



# Etiology of childhood burns and parental awareness in Turkey

## Türkiye'de çocuk yanıklarında etioloji ve ebeveyn farkındalığı

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### ABSTRACT

**Objective:** Burns continue to be a devastating trauma worldwide. Most of the childhood burns are due to preventable injuries. Burns occurring as a result of negligence of the parents'/carers' may cause mortality or life-long morbidities. Identification of the etiologies will direct the precautions that should be undertaken.

**Material and Methods:** One hundred consequent burn patients admitted to our clinics were included to the study. A questionnaire was filled in with the information gathered from the parents/carers.

**Results:** The mean age of the patients was  $3.74 \pm 3.07$  years, and 52% was male. Most of the injuries occurred in the noon (median 12:45). Seventy-eight percent of the burns occurred at children's own home. Parents/carers were close enough to prevent the child from injury in 66% of the cases. While there was no first intervention in 21% of burns, 14% applied ice and 1% yoghurt. Taxi was the means to reaching the hospital in 45%. Hot liquids were the leading etiology ( $p < 0.003$ ). Sixty-two percent of the patients were dining at the living room and on the floor.

**Conclusion:** The occurrence of the majority of injuries near parents/carers can be related to inadvertence or lack of awareness. To decrease burns incidence among children in our country, dining at the floor and stove heating should be avoided as much as possible. Not cooling the burn with running tap water at the time of injury leads to deepening of the burn, which consequently makes management more complex. Based on our study, there is an apparent need for determination of preventive measurements and to raise public awareness.

**Keywords:** Burn, child, awareness, etiology

### ÖZ

**Amaç:** Yanık yaralanmaları, tüm dünyada olduğu gibi ülkemizde de halen yıkıcı bir travma olmaya devam etmektedir. Çocuk yanıklarının pek çoğu engellenebilir yaralanmalardır. Ebeveyn/bakıcılarının dikkatsizliği sonrasında gelişen yanıklar mortalite yanında hayat boyu devam eden morbiditeler ile sonuçlanabilmektedir. Bu anlamda, çocuk yanıklarının önlenmesi için etiolojinin ortaya konulması ve nedenlerin tespit edilmesi alınacak koruyucu tedbirlerin netleşmesini sağlayacaktır.

**Gereç ve Yöntemler:** Hastanemiz yanık polikliniğine başvuran ardışık 100 hasta çalışmaya alındı. Oluşturulmuş anket formu bu hastaların ebeveyn/bakıcılarından edinilen bilgiler ile dolduruldu.

**Bulgular:** Hastaların yaş ortalaması  $3,74 \pm 3,07$ , ve %52'si erkek idi. Yanıkların çoğunluğu öğlen saatlerinde izlenmekteydi (ortanca 12:45). Yanıkların %78'i kendi evlerinde oluşmuştu. Yaralanmaların %66'sında ebeveyn çocuğa müdahale edebilecek mesafede bulunmaktaydı. Hastaların %21'ine yanığı takiben olay yerinde hiçbir müdahale yapılmazken %14'üne buz ve %1'ine yoğurt uygulandığı tespit edildi. Hastaların %45'i taksi ile hastaneye ulaşmıştı. Tüm grupta sıcak sıvı yanıkları en sık izlenen etiyojik ajandı ( $p < 0,003$ ). Hastaların %62'si yemekleri salonda ve yerde yemekteydi ( $p < 0,001$ ).

**Sonuç:** Yaralanmaların büyük çoğunluğunun ebeveyn/bakıcıların müdahale edebileceği uzaklıkta olması, dikkatsizlik veya farkındalık yaratılmaması nedeniyle oluştuğunu göstermektedir. Çocuk yaş grubunda yanık insidansının düşürülmesi için ailelerin yerde yemek yememeleri ve mümkün olduğunca merkezi soba dışında ısınmaları sağlanmalıdır. Yanık oluşumu sonrası su ile soğutmanın yapılmaması klinik tabloyu daha da ağırlaştırmaktadır. Bu çalışmamız ışığında, koruyucu tedbirlerin oluşturulması ve halka ulaştırılması konularına özel önem verilmelidir.

**Anahtar kelimeler:** Yanık, çocuk, farkındalık, etioloji

### INTRODUCTION

Burn is a trauma with high mortality rates and serious morbidity in children as much as in adults. In burn injuries, as in other diseases, age has a significant effect on both the etiology and treatment.

The first and most important issue in burn injuries is to prevent the burn. Protecting children from burns can be considered as the most important duty of parents and carers when the children are at an age when they have not completed their mental and physical development. Incidents of burns in children are associated with (a) the child's not having completed her/his development, (b) lack of care and concentration of the parents, and (c) curiosity of the child to burn agents. In Turkey, burns are often related to accidents during the traditional tea brewing technique and to production of dairy products in rural areas (1, 2).

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In addition, 10% of child abuse is associated with burns (3-5). Therefore, it is necessary to approach burns in children carefully. For example, diapers protect the buttocks, hips and upper thighs of infants, so burns in those areas are rarely seen (6). When children present with burns in those areas, abuse in the form of placing the child in hot water as punishment must be kept in mind. In addition, the epidemiology and etiology of pediatric burns may vary according to regional, cultural and economic conditions. For example, in eastern Turkey, burns from tandoori ovens may be seen, whereas these types of burns are rarely seen in the western regions of the country.

Factors affecting mortality in childhood burns are age, burn surface area and the depth of the burn injury (7). The extent of the surface area of the burn has a greater effect in children than in adults, as anatomically the skin of a child is thinner than that of an adult. Therefore, exposure to the same severity of burn injury will cause a deeper burn in a child. In addition, the rule of '9' that is used in adults is not usually appropriate except for the adolescent age group. The Lund-Browder Scale is more suitable for children (8).

Pediatric burns require a multi-disciplinary approach. This team should include a trained burns specialist, a plastic and reconstructive surgeon, a physical therapy and rehabilitation specialist, and a pediatric infectious diseases specialist. In a study conducted in Taiwan, it was stated that burns reach a peak in two periods, one of which is the pediatric group aged <5 years (9). In another study, it was reported that pediatric burns occur especially in early childhood (10). A study in the USA placed burns as the 3<sup>rd</sup> most common cause of trauma-related childhood deaths (11).

Data obtained by a study on childhood burns would be useful in terms of determining the precautions to be taken to protect the children from burn injury as well as in establishing what parents or carers should do after a burn trauma until the hospital is reached. The actions taken immediately after a burn injury have a direct effect on treatment outcome. Appropriate early stage treatment will make management easier and can seriously reduce the high costs of treatment and rehabilitation. That is why this study was planned with the aim of shedding light on what should be done and the preventative steps to be taken by the target group, and determining the etiology of pediatric burns for which the treatment is difficult and the costs are extremely high.

## MATERIAL AND METHODS

The study included 100 consecutive children aged 0-14 years who presented to the Ankara Numune Education and Research Hospital Burns Treatment Center. Children were excluded from the study if they spent most part of the day at a day-care center. Patients were enrolled if the parent or legal guardian willingly completed the prepared study forms in addition to the hospital records. The Burns Treatment Center has 9 beds for adult patients (6 intensive care beds and single or double rooms with intensive care features where they can be monitored) and 3 beds for pediatric burns. There is also a burns outpatient clinics serving to both adult and pediatric patients.

In this study, a datasheet containing the epidemiologic and demographic features of pediatric patients who presented to our clinic was filled-in. Using a prepared questionnaire, a record

was also made of the medical and social events experienced in the process from the time of the incident until arriving to the hospital. The questions included in the questionnaire that was filled-in by the parents/care takers included insurance status, occupational status, time of the incident, place of the incident, place of the residence, first medical intervention applied, first medical facility attended and the preferred medication at the facility, patient transport, place of parents at the time of incidence, family population, heating type of the house, if the house was owned or rented, number of rooms in the house, socio-economical and socio-cultural level, and family's dining location.

## RESULTS

The patients consisted of 52 (52%) males and 48 (48%) females. The mean age was 3.74 years (median 2.50; standart deviation 3,07 and range 1-14 years). The healthcare insurance status of the parents was found to be 54 (54%) Social Security Institution (governmental), 19 (19%) green card (governmental coverage), 6 (6%) Unaffiliated Companies Security Institution, 4 (4%) retirement fund, which are all part of the state national insurance scheme, and 17 (17%) had no form of health insurance. Ninety-five mothers were housewives (95%), and only 5 (5%) had an education level of university degree or above. Of the fathers, 12 (12%) were educated at the university degree level or above.

The place of residence was Ankara and surrounding towns in 80 (80%) cases and 20 (20%) came from other cities. When the time of the incidents was examined, the median time was 12:45 and the mean time was determined as 14:10 (Table 1). In 78 (78%) cases, the burn injury occurred in their own home and in 22 (22%) cases the burn occurred outside the home (Table 2).

Sixty-four (64%) parents made a first intervention with water, 14 (14%) with ice and 21 (21%) made no intervention (Table 3). After the incident, 27 (27%) presented directly at our clinic, 47 (47%) went to the university or a state hospital, and 26 (26%) presented at a first-stage or private healthcare center. In 80% of the patients who presented to medical cen-

Table 1. The time of injury

Exact time of injury	
Mean	14:10
Median	12:45
Standard Deviation	03:58
Earliest	08:00
Latest	23:45

Table 2. The location where the burn injury occurred

Place where burn injury occurred	n	%
Own house	78	78.0
Another house	12	12.0
Outdoor	9	9.0
Workplace	1	1.0

Table 3. The first interventions applied to the patient, the healthcare institution first consulted, means of transport and treatment applied

First interventions		n	%
	None	21	21.0
	Water	64	64.0
	Ice	14	14.0
	Yoghourt	1	1.0
Healthcare institution first consulted			
	Ankara Numune Hospital, Burns Center	27	27.0
	State hospital	44	44.0
	Private clinic	14	14.0
	State local healthcentre	12	12.0
	University hospital	3	3.0
Transport			
	Taxi	45	45.0
	Own car	24	24.0
	Inter-city bus	10	10.0
	Ambulance	7	7.0
	Minibus	7	7.0
	City bus	7	7.0
Dressing applied at the first medical centre			
	None	21	21.0
	Silver sulfadiazine	66	66.0
	Nitrofurazon	12	12.0
	Povidone-iodine	1	1.0

ters a medical application was performed, and no medical application was applied in 20 (20%) cases. The most common medication used was silver sulfadiazine in 66 (66%) patients, followed by nitrofurazone cream in 12 (12%) patients. In 5 patients transferred to our hospital, no dressing had been applied at the first centre, 2 patients came from private hospitals, 2 patients from a first-stage health care facility, and 1 patient from a state hospital.

Transport to the hospital was provided by the family car in 24 (24%) cases, by private taxi in 45 (45%) cases, and by ambulance in 7 (7%) cases. It was also determined that 10 (10%) patients had transportation by an inter-city bus (Table 3).

When the incident occurred, 66 (66%) of the parents were near their child and 34 (34%) were at a distance. The number of the children in the family were a single child in 26 (26%) cases, 2 children in 44 (44%) cases, and 3 children in 20 (20%) cases. While no burn injuries had been seen previously in any children of the family in 87 (87%) cases, there was a history of burns to the children in 13 (13%) families.

Table 4. Location and activity of the parent/carer at the time of Injury-Cross-tabulation

Activity of the parent/carer at the time of the injury	Location of the parent/carer		
	Close	Far	Total
With the child	20	0	20
Watching television	9	0	9
With other children	3	5	8
Busy with housework	14	15	29
Cooking	5	10	15
At the neighbour's	0	4	4
Eating a meal	13	0	13
In the bathroom	1	0	1
Serving tea	1	0	1
Total	66	34	100

With respect to the family's residence, 41 (41%) were homeowners and 57 (57%) were rental houses, and 56 (56%) families lived in a townhouse and 44 (44%) were in an apartment block. The houses of 91 (91%) patients had 3 or fewer rooms, and 65 (65%) used a wood/coal-burning stove for heating. Taking the national socio-economic and sociocultural level into consideration, 56% of the families were seen to be living in substandard conditions. In 91% of these families, a crowded lifestyle was demonstrated with having only 1 or 2 rooms of living space. When the incident took place, the majority of parents were occupied with various forms of housework, 8 (8%) were dealing with another child, 9 (9%) were watching television, while 20 (20%) reported that they were with the child (Table 4). Table shows that 66% of the children were within controlling distance of the parent at the time of injury and that in fact 35% of the burn injuries occurred while the parent was engaged in an activity with the child.

It was reported that 67% of the families had their meals in the living room and 33% in the kitchen, and that 72 (72%) ate sitting on the floor while 28 (28%) preferred a dining table. When the mealtime habits of the families were examined, it was determined that 92.5% ate in the living room sitting on the floor. As can be seen from Table 5, only 5% of the patient population ate meals in a dining room and used a dining table.

The causes of the burns were determined as hot liquid (82%), flames (10%) and contact burns (6%). According to age groups, 63 (63%) patients were in the 0-3 years age group and 37 (37%) were aged over 3 years. In the 0-3 year age group, the most common burn agent was hot liquid in 54 (54%) cases. In the group aged over 3 years, the agents were hot liquid in 29 (29%) patients, flames in 8 (8%) and no contact burns (Table 6).

Consistent with the literature, hot liquid burns was the most common agent, being the cause in 84% of the whole patient group. In the patient group aged over 3 years, the leading burn agent was hot liquids in 78.3%, followed by flammable materials in 21.7%.

Table 5. The place and manner of mealtimes

			Manner of eating meals		
			Floor	Table	Total
Place where meals are eaten	Living room	Number	62	5	67
		% within place where meals are eaten	92.5%	7.5%	100.0%
	Kitchen	Number	10	23	33
		% within place where meals are eaten	30.3%	69.7%	100.0%
Total	Number		72	28	100
	% within place where meals are eaten		72,0%	28.0%	100.0%

p&lt;0.001

Table 6. Burn agents according to age groups

		Age groups		
		0-3 years	>3 years	Total
Burn agents	Liquid	55 (87.3%)	29 (78.3%)	84
	Contact	6 (9.5%)	0	6
	Flammable material	2 (3.2%)	8 (21.7%)	10
Total		63	37	100

p&lt;0.003

## DISCUSSION

Parallel with the literature, the frequency of male patients was higher within the pediatric study group (12).

The fact that only 4% of the parents were eligible for retirement from a qualified healthcare insurance supported previous reports in the literature stating that burn injuries occur more in families with a low socio-economic and education level (13, 14). Although various insurance institutions in Turkey have now been combined under the umbrella of the Social Security Institution, it was important to make this separate grouping to show how many parents had worked in a position that qualified for insurance coverage.

The time of the incident often followed lunchtime, when the mother (95% of the mothers in this study were housewives) was clearing away the meal, when she was preparing for the evening meal planned for after the father's returning from work, or when other children were returning from school and she was busy with preparations and thus was distracted and paying less attention to the child.

In a 2003 study by the same authors, the rate of presentation to the clinic from outside the region was reported as 36.2% (15). The reduction of this rate to 20% is thought to be due to new burn units that became active in the intervening period, both in our region and in Turkey in general. This has been a positive development that reduced unnecessary patient transport and increased chances of treatment in patient's area of residence.

It is noticeable that 64% of patients were treated in the early stage with cooling water, which is the correct application. However, 14% of the patients had ice application for cooling as the first invention. Cooling with ice causes a worse outcome

by adding the trauma of the cold on top of heat trauma (16). In addition, 21% of the patients were found to have had no treatment applied. A total of 36% of the patients did not have the correct procedure as a first intervention. When a burn incident has unavoidably occurred despite preventative measures, it must be strongly emphasized that after taking the etiological factors into account, the first stage should be to cool the burn area under running tap water.

Transport of the patients to a clinic by ambulance or other vehicles is acceptable depending on the severity of the burn injury. However, the overall situation of not being able to treat a patient in their own residential area and requiring a bus journey between cities is a subject that requires attention. According to the Inpatient Healthcare Burns Units Foundation and Action Directive, a 'Burns Room' was established in all inpatient treatment centres as a mandatory requirement to provide treatment in the area of residence for all minor burns patients with indications for hospitalization (17).

Thus, it is necessary to prevent these patients with minor burns travelling to other regions by bus. In this context, attention should be directed at the necessity of education on the subject of burns treatment at graduate and postgraduate level as well as directed to those who quit school earlier. By travelling outside their own region, this group of patients have experienced economical, physical and psychological trauma, created an increased workload at the reference centre, and removed themselves from the labour force for that period.

The fact that 13% of the patients were the second burn case within the same family indicates that the family is careless to precautions against fire. Child abuse should also be taken into consideration in these families with repeated burn injuries. There is a need for nationwide studies to inform and create awareness on both of these topics.

It has been previously reported that crowded living conditions and heating with stoves play a role in the etiology of burns (18). Similarly, in this study, the crowded nature of the family living condition is a factor facilitating exposure of the child to burns as well as related distractions. The stove, which is used for heating is located in the centre of the living area, has been suggested as one of the leading factors in burns in children who have not yet completed their physical and mental development.

In this situation, in the sense of protecting children from burns, it can be thought that either parents are not aware of preventative measures or the families are careless due to repeated burn

injuries within the same family. There is an urgent need for educational programs to correct this. Awareness can be raised in families on anticipated negligence and what needs to be done, thus overcoming the problems and preventing these burns.

Evaluation of mealtime habits of the families (Table 5) shows that improper ways of eating can make it easier for a child to be in contact with hot pans or teapots. In the same way, there is an increased likelihood of uncontrolled spillage of hot liquids or food by running into another person. These events can be interpreted as a reflection of the socio-cultural level of the family, as depicted by table . Taking this factor into consideration in the etiology of burns injuries, informing families about eating in the living room and more importantly at a table emerges as a requirement.

In the patient group aged over 3 years, it is more significant that rather than the reduction in contact and hot liquid burns, an increase is seen in burns from flammable materials. At this age children are mobile and are curious about their surrounding environments, and if they can touch and reach everything that attract their attention, this may result in exposure to burn injuries. In this sense, the preventive programs to be applied should emphasize that the families must be warned of the potential dangers that are encountered along with the physiological and mental development of children. Parents and carers must be warned and made aware of requirements to prevent children of this age group, with increased movement ability and an awareness of their surroundings, from reaching combustible agents.

## CONCLUSION

The etiology of burn injuries may differ according to the socio-cultural and socio-economic status of each country. The results of this and similar previous studies conducted in Turkey have shown that crowded living conditions, the heating systems used, and the traditional custom of eating meals sitting on the floor are significant etiologic factors in pediatric burn injuries. Therefore, the planning of collaborative programs by public and private civil organizations and clinicians who provide the treatment for burns to change these habits and customs would be of great importance in reducing the incidence of burns, which are known to be one of the most serious traumas.

**Ethics Committee Approval:** The study only includes the etiology of burns and do not include any sort of treatment. Also, all the parameters were gathered via past history of the injury. For this reason, an ethical committee approval was not obtained for this study.

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