



Epidemiologic evaluation of patients with major burns and recommendations for burn prevention

Majör yanıklı hastaların epidemiyolojik açıdan incelenmesi ve yanıktan korunma yolları

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BACKGROUND

Burns are an important health problem in our country and in the world. In our study, we aimed to epidemiologically analyze the patients who were hospitalized in a burn unit that serves 3 million individuals in Central Anatolia.

METHODS

Records of 457 patients who had been hospitalized in the burn unit during the period 2008-2010 were analyzed retrospectively. Patients were assessed in terms of gender, age, burn area, burn depth, admission time to the health center, burn region, and factors causing burns.

RESULTS

Most (44.6%) of the patients were in the 0-5 age group. Burn surface area was detected as 11.6±8.5%. Patients had reached the health center in 252.8±892.5 minutes. While 82.7% of the patients had second degree burns, 17.3% had third degree burns. Most burns were on the extremities (39.6%). The most common burn agent was scalds with hot liquids (54.1%).

CONCLUSION

In our study, children in the 0-5 age group were found to be the most commonly affected group with respect to indoor burns. The basic contributing factor is that children spend more time in the house and are more active. Scalding burns may be prevented when greater care is taken when using hot liquids that may lead to indoor burns. Informing parents on this issue is of first priority.

Key Words: Burn prevention; burns; epidemiology; hospitalized patients.

AMAÇ

Yanıklar ülkemizde ve dünyada önemli bir sağlık sorunudur. Bu çalışmamızda amacımız, Orta Anadolu'da yaklaşık 3 milyon nüfusa hitap eden yanık ünitesindeki hastaları incelemektir.

GEREÇ VE YÖNTEM

2008 ile 2010 yılları arasında yatarak tedavi gören 457 kayıtlı hasta geriye dönük olarak incelendi. Olgular cinsiyet, yaş, yanık alanı, yanık derinliği, sağlık kuruluşuna başvuru süresi, yanık bölgesi ve yanık nedenleri açısından karşılaştırıldı.

BULGULAR

Olguların çoğunluğunu (%44,6) 0-5 yaş grubu çocuklar oluşturuyordu. Yanık alanı ortalama %11,6±8,5, sağlık merkezine başvuru süresi ortalama 252,8±892,5 dakika olarak bulundu. Olguların %82,7'si 2. derece, %17,3'ü 3. derece yanık derinliğine sahipti. Yanık bölgesi ekstremitelerde en fazla idi (%39,6). Yanık nedeni olarak sıcak sıvı haşlanma yanıkları fazla idi (%54,1).

SONUÇ

Çalışmamızda 0-5 yaş grubu olgular en fazla etkilenen gruptu ve genellikle yanıklar ev içinde oluşmaktaydı. Bu konuda çocukların ev içinde geçirdikleri sürenin fazla olması ve çocukların bu dönemde çok hareketli olması temel faktörlerdir. Yanıkla mücadelede, haşlanma yanıklarının önlenmesi ve ebeveyn bilgilendirmesinin sağlanması en önemli aşama olmalıdır.

Anahtar Sözcükler: Yanık önlenmesi, yanıklar, epidemiyoloji; hastanede yatan hastalar.

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Burns represent an important health problem, as they lead to significantly high rates of mortality and morbidity worldwide. In addition, burns are associated with multiple problems in the community. The most effective way to overcome this problem is to prevent burns and treat existing burns quickly and effectively.^[1-3] Patients with burns are affected physically and psychologically in the long term.^[4-6] Therefore, preventing burns is crucial for both human health and the country's economy, given that burn treatment is enduring and expensive.^[7,8] Despite the presence of studies about minor and moderate burns in the literature, there is limited data about our country.^[9] Those types of burns are treated in outpatient clinics in many institutions. Some patients with minor and moderate burns do not even visit a health center. Treatment and follow-up of patients with major burns are done carefully in newly established burn units.^[10,11]

The Burn Unit of the Konya Research and Training Hospital was established in 2008 in central Anatolia. With 13 beds, it serves approximately 3 million individuals. One pediatric surgeon, one general surgeon, and one plastic surgeon work in this unit. It is also supported by other specialists in the hospital when needed.

The aim of this study was to investigate the epidemiological characteristics of 457 major burn patients admitted to the Burn Unit of the Konya Research and Training Hospital between 2008 and 2010, according to the American Burn Association (ABA) criteria.^[12] In order to design and implement an effective prevention effort, it is essential to define the epidemiology and causes that should be addressed to achieve the maximum benefit.

MATERIALS AND METHODS

A total of 457 patients who were admitted to the Burn Unit of the Konya Research and Training Hospital between 2008 and 2010, who were hospitalized and treated according to ABA criteria, were included in the study. Patient files were analyzed retrospectively in terms of age; cause of burn; admission time; burn injury site, area, depth, and location; season; and gender.

Patients were divided into five groups as follows: ≤ 5 years, 6-12 years, 13-18 years, 19-65 years, and ≥ 65 years. Patients were divided into groups according to burn agent, such as scalding, flame, contact, chemical, and electrical burn. Admission time was recorded as the duration from burn development to reaching a health institution according to the reports of the patient or relatives. Burn areas were categorized as face/neck, trunk, perineum, extremity, and whole body. Burn area was estimated as the ratio of the burn area to the total body surface (%). Burns characterized with bulla formation affecting the epidermis and some part of the dermis were classified as second degree,

whereas burns characterized with color change in which the dermis was affected were classified as third degree. The location in which the burn developed was divided into two groups as indoor or outdoor.

Statistical Analysis

Data were transferred to computer, and faults were controlled. Data were summarized as mean \pm standard deviation and percentages. Comparisons between two groups were performed using the Mann-Whitney U test. Comparisons between more than two groups were conducted using Kruskal-Wallis variance analysis. Significant parameters were compared using the Bonferroni correction in the Mann-Whitney U test. Comparisons of categorical data were done using chi-square tests. The level of significance was set at 0.05.

RESULTS

A total of 457 patients with major burns according to ABA grading who had been hospitalized and treated in the Burn Unit of the Konya Research and Training Hospital were examined. The mean age was 16.9 \pm 19.3 years (17.7 \pm 20.6 for females, 16.4 \pm 18.5 for males; $p > 0.05$). Of the patients, 36.8% were females and 63.2% were males. The majority of patients were in the 0-5 age group (44.6%, $n=204$). As shown in Table 1, no difference was detected across age groups according to gender ($p > 0.05$).

The mean burn area was 11.6 \pm 8.5%. While the mean burn surface area did not differ according to gender, place of burn, season, or age group ($p > 0.05$), as shown in Table 2, a significant difference was detected according to burn degree, burn cause and burn site ($p < 0.05$). Although the mean burn area was higher in second degree burns compared to scalding burns, it was lower in extremity burns.

Patients reached a health center within 252.8 \pm 892.5 minutes before their treatment began. While there was no difference in terms of admission time according to gender, burn place, burn degree, burn cause, burn site, and burn season, a significant difference was detected in admission times according to age. As shown in Table 3, individuals in the 0-5 and 19-65 age groups

Table 1. Distribution of patients according to age groups and gender

Age groups	Gender		Total (n)
	Female n (%)	Male n (%)	
0-5 years	77 (37.7)	127 (62.3)	204
6-12 years	22 (36.7)	38 (63.3)	60
13-18 years	10 (30.3)	23 (69.7)	33
19-65 years	54 (37.0)	92 (63.0)	146
≥ 65 years	5 (35.7)	9 (64.3)	14

$\chi^2 = 0.69$, $p = 0.95$, $SD = 4$.

Table 2. Comparison of burn area according to some variables

	Burn area (%)	p
Gender		
Female	11.1±7.9	0.431
Male	12.0±8.8	
Degree		
2nd degree	12.4±8.6	0.000
3rd degree	7.9±6.8	
Place		
Indoor	11.3±8.0	0.375
Outdoor	12.5±9.6	
Age group		
0-5 years	10.8±7.5	0.057
6-12 years	10.2±7.5	
13-18 years	12.9±8.3	
19-65 years	12.9±9.9	
≥65 years	14.0±7.8	
Cause		
Liquid-vapor	11.6±7.5	0.000
Chemical	12.2±10.4	
Contact	5.3±4.1*	
Flame	12.4±7.0	
Electric	12.2±10.1	
Region		
Face-neck	10.1±5.9	0.000
Trunk	17.0±10.6 [§]	
Perineum	11.0±6.5	
Extremity	8.5±5.5	
Whole body	24.5±11.5 [§]	
Season		
Winter	10.9±6.1	0.686
Spring	12.5±8.9	
Summer	11.0±8.3	
Autumn	12.0±9.2	

* Different from other causes; § 2-5 have similar burn percentage but different from other burn regions.

Table 3. Comparison of admission times according to some variables

	Admission time (min)	p
Gender		
Female	276.3±1088.8	0.919
Male	239.2±757.1	
Degree		
2nd degree	210.5±829.1	0.456
3rd degree	455.3±1132.9	
Place		
Indoor	298.9±997.6	0.104
Outdoor	129.1±495.5	
Age group		
0-5 years	175.2±814.5*	0.004
6-12 years	539.0±1216.5	
13-18 years	363.8±1179.9	
19-65 years	195.0±708.5*	
≥65 years	499.6±1109.0	
Cause		
Liquid-vapor	286.9±1025.4	0.130
Chemical	236.3±768.1	
Contact	508.8±1193.1	
Flame	104.6±279.5	
Electric	38.5±41.9	
Region		
Face-neck	191.4±653.5	0.151
Trunk	224.8±755.6	
Perineum	350.2±935.0	
Extremity	307.5±1102.9	
Whole body	23.2±16.6	
Season		
Winter	128.5±501.8	0.291
Spring	244.3±797.0	
Summer	288.1±917.3	
Autumn	275.6±1035.1	

* Significantly lower compared to ≥65 years.

reached a health center earlier than those in the other age groups ($p<0.05$). Although no difference was detected in mean age according to gender and season, a difference was found in mean age according to burn place, burn site, and burn cause ($p<0.05$). While scalding burns were seen in younger individuals, flame burns were seen in older individuals (Table 4). No difference was found in burn causes, burn site, age group, and burn degree according to gender ($p>0.05$). However, outdoor burns were found significantly less often in females (6.5%) compared to males (39.1%) ($p=0.000$, $\chi^2=56.9$).

Of the patients, 82.7% had second degree burns and 17.3% had third degree burns. No difference was detected in burn degree in terms of burn place ($p>0.05$). Nevertheless, as shown in Table 5, third degree burns were found more frequently in individuals ≥65 years,

as well as in those with contact burns, burns in the spring season, and burns of the extremities ($p<0.05$).

Among the hospitalized patients, burns were seen most frequently on the extremities (39.6%), followed by the trunk (26.0%), face and neck (25.2%), perineum (6.8%), and whole body (2.4%). Burns were most commonly caused by scalding (54.1%), followed by flames (20.7%), chemicals (13.8%), objects (6.4%), and electricity (5.1%).

When the place of burn injury was analyzed according to age, it was found that they occurred indoors in 84.3% of the ≤5 age group, 78.3% of the 6-12 age group, 57.6% of the 13-18 age group, 56.8% of the 19-65 age group, and 85.7% of the ≥65 age group. Outdoor burns were observed most frequently in the 19-65 age group ($p=0.000$, $\chi^2=38.4$, $SD=4$) followed by 13-18 age group ($p=0.004$, $\chi^2=13.3$, $SD=3$) (Fig. 1).

Table 4. Comparison of mean ages according to some variables

	Age	p
Gender		
Female	17.7±20.5	0.828
Male	16.4±18.5	
Degree		
2nd degree	15.2±17.9	0.001
3rd degree	24.8±23.5	
Place		
Indoor	15.2±19.9	0.000
Outdoor	21.3±16.9	
Cause		
Liquid-vapor	11.0±16.2	0.000
Chemical	14.8±19.5	
Contact	17.1±17.5	
Flame	30.6±20.6*	
Electric	28.1±12.8*	
Region		
Face-neck	21.7±19.5	0.000
Trunk	14.5±17.6§	
Perineum	18.3±16.6	
Extremity	15.1±20.4§	
Whole body	16.1±17.2	
Season		
Winter	14.5±19.9	0.408
Spring	16.7±18.9	
Summer	16.6±19.8	
Autumn	18.1±18.9	

*Mean age was similar in flame and electric burns; however, greater than other burn causes; § Mean age for 2nd and 4th regions was similar but lower than for other burn regions.

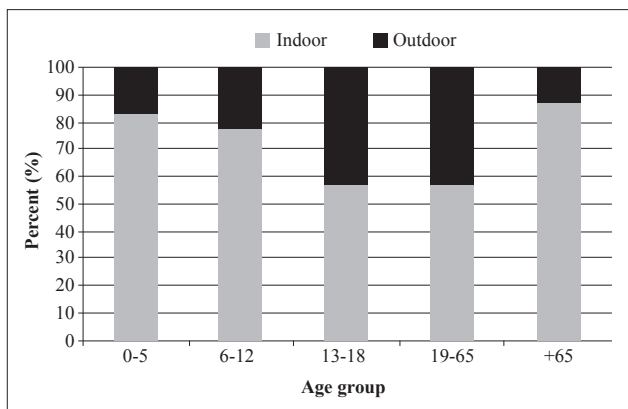


Fig. 1. Distribution of burn accidents according to age and place.

DISCUSSION

Burn injury is a significant public health concern. Severe burns can be lethal. In addition, survivors often suffer from disfiguring and disabling scar, psychological trauma, and loss of productive years. Many epidemiologic studies about burns are available in Turkey,^[2,10,11,13] with the primary aim of developing a burn profile and promoting prevention.

Table 5. Comparison of burn degree according to some variables

	Burn degree		p
	2nd degree n (%)	3rd degree n (%)	
Gender			
Female	144 (85.7)	24 (14.3)	0.203
Male	234 (81.0)	55 (19.0)	
Place			
Indoor	278 (83.5)	55 (16.5)	0.488
Outdoor	100 (80.6)	24 (19.4)	
Age group			
0-5 years	179 (87.7)	25 (12.3)	0.004
6-12 years	51 (85.0)	9 (15.0)	
13-18 years	29 (87.9)	4 (12.1)	
19-65 years	111 (76.0)	35 (24.0)	
≥65 years	8 (57.1)	6 (42.9)*	
Cause			
Liquid-vapor	220 (89.4)	26 (10.6)	0.000
Chemical	53 (84.1)	10 (15.9)	
Contact	13 (44.8)	16 (55.2)*	
Flame	77 (81.9)	17 (18.1)	
Electric	13 (56.5)	10 (43.5)	
Region			
Face-neck	106 (92.2)	9 (7.8)	0.000
Trunk	110 (92.4)	9 (7.6)	
Perineum	27 (87.1)	4 (12.9)	
Extremity	125 (69.1)	56 (30.9)*	
Whole body	10 (90.9)	1 (9.1)	
Season			
Winter	50 (90.9)	15 (9.1)	0.024
Spring	64 (90.9)	22 (9.1)	
Summer	132 (90.9)	17 (9.1)	
Autumn	132 (90.9)	25 (9.1)	

Burns may lead to fear and psychological damage in patients and their loved ones. In addition, health care professionals have trouble approaching these patients. We analyzed outcomes over approximately two years in a clinic that was established to fight burns and intervene with burn patients. In this study, we assessed prevention and started treatment earlier rather than later. The majority of the study population in our investigation was male, a finding that corresponded with information in other reports.^[9,10]

Consistent with the literature, a vast majority of the patients included children under 18 years of age (65.0%), with many being ≤5 years (44.6%).^[9-11,13-15] This result indicates that burn prevention efforts should be emphasized among this age group. Reaching this age group may only be possible by reaching parents. Focusing parents' attention on burn injury and protection from burns is crucial. Thus, informing and educating them should be in the foreground in the fight against burns. Schools, parents and administrators

should collaborate to offer this education.^[16] Several researchers have found success by working in this manner.^[17] The difference between burn agents is also present in the treatment of children. For this reason, the approach to children's treatment is different than that of adults.^[18]

In this study, scalding was the leading cause of burns, followed by fire. This finding is consistent with those of other studies^[11,14-16] and inconsistent with another.^[19] The main contributor to scalding injuries is the habit of drinking tea in the Turkish population and traditional tea-making tools that can lead to severe accidents.^[11,20] The traditional tea habit should be questioned. In addition, safer methods should be developed for protection. Given that the kitchen or cooking area and open fires are dangerous, certain steps could and should be taken to intervene in these specific areas, preventing the possibility of burn injuries in Turkey.

Contact burns were found to be significantly more common in the spring and among individuals ≥ 65 years. The reason for this is the relative reduction of other burns. Contact burns related to contact with hot ovens are significantly more common in this age group due to carelessness as a result of advancing age. There were higher rates of contact burns among individuals aged 19-65 years; however, this difference was not statistically significant. This age group includes actively working individuals. These types of burns are seen frequently due to occupational accidents.^[21] Occupational safety and worker protection should be obtained for prevention. Preventive measures by employers may not be enough; worker education should also be provided.

The mean admission time was 253 minutes. We could not make comparisons due to the small number of studies on this topic; however, we considered the admission time to be long. Future studies should be performed to examine these patterns. Early treatment is important, especially when dealing with burns involving wide surfaces. Getting the patient to a health center and a burn unit quickly and safely is crucial in terms of relieving pain and preventing foreign body contact and infection. The first intervention should be effective in burns. Minor burns can be treated with first intervention and wound care.^[19] Directing and transporting patients to the appropriate unit is crucial for burn injuries as well as early treatment. Treatment of patients with minor or moderate burns differs from treatment of those with major burns.^[22] Patients' suffering due to pain and prevention of incorrect treatments may be hindered as admission time decreases.

The burn surface area is wider in second degree burns compared to third degree burns. Second degree burns usually develop as a result of scalding, whereas

third degree burns usually develop as a result of contact burns. This result should be viewed as normal, as the area of a contact burn is smaller. Second degree burns were more common compared to third degree burns in all groups in this study. This finding is consistent with the literature.^[23]

Also consistent with the literature, there was no significant difference according to gender.^[9,16,23] Outdoor burn injuries were less common among females. Traditionally, adult women do all of the cooking for the family in Turkey; therefore, they are at greater risk for domestic burns. Preschool boys spend most of their time at home, whereas they are outside the home the majority of the time when they are older. Specifically, they are either in school or outside playing. This gender-related pattern in Turkey continues into adulthood. Most adult women work at home, spending more time inside their houses, especially during cold seasons, while most men spend their time outside and are less susceptible to burns in home settings.

With regard to outdoor burns, we found that some of the most important factors were downed power lines (especially in rural areas), children playing with fire or fireworks, unlawful entry into transformer stations, road accidents, and lightning strikes. These types of injuries cause more severe burns, which is why third degree injuries were more frequent in the burns that took place outdoors.

The rate of indoor burn injuries was relatively high (72.9%). This finding is consistent with those of other studies.^[14,16] The main factor contributing to the high ratio of indoor burns was accidents involving children. Children in the 0-5 age group were found to be most affected by indoor burns. We found that the most frequent medically attended injuries were among children who were already walking and up to 16 months of age, which we characterized as "beginning to walk and becoming inquisitive". Rates of accidental burns were high among children, as they spend much of their time at home and are active. Thus, reducing indoor burn exposure should be in the foreground among burn protection activities. In particular, scalding burns should be prevented.

Parent education is important. The house should be arranged in consideration of the children. In addition, children should avoid materials that could cause burns. Further, they should not be left unattended. Females are viewed as being more affected by indoor accidents, as they stay home longer than males. This study focuses our attention on a specific group that is at risk for burn injury in a well-defined community. Some of the risk factors, such as cooking and heating techniques, appliances, and behavior trends, should be changed.

In conclusion, burn injury has become a significant public health problem in Turkey and the world. To reduce the burden of burn injury, it is necessary to increase current efforts in community education. The family, schools, manufacturers, and government should all be involved. The most important step in fighting burns is protecting children and preventing burns in this age group. Indoor accidents are important for burn injuries. Children are most affected by these accidents. In addition, children should avoid factors that may lead to burns.

Information and education for parents are essential components of burn prevention among children. Parents should be educated about the severity of burn injuries and the difficulty of treatment. The causes of scalding burns should be clarified, and measures should be taken.

Individuals with burn injuries should be transported to a health center quickly and safely. Moreover, patients with major burns should be transported to a special burn unit. Contact burns cause small, but deep burns. Therefore, treatment should take seasonal differences into consideration. The role of indoor accidents is great in burn injuries. Communication tools, such as radio and television, can be useful because they reach large populations.

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