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Prevalence of Post-Traumatic Stress Disorder Following Unintentional Injuries In Children

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ABSTRACT

Post-traumatic stress disorder (PTSD) is a trauma and stressor-related disorder that might have prominent negative effects on the social and academic life of children. Unintentional injuries are the leading reason for physical disability and death during childhood. We aimed to investigate PTSD symptoms in children withunintentional injuries who weretreated in hospital.

Children who were injured due to various causes and treated in emergency servicewere retrospectively evaluated for PTSD symptoms. The PTSD symptoms were assessed by the revised Children's Revised Impact of Event Scale (CRIES-8), and The Schedule for Affective Disorders and Schizophrenia for School-Age Children.

The average age of the study sample consisting of fifty-eight male and thirty-one female children (n= 89) was found to be 13.5 ± 2.9. On average, 5.2 ± 3.4 months had passed after the event. The most common cause of injury was traffic accidents (37.1%) and it was followed by falling from high (33.7%), burn (25.8%), and sharp object injury (2.2%). PTSD was prevalent as 24.7% according to K-SADSevaluation. PTSD rates were observed to vary according to the nature of the event that caused the injury.

The findings of our study show that more than one-third of the children, who were hospitalized due to unintentional injuries, developed severe PTSD symptoms. Children who treated for unintentional injuries in emergency services should be referred for psychiatric evaluation.

Key Words: Accident, PTSD, Child, Injury, Trauma

Introduction

Trauma is defined as the direct personal experience of an event that involves actual or threatened death or serious injury (1). Many people are exposed to traumatic events such as natural disasters, wars, fire and traffic accidents or sexual assault. Besides, witnessing someone seriously injured or killed, experiencing death or injury of a family member or close relatives due to a traumatic event might also be traumatic (2, 3). In addition, various medical procedures and some compulsory medical interventions, such as surgery, can also be traumatic for children (4).

It has been noted that the rates of exposure to a traumatic event can vary depending on the age of the person, country of origin and occupation (3). In a national study conducted in the UK, the prevalence of having been exposed to a traumatic event was found to be around 8.7% in children between 5-10 years and 12.6% in children between 10-15 years (5). Children in underdeveloped or developing countries are exposed to a higher number of traumatic events (6). Although it is estimated that the proportion of children who are exposed to this kind of experience in Turkey is high, there is not enough data about this subject in our estimation.

Traumatic events in childhood can lead to the development of post-traumatic stress disorder (PTSD) characterized by intrusive memories, avoidance, hyperarousal, and negative alterations in mood and cognition (3). Although a significant proportion of children exposed to traumatic events are reported to develop PTSD, this rate varies considerably between studies and it was stated that this difference may be related to various factors including both the person who is exposed to the traumatic event and the nature of the traumatic event (7). Thus, the nature of the traumatic event, physical and psychological proximity to the incident, previous traumatic

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exposure, age, and the psychological development may affect the development of PTSD following a traumatic incident(7-9).

The incidence rates of PTSD are reported as high as 8.7%in the United States. However, the incidence rates vary between different countries and it is estimated that the incidence rates of PTSD might be higher in the US than in Europe (3). The disorder, which is estimated to be around 3.5% of the 12-month prevalence in the adult population, is less prevalent in children and adolescents but it was stated that it is related with not taking the developmental differences into account in the previous criteria (3). In a national child and adolescent psychiatric epidemiology study which involved 10,438 children between 5-15 years of age the prevalence of PTSD was found to be around 0.14% in the UK(5). A study conducted in the US which involved adolescents between ages of 12-17, the prevalence of PTSD was reported to be 6.3% in girls and 3.7% in boys, besides PTSD was also associated with higher rates of depression and substance abuse (8).

PTSD, which develops after a traumatic experience, can seriously disrupt the developmental process of the child and can negatively affect the social and academic life of the child by causing considerable loss in functionality (1). It has been reported that people can be get annoyed more easily, can get more aggressive towards the family members and can have difficulties in controlling their emotions after a traumatic experience (10, 11). It was found the heart rate increases even more when people with PTSD get nervous (12). Several studies have also shown that PTSD has a detrimental effect on cognitive functions (13, 14). It is therefore understood that PTSD has a serious negative impact on children's social and academic functioning (15). It is stated that early treatment may prevent the later negative outcomes by preventing further functionality loss (9). However, it is stated that PTSD in children is not well recognized in society and treatment can be delayed (16, 17). Despite these serious adverse effects of PTSD on children, it is seen that they were mostly carried out with on victims of various disasters and physically or sexually abused children. The number of studies on PTSD in children injured due to various reasons is limited (9, 18, 19).

Accidental injuries are identified as a major public health problem which are also the leading cause of traumatic experiences in childhood (20, 21) and one of the main causes of death for children older than 5 years (6, 22). In Turkey, there is no clear data for patients under the age of 18 who were admitted to the emergency service due to accidental injuries. However, traffic accident statistics of Turkey shows that more than a million traffic accidents happen every year which result in thousands of deaths and hundreds of thousands of injuries. For example, 7427 people died and 300383 people were injured as a result of 1202716 traffic accidents in Turkey in 2017 (23). Globally, more than one million deaths and nearly 50 million injuries are reported due to traffic accidents, every year (24).

Every day around the world, 2000 children die as a result of involuntary injuries called accidents (6). Besides the death, accidental injuries are also one of the main causes of permanent disabilities in children and adolescents(21).The literature review also reports that the number of children died from accidents and injuries is higher than the total number of children died from various infectious diseases (25).However, it is obvious that childhood accidents and injuries do not get attention(6).It is observed that the studies on traumatic injuries focus more on the physical aspect of the injuries and that the effect of such experiences on children's mental wellbeing has not studied sufficiently(9, 19). Researches that examine childhood post-traumatic stress tend to focus on PTSD that develops after physical or sexual abuse and assault. However, the results of studies that investigated the development of PTSD after accidents or injuries in children suggest increased PTSD rates. Karakayaet al., (2007) found that PTSD was found in almost three-quarters of children in a study conducted on children with traumatic injuries (26). Other studies that have examined the development of PTSD in children following an accident or injury also showed that PTSD develops in 20 to 50% of these children (7, 9, 27-29). Even though many children develop PTSD following the accidental injuries there are few studies investigating the mental wellbeing of survivors of unintentional injuries.

In this study, we aimed to investigate the symptoms of PTSD in children who admitted to emergency service and hospitalized due to unintentional injuries.

Material and Method

The study consists of children and adolescents (8 - 18 years old) who attended to Şanlıurfa Mehmet Akif İnan Education and Research Hospital Emergency Department due to unintentional injuries derived from traffic accident, falling from height, burn, sharp object and firearm injuries.

Table 1. Sociodemographic findings

Demographic features (n 89)	n (%) and mean ± SD
Age (8-18)	12.3 ± 2.9
Gender	
Female	31 (34.8)
Male	58 (65.2)
Children (8-12)	47 (61.0)
Adolescent (13-17)	30 (39.0)
Father's age	43.4 ± 7.15
Mother's age	38.1 ± 6.30
Number of siblings	3.4 ± 0.90
Monthly household income (Turkish Lira)	
0-1000	
1000-2000	10 (11.2)
2000-3000	36 (40.4)
	24 (27.0)
3000-5000	13 (14.6)
7000 +	6 (6.7)
The time passed after the event	5.2 ± 3.4
Family integrity	
Together	82 (92.1)
Divorced	7 (7.9)
Relation between parents	
Yes	50 (56.2)
No	39 (43.8)
Post-accident surgery	
Yes	42 (47.2)
No	47 (52.8)

The files of children with injuries listed above were obtained and a total of 147 records were found. Among these children, 13 were excluded since the time between the incidence and hospital admission was shorter than 30 days in these patients. The remaining 134 children's families were called by phone, 17 families could not be reached due to missing or incorrect information and 14 families refused to participate in the work. 5 patients died during the course of research and the families of 9 patients did not attend the appointment even though they had accepted to attend the research. Thus, a total of 89 children and adolescents aged between 8-18 were included into the study. The study was approved by Harran University medical faculty ethics committee.

Socio-demographic form: The socio-demographic form that includes the age of the child and the parents, socio economical conditions, medical and psychiatric disorders, information about the accident and the subsequent time period was filled in the interviews.

Mood Disorders and Schizophrenia Interview Chart for School Children (K-SADS): K-SADS was developed by Kauffman et al. based on DSM-IV-TR diagnostic criteria for the purpose of screening past and present psychopathologies of children and adolescents aged 6-18 years. The Turkish validity and reliability study of K-SADS was conducted by Gökler et al (30,31). Although K-SADS assesses various psychopathologies, we evaluated the children only for a posttraumatic stress disorder.

Revised Child Impact of Event Scale (CRIES-8): Revised Child Impact of Event Scale (CRIES) was developed to screen various symptoms that may develop after traumatic exposure. It was

Table 2. Distribution of PTSD diagnoses according to the causes of applying to an emergency service

Reason for application	CRIES-8 n (%)	K-SADS n (%)
Female (n=31)	13 (41.9)	7 (22.6)
Male	19 (32.8)	15 (25.9)
Traffic accident (n= 33)	17 (51.5)	12 (36.3)
Falling from high (n= 30)	1 (3.3)	1 (3.3)
Burn (n= 23)	11 (47.8)	6 (26.1)
Sharp object injury (n= 2)	2 (100)	2 (100)
Firearm injury (n= 1)	1 (100)	1 (100)
Total (n=89)	32 (35.9)	22 (24.7)

CRIES-8: Child Revised Impact of Event Scale-8,
K-SADS: Mood (Affective) Disorders and Schizophrenia Interview Chart for School Children

designed for children who can read independently. It has been translated into many languages and has been widely used. Although it has two different forms consisting 8 or 13 items, we used CRIES-8 which has been showed to be as effective as CRIES-13.

The patients were asked to fill the Turkish version of the 'Revised Child Impact of Event Scale (CRIS-8). Since the scale was translated into Turkish about 20 years ago (32), investigators wanted to make an update and discussed the topic with the officials of warandchildren.org who developed the scale and it has been decided to use the scale after re-translation. In the process of translating the scale, the directions of the Children and War Foundation were followed, and two professional experts were assisted in the translation and proofreading of the original English scale. The second author of the study was also involved in the translation process. In the first phase of the translation of the scale into Turkish, the three members of the translation team worked independently for translating the scale. In the second phase, a common translation text has been created on the basis of these 3 different translations in terms of comprehensibility, cultural compatibility, and PTSD diagnostic criteria. This common text was then translated into English and the original form of the scale was compared to the new form, and the following form was agreed on the comparison form and the form shown in Appendix-1. The cut-off value of the scale was rated at 17 points and above, as used before (33, 34,19).

Results

The mean age of the sample consisting of thirty-one girls and fifty-eight boys was found to be 13.5 ± 2.9. The average time after the incident was found as 5.2 ± 3.4 months. There was no significant difference between the ages, the reasons for emergency service admittance, the surgical rates and the socio demographic data of the boys and girls. Demographic data on children and their families are included in (Table 1).

The most common cause of injury was traffic accident (37.1%), followed by falling from high (33.7%), burn (25.8%), sharp object injury (2.2%) and firearm injury (1.1%). The hospital diagnoses of children are shown in figure 1. The most common diagnosis of hospitalization was head and face trauma. Nearly half of the evaluated children (47.2%) needed to undergo a surgery. 21 of the children had a history of injury or surgery before.

K-SADS and CRIES-8 scales were used to investigate PTSD rates in children. The average CRIES-8 score of the participants was determined as 13.1 ± 9.7. No significant difference was found between mean scores of girls (14.6 ± 10.4) and boys (12.3 ± 9.4). There was no significant correlation between scale scores and age.

As shown in Table 2, the highest rates of PTSD were observed in children who applied because of a traffic accident and sharp object injury. When the incidence of PTSD in children was analysed according to the diagnoses, it was determined that the children with internal organ injury and those with burn in the face or genitalia had the highest PTSD rates. There was no significant difference in terms of PTSD diagnoses among those who did or did not have surgery.

K-SADS and CRIES-8 diagnosis: In a semi-structured interview with K-SADS, PTSD was diagnosed in 22 children (24.7%). According to the CRIES-8 scale, 32 (36%) children's CRIS-8 total score was higher than the cut-off value. A

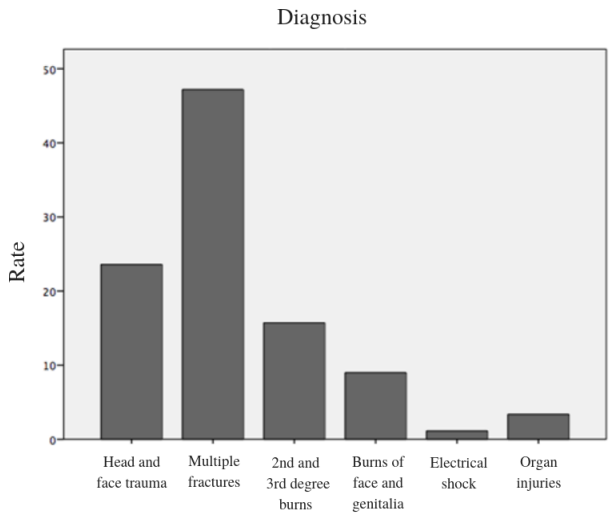

Fig. 1. Hospital admission diagnosis

significant correlation was found between the K-SADS and the total score of CRIES-8 scale (r=0.602, p=0.000). When the cut-off value for the CRIES-8 scale is considered as 17 as previously suggested (34); it was observed that K-SADS correctly identified 19 (86.3%) from 22 cases diagnosed with PTSD. Moreover, 54 out of 67 cases (80.5%) who were not diagnosed with PTSD in K-SADS were correctly identified with CRIES-8 scale cut-off values. In other words, CRIES-8 cut-off values had a specificity of 80.5% and a sensitivity rate of 86.3%.The CRIES-8 Cronbach alpha value was found to be 0.89.

Both K-SADS interview and CRIES-8 data showed no difference in PTSD diagnosis between boys and girls as well as children and adolescents.

Despite PTSD diagnosis in 24.7% of the children, it was observed that none of the children in our sample had been referred to the child psychiatrist.

Discussion

The results of our study suggest that more than one-third of children, who were injured due to several reasons and admitted to emergency service, develop PTSD symptoms at the clinical level. PTSD symptom severity was also associated with the nature of the event that caused the injury. It has been shown that intense PTSD symptoms develop in approximately half of all traffic accidents and burn patients and that the severity of PTSD symptoms in these children may be as severe as in refugees (35, 36) or earthquake victims (32). Considering that PTSD can affect children's social and biological development and academic life which lasts for many years (18, 37, 38), it is understood that focusing on only the physical damage of accident and injuries means leaving the patient at a serious risk of mental problems. Considering the high rates of post-traumatic stress symptoms in the children who are participated in the study, we recommend that children who have been injured due to various reasons should be directed to child psychiatry physicians following their treatment in emergency services.

Hospital admission and medical interventions may cause an acute or prolonged stress response in children (39). The results of a recent study indicate that PTSD develops in approximately 10% of children who have been operated on for various diseases (4). However, there is not enough data on the mental problems that develop in relation to medical interventions (4). There was no difference in terms of PTSD symptom severity between the children with and without the surgery. This finding is not compatible with the findings of studies which suggest that surgery can lead to PTSD development. Findings obtained in previous publications may be related to the conditions that led to the surgery rather than the surgery itself. As a matter of fact, it was seen that the phenomenon that caused the injury in our study was more effective on symptom severity of PTSD.

Research findings indicate that that PTSD develops in one-third to one-fourth of children experienced injuries. However, most of these studies are carried out with road traffic accident survivors (7). It is known that traffic accidents are the main factor in the development of PTSD in adults (40). However, the psychological effects of such injuries have not been studied well in children (41). In a follow-up study conducted on adults, PTSD was diagnosed in 32% of the survivors one year after the accident. The stress symptoms developed following the accident were found to be better in predicting the development of PTSD compared to the severity of accidental injury (42). The results of a study conducted on children showed that stress symptoms were present in 24% of children after an average of 9 months of traffic accidents and PTSD was developed in 14% (41). Another important finding of the same study was that the supportive approach of the police or health team after the incident has been found to prevent the development of PTSD symptomatology in children. This result shows the importance of the supportive attitude of the team that interfered with the accident or injury when the victim is children and suggests the importance of care of

injured children following accidents. In another study (43), PTSD was observed in 35% of the children whereas the results of another study (44) showed that PTSD developed in 50% of the children. PTSD symptoms in children were observed in 69%, 57%, 59%, and 38%, in a follow-up study in which the children were evaluated immediately after the accident and at 1, 6 and 18 months (28), respectively. In a review including twelve studies, it was reported that PTSD was observed around 30% over the period of 1-2 months after the event (9). Thus, our findings seem to be in line with previous study results, indicating that more than one-third of injured children due to various reasons develop considerable PTSD symptoms.

In addition to studies reporting that injury severity is associated with PTSD development (27, 45), there are also studies indicating that it is not associated with PTSD development (46). In a previous study, it was reported that the severity of the injury was not related to PTSD (28). Although there was no quantitative measurement tool for the severity of injury in our study, when we considered the need for surgery as a parameter of the severity of the injury, we observed that this was not related to PTSD symptomatology. However, the high incidence of PTSD in internal organ injuries, face and genital area burns suggests that severity of injury may be associated with the development of PTSD. Differences between these studies may be derived from the different perspectives used in assessing the severity of the injury. We think that it is necessary to achieve a more accurate result by considering the wound location when measuring the severity of the injury.

A small number of studies (28) reported that PTSD was more common in young children after an accident or injury, but most of the studies did not find such an association (45, 47, 48). In our study, we did not observe a correlation between the child's age and PTSD symptom severity. There was no significant relationship between PTSD symptom severity in child and adolescent age groups. Although our study data showed that PTSD development was not age-related in children aged between 8-18; it is not possible to make a conclusion for other age groups based on the results of our study.

Whether the development of PTSD after an accident or injury differs according to gender is controversial (7). Although some studies have suggested that PTSD develops more often in girls following an injury, (48, 49) such difference was not observed in other studies (29, 47). The results of our study also support the view that there is no significant difference in the development of PTSD between boys and girls after traumatic injuries.

Although severity of the injury is not associated with the development of PTSD, it has been shown in many studies that the type of injury (such as traffic accidents, falls, burns) is associated with PTSD development (7, 49). In our study, it was observed that the PTSD rates differed according to the nature of the incident which causes injury. PTSD development was observed in all of the injuries occurred with firearms or sharp objects while the ratio of PTSD development was found as 36.3%, 26.1% and 3.3% in traffic accidents, burns, and falling from high, respectively. These results show the impact of the threat perception and the nature of the event on the development of PTSD, which suggest that the first moments of the event may be more important on the development of PTSD (19).Some studies have shown that the injury or death of a loved one who is injured during the accident may be associated with PTSD development. We can not make any comment on this subject since we did not collect any information regarding this issue in our study. Later investigations will require more detailed information on the cause of the injury and the need to assess the relevance of these details to PTSD symptoms.

Perhaps the most important finding of our study is that despite the high-stress symptoms, none of these children ever referred to a child psychiatry due to the symptoms. Children with PTS D remained untreated, even though it has been shown that PTSD has a detrimental effect on cognition and emotion regulation. It was also indicated that PTSD can disrupt the child's academic and social functioning pervasively when not treated. This may be related with the family's lack of knowledge about the post-traumatic psychological symptoms, as well as difficulties in accessing psychiatric services or due to concerns about stigma and similar reasons when referring to these services. This suggests that these children, who are clearly at risk for PTSD development, should be directed to pediatric psychiatry physicians in order to be evaluated following their treatment. When pediatric psychiatric services are not accessible; The CRIES-8 scale, which is very easy to administer and evaluate, can be applied to these children and children with higher scores could bereferred to hospitals where the child psychiatric services are accessible.

Limitations: Although the results of our study revealed high rates of traumatic stress symptoms,

there are some limitations to our research. The main limitation of our study is that no detailed information was obtained about the event and the things that happened just after the event. Moreover, the lack of a control group limits further analyses. Despite these limitations, we think that our study data will contribute to literature about post-traumatic stress in injured children due to various reasons and especially will be helpful for emergency service physicians when treating injured children by taking into account their psychological well-being.

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