It is illegal to post this copyrighted PDF on any website. Does Acute Stress Disorder Predict Subsequent Posttraumatic Stress Disorder in Pediatric Burn Survivors?

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ABSTRACT

Objective: This study examined the prevalence of posttraumatic stress disorder (PTSD) in pediatric burn survivors who had been treated for acute stress disorder (ASD) symptoms during their initial hospitalization and compared them to patients who had been asymptomatic for ASD symptoms.

Method: Participants were identified from electronic medical records from 1995 to 2008 and data were collected from 2006 to 2008. Participants were primarily matched on total body surface area burned and gender, and as close as possible on age at time of burn and number of years postburn. Pediatric burn survivors completed a semistructured clinical interview, the Missouri Assessment of Genetics Interview for Children-PTSD section, which is based on criteria from the *DSM-IV* for evaluating lifetime PTSD.

Results: There were 183 participants in the study, and from this sample 85 matched pairs were identified. Most were 5 years postburn. The prevalence of PTSD at the time of follow-up was 8.24% (7 of 85) for the ASD group and 4.71% (4 of 85) for the non-ASD comparison group. No significant differences were found between these groups at *P* value \geq .05. A logistic regression analysis was conducted to determine if prior ASD diagnosis, burn size, gender, ethnicity, age at time of study participation, and number of years postburn predicted subsequent PTSD. None of the variables were significant predictors.

Conclusions: The prevalence of PTSD was similar in children who had ASD symptoms and those without ASD symptoms. The lifetime prevalence of PTSD was lower than reported in other studies. A possible explanation for this finding is that children received timely pharmacotherapy and psychotherapy during their acute hospitalization.

J Clin Psychiatry 2015;76(11):1564–1568 dx.doi.org/10.4088/JCP.14m09365 ©Copyright 2015 Physicians Postgraduate Press, Inc. **B** urn injury can be traumatic and may trigger symptoms that negatively affect a person's emotional and social well-being. Burn survivors often experience anxiety disorders several years after the injury.^{1,2} Two common anxiety disorders that may develop after trauma are acute stress disorder (ASD) and posttraumatic stress disorder (PTSD).³

Various investigators have examined the prevalence of these disorders in adults following burn injury. Prevalence rates of ASD range from 19%⁴ to 23.6%⁵ and of PTSD from 33.3% to 40% 6 months postburn injury^{4–6} and 15% to 45% 1 year postburn injury.^{5–10} More research has become available on the prevalence of these disorders in children. The National Comorbidity Survey Replication Adolescent Supplement reported the 12-month rate of PTSD for adolescents in the United States was 3.9%, and lifetime prevalence in this group was 78.1%.¹¹ ASD prevalence rates in children with postburn injury range from 8.7%¹² to 31%.^{13,14} Stoddard and colleagues¹⁵ reported the current rate of PTSD in children after a burn was 6.7% and the lifetime rate 30%. Meyer and colleagues¹ found the current prevalence of PTSD in young adults who sustained burns during childhood was 9% and the lifetime rate was 21%.

Risk factors for very young children (under 3 years of age) developing trauma symptoms after a burn injury include pain,¹³ burn size,^{13,16} length of hospital stay,¹⁶ and number of dressing changes.¹⁶ Heart rate and parents' acute stress symptoms have also been associated with trauma symptoms.^{13,14} Daviss and colleagues¹⁷ examined predictors of ASD in hospitalized, school-aged children. They concluded caregiver stress and premorbid psychological problems were associated with ASD. Saxe and colleagues¹⁸ found that pain, separation anxiety, burn size, and dissociation predicted PTSD in older children with postburn injury and contributed to 59% of the variance.

The relationship between childhood ASD and PTSD remains unclear. Kassam-Adams and Winston¹⁹ evaluated childhood survivors of accidental injury for ASD symptoms during their initial hospital stay and PTSD 3 months later. Fourteen percent of the children experienced ASD symptoms and 8% were diagnosed with ASD, while 11% experienced PTSD symptoms and 6% were diagnosed with PTSD. A small percentage (14%) of the children with ASD developed PTSD. The ASD diagnosis was not strongly predictive of subsequent PTSD, but dissociation and arousal were.

To our knowledge, the prevalence of PTSD in pediatric burn survivors who had ASD symptoms during their initial hospital admission has not been estimated. The purpose of this study was to examine the prevalence of PTSD in children with large burns who received treatment for ASD symptoms during their initial hospitalization. As supported by the adult literature on burns, we hypothesized that the prevalence of PTSD would be significantly greater for pediatric burn survivors who had ASD symptoms than the non-ASD comparison group. Additional predictors of PTSD were also examined. We hypothesized that gender, age at time of recruitment, number of years postburn, and burn size would predict PTSD.

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Rosenberg et al It is illegal to post this copyrighted PDF on any website. symptom from 1 of the other 3 other clusters. ASD lasts at

- The relationship between acute stress disorder (ASD) and posttraumatic stress disorder (PTSD) in children with burn injuries is not well defined.
- ASD did not predict lifetime PTSD in children who had major burn trauma and were assessed on average 5 years postburn.
- For children who have major burns, an extensive treatment for pain and anxiety may reduce the incidence of PTSD regardless of whether they have previously had ASD.

METHOD

nical Points

Participants

The study was approved by the institutional review board of the University of Texas Medical Branch in Galveston. The study was supported by a Shrine grant and partially by a grant from the National Institute on Disability and Rehabilitation Research (NIDRR) because some of the participants were recruited for this study when they attended their clinic appointments for NIDRR. Two thousand eight hundred pediatric burn survivors who received burn care at Shriners Hospitals for Children in Galveston, Texas, from 1995 to 2008 were identified from the electronic medical records. From this list, 285 eligible participants were identified. The sample consisted of both children and adolescents who experienced ASD symptoms during their initial admission and received pharmacologic treatment and a non-ASD comparison group. Participants were primarily matched on total body surface area burned and gender and as close as possible on age at time of burn and number of years postburn. Participants in the ASD group had been identified with the ASD Symptoms Checklist previously used at Shriners Hospitals for Children-Galveston.²⁰⁻²³ Those in the ASD group had at least 2 ASD symptoms, enduring for a minimum of 2 days, with an intensity rating of 5 or higher on a 10-point scale.²³ The following inclusion criteria were used for the study. The sample consisted of English and Spanish speaking pediatric burn survivors from the United States and Mexico who received their acute medical care at this pediatric burn center. Participants were grouped as having experienced or not experiencing ASD. They were 2 to 12 years postinjury, and 5 years of age or older at the time of study recruitment. Children and adolescents who did not meet the inclusion criteria or had cognitive deficits were not asked to participate in the study.

Measures

DSM-IV-TR, ASD and PTSD sections. According to the *DSM-IV-TR*, the anxiety disorders of ASD and PTSD may occur after a trauma. The main differences between these disorders are the onset and duration of symptoms. Symptom clusters for these disorders include reexperiencing, avoidance, and increased arousal.³ ASD involves experiencing dissociative symptoms, and diagnosis requires at least 3 dissociative symptoms, in addition to 1

symptom from 1 of the other 3 other clusters. ASD lasts at least 2 days and less than 1 month from the time of injury.³ Comparatively, the diagnostic criteria for PTSD requires at least 1 reexperiencing, 3 avoidance, and 2 increased arousal symptoms for at least 1 month.³ In this study, ASD was measured with a brief clinical checklist and PTSD was measured with a semistructured clinical interview.

Acute Stress Disorder Symptoms Checklist. The ASD Checklist²⁰ was developed to evaluate ASD in critically ill, burn-injured children who received medical care at Shriners Hospitals for Children-Galveston.^{20–23} The ASD Checklist is based on *DSM-IV* criteria and assesses the 12 most commonly occurring symptoms in pediatric burn survivors. A score is obtained for the total number of symptoms reported.²⁰ Each endorsed item is rated for distress intensity using a 10-point scale, with higher numbers signifying greater distress.²³ The checklist can be administered to either the child or the caregiver and is available in English and Spanish.^{20–23} This measure was used in previous studies on ASD conducted at Shriners Hospitals for Children-Galveston.^{20–23}

Missouri Assessment of Genetics Interview for Children (MAGIC), PTSD section. The MAGIC²⁴ is a semistructured clinical interview, and its format is similar to the Diagnostic Interview for Children and Adolescents (DICA).²⁵ The MAGIC was developed using diagnostic criteria from the *DSM-III-R* and *DSM-IV*.^{24,25} There are different interviews for assessing diverse psychiatric disorders, including lifetime PTSD, in children and adolescents. The child version for measuring lifetime PTSD (MAGIC-C) contains 47 questions and is for ages 6–12 years. The adolescent version (MAGIC-A) has 45 questions and is for ages 13–17 years. Both are available in English and Spanish.²⁴ Todd and colleagues²⁶ found the measure had good interrater reliability and stability for assessing attention problems and depression in children and adolescents.

In this study, the MAGIC was scored using *DSM-IV-TR* diagnostic criteria for diagnosing PTSD: 1 or more reexperiencing, 3 or more avoidance, and 2 or more increased arousal symptoms.³

Procedure

Pediatric burn survivors who met criteria and their parents or caregivers were invited to participate in the study when they attended hospital clinic visits and outreach clinics in the United States and Mexico. Data were collected from 2006 to 2008. Eligible participants who did not have scheduled clinic appointments were contacted by phone, and arrangements were made for them to be seen at an outreach clinic near their community. Travel was provided by the hospital, local sponsors, or grant monies for the pediatric burn survivors to attend their regularly scheduled appointments.

Psychologists, a postdoctoral psychology fellow, a child psychiatrist, and a project coordinator assented and consented study participants. Families were given copies of the consent and assent forms. Pediatric burn survivors completed a semistructured clinical interview, the MAGIC-C or MAGIC-A (PTSD) by Reich and Todd.²⁴

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Table 1. Demographics for the Total Sample (N = 183)						
Variable	With Acute Stress Disorder (n=91)		Without Acute Stress Disorder (n=92)			
	n	%	n	%		
Gender						
Male	48	53	50	54		
Female	43	47	42	46		
Ethnicity-race						
White	13	14	14	15		
Hispanic	74	81	77	84		
Black	4	5	12	1		
Age at burn, y						
≤5	37	41	46	50		
6–12	40	44	36	39		
13≥	14	15	10	11		
Current age, y						
≤5	5	5	3	3		
6–12	35	39	48	52		
13≥	51	56	41	45		

Table 2. Demographics for the Matched Pairs (n = 170)					
	With Stress [(n=	Acute Disorder ^a = 85)	Without Acute Stress Disorder ^a (n=85)		
Variable	n	%	n	%	
Gender					
Male	46	54	46	54	
Female	39	46	39	46	
Ethnicity-race					
White	13	15	11	13	
Hispanic	69	81	74	87	
Black	3	4	0	0	
Age at burn, y					
≤5	37	44	40	47	
6–12	36	42	35	41	
13≥	12	14	10	12	
Current age, y					
≤5	5	6	2	2	
6–12	34	40	44	52	
13≥	46	54	39	46	
^a x ² Test, not significar	nt (<i>P</i> ≥.05).				

Although the MAGIC-C was developed for children 6–12 years of age, 8 children who were 5 years of age participated in the clinical interview because they were deemed mature enough to answer the questions. Parents and caregivers completed a demographic questionnaire. Three licensed psychologists (2 bilingual fluent in English and Spanish), 1 psychology postdoctoral fellow, and 1 child psychiatrist were trained to administer the MAGIC and conducted the interviews. Spanish-speaking participants were interviewed by 1 of the Spanish-speaking psychologists who are familiar with cultural issues in Mexico. When participants did not understand a question, it was clarified by the psychologist during the interview. The interviews took approximately 1 hour.

Statistical Analyses

Data were managed by the project coordinator and statistician. Data were analyzed using SAS statistical software (SAS Institute). Descriptive statistics were used for demographic information. χ^2 Tests were used to examine

Table 3. Demographics for Age, Years Postburn, and Burn Size of Matched Pairs (n = 170)

Variable	With A Stress D (n=	With Acute Stress Disorder (n=85)		t Acute isorder 85)	
	Mean	SD	Mean	SD	P Value ^a
Age at burn, y	7.3	4.3	6.8	4.2	.38
Current age, y	12.8	4.4	12.0	4.0	.26
Years postburn	5.4	1.9	5.3	2.1	.60
Total body surface area burned, %	52.0	21.1	51.5	18.8	.87
area burned, % av ² Test, not significat	pt (P > .05)				

whether there were differences between the ASD and non-ASD groups on any of the demographic variables and to examine the prevalence of PTSD in these groups. Logistic regression analysis was done to determine whether previous diagnosis of ASD, gender, age at time of recruitment, number of years postburn, and size of burn predicted PTSD. A 95% level of confidence was assumed.

RESULTS

Of 285 eligible participants, 183 participated (64% participation rate). Eight declined participation and 2 expired. Contact was not established with 92. We are not aware of any systematic differences between the participants and those lost to follow-up. The participants we were not able to contact had either moved or changed their phone numbers. Ninety-one participants were in the ASD group and 92 in the non-ASD group. Gender distribution was relatively equal. The large representation of Hispanics was the result of a Mexican philanthropy that sponsors the transportation of children with large burns to this pediatric burn center. The mean \pm SD age at the time of burn for the overall sample (N = 183) was 7.0 ± 4.3 years, mean age at time of recruitment was 12.4 ± 4.2 years, and mean years postburn was 5.4 ± 2.1 years. The mean \pm SD total body surface area burned was $51.4\% \pm 20.4\%$. Demographics for the overall sample are presented in Table 1.

Of the 183 participants, 85 were matched pairs with and without ASD. The χ^2 test was used to examine any differences between the matched pairs on demographic variables. Demographic information for the matched pairs is presented in Tables 2 and 3.

The χ^2 test was also used to examine the prevalence of PTSD at follow-up. First, participants who experienced PTSD symptoms but did not meet full diagnostic criteria for PTSD were examined. Participants in this group endorsed a minimum of 1 reexperiencing, avoidance, and increased arousal symptom on the MAGIC. Twelve participants (14.12%) in the ASD group and 7 (8.24%) in the non-ASD group endorsed PTSD symptoms. No between-group differences were found ($P \ge .05$). Seven participants (8.24%) who experienced ASD symptoms during their initial hospital admission met full diagnostic criteria for PTSD, while 4 participants (4.71%) in the non-ASD group were diagnosed with PTSD. No significant differences were

Rosenberg et al **It is illegal to post this copyrighted PDF on any website Table 4. Logistic Regression for Posttraumatic Stress Disorder**

Diagnosis of Matched Pairs (n = 170)

	Standard				
Predictor	df	Estimate	Error	Wald χ^2	P Value ^a
Prior diagnosis of acute stress disorder	1	-0.32	0.33	0.96	.33
Total body surface area burned	1	0.02	0.02	0.80	.37
Gender	1	-0.32	0.34	0.86	.36
Ethnicity-race	1	-7.67	192.3	0.00	.97
Current age	1	-0.07	0.08	0.79	.38
No. of years postburn	1	0.04	0.18	0.05	.82
^a Not significant ($P \ge .05$).					

found between the groups ($P \ge .05$). Three of the 37 children (8.1%) diagnosed with ASD symptoms under the age of 5 years developed PTSD. It is possible that, had we used an older sample of children with ASD, we may have different results. Of interest was that 4 of 11 participants (36.4%) who developed PTSD experienced a second trauma, as repeated trauma is a known risk factor for PTSD.

Logistic regression analysis was conducted to determine whether prior diagnosis of ASD, burn size, gender, ethnicity, and number of years postburn predicted PTSD. No predictive variable was identified (Table 4).

DISCUSSION

In this sample of long-term pediatric burn survivors, there was a small prevalence of lifetime PTSD (5%–8%). Using matched pairs, we detected no association between ASD and PTSD. In contrast, the literature on adult burn survivors reported that ASD experienced during the initial hospital stay was a strong determinant of subsequent PTSD.^{4,5} Difede and colleagues⁴ evaluated adults for ASD during their acute hospital stay and for PTSD 6 months later. Of the 19% of adults who had ASD, 89% developed PTSD. Similarly, McKibben and colleagues⁵ concluded that adult burn survivors who had ASD were more likely to develop PTSD that oftentimes persisted up to 2 years.

Individual ASD symptom clusters have received attention in the prediction of PSTD, yet the results have been equivocal. Van Loey and colleagues⁹ found dissociation correlated with PTSD scores 1 year postburn. Conversely, Difede and colleagues⁴ reported dissociative symptoms were not stronger predictors than the other symptom clusters. Reexperiencing symptoms were also common in individuals with PTSD.⁷ Other variables associated with the development of PTSD in adult burn survivors included number of acute surgeries,⁵ psychological problems,^{5,10} gender,^{5,9} size of burn,^{9,10} and length of hospitalization.^{9,10}

Inadequate pain control for a burn injury may contribute to the development of PTSD.^{18,27} During the intensive care treatment phase, pain is a strong predictor for developing trauma symptoms in children.^{13,18} Saxe and colleagues²⁷ examined the association between pain management and development of trauma symptoms in children who had burn injuries. They identified a significant inverse correlation between morphine dose and PTSD scores. Children who received higher doses of morphine reported fewer PTSD symptoms at 6 months' postburn.²⁷ At this pediatric burn center, the standard of care includes all children receiving frequent pain and anxiety assessment and timely polypharmacologic and psychological interventions. Virtually all receive opiates and benzodiazepines.¹² A limitation of the present study was that we did not control for the amount of opiates and benzodiazepines administered to children. However, Ratcliff and colleagues¹² reported a decrease in ASD prevalence from 12.1% to 8.7% when pain was more aggressively managed subsequent to the implementation of a pain protocol at Shriners Hospitals for Children-Galveston.

Meyer and colleagues¹ studied long-term psychosocial outcomes of young adult survivors of pediatric burns and reported a higher incidence of lifetime PTSD (21%). The majority of these patients from the 1980s and early 1990s did not receive the same quality of pain treatment with opiates for pain management.

Research has begun to examine the relationship between propranolol and prevention of PTSD in adults with burns, but the benefits for children need to be studied. Some of the participants in this sample received propranolol as part of their care during their initial hospital stay. In a previous study at Shriners Hospitals for Children-Galveston, Sharp and colleagues²⁸ found propranolol did not reduce the prevalence of ASD in children with major burns.

Another possible explanation for the low prevalence of PTSD in this study was that children received rather immediate psychological interventions and pharmacotherapy for management of anxiety. Early ASD intervention may reduce the likelihood of developing PTSD.⁵ Robert and colleagues²⁰²³ found fluoxetine and imipramine decreased ASD symptoms in children with burns during their initial treatment.

The use of a semistructured clinical interview gave participants the opportunity to elaborate on their experiences. However, rates of ASD and PTSD in childhood may be lower than expected due to developmental limitations. For example, very young children do not have the developmental capacity to understand the implications of their injury. Many participants were injured before the age of 5 years and were too young to recall injury-related events. A small percentage (8.1%) of children who experienced ASD under the age of 5 years developed PTSD. It is possible that having used an older sample of children with ASD may have provided different results.

In this study, a cohort of participants was evaluated at 1 time point rather than across time. Most studies that examined the relationship between ASD and PTSD after a burn injury evaluated participants at 6, 12, and 24 months' follow-up. Evaluating children across time may provide information not available in this study method. For example, some symptoms may be more problematic than others, which would be important for treatment. The current study addressed lifetime PTSD with the MAGIC-C and MAGIC-A (PTSD).²⁴ It is possible that some participants did not remember PTSD symptoms that occurred more than a few years prior to the

It is illegal to post this copy administration of the questionnaire. However, they were not bothered by PTSD symptoms at the time of follow-up. Of interest was that 36.4% of the participants who developed PTSD reported experiencing a second trauma.

The findings of this study may not generalize to other pediatric populations. Additional research exploring the relationship between ASD and PTSD is warranted, especially with the development of the *DSM-5*.²⁹ The revisions in diagnosis of ASD and PTSD in the *DSM-5* could potentially affect the results of this study. The *DSM-5* criteria for ASD remove the emphasis on the presence of dissociative symptoms and require that an individual only exhibit any 9 of the 14 listed symptoms. Likewise, the *DSM-5* criteria have been altered to include persistent negative emotional states as possible symptoms. In addition, the *DSM-5* provides specific alterations for diagnosis of PTSD in children and adolescents that lower the diagnostic threshold.²⁹ These changes might increase the number of study participants

in each diagnostic group. It is not clear if these additional potential participants would alter the study findings concerning the central hypothesis. It would therefore be useful to repeat the investigation using the revised criteria to see if the *DSM-5* diagnoses show a similar relationship between ASD and PTSD.

CONCLUSION AND FUTURE STUDY DIRECTIONS

Risk and protective factors for children developing ASD and PTSD following a burn injury is little understood. In this study, ASD did not predict lifetime PTSD in children who suffered major burn trauma and were assessed on average 5 years postburn. Future examination of timely, effective, and on-going psychotherapy and pharmacotherapy for management of pain, anxiety, and trauma symptoms is warranted.

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