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Hot milk burns in children: a crucial issue among 764 scaldings

Çocuklarda sıcak süt yanıkları: 764 haşlanma yanığında önemli bir sorun

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BACKGROUND

Burns are among the preventable traumas encountered during childhood. Burn injuries are mostly classified as scalds, flame, electric, and chemical burns. However, each subject has some difference in the course of treatment related to the sub-etiologies. To reveal the importance of milk burns, scald burn patients were studied retrospectively.

METHODS

Demographics of the patients, burn etiologies, clinical presentations, and clinical courses were analyzed. There were 461 (60.4%) male and 303 (39.6%) female patients, with a 1.52 male to female ratio.

RESULTS

The mean age of the group was 3.36±2.86 years. There were no difference in burn causes between males and females. The mean burned total body surface area of patients was 16.91±12.63%. Hot milk caused larger, deeper burns than the other scalds and caused more third-degree burns ($p<0.001$, $p<0.001$, $p<0.05$, respectively). Milk burns also resulted in longer hospital stay (days) ($p<0.001$). The mortality rate was also higher in milk burns than other scalds ($p<0.001$).

CONCLUSION

Due to the more detrimental clinical course, milk burns necessitate special consideration in clinical settings. The most important factor is to be aware that burns are deeper than they appear.

Key Words: Children; scalding; milk burn.

AMAÇ

Yanıklar çocukluk döneminde önlenebilir travmalar arasındadır. Yanık yaralanmaları çoğunlukla haşlanma, alev, elektrik ve kimyasal yanıklar olarak sınıflandırılır. Ancak her biri altta yatan etyolojiye göre tedavi sırasında farklılıklar gösterir. Bu çalışmada, haşlanma yanıklarında süt yanıklarının önemini vurgulamak için hastalar geriye dönük olarak incelendi.

GEREÇ VE YÖNTEM

Hastaların (461 erkek [%60,4], 303 kadın [%39,6]; kadın erkek oranı 1,52) demografik özellikleri, yanık etyolojisi, kliniği ve klinik seyirleri değerlendirildi.

BULGULAR

Grupların yaş ortalamaları 3,36±2,86 idi. Kadın ve erkek hastalar arasında yanık nedenleri açısından fark bulunmadı. Hastaların toplam vücut yanık alanı ortalaması %16,91±12,63 idi. Sıcak süt yanığının diğer haşlanmalardan daha geniş ve daha derin yanığa neden olduğu ve daha çok 3. derece yanıklar olduğu belirlendi (sırasıyla, $p<0,001$, $p<0,001$, $p<0,05$). Süt yanıkları aynı zamanda hastanede daha uzun süre kalmanın nedeniydi ($p<0,001$). Mortalite oranı süt yanıklarında diğer haşlanmalardan daha yüksek bulundu ($p<0,001$).

SONUÇ

Süt yanıkları kötü klinik seyir nedeniyle özel dikkat gerektiren bir durumdur. En önemlisi ise süt yanığının görünenden daha derin olacağı gerçeğinin farkında olmaktır.

Anahtar Sözcükler: Çocuklar; haşlanma; süt yanığı.

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Even though over 90% of burns in children are preventable, this sort of trauma is still encountered worldwide. Burns carry considerable morbidity and mortality risks, and are one of the leading death causes in the pediatric population.[1] Scalding is a well-known leading burn cause among children, and children under six years of age are more prone to scalding.[2]

In the literature, almost all burns regarding liquids are found under the same title, as scalding. However, in some countries, like Turkey, scalding should be subdivided. In the series considering scaldings that are sub-titled, some differences evolve in the clinical course and outcomes of the patients; however, previous reports regarding such subgroups of scalding and the number of the patients studied are limited.[3]

In our study, according to our literature search, we present the largest series on scalding comparing hot water and other concentrated liquids. To evaluate the outcomes of different concentrated liquid burns in children, we prospectively followed up the burned pediatric patients.

MATERIALS AND METHODS

A total of 764 patients younger than 16 years of age were hospitalized due to scalding at the Burns Units of Ankara Numune Training and Research Hospital and Ankara Dışkapı Children Training and Research Hospitals between January 1998 and January 2006. The American Burn Association hospitalization criterion was applied to all patients admitted to our department. Medical histories of the patients were questioned to reveal the etiology of the scalding. Each patient's medical record was reviewed, and demographic features, depth and burned total body surface area (TBSA), length of hospital stay, treatment modalities, morbidity, and mortalities were determined.

Scalds were grouped as hot water, milk, soup, oil, and others (jam, marmalade, conserve, etc.). Categorical variables were evaluated by 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 was used for multiple comparisons. Statistical analyses were carried out using the Statistical Package for the Social Sciences for Windows (version 10.0; SPSS Inc., Chicago, IL, USA). P values less than 0.05 were considered as significant.

RESULTS

There were no differences in annual hospitalization numbers and male to female ratios during the study period. There were 461 (60.4%) male and 303 (39.6%) female patients. The male to female ratio was 1.52. The mean age of the group was 3.36±2.86 years (range: 0 to 16).

Water was the most frequent burning agent among the study group (Table 1). Length of hospital stay was mean 12.41±10.03 days in the whole population. The mean burned TBSA of patients was 16.91±12.63%. When the burn causes were analyzed according to the width of their burned TBSA, hot milk caused larger burns ($p<0.001$). The hot milk group required more operative interventions than other scalds (Table 2).

When the depth of the burn injury was considered, hot milk caused significantly deeper burns than the

Table 1. Patient distribution and mean ages according to the burn agent (note the high incidence of scalding with water)

Etiology	n (%)	Age (mean±SD) (years)	Range (years)
Water	615 (80.5)*	3.44±3.04	0-16
Milk	81 (10.6)	2.62±1.34	1-8
Soup	36 (4.7)	3.56±2.77	1-13
Oil	12 (1.6)	3.04±1.28	1-5
Others	20 (2.6)	3.65±2.20	1-8

* $p<0.05$; SD: Standard deviation.

Table 2. Length of hospital stay (days), burned TBSA and interventions in patients according to the scalding agent

Etiology	Length of hospital stay (days) ± SD	Burned total body surface area (%) ± SD	Number of operations [n (%)]
Water	12.16±10.30	16.17±12.03*	226 (42.7)
Milk	13.47±8.70	25.30±14.44	44 (54.3)
Soup	13.47±9.28	11.86±9.57*	16 (45.7)
Oil	10.17±7.32	9.75±7.53*	2 (16.7)
Others	15.30±9.32	16.00±13.58#	8 (40.0)

SD: Standard deviation; * When compared to milk $p<0.001$, # When compared to milk $p<0.05$.

Table 3. Burn depth according to the scalding agent and compared with milk burns

Depth	1st degree	Superficial 2nd degree	Deep 2nd degree	3rd degree	
Etiology	n (%)	n (%)	n (%)	n (%)	n
Water	5 (0.8)	87 (14.2)	414 (67.3)	109 (17.7)*	615
Milk	0	11(13.6)	38 (46.9)	32 (39.5)	81
Soup	0	4 (11.1)	27 (75.0)	5 (13.9)#	36
Oil	0	1 (8.3)	9 (75.0)	2 (16.7)	12
Others	0	1 (5.0)	17 (85.0)	2 (10.0)§	20
Total	5	104 (13.6)	505 (66.0)	150 (19.7)	764

* When compared to milk p<0.001; # When compared to milk p=0.012; § When compared to milk p=0.009.

other scalds (Table 3) (p<0.05). In addition, hot milk caused more third-degree burns than water (p<0.001).

The mean age of patients burned with hot milk was younger than of those burned with hot water (p<0.001).

Medicolegal aspects of the incidents were also determined. Most of the injuries occurred accidentally (72.3%); however, data on this topic were gathered from the patient's and/or their caretaker's declaration on the patient charts (Table 4).

The overall mortality of the study group was 10.7% (82/764) (Table 5). Mortality was due to sepsis in 42.2% and acute renal failure in 30.1% of the patients; however, there was no statistical difference between these mortality causes. The mortality rate in the hot milk group was significantly higher than in all other scalds (p<0.001).

Table 4. Medicolegal aspects of the injuries regarding the burn agent

Etiology	Accident n (%)	Neglect n (%)	Intent n (%)
Water	455 (74.1)	158 (25.7)	2 (0.2)
Milk	57 (70.4)	24 (29.6)	0
Soup	21 (58.3)	15 (41.7)	0
Oil	8 (66.7)	4 (33.3)	0
Others	12 (60.0)	8 (40.0)	0
Total	533 (72.3)	209 (27.2)	2 (0.2)

Table 5. Mortality rates compared with milk with respect to the burn agent

Etiology	n	Mortality n (%)
Water	615	52 (8.5)
Milk	81	26 (32.1)*
Soup	36	3 (8.3)
Oil	12	0
Others	20	1 (5)

* p<0.001.

When the hot oil and soup groups were compared with the water group, there were no statistically significant differences in the aforementioned parameters.

DISCUSSION

Scalding is the most common cause of burn among the Turkish pediatric population.[4] In this age population, children generally have the capability to move about freely; however, they do not have sufficient cognition about the dangers in their immediate environment. Together with the well-known factors aggravating burn occurrence in childhood, like the socioeconomic status of the family, cultural and ethnic factors and educational status of the parents, children are put at greater risk of burn.[2]

Tea is a very popular beverage among the Turkish population. Steeping tea via brewing in two pots stacked on top of each other is the traditional method of brewing tea in Turkey. Leaving the tea pot on the floor or near the edges of tables places them in easy reach of the children. Electric kettles with relatively short electric cables necessitate that they are kept far from the edges of the counter and close to the wall; however, short-cabled kettles are still not widely used in our country.[5]

Most people living in the rural areas of Turkey live the traditional lifestyle, and they make dairy products such as cheese and yoghurt in their homes or backyards. In the process of preparation, milk is boiled and then left to cool to a sufficient degree for adding special fermentation culture, and consequently stored in optimum warm outdoor conditions for fermentation. As it is produced in large pots, during the production interval, it serves as a potential hazardous situation for pediatric burns. Children involuntarily bump these pots and spill them or may accidentally fall into them. Both situations result in scalding.

Like other series, water was the most frequently encountered scalding agent in our series[4,6,7] followed by hot milk. All burns with hot milk were encountered among children younger than eight years of age.

This is the age for starting primary school in Turkey, and is considered the age at which children are believed to have reached a sufficient level of cognitive development that secures them from the harmful effects of hot milk. The higher frequency of milk burns in the infancy period can also be correlated to parents' tendency to feed their children with milk for its beneficial impact on healthy growth.

Milk burns caused significantly larger burns in our series. As most of the hot milk burns in our patient population were due to spillage of or immersion into huge amounts of milk, they caused larger burns. According to our results, third-degree burns were encountered more frequently in milk burns. This can be explained via the oil content of the milk; however, burns were still deeper than in the oil only group, which raises the question of whether milk has a specific composition or concentration leading to deeper burns. Comprehensive animal studies can be constructed to address this topic in centers with sufficient technical support. In our series, the amount of oil that caused burn was almost always less than the amount of milk and water, and burning was always a result of spillage. Thus, oil burns were not found to be similar to milk burns in the clinical course.

Milk burns required more operative interventions. This is a consequence of the deeper burns seen in this group. Nevertheless, physicians dealing with burns should be aware of the fact that milk causes deeper burns and requires frequent surgical intervention.

With the aforementioned clinical presentation, milk burns appeared to have a similar hospital stay as with other burn causes; however, when mortality rates were considered, it was seen that children with milk burns would have been hospitalized for a much longer period if they had lived. To lessen the length of hospital stay and cost of the treatment, surgical intervention should be initiated as early as appropriate in the clinical course, and conservative modalities should be avoided.[8]

When soup burns were considered, we saw a similar clinical course with that of water burns, which is probably related to the lower oil content of the agent. The burning due to soup was almost always a result of spillage, which caused limited burn areas as a patchy area on the skin, which we believe facilitated heat dispersion at the burned area.

Most of the burns were accidental in our series; however, we had considerable neglect cases. In neglect cases, we provided information to the social services office and they initiated a process starting with an interview with the caretakers. If neglect is an ongoing issue in the family or the real etiology is intent, cases may proceed to a law court to secure the children's rights. If it is not the case, preventive measures are explained to the caretakers to avoid further injuries to the children.

Even with the advanced therapy modalities in burn management, mortality remains a devastating consequence. In our scalded pediatric population, the overall mortality rate was 10.7%. Sepsis and renal insufficiency were the leading mortality causes. Both were frequent in patients referred to our clinic in the late phase of burn, reflecting the necessity and importance of early transfer to specialized burn centers. Milk burns have significantly higher mortality risk than other scalds.[3]

In conclusion, scalding is the most frequent burn cause among the Turkish pediatric population. Hot milk burns should be considered as an important entity among scalds as they have a complicated clinical course and considerable mortality rates. Thus, special attention should be given to patients with milk burns. Keeping in mind that approximately 90% of burns in children are accidental according to the literature, preventive measures should be taken to protect children from scarring, in a world in which the rights of an unborn fetus are debated.

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