

# Psychiatric disorders and their association with burn-related factors in children with burn injury

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## ABSTRACT

**BACKGROUND:** The aim of this study was to assess psychiatric disorders and their association with burn-related factors in a population of Turkish children with burns.

**METHODS:** Thirty-one children admitted to the Cerrahpasa Medical Faculty Burn Unit between January 2013 and August 2013 were first assessed by the plastic surgeon, and then those with psychological symptoms were referred to a child psychiatrist, and the records were analyzed retrospectively.

**RESULTS:** The percentage of burned area to Total Body Surface Area (TBSA) ranged between 2-60% (mean, 17.3%). Nineteen patients (61.3%) had a psychiatric diagnosis, which included acute stress disorder (ASD) (n=15), depression (n=3), posttraumatic stress disorder (n=2, comorbid with depression), and delirium (n=1). The percentage of burned area to TBSA was associated with the presence of psychopathology and ASD. Further, psychopathology was associated with the number of burned major body regions.

**CONCLUSION:** Pediatric burn patients are at risk of developing psychopathology. The children with a greater percentage of burned area to TBSA and more burned body regions have the greatest risk of psychopathology. Surgeons have an important role in patient referral for psychiatric interventions, so that psychiatric disorders can be prevented as early as possible.

**Key words:** Burn; children; major body regions; percentage of burned area; psychopathology.

## INTRODUCTION

Having a severe burn injury is one of the most traumatic accidents a child or adolescent can experience.<sup>[1]</sup> Advances in burn care and treatment have increased survival in patients with burns, which in turn has resulted in progression of the focus of burns research to include the psychological impacts of burn injury.<sup>[2,3]</sup> Pediatric burn injuries can place the affected children at risk of suffering from psychiatric diseases in a number of ways. Firstly, a burn injury is an unexpected, painful, and

life-changing injury, which can cause pain and feelings of uncertainty and fear in the child.<sup>[4]</sup> Secondly, the burn injury threatens the child's health and bodily integrity,<sup>[5]</sup> which may result in psychological trauma in the child.<sup>[4]</sup> Further, burn injury may result in permanent scarring, limited functionality, and intensive and long-lasting physical treatment,<sup>[5]</sup> all of which may place the affected children at risk of psychiatric disorders.<sup>[6]</sup>

The above risk factors and the psychological impact of burn injury on children have long been the subject of many research efforts. Most of the research has been focused on stress disorders, namely, acute stress disorder (ASD) and posttraumatic stress disorder (PTSD).<sup>[6]</sup> ASD describes the psychopathologic response in the intermediate aftermath and up to one month after trauma, whereas PTSD describes psychopathology that persists after one month.<sup>[6,7]</sup> Children with burn injury were reported to have ASD,<sup>[8-10]</sup> PTSD,<sup>[11-15]</sup> separation anxiety disorder,<sup>[12]</sup> depression,<sup>[16]</sup> and lower quality of life.<sup>[4]</sup> On the other hand, some of the studies have reported that children and adolescents with burn injury had a satisfying quality of life<sup>[17]</sup> and were not different from their healthy peers in terms of depression scores<sup>[18]</sup> in the long-term. In

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one of these studies, it was stated that methodologically strong systematic research could overcome the discrepancies between studies and improve understanding of psychosocial functioning in children with burn injury.<sup>[4]</sup> Although there are many studies in the international literature about the psychiatric aspects of burn in children,<sup>[4,5,8-18]</sup> there are no published studies about this topic in Turkey.

The aim of this study was to assess the psychiatric disorders in a population of Turkish children with burns with a systematic diagnostic assessment. The second aim of the study was to assess the association of psychiatric disorders with burn-related factors.

## MATERIALS AND METHODS

Children admitted to the Cerrahpasa Medical Faculty Burn Unit between January 2013 and August 2013 were first assessed by the plastic surgeon (SB), and those with psychological symptoms were referred to the child psychiatrist (GK), who performed the psychiatric assessments. Records of the psychiatric diagnosis and burn-related factors were analyzed retrospectively. Children with mental retardation were excluded from this study. As a result, the psychiatric and burn-related records of 31 children were assessed.

The psychiatric diagnoses were assessed by means of the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, Text Revised (DSM-IV, TR).<sup>[7]</sup> In addition, Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood: Revised Edition (DC: 0-3R)<sup>[19]</sup> was used for children below 4 years of age. Two diagnostic systems were used in the study because previous studies have pointed out the importance of systematic diagnostic tools<sup>[4]</sup> and developmental stage of the child.<sup>[5]</sup> Further, as the DC: 0-3R does not cover the whole range of possible disorders in the preschool age, the authors of the DC: 0-3R recommend that clinicians use DSM-IV-TR or International Classification of Diseases (ICD-10) diagnoses, if they better describe the symptoms.<sup>[19]</sup> We used DSM-IV-TR as an additional diagnostic tool. Age, sex, cause and etiology of the burn, duration after the burn, reason for consultation, psychiatric symptoms and signs, psychiatric diagnosis, and treatment were recorded.

### Statistical Analyses

Chi-square or Fisher's exact test was used to compare categorical variables. Quantitative variables were compared by Student's t-tests. Mann-Whitney U-test was used to assess nonparametric scales. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) 16-pocket program. The significance level was set as  $p < 0.05$ .

## RESULTS

Of the 31 children, 23 were male and 8 were female. The age of the patients ranged from 15 months to 15 years, with

a mean of 6.18 ( $\pm 4.09$ ) years. The most common cause of burns was negligence (59.8%), and the remaining consisted of burns due to accident. The most common mechanism of burn was scald, with a ratio of 74.2% ( $n=23$ ), followed by flame (12.9%,  $n=4$ ), contact (9.7%,  $n=3$ ) and electrical burns (3.2%,  $n=1$ ). The percentage of burned area to Total Body Surface Area (TBSA) ranged from 2-60%, with a mean of 17.32 ( $\pm 13.59$ )%. Four (12.9%) patients had only 2nd-degree deep burn, 6 (19.4%) had only 3rd-degree burn, and 21 (67.7%) had 2nd- and 3rd-degree burn. With respect to the affected major body region, 8 patients had injury involving one major region of the body, as trunk ( $n=2$ ), upper extremity ( $n=3$ ) and lower extremity ( $n=3$ ). Head and neck injury was associated with trunk injury in 9 patients, who also had additional injury to the lower extremity ( $n=3$ ), upper extremity ( $n=2$ ) and both extremities ( $n=1$ ). In addition, trunk injuries were associated with injury of the lower extremity ( $n=4$ ), upper extremity ( $n=1$ ) and both extremities ( $n=3$ ).

The duration between burn and psychiatric assessment ranged from 4-190 days, with a mean of 21.1 days. Psychological symptoms that prompted referral to the child psychiatrist were multiple in 83.9% ( $n=26$ ) of the patients, and 16.1% ( $n=5$ ) of the patients were mono-symptomatic. The most common psychiatric symptom was agitation ( $n=24$ ), followed by difficulty falling asleep ( $n=9$ ), startle response while sleeping ( $n=11$ ), reluctance to speak ( $n=2$ ), and frequent crying ( $n=6$ ). As a result of the psychiatric assessment of children, 61.3% ( $n=19$ ) had a psychiatric diagnosis satisfying the diagnostic criteria for DC: 0-3R or DSM-IV. ASD was the most common diagnosis, found in 48.4% ( $n=15$ ) of the children, followed by depression, which was diagnosed in 9.7% ( $n=3$ ) of the patients. Of these depressive children, 2 had comorbid PTSD, which was found in 6.5% of the whole sample. One of the patients had delirium, with loss of orientation and visual hallucinations, which was associated with hyponatremia.

Assessment of the association between burn-related factors and psychiatric diagnosis revealed that the percentage of burned area to TBSA was associated with the presence of psychopathology (Mann-Whitney test,  $p=0.001$ ) and ASD (Mann-Whitney test,  $p=0.036$ ). Further, psychopathology was associated with the number of major body regions (Mann-Whitney test,  $p=0.022$ ). The duration between burn and psychiatric assessment was positively associated with depression (Mann-Whitney test,  $p=0.005$ ) and PTSD (Mann-Whitney test,  $p=0.019$ ); that is, children with depression and PTSD had a longer duration between burn and psychiatric assessment.

## DISCUSSION

To the best of our knowledge, the present study is the first to assess psychiatric diagnoses and their association with burn-related factors in Turkish children with burn injury. ASD was the most common diagnosis in the study group, and this

finding was in line with previous studies reporting that ASD is a core feature of a child's initial psychiatric reaction to a traumatic event.<sup>[8,9,20,21]</sup> This finding was also consistent with previous studies reporting ASD in children with burn injury.<sup>[8-10]</sup> The prevalence of ASD diagnosis was 48.4% in our sample, which was higher than in previous studies reporting an ASD prevalence of 40%,<sup>[6]</sup> 39.4%,<sup>[9]</sup> 31%,<sup>[10]</sup> and 29%.<sup>[8]</sup> The higher prevalence of ASD in our study may be attributable to the differences in the sampling procedure between studies. Our sample consisted of children who were referred for psychiatric assessment because of their psychological symptoms, whereas the studies reporting lower prevalence rates for ASD included children with burns without regard for the presentation of symptoms. The percentage of burned area to TBSA was associated with ASD, and this finding was consistent with previous studies reporting an association between the size of the burn and ASD.<sup>[8,22]</sup> In addition, the burn size was associated with the presence of psychopathology in our study, a finding consistent with studies reporting that the burn size might be related to psychological reactions.<sup>[5]</sup>

Acute stress disorder (ASD) was reported to predict PTSD,<sup>[6,23]</sup> which is associated with long-lasting neurobiological abnormalities, such as reduced hippocampal size due to autonomic arousal and the acquisition of conditioned fear with chronic re-experiencing of traumatic events.<sup>[24]</sup> Recognizing acute stress symptoms in children is reported to be a critical first step in the path toward developing interventions to ameliorate traumatic stress responses and prevent the development of PTSD.<sup>[9]</sup>

Children with major burn injury form a particular high-risk group for developing PTSD, which was found in 6.5% of the patients in our study. This ratio was lower than in the previous studies reporting the prevalence of PTSD as 10%,<sup>[11,12]</sup> 13.2%,<sup>[13]</sup> 25%, and 33%.<sup>[15]</sup> As PTSD describes the psychopathology that persists after one month, this difference may be attributable to the relatively short interval between burn injury and psychiatric assessment in our sample, with a mean of 21.1 days, which was shorter than in the previous studies, in which this interval was 6 months<sup>[11-12]</sup> and 15 months.<sup>[13]</sup> One of the prevalence rates (25%-33%) that was higher than in our study was reported by Stoddard et al.<sup>[15]</sup> in children with severe burns. Severe burns (>20% TBSA) constituted 29% of our sample, which may be the factor impacting on the lower prevalence rate of PTSD than in the study of Stoddard et al.,<sup>[15]</sup> which included severe burns. In a study including Turkish adult patients with burns, patients with PTSD were reported to have high burn rates and excessive burn-related pain symptoms.<sup>[25]</sup> This was also found in studies of pediatric burn patients reporting PTSD symptoms to be correlated with trauma severity.<sup>[13]</sup> In our study, PTSD was associated with the duration between burn and psychiatric assessment, and this is in line with the finding that PTSD was higher in studies with longer post-burn duration<sup>[13]</sup> than in those with shorter post-burn duration.<sup>[12]</sup>

The second most common psychiatric diagnosis in our sample was depression, with a rate of 9.7%, which was higher than the rate of depression in Turkish children.<sup>[26]</sup> This finding was consistent with a previous study reporting lifetime rates for depression in children with burn injury to be higher than in the general population.<sup>[16]</sup> In this previous study, the rate of depression was lower than in our sample (3%) for the present time and higher than our sample (27%) for the lifetime,<sup>[16]</sup> indicating that the risk of depression in pediatric burn patients continues for one's lifetime. On the other hand, our findings were inconsistent with some of the studies reporting that children with burns were not at risk of developing symptoms of depression.<sup>[18,27,28]</sup> As pointed out by previous authors,<sup>[5]</sup> the divergent results may be attributed to the differences in burn severity across the samples, with the more positive studies comprising less severely injured children.<sup>[18,27,28]</sup> For example, our sample consisted of children with a mean burn size of 17.3% (corresponding to moderate burn), whereas one of the conflicting results belonged to a sample of children with mild to moderate burns,<sup>[18]</sup> while another had a mean burn size of 22.5%, showing that there may be factors other than burn size impacting the rate of depression in pediatric burn patients.<sup>[28]</sup>

One of the patients in our sample had delirium, which was associated with hyponatremia. This is in line with studies describing cases of delirium in children with burn injury.<sup>[29-31]</sup> The precipitating factor for delirium in our study was hyponatremia, which is one of the risk factors reported in the etiology of delirium in previous studies.<sup>[29]</sup> Other risk factors that were reported to have a role in the pathogenesis of delirium in pediatric burn patients are hypertension, hypoglycemia, electrolyte imbalance, and sepsis.<sup>[29]</sup> The case with delirium in our study had loss of orientation and visual hallucinations, which were among the symptoms reported in the presentation of delirium in previous studies.<sup>[31]</sup> Other symptoms that were reported in the presentation of delirium in previous studies were impaired attention, sleep disturbance, confusion, impaired responsiveness, impaired level of consciousness, irritability, affective lability, agitation, apathy, and auditory and tactile hallucinations.<sup>[31]</sup> The surgeons should be alert to the risk factors and symptoms of delirium, because delirium can complicate patient care and be life-threatening.<sup>[6,29]</sup>

In conclusion, severe burn injuries are the most painful injuries known; both the injury itself and the treatment procedures can be frightening and difficult to cope with for children. Intensive medical treatments, painful dressings often necessitating sedation and massive surgical treatments are too difficult for children and adolescents to handle. The traumatic nature of the burn and the painful treatment may induce ASD, PTSD, depression, and delirium. Research findings suggest that psychiatric interventions may help children to cope with the painful treatment and their emotional effects and may reduce the psychiatric sequelae of burn injury.<sup>[32]</sup> As psychiatric disorders may have a negative impact on the

prognosis and treatment of children with burns, the diagnosis and treatment of psychiatric disorders are very important. Surgeons who lead the burn team have a critical role in referring children to a child psychiatrist for evaluation.

Conflict of interest: None declared.

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KLİNİK ÇALIŞMA - ÖZET

## Yanık yaralanması olan çocuklarda görülen psikiyatrik bozukluklar ve yanık-ilişkili faktörlerle olan bağlantısı

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**AMAÇ:** Bu çalışmada, yanık yaralanması olan Türk çocuklarda psikiyatrik bozuklukların ve bu bozuklukların yanık-ilişkili faktörlerle bağlantısı değerlendirildi.

**GEREÇ VE YÖNTEM:** Ocak 2013 ile Ağustos 2013 tarihleri arasında Cerrahpaşa Tıp Fakültesi Yanık Ünitesi'nde yatmakta olan 31 hasta öncelikle plastik cerrah tarafından değerlendirildi, psikolojik semptomları olan hastalar çocuk psikiyatristine yönlendirildi, daha sonra veriler geriye dönük olarak analiz edildi.

**BULGULAR:** Hastaların yanık yüzdesi %2 ile %60 arasında değişmekteydi (ortalama yanık yüzdesi= %17.32). On dokuz hastada (%61.3) psikiyatrik bozukluk saptandı. Psikiyatrik bozukluklar arasında, akut stres bozukluğu (ASB) (n=15), depresyon (n=3), travma sonrası stres bozukluğu (n=2, depresyona eşlik etmektedir) ve delirium (n=1) bulundu. Yanık yüzdesi psikopatoloji varlığıyla ve ASB ile ilişkili bulundu. Ayrıca, psikopatoloji yanan vücut bölgesi sayısı ile ilişkili bulundu.

**TARTIŞMA:** Pediatrik yanık hastaları psikopatoloji açısından risk altındadırlar. Yanık yüzdesi ve yanan vücut bölgesi fazla olan çocuklar psikopatoloji açısından en fazla risk taşıyan gruptur. Hastaların psikiyatrik değerlendirilme için yönlendirilmesi ve böylece psikiyatrik bozuklukların gelişmesini önlemek açısından cerrahlar önemli role sahiptir.

**Anahtar sözcükler:** Çocuklar; psikopatoloji; vücut bölgeleri; yanık; yanık yüzdesi.

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