several years. During this period there were changes in the diagnostic criteria for PTSD. Despite the incorporation of the new criteria in the diagnosis of the participants, the scale used was based on DSM-IV criteria, so results for severity in the dimension of negative alterations in cognitions and mood were not obtained. This dimension should be assessed in future studies. Third, patients injured in bullfighting-related events (BREs) could have unique characteristics that differ from other trauma patients, limiting the generalizability of the results. It is possible that participants differ in other psychosocial variables, such as the quality of social support, family responsibilities, or socioeconomic status, whose relationship with PTSD symptoms was not examined in the current study. Fourth, other potential predictors, such as the body site of the injury, the presence of disfigurement, or comorbid anxiety and depression, could not be analyzed. Therefore, future studies should include long-term follow-up assessments and measures examining disfigurement, comorbidities, social support, socioeconomic status, and other relevant factors.

Despite these limitations, the strengths of the current study (large sample size, standardized diagnosis, and the inclusion of new predictors) have contributed to a better understanding of why exposure to similar traumatic situations led some people to

develop PTSD, while others do not. As seen, more than a quarter of patients injured in BREs could develop PTSD within the first three months after the accident, with symptom severity still low at this stage. This suggests a need for early identification and follow-up of psychopathological symptoms in traumatically injured patients. The absence of early identification and treatment of PTSD symptoms will negatively impact individuals' long-term recovery, quality of life, and risk of other mental health problems, such as anxiety or depressive symptoms (Wiseman et al., 2013). Therefore, screening and intervention for PTSD symptoms are encouraged in patients injured in BREs and other similar leisure risk situations in the first few months after the injury, when symptom severity is still mild. In this way, it would be possible to reduce the long-term negative effects on mental and physical health and functioning.

Although this study was conducted in the context of bullfighting-related injuries, the findings can have broader implications for the treatment of PTSD in individuals with trauma injuries. Further research is needed to explore the effectiveness of early screening and intervention in reducing the prevalence and burden of PTSD in these patients.

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