

The Necessity of Burn Treatment Units

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ABSTRACT

Aim of study to identify, describe the patterns first 950 burn patients treated in Konya Education and Research Hospital Burn Unit. First consecutive 950 patients with burn injury hospitalized included in this study. The patient's records reviewed for this study. Patient's ratio male to female is 1.64. The mean age was 30.52±22.54 years; range was 0-94 years. Scald was the most frequent caused burn (51.2%). Electrical burns were the most common cause of full-thickness burns(%82.8). The patients 77.2% treated conservatively with burn dressing and them 22.8% treated surgically. The mean hospitalization time is 13.48±6.48 days and the mean burned TBSA 14.02±6.2%. The mortality rate was 2% for the study period and lastly cost of treatment burns injury Turkish Liras 1.345 per patient. Burn unit should be established in developing countries. Because the burn unit do not have in hospitals, burn patients are forced to be treated, other clinics and unsuitable conditions for burn wounds and the staff have not been received training in burn wounds and treatment of burn injury. The most of the burned patients can be treated with advanced burn dressing conservatively and lastly treatments of patients with burns injury are very expensive according to the treatments other diseases.

Key words: Burn unit, burn injury, treatment of burn injury

Yanık Tedavi Ünitelerinin Gerekliđi

ÖZET

Bu çalışmanın amacı yeni kurulan Konya Eğitim ve Araştırma Hastanesi Yanık Ünitesine yatırılan ilk 950 yanık hastasını tanımlamaktır. Yanık yaralanması teşhisiyle Ağustos 2008 ile Eylül 2011 tarihleri arasında ünitimize yatırılarak tedavi edilen hastalar çalışmaya alındı. Hastaların bilgileri retrospektif incelendi. Cinsiyet, yaş, etyoloji, derece, hastanede yatış süresi, uygulanan konservatif, cerrahi tedavi ve tedavi maliyetleri incelendi. Toplam 38 ayda 950 hasta tedavi edildi. Erkek / kadın oranı 1,64, ortalama yaş 30,52±22,54 (range: 0-94) idi. En sık hasılama (%51,2) yanıkları ile karşılaştı. Elektrik yanıkları en fazla (%82,8) tam kat yanık nedeniydi. Yanık pansumanı ve yanık örtüleri ile tedavi edilenlerin oranı % 77,2 ve cerrahi tedavi uygulanan hastaların oranı ise % 22,8'di. Hastane yatış gün sayısı ortalama 13,48±6,48 ve toplam vücut yüzey yanık alanı ortalama % 14,02±6,2 idi. Çalışma süresince mortalite % 2 ve son olarak tedavi maliyeti her hasta için 1.345 Türk Lirası idi. Gelişmekte olan ülkelerde yanık tedavi birimleri kurulmalıdır. Yanık tedavi birimi olmayan hastanelerde yanık hastaları Genel Cerrahi ve Plastik Cerrahi gibi diğer kliniklerde, yanık tedavisi için uygun olmayan şartlarda, yanık tedavisi için eğitim almamış personel tarafından tedavi edilmeye zorlanmaktadır. Yanık hastalarının çođu yanık pansumanı ve gelişmiş yanık örtüleri ile tedavi edilebilmektedir. Son olarak yanık hastalarının tedavisi diğer hastalıklara göre oldukça pahalıdır.

Anahtar kelimeler: Yanık ünitesi, yanık hasarı, yanık hasar tedavisi

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INTRODUCTION

Turkey's area, occupies 783.562 square kilometers (300.948 sq. mi), of which 755.688 square kilometers (291.773 sq. mi) are in Southwest Asia and 23.764 square kilometers (9.174 sq. mi) in Europe. Turkey is the world's 37th-largest country in terms of area. According to the Address-Based Birth Recording System of Turkey, the country's population was 73.7 million people in 2010. People within the 15-64 age groups constitute 67% of the total population; the 0-14 age group corresponds to 26%; while senior citizens aged 65 years or older make up 7%.** Information regarding the incidence of burns injury is limited in Turkey (1-3). However, regional studies, the incidence of burns there are at least in USA (4). Thus in Turkey, about 12.000 people a year may need to be treated for burns to the hospital inpatient. In Turkey, 6 years ago, the number of burn beds was insufficient, society and health professionals' inadequate awareness. Burn to date information on the health care team were limited. In the burn units made of individual efforts, physicians practiced by a variety of different treatment approaches. There was no legal regulation on burn treatment units. The last 5 years as a result of studies made by the Republic of Turkey Ministry of Health has been a description for burn units. The Treatment Burn Scientific Committee in the Ministry of Health was set up as a result of these studies. This committee has published the first instruction with establishment of burn treatment units, the functioning and organization of staff (5). In 2002, there were 35 number of beds for burns patients, and these were very inadequate. At the end of the studies throughout the country, according to population density and ease of transportation, burn treatment units were established and total number beds of burns patients improved to 260. Volunteer staff was trained for these units and the certificate was provided. The necessary facilities and equipment have been provided in the burn treatment units. Our province also have not got burn treatment unit before 2008. Patients with burn injury, general surgery, pediatric surgery and plastic surgery clinics were treated with other patients with non-burn injury. Our hospital burn unit was established in 2008 and volunteer staff was trained to take the certificate was provided. Patients with burn injury has been admitted here. Only very severe cases are referred to more extensive burn center. Konya is a metropolitan city with a population of 1 million in central Anatolia and it serves about 3 million people with the neighboring provinces. Our study was described

and evaluates the results of the first 950 patients treated in Konya Education and Research Hospital Burn Unit in Turkey.

MATERIALS AND METHODS

Konya Education and Research Hospital is a regional hospital that included tertiary hospital. It is currently has 900 patient beds and the burn unit consists of cleaning, dressing, intervention and therapy section, 13 normal bed and 2 intensive care bed. The staff included one general surgeon, one plastic surgeon and 2 pediatric surgeons, an anesthesiologist, and 12 nurses specialized in burn care and three technicians. It is also supported by the other specialists of the hospital when needed. Our retrospective study included first consecutive 950 burn patients hospitalized according to American Burn Association (ABA) and treated in burn Unit of Konya Education and Research Hospital between August 2008 and October 2011. The outpatients and patients treated only in emergency department are not included in this study. Each patient's medical records was reviewed and demographic features, etiology of burns injury, total body surface area (TBSA) burned, surgical intervention (fasciotomy, escharotomy, amputation, excision and graft), local treatment (wound dressing, ointment locally, debridement), duration of hospital stay and mortality rates. Finally health care costs of all burn patients were reviewed in list prices of the social safety institution. Health care facilities in Turkey, examination, diagnosis and treatment costs have identified the social security institution. This institution depends on working and social security ministry. According to this list to patients in hospitals in the examination, diagnosis and treatment holds for the bill. Billing is paid by the patient's insurance company. We have detected that lists the costs of patients with burns, prepared in accordance with bills.

Statistical Analysis of Data

For statistical analysis, SPSS (Statistical Package for the Social Sciences) 15.0 for Windows (SPSS, Chicago, IL, USA) was used. The Kolmogorov - Smirnov distribution test and Lilliefors Significance Correction was used for the examination descriptive statistical methods (frequency, percent, mean, Standard deviation, median) as well as of the normal distribution. Categorical variables were evaluated by chi-square and Pearson chi-square test. One-way analysis of variance was used to compare

normally distributed continuous variables. After one-way analysis of variance, Tukey's B test was used for post-hoc test. Bonferroni correction and Kruskal Wallis test were used for multiple comparisons. $p < 0.05$ was recognized as statistically significant.

Treatment Strategy

Initially, all the patients with burns injury had been admitted to the emergency room and evaluated in accordance with the Advanced Trauma Life Support (ATLS) algorithm and ABA burns referral criteria, later transferred to the Burn Unit. The initial resuscitation was performed according to the Modified Brooke formula, which consists of a replacement of 2ml of Ringer's lactate solution x kg of weight %TBSA for the first 8 h, infusing the same volume in the subsequent 16 h. For children, the replacement was 1.5- 2ml of Ringer's lactate solution x kg of weight x %TBSA for the first 8 h, infusing the same volume in the subsequent 16 h, aiming to maintain an adequate intravascular volume. The main purpose of the treatment is to keep the urine output between 30 and 50 ml/h in adults and 1ml/kg/h in children, in order to prevent shock and other complication. Patients were monitored for any compartment syndrome signs secondary to the tissue injury, such as cold extremities, absence of distal pulse, ventilator difficulty, circumferential scabs and pain when stretching out and hardened muscular compartments. If compartment syndrome was noted, the patients were subjected to urgent escharectomy and fasciotomy as required. Superficial second-degree wounds were treated with daily dressing changes

with topical antibiotics (silver sulfadiazine and other topical agent), cotton gauze and elastic wraps. Deep second-degree and third-degree wounds were submitted to early excision and grafting. After surgery, the skin grafts were covered with three layers of dressing (paraffin gauze dressing, cotton gauze and wrap) which were changed every 72-96 h.

RESULTS

A total of 950 patients were admitted over a 3-year period between August 2008 and October 2011. The mean ages of the burns patients were 30.53 ± 22.54 years, and ranged from 0 to 94 years. There was a predominance of male patients 590 (62.1%) among the admissions, female patients accounted for 360 admissions giving rate of 37.9% and ratio was 1.64 (Figure 1). In 618 cases (65.1%) the accident location was home, in 280 cases (29.5%) it was workplace and 52 cases (5.6%) was outdoors. Scald was the most frequent etiology of burning which accounted in (51.2%) of patients (n:486). Flame burns accounted for 33.2% (n:315) of admitted burn patients, followed by contact burns (6.9%, n:66), electrical burns (6.1%, n:58) and chemical burns (2.6%, n:25). Scald burns and flame burns were significantly higher than the other burns ($p < 0.001$) (Table-1). Mean age of patients of scald burns was 25.33 ± 24.39 and was significantly lower than burns of other factors ($p < 0.001$) (Table-1). Scald burns the leading cause of burn injury for young children and the most of them had been at home. The most of flame burns had been at work place. A part of flame burns as a childhood made at traditional spring fire ceremony. Contact burns had been in touch at stove used to warm and oven used to cooking. In 10 cases (1.1%), the reason was a suicidal attempt. Superficial partial thickness (second degree) was most frequently according to the depth of burns (60.3%). Deep partial thickness (second degree) and full thickness (third degree) were 30.4% and 9.3% respectively. Among scald burns 2.3% were third degree, among flame burns 5.7% among contact burns 12.2%, among chemical burns 8%. Electrical burns injury were often full thickness (82.8%). Electrical injury more deep burns that occurred of other factors and there are statistically significant difference ($p < 0,001$) (Table-2).

Burns of the upper extremity affected 61.5% (n:584), of the face 26.8% (n:255) of the trunk 23.6 (n:224), of the foot 12.6% (n:120) and of the perineum 4.7% (n:45) of

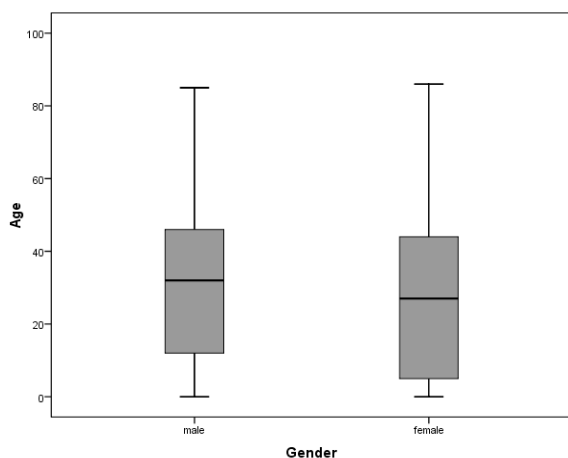


Figure 1. Age distribution by gender

Table 1. Patient distribution and mean ages according to the burn etiology

Etiology	n	Age (Mean±SD) (Years)	Range (Years)	p value*
Scald	486 (51.2)#	25,33 ± 24,39	0-94	<0,001
Flame	315 (33.2) £	35,01 ± 17,23	1-86	
Contact	66 (6.9) §	39,50 ± 24,32	1-85	
Electrical	58 (6.1) §	35,78 ± 15,09	5-82	
Chemical	25 (2.6) §	34,72 ± 17,77	8-67	

#,§,£: Chi square, *ANOVA

the study population. Length of hospital stay was mean 13 (3-45) days in the whole population with a range from 2 to 95 day. When the burn causes were analyzed according to the width their burned length of hospital stay, scald and electrical burns caused longer ($p<0,005$) (Table-3). The mean TBSA was 14 (5-50)% with a range from 1% to 85%. A TBSA of 10-19% was seen 470 (49.5%) the patients. This was the most frequently observed TBSA category. When the burn causes were analyzed according to the width their burned TBSA, electrical burns caused larger than other burns ($p<0,005$) (Table 3). The most of patients 77.2% (n:733) were treated conservatively and 22.8% (n:217) patients were performed miscellaneous surgical procedure. Silver sulphadiazine was the choice of topical treatment and was applied twice a day. Nitrofurantoin, fusidic acid and Vaseline also used for injury dressing. Patients who treated conservatively used to variety of wound dressing. The most frequently used chlorhexidine acetate 0.5% (Bactigrass®), novel silver containing hydrofiber (Aquacell Aq®), polyhexanide containing bio-cellulose dressing (Suprasorb®) and polyurethane film (Omniderm®). Escharotomy or fasciotomy in cases 37 (3.9%) became necessary. Escharotomy the most frequent upper extremities were necessary (75.7%). The lower extremity 27%, in thorax

13.5% and abdomen was required at least (5.4). The most of surgical procedure was excision and skin grafting 21.1% (n:200). The same patient may have had several different techniques/operative procedures used.

During periods of study the average bills the patients treated for burns unit was Turkish Lira (TL) 1.316. The total bill for all patients was TL 1,278.046. While electrical burns an average cost per patient was TL 1.575 and higher than other burns. There were statistically significant difference ($p<0,005$). The cost of contact burns patients were found to be TL 710 and significantly lower than in other burns ($p<0,005$) (Table-3). Because of the maximum number of patients with scald burns in this group were found to be the total invoice amount of TL 649.782.

The overall mortality of the study group was 2% (19/950) Mortality was duo to sepsis in 52.6 and acute renal failure in 36.8. Total mortality in flame burns was significantly higher than other burns. However when evaluating each group separately electricity burns had the highest mortality rate and this was statistically significant ($p<0,001$) (Table 4).

Table 2. Burn injury depth according to the etiology and compared with electrical burns

Etiology	n	Superficial Partial -Thickness (Second-Degree)n(%)	Deep Partial -Thickness (Second-Degree)n(%)	Full-Thickness (Third-Degree)n(%)	p value
Scald	486	270 (%55,6)	204 (%42,0)	12 (%2,5) a	<0,001*
Flame	315	245 (%77,8)	52 (%16,5)	18 (%5,7) b	
Contact	66	49 (%74,2)	9 (%13,6)	8 (%12,1) a	
Electrical	58	2 (%3,4)	8 (%13,8)	48 (%82,8) c	
Chemical	25	7 (%28,0)	16 (%64,0)	2 (%8,0) d	
Total	950	573 (%60.3)	289 (%30.4)	88 (%9.3)	

a. When compared to electrical $p<0,001$, b When compared to electrical $p<0,001$, d When compared to electrical $p<0,001$

*Pearson Chi-square (1 cells (6,7% < 25%) have expected count less than 5) a,b,c,d,e: Chi square:

Table 3. Length of hospital stays (days), burned TBSA and mean cost in patients according to the etiology

Etiology	Length of hospital stay (days) Med (Min-Max)	TBSA(%) Med (Min-Max)	Cost per patient Med (Min-Max)
Scald	14 (5-25)	15 (5-30)	1250 (450-2600)
Flame	13 (5-20)	15 (5-35)	1340 (530-2300)
Contact	9,5 (4-19)	10 (5-10)	710 (290-1560)
Electrical	15 (3-45)	20 (5-50)	1575 (330-4450)
Chemical	10 (4-18)	10 (5-20)	1020 (430-1860)
	<i>p</i> <0,001*	<i>p</i> <0,001*	<i>p</i> <0,001*

*Kruskal Wallis

DISCUSSION

The burn unit of a newly established Konya Education and Research Hospital Burn Unit at 39 months had 950 patients admitted and treated. This study shows the need for developing countries to have burn units. Because the burn units are not in hospitals, in burn patients are forced to be treated in other clinics with unsuitable conditions for burn wounds, where the staff have not received training in burn wounds and treatment of burn injuries. Age is an essential epidemiological determinant, and for our study, the findings revealed that, most (27.8%) of the patients were less than 10 years old. Similar trends have been reported by Herndon et al. (6). The frequency of burns to children in different countries varies according to the development and socio-cultural characteristics are relatively frequent. This has been confirmed in many studies (7-15). Parents of young children have many misconceptions regarding childhood injuries, and they show a limited understanding of the major causes of injury. They frequently underestimate the risk of injury to children. Most non-accidental burns occur in younger children during the most sensitive neurobiological developmental period. Turkish people are used to drinking tea almost everywhere and at all times of their daily routine; this poses a high-

risk situation that is unfortunately created for children wherever they are. The most dangerous times for scald burns in children are reported to be during the preparation of meals. In these age groups both the frequency of burns and burns that require hospitalization is high (17). The risk of burn injury is very high among the dementia and diabetic patients (18,19). Stove or hot bag burns are common in diabetic patients with peripheral neuropathy (20). Within this group, complications such as amputation of a significant cause of morbidity and mortality. Therefore, education for patients with diabetes is important and supports the need for assistance and supervision with daily activity and burn prevention education for this population.

The findings of this present study in terms of the etiological factors of burns indicate that scald burns were the most common types, followed by open flames, contact, electrical and chemical burns. In a study conducted in Turkey, burn patients brought to the emergency department of a university hospital reported that 54% of the burns were scalds (21).

Scald is the major cause of burns and most of these injuries are preventable. Various studies were conducted in children to prevent burn injuries. To prevent burns, it became compulsory for children to wear combustible pajamas. Smoke detector placement in all indoor living spaces has been enforced. Water heaters have been required to be produce a maximum of 60°C (21-23). Burn incidents and size has shown to decrease as a result of these studies (24-27).

In this scald burn population, the child's own parents was at home and present in the same room at the time of the burn, in most of the cases. At first glance, this may seem surprising; however, prior research has shown that many mothers do not engage in preventive behaviors when they believe that their own presence

Table 4. Mortality rates according to the etiology

Etiology	liven (%)	ex n(%)	<i>p</i> value
Scald	483(%99.4)	3(%0.6)	
Flame	305(%96.8)	10(%3.2)	
Contact	66 (%100.0)	0 (%0.0)	<0.001*
Electrical	52 (%89.7)	6 (%10.3)	
Chemical	25 (%100.0)	0 (%0.0)	
Total	931 (% 98)	19 (% 2)	

*Pearson Chi-square (3 cells (30%) have expected count less than 5)

and care provide adequate supervision to ensure their child's safety. The studied mothers often indicated that placement of environmental safeguards was unwarranted when they were personally watching their children (28). This type of unfounded belief may be contributing to large number of scald burns in toddlers. Prevention strategies should also communicate that good parental supervision alone is not enough to keep children safe because burn injuries can happen so quickly. The teaching of passive strategies such as the installation of anti-scald devices in faucets, setting the hot water heater at 50°C (122°F) or lower, and removal of table cloths from family dining tables, should be combined with active strategies such as instructing parents to keep toddlers in a safe place when cooking and keeping crock pots, coffee pots, and electric frying pans and cords out of the children's reach. Parents should also be instructed to cook on the back burners, place pan handles towards the back of the stove, etc.

In our study, rate of flame burns were found more frequently in adults. Most adult burns are a result of open flames and are typically much deeper than those seen in children. However, in the 10-20 age group during the traditional spring festival in the spring ritual of jumping over the fire, the flame burns was peak. So much so that there were not enough beds for burn units, and burn injured children had to be hospitalized in other clinics. Of these patients, according to scalding burns more than surgery and had to stay in the hospital for a long time. During these ceremonies, governments should take safety measures. Unfortunately, this kind of tradition, social behavior and festivals are also in other countries (29).

In our study, 77.2% of the patients were treated conservatively. These patients underwent the first applications to silver sulfadiazine and 2-4 day were used as appropriate burn dressings. Local treatment such as silver sulfadiazine in previous studies have proven the effectiveness of local infections (30). Burn dressing reduces the length of hospital stay, prevents infection and increases patient comfort, because the frequency of change is less, so patients would not be in pain during dressing changes. The most frequently used was chlorhexidine acetate 0.5% (Bactigrass®), novel silver containing hydrofiber (Aquacell Aq®), polyhexanide containing bio-cellulose dressing (Suprasorb®) and polyurethane film (Omniderm®). These burn dressing have been shown effective in superficial partial thickness and deep par-

tial thickness (second degree) burn injuries (31-34).

In our study, electrical burns were the most mortal, the most costly and the had longest duration of hospital stay, as we found in all burn injuries. The complications in the high-voltage burn injury were more severe and common while longer hospital stays and more complex surgical procedures were due to the greater depth of burns. High-voltage burns are mainly labor and occupation related. The majority of the patients were young men at the beginning of their professional lives. This factor generates an important socio-economic impact due to the high incidence of sequelae, resulting in amputations, rendering them unable to maintain their occupations (35). A previous study identified three risk factors for death: age greater than 60 years, more than 40 percent of body-surface area burned, and inhalation injury (36). According to the results of our study, electrical burns may be added to the risk factors for death.

There is little written on the cost of burn care, although there is a widely-held view that it is expensive (37). The cost of caring for a burn patient is known to be higher than for non-burn patients. Dimick et al estimate that care for burn patients is at least twice as expensive that that for other hospitalized patients (38). Griffiths et al. (39) estimated an average cost of £1850 per case for a pediatric minor scald (<10% TBSA). In 2003, 144 children were admitted to the hospital with minor scalds, for a total cost of £266,400. However the study ignored more complicated (and expensive) cases that would involve further surgical procedures, and potential complications such as wound infection. We calculated a mean cost of TL 1,345 per case. The total cost for 950 burned patients were TL 1,277.750. Especially for the limited economies of developing countries, these costs are quite expensive. Because burn trauma is a preventable, at least some of these expenditures could be saved. The tariff list social security institution in Turkey in 2010 for appendectomy is TL 719 and for inguinal hernia is 1170 Turkish Liras. This wage if compared with other countries is very low. In examining the cost of burn injury treatment, this situation should be considered.

In conclusion, especially in developing countries burns units should be established along with training of staff. High incidence of burns injury suggests the need for professional burn care centers that can be easily reached by burn victims. Parents should be educated to prevent burns in children and house equipment should be modi-

fied. Although various preventive modalities have been applied in many societies, burn injuries have continued to occur, but any contribution that reduces its frequency is of great importance. In addition, treatment of burns is very expensive; burn prevention measures should be implemented.

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REFERENCES

1. Yılmaz S, Sezer RE, Karagöz N, et al. A Population-Based Survey on the Incidence of Burn Injuries in Sivas-Turkey. *Türkiye Klinikleri J Med Sci* 2010;30(5):1552-60.
2. Gürdal SÖ, Yücel T. Burn, Introduction, Epidemiology, Etiology. *Türkiye Klinikleri J Surg Med Sci* 2007;3(1):1-3.
3. Şahin İ, Öztürk S. Burn Trauma: Etiology, Incidence and Prevention. *Türkiye Klinikleri J Plast Surg* 2010;2(1):1-7
4. Kara IG, Gok S, Horsanlı O, Zencir M. A population-based questionnaire study on the prevalence and epidemiology of burn patients in Denizli, Turkey. *J Burn Care Res* 2008; 29(3):446-50.
5. Akdağ R, Yastı AC, Senel E. Turkey with health issues that require planning 2011-2023. Ministry of Health General Directorate of Treatment Services Ministry of Health Publication No: 836 Ankara 2011; p: 242-58.
6. Herndon DN, Spies M. Modern burn care. *Semin Pediatr Surg* 2001; 10(1): 28-31.
7. Burd A, Yuen C. A global study of hospitalized paediatric burn patients. *Burns* 2005;31(4):432-8.
8. Albertyn R, Bickler S, Rode H. Paediatric burn injuries in Sub Saharan Africa—an overview. *Burns* 2006;32(5): 605-12.
9. Elisdottir R. Paediatric burns in Iceland. Hospital admissions 1982-1995, a populations based study. *Burns* 1999; 25(2):149-51.
10. Ho W. An epidemiological study of 1063 hospitalized burn patients in a tertiary burns centre in Hong Kong. *Burns* 2001; 27(2):119-23.
11. Mukerji G. Epidemiology of paediatric burns in Indore,India. *Burns* 2001;27(1):33-8.
12. Fukunishi K. Epidemiology of childhood burns in the Critical Care Medical Center of Kinki University Hospital in Osaka, Japan. *Burns* 2000;26(5):465-9.
13. Lin T, Wang K, Lai C, Lin S. Epidemiology of pediatric burn in southern Taiwan. *Burns* 2005;31(2):182-7.
14. Ly K-Y, Xia Z-F, Zhang L-M, et al. Epidemiology of pediatric burns requiring hospitalization in China: a literature review of retrospective studies. *Paediatrics* 2008;122(1):132-42.
15. Mercier CMH, Blond M. Epidemiological survey of childhood burn injuries in France. *Burns* 1996;22(1):29-34.
16. Bradshaw C, Hawkins J, Leach M, Robins J, Vallance K, Verboom K. A study of childhood scalds. *Burns Incl Therm Inj* 1988;14(1):21-4.
17. Bessey PQ, Arons RR, Dimaggio CJ, Yurt RW. The vulnerabilities of age: burns in children and older adults. *Surgery* 2006;140(4):705-1.
18. Alden NE, Rabbitts A, Yurt RW. Burn injury in patients with dementia: an impetus for prevention. *J Burn Care Rehabil* 2005;26(3):267-71.
19. McCampbell B, Wasif N, Rabbitts A, Staiano-Coico L, Yurt RW, Schwartz S. Diabetes and burns: retrospective cohort study. *J Burn Care Rehabil* 2002;23(3):157-66.
20. Günay K, Taviloglu K, Eskioglu E, Ertekin C. A study of Epidemiology and Mortality In Burn Patients. (Turkish) *Ulusal Travma Derg* 1995;1(2):205-89.
21. Liao CC, Rossignol AM. Landmarks in burn prevention. *Burns* 2000;26(5):422-34.
22. Warda L, Tenenbein M, Moffatt ME.. House fire injury prevention update. Part II. A review of the effectiveness of preventive interventions. *Inj Prev* 1999;5(3):217-25.
23. Erdmann TC, Feldman KW, Rivara FP, Heimbach DM, Wall HA. Tap water burn prevention: the effect of legislation. *Pediatrics* 1991;88(3):572-7.
24. Weaver NL, Williams J, Jacobsen HA, Glasheen C, Botello-Harbaum M, Nansel TR. Translation of an evidence-based tailored childhood injury prevention program. *Journal of Public Health Management and Practice* 2008;14(2): 177-84.
25. Towner E, Carter Y, Hayes M. Implementation of injury prevention for children and young people. *Injury Prevention* 1998;4(4):26-33.
26. Towner E, Downhill T. Community-based childhood injury prevention interventions: what works? *Health Promotion International* 2002;17(3):273-83.
27. Tse T, Poon C, Tse K, Tsui T, Ayyappan T, Burd A. Paediatric burn prevention: an epidemiological approach. *Burns* 2006;32(2):229-34.
28. Glik DC, Greaves PE, Kronenfeld JJ, Jackson KL. Safety hazards in households with young children. *J Pediatr Psychol* 1993;18(1):115-31.
29. Al-Qattan MM, Al-Zahrani K. A review of burns related to traditions, social habits, religious activities, festivals and traditional medical practices. *Burns* 2009;35(4):476-81.
30. Atiyeh BS, Costagliola M, Hayek SN, Dibo SA. Effect of silver on burn wound infection control and healing: review of the literature. *Burns* 2007;33(2):139-48.
31. Queen D, Evans JH, Gaylor JD, Courtney JM, Reid WH. Burn wound dressings-a review. *Burns Incl Therm Inj*. 1987;13(3):218-28.
32. Barnea Y, Weiss J, Gur E. A review of the applications of the hydrofiber dressing with silver (Aquacel Ag) in wound care. *Ther Clin Risk Manag* 2010;2(6):21-7.

33. Wasiak J, Cleland H, Campbell F. Dressings for superficial and partial thickness burns. *Cochrane Database Syst Rev* 2008;8;(4): CD002106.
34. Barret JP, Dziewulski P, Ramzy PI, Wolf SE, Desai MH, Herndon DN. Biobrane versus 1% silver sulfadiazine in second-degree pediatric burns. *Plast Reconstr Surg* 2000; 105(1):62-5.
35. Luz DP, Millan LS, Alessi MS, Uguetto WF, Paggiaro A, Gomez DS et al. Electrical burns: a retrospective analysis across a 5-year period. *Burns* 2009;35(7):1015-9.
36. Ryan CM, Schoenfeld DA, Thorpe WP, Sheridan RL, Cassem EH, Tompkins RG. Objective estimates of the probability of death from burn injuries. *N Engl J Med* 1998;338(6): 362-6.
37. Wheeler JRC, Harrison R, Wolfe RA, Payne BC. The effects of burn severity and institutional differences on the costs of care. *Medical Care* 1983;21(12):1192-203.
38. Dimick AR, Potts LH, Charles ED, Wayne J, Reed M. The cost of burn care and implications for the future on quality of care. *The Journal of Trauma* 1986;26(3):260-5.
39. Griffiths HR, Thornton KL, Clements CM, Burge TS, Kay AR, Young AER. The cost of a hot drinks scald. *Burns* 2006;32(3):372-4.