

## EVALUATION OF THE PATIENTS ADMITTED TO A BURN CENTER IN TURKEY

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**ABSTRACT**

**Background:** Burns constitute an important part of the accident-related deaths due to high morbidity and mortality.

**Methods:** The medical records of 778 (279 female) patients who were treated during last three years period were retrospectively analyzed concerning age, gender, the cause of the burn, the month when the burn occurred, admission date, duration of the hospital stay, area of the burn. The relationship between these parameters and the mortality was analyzed.

**Results:** The average age of the patients was 20 years. The burns were related to accidents in 87% patients, abuse in 8%, co-morbid diseases in 3% and suicidal attempts in 2%. In 48% of the cases there were hot fluid burns and in 37% (284) fire-flames. The burns were due to electrical burns in 13% patients and to other reasons in the remaining 2%.

One hundred and seventy - two patients had fatal courses. The mortality rate was 75% in 12 patients who were above 60 years. Average burn area was 24% (10-100) and average hospital stay was 13 days.

**Conclusion:** As most of the burns were due to accidents, the number of burns might be reduced by prioritizing preventive measures and better results could be obtained when the quality and the number of the burn centers is increased.

**Key words:** Burns, co-morbid disease, mortality, fluid burns, fire-flames, electrical burns.

**INTRODUCTION**

Though burns constitute an important percentage of accident-related deaths, 80-90% of the burns are preventable.<sup>1,2</sup> This problem should be perceived in detail in order to imply preventive measures and offer public education. It is very difficult to find reliable epidemiological data about burn patients in the literature. In USA, 2 million burn cases are reported annually and 100.000 of them require hospital treatment.<sup>3</sup> In Turkey, we do not have epidemiological data covering the whole country. Ankara Numune Teaching and Research Hospital (ANH) is the only state hospital with a special burn center. For this reason, most of the burn patients who need to be hospitalized in state hospitals are referred to our hospital from all the regions of Turkey. Therefore, evaluation of the patients' data of our hospital might reveal important information about the situation in the country.

**MATERIAL AND METHODS****Constitution of the burn centre**

In the burn center of ANH there are six surgeons, including one staff surgeon who is a pediatric surgeon and two general surgeons on rotation and three general surgery residents in

training on rotation and six staff nurses. There are 25 beds, including a 10-bed intensive care unit. The indications for hospitalization are stated below:

1. Second degree burns that are larger than 20% of the body area in adults and larger than 10% in children
2. Third degree burns that are larger than 10% in children and adults.
3. Third degree burns of the hands, face and the perineum.
4. Respiratory tract injury, fractures, soft tissue injuries and burns with co-morbid diseases.
5. All electrical burns.

**Evaluation of patients' records**

The medical records of 778 patients who were admitted to the hospital between January 1998 and March 2001 were analyzed retrospectively. Age, sex, causes of the burns, the month that the most number of burns occurred, admission time, duration of hospitalization, aetiology of the burn, co-morbid diseases (diabetes, cardiac failure, seizures, cerebrovascular accidents (CVO)), the area of the burn and related mortality rates were all recorded and the influence of these factors on mortality was then evaluated. Forty-one patients who were referred to other centers by their own

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will or by their relatives request were excluded and the remaining 737 patients were included in the study.

Statistical Analyses: All data were stored using SPSS 9.05 for Windows. Statistical analyses were performed by using one-way ANOVA, chi-square and t tests. P values less than 0.05 were considered as significant.

### RESULTS

#### *The age and sex distribution of the patients (Table 1)*

The mean (range) age of patients was 20 (0.1-95) years. Male/Female (M/F) ratio was 1.8 and 279 patients were female. While the numbers of children (0-16 years) and adult (16 years over) patients were about the same, 0-2 years age group was the most common (22%) amongst children, whereas 16-40 years age group was the most common (30%) in adult groups. When the mortality

rates was compared amongst the age groups, no statistically significant difference was observed.

#### *The cause of burns (Table 2)*

The most common cause of the burns was accident (87%) which was followed by burns due to negligence, burns related to co-morbid disease, suicidal attempts and abuse related burns. Six out of nine epileptic patients and two out of ten patients with cardiac failure fell down on hot water or fire-flame during epileptic seizures or syncope. When the cause of burns was compared according to age groups, there was a statistically significant difference. Especially accident related burns were found to be more common in the age group of 12-16 years.

#### *Time of admission (Table 3,4)*

Although 64% of the patients were admitted to the hospital in the same day of burn, the number

**Table 1.** Age and sex distribution of the patients and mortality rates.(p=ns)

Age groups (years)	Sex (%)		Total (%)	Mortality(%)
	Male	Female		
0-2	105	62	167 (22)	35 (26)
2-6	96	45	141 (18)	37 (27)
6-12	43	20	63 (8)	9 (5)
12-16	31	15	46 (6)	12 (6)
16-40	134	91	225(30)	39 (22)
40-60	51	25	76 (10)	22 (12)
60 years older	39	21	60 (8)	18 (16)
Total	499(64)	279 (36)	778	172 (23)

**Table 2.** Distribution of the patients according to the age and causes of burn. Accident related burns were significantly common in all age groups (p<0.001)

Age groups (years)	Causes of burn				
	Accident	Negligence	Co-morbid disease	Suicide	Abuse
0-2	128	39	0	0	0
2-6	131	9	0	0	1
6-12	58	4	1	0	0
12-16	44	2	0	0	0
16-40	189	4	16	15	1
40-60	69	1	6	1	0
60 years older	55	0	5	0	0
Total	674(87)	59 (8)	27 (3)	16 (2)	2 (0.2)

**Table 3.** Time of admission and mortality according to age groups (p=0.058).

Time of admission	0-16 years	16 years and over	Total (%)	Mortality
Same day	254	241	495 (63.6)	122 (17)
In 2-5 days	71	67	138 (17.6)	20 (3)
Later	70	75	145 (18.6)	29 (4)

**Table 4.** Aetiology of burns and time of admission. The most common delaying cause was hot-fluid burns which was followed by fire-flame (p=0.047).

Time of Admission	Aetiology of burn						Total
	Scald	Fire-Flame	Steam	Chemical	Electrical	Contact	
Same day	229	184	5	-	72	5	495
In 2-5 days	73	41	1	4	15	2	136
Later	73	59	-	-	1	14	147

of patients who were admitted to the hospital later than five-days were 145 (19%). The time of admission were being changed by etiology of the burns and the delay was most commonly observed in hot-fluid burns. When the relation between time of admission and mortality was analyzed, there was no significant difference.

**Aetiology of the burns (Table 5,6)**

Hot fluid burns had a prevalence of 48% (375 patients), followed by fire-flame burns of 37% (284 patients) and when the age groups and aetiology of the burns were compared, there was a statistically significant difference (p<0.001). While in the 0-2 years age group hot fluid burns were

**Area of the burn (Table 7)**

Average burn area was 24% in general, it was found to be 49% in patients who had a mortal course and was 16% in patients who had total cure (p<0.05).

If the cut-off limit was taken as 30% for the burn area, there was a statistically significant difference in mortality rates between the groups. In the group with a burn area of more than 30%, mortality was significantly higher. When all cases were taken into consideration, the most common cause of mortality was acute renal failure and sepsis.

Average burn area was 24% (10-100%), mean duration of hospital stay was 13 (1-141) days, and the highest number of burns occurred in March

**Table 5.** Aetiology of burns and age groups

Age groups (years)	Aetiology of burn						Total
	Scald	Fire-Flame	Steam	Chemical	Electrical	Contact	
0-2	152	14	-	1	-	-	167
2-6	108	29	-	-	2	2	141
6-12	23	17	-	-	21	2	63
12-16	10	23	-	1	12	-	46
16-40	45	123	5	2	47	3	225
40-60	17	44	-	-	15	-	76
60 years older	20	34	1	1	4	-	60
Total	375	284	6	5	101	7	778

**Table 6.** Aetiology of Burns and Mortality. The mortality was significantly higher in patients with fire-flame (p<0.01)

Aetiology	No. of patients (%)	Mortality (%)
Scald	375 (48.3)	57 (15)
Fire-Flame	284 (36.5)	99 (34)
Steam	6 (0.8)	-
Chemical	5 (0.6)	-
Electrical	101 (12.7)	15 (14)
Contact	7 (1)	1 (14)

more common (40.4%), electrical (45.5%) and fire-flame (43.3%) burns were seen more frequently in the 16-40 years age group. When these two causes were compared for related mortality, the rates were found significantly higher in fire-flame burns.

**Table 7.** Mortality rates according to age groups and burn area (Cut off value is taken as 30%) Mortality increases significantly when the burn area is over 30% (p=0.001)

Age Groups	Mortality (%)	
	Burn Area <30%	Burn Area >30%
0-2	7	73
2-6	9	69
6-12	0	45
12-16	0	33
16-40	1.4	51
40-60	2.1	100
60 years older	17	100
Total	5	66

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(12.5%) and January (9.6%). The etiology of burns changed with months ( $p=0.003$ ) and duration of hospital stay was related to the etiology ( $p<0.01$ ). There was a statistically significant correlation between months and burn mortality and August was found to be the most mortal month (19/37, 51%) which was followed by March (27/66, 25%) ( $p=0.029$ ). There was no statistically significant correlation between the duration of the hospital stay and mortality.

### Inhalation Injury (Table 8)

There were ten patient, aged between (1-53) years, with inhalation injury and all were males. Diagnosis of inhalation injury was based on the respiratory distress and otorhinolaryngologist consultation. Eight patients had fire-flame burns and one of the remaining two patients, aged one year, had hot-fluid burns and the other one had electrical burns.

children between 0-6 years of age were in majority (40%) in the pediatric age group. The children between the ages of 0-2 are frequently confronted with accident-related hot fluid burns during or before the stage of crawling due to the carelessness of the family and inappropriateness of the living environment. As in correlation with all previous epidemiological studies we also found that the number of male burn patients were higher than the females.<sup>1,4,5,8-17</sup> The dominance of males might be explained by the fact that boys are more active and curious during childhood and occupational accidents are more common in males during adulthood.

In a study by Cutillas M, elderly constituted 7% of all burn related hospitalizations.<sup>18</sup> In our study, 60 (8%) patients were above the age of 60 years. The reason for having more males in this age group (39 M/21 F) might be related to the fact that males were being incapable of caring for themselves if

**Table 8.** The characteristics of the patients with inhalation injury

Age(years)	Aetiology	Time of admission	Burn Area(%)	Hospital Stay	Mortality
1	Scald	Later	25	21	-
2	Fire-Flame	In 2-5 days	20	8	-
5	Fire-flame	Same	35	22	+
23	Fire-flame	Same	9	4	-
26	Fire-flame	Same	50	62	-
27	Fire-flame	Same	15	6	-
35	Fire-flame	In 2-5 days	40	34	-
38	Electrical	Same	17	16	-
44	Fire-flame	Same	90	1	+
53	Fire-flame	Same	20	46	-

There were two patients with mortal course, both being fire-flame burns. The causes of mortality were sepsis and renal failure. The characteristics of the patients were shown in table 8. While evaluating the effects on mortality, we failed to find any relationship but, both mortal cases had burn area over 30% (90%, 35% respectively).

### DISCUSSION

Burn is an important problem that might be experienced at any time of human life and some individuals are under greater risk when compared to the others: children below five years of age, people over 65 years of age, careless people and unconscious individuals.

When burn patients were evaluated in terms of age groups, children below the age of five had a ratio between 36-76% while those over five years had a ratio around 24%.<sup>1,4-8</sup> In the present study

they were living alone as the house works are usually managed by women in our culture. While trying to heat their environment, thirty-two patients had fire-flame burns and in eight of them the burn area was more than 30%. All these patients were living alone and they had a delay in admission as well. Our mortality rate of 31% (18/60) in the age group of 60 and above was correlating with the literature.<sup>18</sup>

Total mortality rate (24%-172/725) was also in correlation with the literature.<sup>13-22</sup> However, there are some reports with higher rates as well.<sup>23,24</sup>

The mortality rates increased as the burn area goes beyond 30%. In the literature, though the mortality rate for pediatric age group is between 1-7%,<sup>4,9,13,15</sup> our mortality rate is higher (23.3%) and similar to that reported from India.<sup>13,22</sup> When the mortality was evaluated according to age groups, there was no statistically significant difference. This might be explained by the fact that the

indications for hospitalization were wider in the pediatric age group. On the other hand, in a study by Anlatıcı et al, the rate of mortality was found to be 33.5% and was higher in children, females and retired persons.<sup>25</sup>

Burns are frequently related to occupational or household accidents.<sup>1,4,19,20</sup> In our series, 87% of the cases were accident related burns.

Suicidal attempts which result in burns are more commonly encountered in women and burn area is usually wider than 30% which is striking.<sup>19,21</sup> In our study, all the 16 patients who attempted suicide were in 16-60 years age group and 8 (50%) of them were women. The burn area was found to be more than 30% in ten of these patients.

The burns due to negligence were seen in 59 (8%) patients and most of those are due to accidents as a result of children being left alone at home by their parents. In 34 of those, burn area was more than 15% which is an evidence to support that such children were not at age or consciousness level to care themselves from accidents.

Six patients, who were all in adult age group (16-60 years), with fall down on hot water or flame during epileptic seizures were found to interrupt their anti-epileptic treatment for a long period of time. The burn area was over 30% in five of those patients.

Hot fluid spills and inflammable material burns due to uncontrolled flaming are the main reasons of burns.<sup>1,4,5,7,9,11,12,17,19,20</sup> In our study hot fluid burns (48.3%) were the most common etiology and was followed by flame burns (36.5%) which is in correlation with literature.<sup>4,17</sup> Flame burns were reported to be more common in some previous studies.<sup>19,21,26</sup>

As the causes of burns differed by cultural and environmental influences, there are differences between countries and even provinces.<sup>4,17</sup> In our country, amongst hot fluid burns, there were accidents that happened while boiling milk which might be originated from the habit of making yoghurt at home and 34 patients (4%) had milk related burns. Estimating the degree of milk burns is difficult and these are usually second to third degree burns necessitating longer treatment periods.

Flame burns are usually due to the explosion of LPG (gas fuel). As Bekerecioğlu stated, tandır (which is a kind of oven buried underground and resembles a big hole, full of embers and surrounded with sheet iron) burns are important in our country, and they are major burns.<sup>22</sup> We had eight patients with tandır burns, seven of them were died and only one was discharged from the

hospital.

Electricity which brings comfort to our daily lives can cause fatal consequences if it is not used properly. The burning effect of the electrical current is dependent on the voltage and the resistance of the body. In the literature, electricity related burns have a prevalence of 3-5%. In the studies that were conducted in our country, the hospitalization rates due to electricity burns were similar to ours (13%) and it was around 12%.<sup>17,19,23</sup>

Some of the cases in our series had occupational exposure to electricity (30/737). Although these people were experienced, accidents occurred because of having insufficient preventive measures. 3% of those were in-house electrical accidents.

The factors determining the severity of the burn are the area of the burn, the thickness, and the localization of the burn, patients' age and general condition and the cause of the burn. It is recommended that the time of admission and appropriateness of center should be added to these factors.<sup>15</sup> However, there was no statistically significant relationship between the time of admission and the mortality rate in the present study. In a study from another burn centre in Turkey, extent and depth of burn were found to be most important predictor of mortality.<sup>25</sup>

The mean duration of hospital stay was 13 days and it was in accordance with the literature.<sup>12,21,24</sup> Although burn cases are reported to be increasing in winter months, we did not notice any seasonal differences.<sup>2,4,13,14</sup> The number of hospitalized patients was significantly higher in January and March which might be due to the fact that our study period extended from January 1998 until March 2001, and an 'extra' month of January, February and March were included in the study. The most common causes of mortality are acute renal failure (13-15%) and sepsis (60%) in burn patients.<sup>5,6,27</sup> In our study, the primary cause of mortality was also acute renal failure with a frequency of 49% (84/172). The reasons for having higher prevalence of acute renal failure in our study might be explained as: the first admission was not made to a burn center, severe hypovolemia occurred due to fluid loss during the time of transport, and problems related to insufficient team work in intensive care support. Average burn area was 24% (1-100) and correlated with the literature.<sup>17,21</sup>

During the last two decades, there have been many advances in burn care. Today, patients with 70% burn area have a survival chance of 50%.<sup>28</sup> According to the results of the Galveston Burn Unit, in 1952 and 1993, belonging to the age group of 0-

14 years, mortality was expected in 50% of the patients with 49% burn area in 1952, whereas 40 years later, it was 50% for the patients with 98% burn area. They also found that the mortality was 50% in patients with 10% burn area who were 65 years and older in 1952. Now burn area of 25% usually results in 50% mortality in same age group of patients. These developments might be related to the advances experienced in the field of intensive care and nutritional support. When the epidemiological studies in our country were examined, we can say that mortality rate has decreased from 34% to 24% during years as well.<sup>5</sup>

The patients with heat burns are usually treated by hospitalization for 1-1.5 days for each percentage of burn area.<sup>29</sup> However, this time is six fold less than the time that will be spent for reconstruction and rehabilitation after discharge.

The most important aspect of the burns is that they are preventable social events. To this end, public should be trained for increasing the

awareness level and socio-economical status. For all developing countries, implementation of preventive measures is always easier and cheaper than treating the burns. Educational visual material should be prepared and media should also prepare programs in an attempt to emphasize the importance of the problem.

Most burn units are usually connected to the Plastic Surgery Departments.<sup>4,5,17</sup> In our hospital, general surgery residents and specialists, one of which is a pediatric surgeon, are working in the burn unit. However, a pediatrician is not present for monitoring the pediatric patients. Although we do not have optimum conditions, we have obtained similar results with the literature which show us the importance of burn centers in the treatment of burns. We believe that the number of burns can only be decreased by prioritizing preventive measures. Increasing the number and the quality of the burn centers is the only way to obtain better results in burn treatment.

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