

Burn and vital risk criteria in industrial accidents (as forensic medicine approach)

İş kazalarında yanık ve hayati tehlike ölçütleri (Adli tıp yaklaşımı)

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BACKGROUND

Burn traumas resulting from industrial accidents may generate a death risk. In such cases a forensic report should be filled up. In forensic findings, the death risk which is associated with the degree of trauma, of the victim is as important as the treatment of the subject. The aim of our research was to investigate what degree of burns causes fatality and which type of industrial accidents cause them.

METHODS

This research was done between the dates October 2004 and December 2006 with the descriptive epidemiology method by the evaluation of all data entered emergency surgical room-burn unit. The results of the study were analyzed with respect to its socio-demographic characteristics clinical findings of the type of burn and the type of the event which caused the burn. Categorical variables were assessed using Chi-square test, continuous variables were tested by Pearson's correlation.

RESULTS

For the total 128 incidents, 69.5% (n=89) were males and 30.5% (n=39) females. 28.9% (n=37) of the incidents were industrial accidents. 48.6% (n=18) of the burns were caused by boiling water, 32.4% (n=12) due to contact by flame, 10.8% (n=4) electrocution and %8.2 (n=3) due to burns by contact with chemicals. The 19.50% (n=25) of the incidents had ended up by loss of life, 80.5% (n=103) were cured and discharged. The incidents which had resulted under 20%, the mortality rate was 1.3% (n=1), the incidents which had above 20%, the mortality rate was 49.0% (n=24) (p=0.0001).

CONCLUSION

The degree of burn was found to be valuable in determining the death risk but the extent of the burned area was found to be more deterministic in assessing this particular risk.

Key Words: Burn causes; burn traumas; forensic medicine; industrial accidents.

AMAÇ

İş kazası sonucu oluşan yanık travmalarında, ölüm meydana getirme riski olmasından dolayı adli rapor düzenlenmesi şarttır. Adli olgularda travmanın ağırlığını belirten en önemli ölçüt olan, hayati tehlikenin saptanması mağdurun tedavisi kadar önemlidir. Bu çalışma, bildirilen yanık yüzde değerlerinin, hayati tehlike kavramını ne ölçüde karşıladığını araştırmak ve iş kazalarında meydana gelen yanık nedenlerini belirlemek amacıyla yapıldı.

GEREÇ VE YÖNTEM

Çalışma Ekim 2004 ile Aralık 2006 tarihleri arasında, tanımlayıcı epidemiyolojik yöntemle, acil cerrahi servisi yanık ünitesine gelen tüm olgular değerlendirilerek gerçekleştirildi. Olguların sosyo-demografik özellikleri sorgulandı. Veriler, frekans, aritmetik ortalama, standart sapma ve median kullanılarak tanımlandı. Kesikli değişkenler Ki-kare testi kullanılarak, sürekli değişkenler Pearson korelasyon testi yardımıyla incelendi.

BULGULAR

Toplam 128 olgunun %69,5'i erkek (n=89), %30,5'i (n=39) kadın idi. Yanık olgularının %28,9'u (n=37) iş kazasıydı. İş kazası nedeni yanıkların, %48,6'sı (n=18) sıcak su, %32,4'ü (n=12) alev, %10,8'i (n=4) elektrik ve %8,2'si (n=3) kimyasal yanık idi. Olguların %19,50'inin (n=25) hayatını kaybettiği, %80,50'sinin (n=103) iyileşerek taburcu edildiği saptandı. Yanık yüzdesi %20'nin altında olan olgularda %1,3 (n=1) oranında, %20 ve üzerinde hesaplanan olgularda %49,0 (n=24) oranında ölüm görüldü (p=0,0001).

SONUÇ

Yanığın derecesi ölüm riski belirlenmesinde değerli olmakla beraber yanık alanının genişliği, ölüm riskinin belirlenmesi ve olayın soruşturulmasında daha dikkatli davranılması açısından daha belirleyici bulunmuştur.

Anahtar Sözcükler: Adli tıp; iş kazaları; yanık nedenleri; yanık travmaları.

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A burn is an injury caused by heat, chemical reaction or physical agent having similar heat effects. Most burns are produced by dry heat and as a result from contact with a flame or a heated solid object, or alternatively from exposure from a radiant heat of an object.^[1]

The total area of the burn is important. This is usually measured in terms of percentage of the total body surface area. The skin acts as a defense barrier from the environment, and without it, patients are subject to infection and fluid loss. Burns that affect more than 15% of the total body surface can lead to shock and require hospitalization for intravenous fluid resuscitation and skin care. A burn injury can be one of the most traumatic injuries a person can suffer.^[2] The financial, mental and physical costs of recovering from a burn injury are staggering. A burn injury can require months, sometimes years of hospitalization, doctor's visits, physical therapy and even counseling to overcome the mental trauma sustained from suffering a burn injury. Burn injuries often happen in industrial accidents, accidents occurred in construction sites or by the inattentiveness of others. We comprehend and sympathize with the victims who have extensive burn injuries and try to assist individuals in being fully recovered/treated.^[3,4] For extensive burns, there are additional significant costs that will include costs for repeat admission for retreatment and for rehabilitation. The most common burn injuries are; car accidents, gas explosions, scalding/hot water, electrocution, gasoline spills, household fires, defective citronella candles, lighters & matches.

An industrial accident is the type of accident which happens at work. Burn traumas resulting from industrial accidents may generate a death risk. In such cases a forensic report should be filled up. In forensic findings, the degree of trauma which determines the death risk of the victim is as important as the treatment of the subject. In Turkey, the criteria for determining whether the patient has a high death risk or not is governed by the percentage of the degree of burns. If the burned surface area is higher than 20% in second degree burns, and higher than 10% in third degree burns the patient is regarded as having a high death risk.^[5,6] Our research was done to investigate what degree of burns causes death risk and which type of industrial accidents cause them.

MATERIALS AND METHODS

This research was done between the dates October 2004 (The inauguration date of the Burn Unit) and December 2006 with the descriptive epidemiology method by the evaluation of all data entered İstanbul University İstanbul Faculty of Medicine -Emergency Surgical Room- Burn Unit. The results of the study were analyzed with respect to its socio-demographic characteristics (gender, age, location and social security status), clinical findings of the type of burn and the type of the event which caused the burn (industrial accident, etc.). The findings were evaluated using SPSS 11.0 software program. Frequencies, percentage, arithmetic average, standard deviation, mean values were all used during this process. Categorical variables were assessed using chi-square test. Continuous variables were tested by Pearson's correlation.

RESULTS

For the total 128 incidents, 69.5% (n=89) were male and 30.5% (n=39) female. The average age was 15.33 ± 18.2 ($r=0.81$) and the median age was found as 5.

The 53.5% (n=68) of these incidents were caused by boiling water, 28.9% (n=37) found to be due to contact with flame, 10.2% (n=13) chemicals, 7% (n=9) electrocutions and 0.8% (n=1) inhalation. The 19.5% (n=25) of the incidents resulted in death, 80.5% (n=103) were cured and discharged. Mortality rate was 1.3% (n=1) for those who had a burned area under 20%, while for the other incidents mortality rate was found to be 49.0% (n=24) who had a burned area more than 20% ($p=0.0001$). Approximately one third of the cases (28.9%) were occupational accidents. Out of these 37 cases, 86% (n=32) were men and 13.5% (n=5) women. Nearly half of the incidents, 45.9%, were burns due to exposure to flames (Table 1).

For those 37 incidents recorded as occupational accidents 32.4% (n=12) was dead. The average of the degree of burnt surface was $63.33\% \pm 15.42$ and the average of degree of burn was found to be as 1.5 ± 0.52 . For the dead, the average percentage of the burn surface area and degrees of burn were found as statistically significant and quite higher compared to the survivors (p values respectively:

Table 1. Causes of industrial accident burns

Causes of burns	n	%
Flame burns	17	45.9
Chemical burn	9	24.3
Electrocution	8	21.6
Hot water	2	5.4
Inhalation	1	2.7
<i>Total</i>	37	100.0

0.0001 and 0.042) (Fig. 1). A significant 41.1% correlation was found between burnt surface percentage and degree ($r=0.411$; $p=0.11$).

DISCUSSION

According to World Health Organization's description - accident is described as "a circumstance that was not planned before and not expected but resulted with injury".^[7] As a result of accidents caused by burns not only physical damages occur but also quite a number of people lose their lives. Most frequently the victims, who are aged between 20-44 require emergency medical assistance due to job accidents.^[8] Nieminen et al. declared that injuries were mostly encountered at the age of 40s for male victims and at the age of 50s for female victims, 14% of cases were under 15 years old, 8% above 65 years old.^[9] Sorock et al. revealed the fact that 75% of injuries were encountered under the age of 44.^[10] In our study average age of patients was found to be as 31.86 ± 10 , 69 years old who needed emergency medical services.

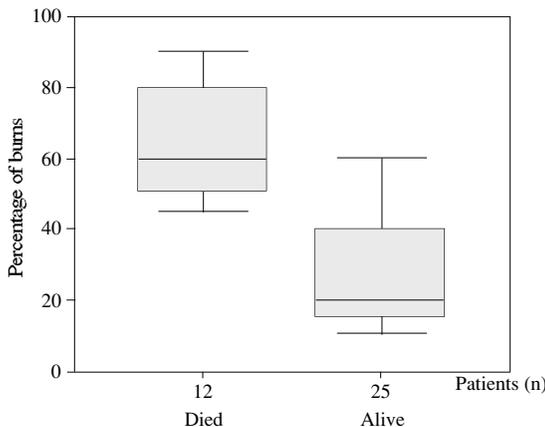


Fig. 1. Job accidents by burn percentages for fatal and non-fatal incidents.

Skin, which has the greatest exposure to one's body has various important functions. If integrity of this organ is breached for any of the above reasons, physiopathologic changes may happen which can result in death.^[11] There are number of factors which determine mortality and morbidity caused by burns. Patient's age, the degree of burn and the percentage of the affected area are the paramount factors. Trauma experts who deal with burn traumas voiced their opinion that the best thing one can do is to avoid being burned in the first place.^[6]

In Turkey, if any injury happens, which threatens life, an official accident report has to be filed by the police. And on this reports it has to be stated whether there is a fatal risk or not. Traumas related to burns, the fatality probability is judged by the degree of burn and its affected surface area.^[12] However recent clinical studies revealed that the affected surface area is more significant in patient's prognosis. In various studies, it is stated that the severity of burns and percentage of the affected area are the two most important factors which influence prognosis. A greater affected area is more fatal than a localized but severe burn. If the burnt area is 50% at 1st degree, fatalities are near to 50%.^[13,14]

In Turkey job accidents are those that are considered as judicial events. In these events prognosis of burns is determined by judicial reports arranged by doctors as such:

If affected area is 20% and second degree, or 10% and 3rd degree there is a risk of fatality.^[15] In our study, the degree of burn was found to be the most prominent factor, which worsen prognosis. In those incidents that have 20% affected area, a higher degree of fatality was found ($p=0.0001$).

In our research, the data related to the victims ended up with fatalities, the average degree of burns was found to be statistically higher than the ones who survived (p values respectively: 0.0001 and 0.042). A meaningful 41.1% of correlation was found between affected area and the degree of burn ($r=0.411$; $p=0.11$).

As a result, it is very important for those who are responsible of labor safety at work, to keep workers away from hazards of incidents which may end up with burn traumas caused by accidents. Clearly, it would be cheaper to prevent traumas caused by a job accident rather than paying compensation.

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