ÖZGÜN ARAŞTIRMA / ORIGINAL RESEARCH

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Comparison of patterns of burn severity and clinical characteristics of pediatric patients in a referral burn center: a retrospective analysis

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Abstract

Comparison of patterns of burn severity and clinical characteristics of pediatric patients in a referral burn center: a retrospective analysis

Objective: Burn injuries continue to be an important public health problem worldwide, and childhood burns constitute the most critical burden among these injuries. Although less common, pediatric non-scald burn injuries (NSBIs) generally have a more severe course and cause more significant morbidity and mortality than scald burns (SBs). Many studies only address SBs or NSBIs separately. There are limited studies comparing severity patterns and clinical characteristics of both injuries. It aimed to investigate the severity patterns and clinical characteristics of SBs and NSBIs in hospitalized pediatric patients and compare them with the existing literature.
Method: A retrospective comparative study design was created among hospitalized pediatric patients. The most frequently observed SBs caused by hot water-tea/hot milk/oil-sauce-soup formed the first group. At the same time, as burn severity was thought to be relatively varied according to initial burn conditions, the NSBIs (fire-flame-related/electrical/contact/chemical-burns) constituted the other group. Data were extracted from the University of Health Sciences- Adana Faculty of Medicine (UHS-AFM) patient files and the electronic registry system.
Results: While SBs constituted 83% of 1715 hospitalized pediatric patients, NSBIs formed only 17% of the study group. Additionally, pediatric non-scald burn injuries had a more severe course in this study. It was determined that NSBIs were responsible for more than two-thirds of mortality compared to SBs. This patient group also required approximately three times more surgical procedures (escharotomy/fasciotomy). Also, the length of hospital stay (LOS) was approximately two times longer than SBs, 23.5±30.5 (1-258), vs. 11.8±9.9 (1-136) ($p<0.001$). While 31.4% of NSBIs required skin grafts (n=91), only 14% of SBs had ($p<0.001$). This identified high trend was consistent with the depth of deep partial-/full-thickness burns, which was detected in only 28.6% of SBs and more than 51% of NSBIs ($p<0.001$).
Conclusion: Further comparative studies on the actual mechanisms of SBs and NSBIs may help develop new strategies from a different perspective on burn prevention programs. In addition to the education of school-age children and their families, there is also a need to raise public awareness on the prevention of burn injuries by using all possible mass media.
Keywords: Pediatric Burn Injuries; Scald Burns; Electrical Injuries; Fire-related Burns; Chemical Injuries; Contact Burns

Öz

Bir referans yanık merkezindeki pediatrik hastaların yanık şiddet paternlerinin ve klinik özelliklerinin karşılaştırılması: retrospektif analiz

Amaç: Yanık yaralanmaları tüm dünyada önemli bir halk sağlığı sorunu olmaya devam etmekte ve bu yaralanmalar arasındaki en kritik yükü çocukluk çağı yanıkları oluşturmaktadır. Daha nadir olmasına rağmen, pediatrik haşlanma-harici yanık yaralanmaları (aleve bağlı, elektrik, temas ve kimyasal) genellikle daha şiddetli bir seyir göstermekte ve haşlanma yanıklarına oranla daha fazla morbidite ve mortaliteye neden olmaktadır. Haşlanma yanıklarını veya haşlanma-harici yanık yaralanmalarını ayrı ayrı inceleyen birçok çalışma olsa da her iki yaralanma türü arasındaki şiddet paternlerini ve klinik özelliklerini karşılaştırmalı olarak inceleyen sınırlı sayıda çalışma mevcuttur. Bu çalışmada bir referans yanık merkezindeki pediatrik hastalarda haşlanma ve haşlanma-harici yanık yaralanmalarına ait şiddet paternlerinin ve klinik özelliklerinin araştırılması ve mevcut literatür ile karşılaştırması amaçlanmıştır..
Yöntem: Yanık şiddetini, gerçekleşme anındaki ilk yanık koşullarına göre değişim göstermektedir. Bu kapsamda, Yanık Merkezinde yatırılarak tedavi edilen pediatrik hastalarda en sıklıkla gözlenen haşlanmaya bağlı yanıklar bir grupta, haşlanma-harici yanık yaralanmaları ise diğer grupta olmak üzere iki alt gruba ayrılarak inceleme yapılmıştır. Veriler Sağlık Bilimleri Üniversitesi- Adana Tıp Fakültesi hasta dosyalarından ve elektronik kayıt sisteminden alınmıştır.
Bulgular: Çalışma dönemine ait kayıtlarda, haşlama yanıkları, Yanık Merkezi'ndeki 1715 pediatrik hastanın %83'ünde gözlenirken haşlanma-harici yanıklar çalışma grubunun sadece, %17'lik kısmını oluşturmaktaydı. Buna karşın, bu çalışma sonuçlarına göre pediatrik haşlanma-harici yanık yaralanmalarının daha şiddetli bir seyre sahip oldukları gözlemlendi. Haşlanma-harici yanıkların haşlanma yanıklarına kıyasla mortalitelerin üçte ikisinden fazlasından sorumlu olduğu, ayrıca bu hasta grubunda yaklaşık üç kat daha fazla cerrahi işlem (eskaratomi/fasiyotomi) gereksinimi olduğu saptandı ($p<0.001$). Ek olarak haşlanma-harici yanıkların, haşlanma yanıklarına kıyasla yaklaşık iki kat daha uzun hastanede kalış süresine sahip oldukları gözlendi ($p<0.001$). Haşlanma-harici yanık yaralanmalarının %31.4'ü için deri grefti ihtiyacı mevcutken (n=91), haşlanma yanıklarında bu oran sadece %14 olarak belirlendi ($p<0.001$). Tanımlanan bu yüksek eğilim, haşlanma yanıklarının yalnızca %28,6'sında ve haşlanma dışı yanık yaralanmalarının ise %51'inden fazlasında saptanan derin kısmi/tam kalınlıkta yanıkların derinliği ile de tutarlıydı ($p<0.001$).
Sonuç: Haşlanma yanıkları ve haşlanma-harici yanık yaralanmalarının gerçek mekanizmaları hakkında daha fazla karşılaştırmalı çalışma, yanık önleme programlarıyla ilgili yeni stratejiler geliştirilmesine yardımcı olabilir. Ayrıca, okul çağındaki çocukların ve ebeveyn eğitimin yanı sıra, mümkün olan tüm kitle iletişim araçlarının kullanılması ile yanık yaralanmalarının önlenmesi konusundaki farkındalığın arttırılmasına ihtiyaç vardır.
Anahtar Kelimeler: Çocuk yanık yaralanmaları, Haşlanma yanıkları, Elektrik yaralanmaları, Alev yanıkları, Kimyasal Yaralanmalar, Temas Yanıkları

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INTRODUCTION

Burn injuries continue to be an important public health problem worldwide, and childhood burns constitute the most critical burden among these accidents (1,2). Very young children with relatively limited mobility need assistance to move away from the environment where the burn accident occurred. Increased contact with causative agents, even longer than for a few seconds, raises the risk of causing more severe injury. Also, most burns occur accidentally due to the misfortunes experienced during children's interests in exploring their surroundings (3,4). In addition, these accidental features of pediatric burn injuries mean that most of these injuries are preventable. Besides, burns in children at an early age are mainly caused by scalds. This mechanism changes between the ages 5 and 17 and gains features close to the etiological features of the adult age group (5).

Burn conditions have been well documented in previous epidemiological investigations, and studies of the time-temperature relationship on pediatric burn injuries can also identify patterns of severity that can aid prevention strategies. In this regard, "the temperatures belonging to the environment," "causative agents of burns (hot liquid sources-scald, hot solid sources-contact, fire-flame-related, electrical and chemical)," "place of the accident," "exposure time with these wet and dry sources," "presence of cooling procedure following injury," and "varying skin thicknesses depending on the children's ages" can be counted among the "pre/post-burn conditions"; are vital in terms of ascertaining the burn severity. The main factor determining morbidity and mortalities in burns is that mentioned severity, which can show significant differences according to these burn conditions, is generally evaluated together with the depth of the burn and TBSA% (3,6). Although burn depth is determined by many factors, for the first time in 1947, Henriques and Moritz's studies, based on thermophysical properties, known as the time-temperature relationship, were widely accepted and became a turning point in burn research (7-11). In this context, animal thermal injury models are frequently used for burn wounds and could provide insight into the outcomes that we can not clinically compare. Regarding this, in an experimental study conducted by Andrews et al. on porcine models, the time-temperature values for progression to mid-dermal burns were 50°C, 55°C, and 60°C, as ≥ 10 minutes, 2 minutes, and 30 seconds, respectively (2,6).

It should be noted that the time-temperature relationships for pain and superficial partial-thickness burns in adults' human skin have an extensive experimental modeling base accompanied by adequate clinical validation. In contrast, the time-temperature relationship for deep partial- and full-thickness burns in children has limited clinical validity and is derived from other data (3). In the light of this information, it has been reported that there is strong evidence that pain occurs in contact with human skin at temperatures just above 43°C. When the temperature in the basal layer of the epidermis rises to 44°C, the starting point of burn injury is reached, accompanied by a logarithmic progression in tissue damage due to increased temperature. Finally, the development in tissue destruction at temperatures above 70°C reaches a level that exceeds the definition criteria (3). In addition, the burn depth changes depending on the varying skin thicknesses according to the affected anatomical region and age, and there is little clinical evidence of a time-temperature relationship for deep dermal burns (3).

Moreover, Martin et al. (3) indicated that the burns in adults in 10 seconds at 48.9°C correspond to a temperature of 46.6°C in children. Recommended domestic water temperatures for adults should be revised to 3-4°C lower to provide adequate protection for children. Also, children are at greater risk for extensive and more in-depth tissue damage than adults with equivalent electrical voltages/lower fluid temperatures due to thinner skin thicknesses, overall lower fat content, and different surface area to volume ratios (12,13).

Many studies only address scald burns (SBs) or non-scald burn injuries (NSBIs) individually. There are limited studies comparing severity patterns and clinical features between both types of these injuries. Therefore, the primary focus of this comparative epidemiological study was to investigate the severity patterns and clinical characteristics of SBs and NSBIs in hospitalized pediatric burn patients and discuss the differences between the existing literature to contribute to awareness efforts on burn prevention.

METHOD

Data extraction comparative study design by burn conditions

Following the approval by the author from the UHS-AFM ethics committee, demographic data which belong to SBs and NSBIs and details of clinical characteristics of children within the age range of 0 to <18 years who were admitted with burns between January 1st, 2015, and June 30th, 2020, were retrospectively extracted from UHS-AFM medical records. A retrospective comparative study design was created among hospitalized pediatric patients. Written informed consent was obtained from all parents. The most frequently observed SBs caused by hot water-tea/hot milk/oil-sauce-soup formed the first group. At the same time, as burn severity was thought to be relatively varied according to initial burn conditions, the NSBIs (fire-flame-related/electrical/contact/chemical-burns) constituted the other group.

Inclusion criteria for the study

All pediatric patients with unintentional burn injuries were admitted for treatment to the inpatient unit of the UHS-AFM burn center and treated for more than 24 hours or longer, with all etiologic factors included in the study.

Data analysis and statistics

Age groups were stratified as 0-2, 3-4, 5-9, 10-14, and 15-<18 age groups to evaluate the reflection of SBs and NSBIs on the clinical results. Additionally, total body surface area burn percentage (TBSA%) was divided into 0-9, 10-19, 20-29-30-39,40-49, 50+ segments for this purpose. Also, demographic and clinical data between SBs and NSBIs were presented as comparative distribution tables and graphs.

Data entry and analysis were performed using the SPSS 21.0 for Windows (Statistical Package for Social Science v21) software. The collected information on SBs and NSBIs was analyzed using descriptive statistics. A chi-square test was used to assess these comparisons between SBs and NSBIs. The results are expressed as mean ± standard deviation (SD) (minimum-maximum). A p-value observed below 0.05 during the comparisons was defined as statistically significant.

RESULTS

Age, gender, length of hospital stays

The study included one thousand seven hundred and fifteen pediatric patients aged between 0.5 and 17.5 years who were admitted to UHS-AFM and were hospitalized in the burn center. A male predominancy was observed in both SBs and NSBIs, with the male to female ratios of 1.17:1 and 1.96:1, respectively (p<0.001). SBs were most observed in hospitalized pediatric patients younger than five years (78.3%), while NSBIs were mainly found among patients within the age range of 10 to <18 years (57.6%).

In terms of the mean length of hospital stays (LOSs), NSBIs had almost two-fold longer hospitalization than SBs, 23.5 days (SD=30.5, range=1–258 days), vs. 11.8 days (SD=9.9, range=1–136 days) (p<0.001).

The comparison of demographic and clinical variables among hospitalized pediatric patients with scald burns vs. non-scald burn injuries is shown in Table 1.

Etiologic factors

SBs comprised 83% (n=1425), while NSBIs made up 17% (n=290) of the total hospitalized pediatric patients. Meanwhile, most burn injuries were caused by hot water-tea with 65%, and the rest were by oil-sauce-soup and hot milk with the percentages of 13.0% and 5.0%, respectively. According to the causes of NSBIs, it was determined that flame-related burns were prominent with 10%, followed by, in descending order, contact, electrical and chemical burns, with percentages of 4.0%, 2.0%, and 1.0%, respectively.

Table 1. The comparison of demographic and clinical variables among hospitalized pediatric patients with scald burns vs. non-scald burn injuries (n=1715).

	TOTAL		SBs		NSBIs		
	n= 1715		n=1425		n=290		
Variables	Mean± SD [a]		Mean± SD [a]		Mean± SD [a]		p-value
Age (year)	4.1±3.4 (0.5-17.5)		3.5±3.3 (0.5-17.5)		7.2±5.3 (0.5-17.5)		<0.001
TBSA (%)	11.4±11.5 (1-99)		10.3±8.4 (1-90)		16.8±19.9 (1-99)		<0.001
LOS (day)	13.8±16.0 (1-258)		11.8±9.9 (1-136)		23.5±30.5 (1-258)		<0.001
Variables	n	%	n	%	n	%	p-value
Gender							0.001
Male	960	56.0	768	53.9	192	66.2	
Female	755	44.0	657	46.1	98	33.8	
Age-group							<0.001
0-2	914	53.3	829	58.2	85	29.3	
3-4	325	19.0	287	20.1	38	13.1	
5-9	267	15.5	203	14.2	64	22.1	
10-14	140	8.2	75	5.3	65	22.4	
15-<18	69	4.0	31	2.2	38	13.1	
Burn Depth							<0.001
Superficial partial-thickness	1152	67.2	1010	70.9	142	49.0	
Deep partial-thickness	268	15.6	212	14.9	56	19.3	
Full-thickness	295	17.2	203	14.2	92	31.7	
Mortality							<0.001
Yes	13	0.8	3	0.2	10	3.4	
Need for surgery							<0.001
Escharotomy/fasciotomy	65	3.8	40	2.8	25	8.6	
Skin graft	290	16.9	199	14.0	91	31.4	

[a], mean±standard deviation (minimum-maximum); TBSA, total body surface area; LOS, length of hospital stays; SBs, scald burns; NSBIs, non-scald burn injuries.

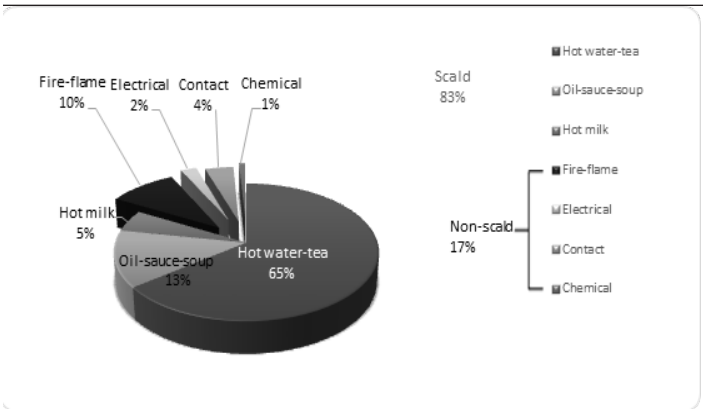

Figure 1. Distribution of the overall scald burns and non-scald burn injuries among hospitalized pediatric patients (n=1715).

The distribution of the overall scald burns and non-scald burn injuries among hospitalized pediatric patients is shown in Figure 1.

Total Body Surface Area Burn Percentage

Considering the mean of TBSA%, it was observed that NSBIs had suffered more extensive burns than SBs 16.8% (SD = 19.9, range = 1%–99%), vs 10.3% (SD = 8.4, range = 1%–90%) (p<0.001). Also, most hospitalizations (56.9%) consisted of pediatric patients with TBSA<10%, among the hospitalized pediatric patients with both SBs and NSBIs. Also, 30.3% of NSBIs suffered major burns with TBSA >20%, compared to only 11.1% of SBs.

The distribution of TBSA% burned segments among hospitalized pediatric patients with scald burns vs. non-scald burn injuries is shown in Figure 2.

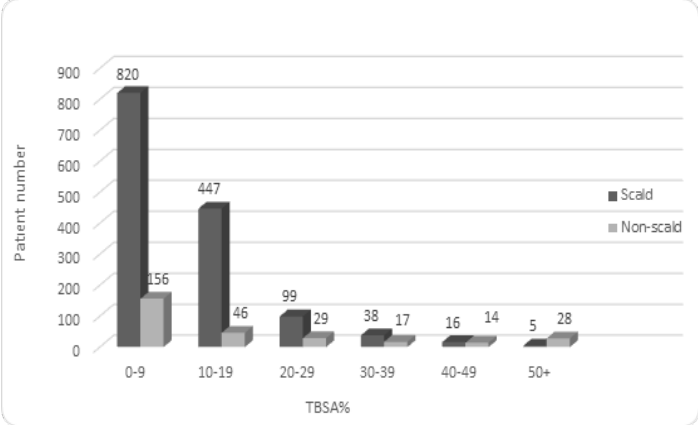

Figure 2. Distribution of TBSA% burned segments among hospitalized pediatric patients with scald burns vs. non-scald burn injuries (n=1715).

Burn depth and the need for surgery

Regarding the burn depth, 70.9% of the SBs were detected as superficial-partial- thickness burns, whereas over 50% (51.0%) of the hospitalized pediatric patients with NSBIs had deep-partial- and full-thickness burn depth with percentages of 19.3% vs. 31.7%, respectively (p<0.001) (Table1).

Concerning the need for surgery, approximately three-fold more escharotomy/fasciotomy procedures were applied for NSBIs (8.6%) than SBs (2.8%) (p<0.001); nearly one-third (31.4%) of NSBIs had skin grafts. At the same time, this procedure was performed solely on 14% of SBs (p<0.001) (Table1).

Burned anatomical regions

The burned anatomic locations were classified as head, neck, anterior trunk, posterior trunk, hands -upper extremities, feet-lower extremities, and the genital region. The most frequently affected anatomical sites among pediatric hospitalized patients with SBs and NSBIs were feet-lower extremities, followed by the hand-upper extremities.

The distribution of the burned anatomical regions among hospitalized pediatric patients with scald burns vs. non-scald burn injuries is shown in Figure 3.

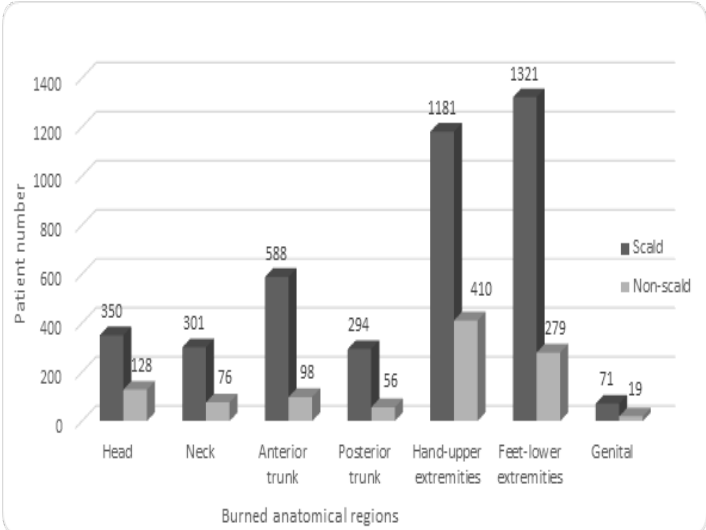

Figure 3. Distribution of the burned anatomical regions among hospitalized pediatric patients with scald burns vs. non-scald burn injuries (n=1715).

Place of accidents

When the places of burns were compared between SBs vs. NSBIs, most of the burn injuries occurred in the kitchen, living room, and bathroom, with percentages of 57.5%, 31.4%, 7.0% vs. 53.8%, 15.9%, 10.0%, respectively.

The distribution of the place of accidents among hospitalized pediatric patients with scald burns vs. non-scald burn injuries is shown in Figure 4.

Age-group specific SBs versus NSBI related mortalities

Table 2 shows the distribution of the age-group-specific scald burns vs. non-scald burn injury-related mortalities among hospitalized pediatric patients.

When considering the mortality causes, 71.4% (n=10) of all deaths by fire-flame-related burns were detected among pediatric hospitalized patients with NSBIs. Regarding NSBI-related deaths, no deaths due to electrical, chemical, and contact burns were found during the study period. The burn

Table 2. Distribution of the age-group-specific scald burns vs. non-scald burn injury-related mortalities among hospitalized pediatric patients.

Age groups	Patient's number		Mortality		Burn injury mechanisms of the mortalities	
	n	% of total	n	%	(n) SBs	(n) NSBIs
0-2	914	53.3	3	0.3	1, hot water-tea; 1, oil-sauce-soup	1, fire-flame-related
3-4	325	19.0	2	0.6	1, hot milk	1, fire-flame-related
5-9	267	15.5	4	1.5	0	4, fire-flame-related
10-14	140	8.2	4	2.9	1, hot water-tea	3, fire-flame-related
15-<18	69	4.0	1	1.5	0	1, fire-flame-related

SBs, scald burns; NSBIs, non-scald burn injuries.

mechanism constituted the remaining 28.6% (n=4) of the total detected mortalities in the study period. The cause of burns due to milk and oil sauce soup was found in two (14.3%) patients, while the remaining two cases were caused by hot water and tea (14.3%). While the overall mortality was 0.8% in the whole study group, increasing mortality rates regarding age groups were observed in the 0-2, 3-4, 5-9, 10-14 age groups, with percentages of 0.3%, 0.6%,1.5%, and 2.9 respectively, it was detected as 1.5% in the 15-<18 age-group ($p<0.001$) (Table 2).

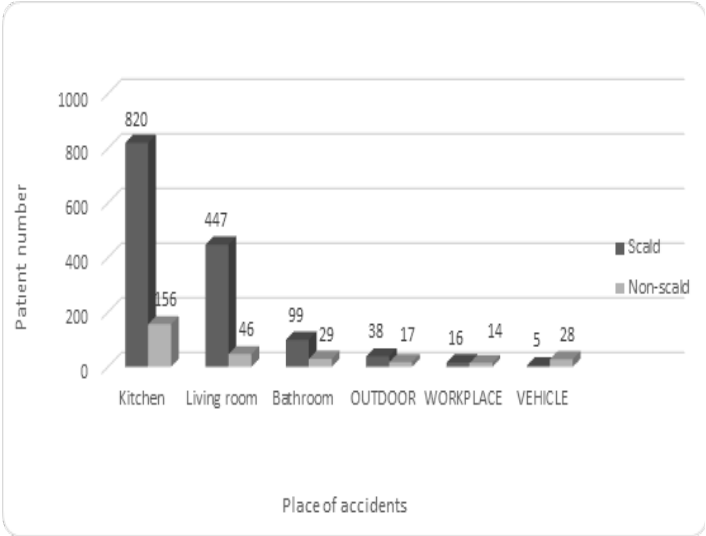

Figure 4. Distribution of the place of accidents among hospitalized pediatric patients with scald burns vs. non-scald burn injuries (n=1715).

DISCUSSION

Pediatric burns deserve special attention from the initial stage of injury due to severe emotional trauma or significant physical damages such as accompanying and painful burn dressing changes/need for multiple surgical procedures or scarring problems/functional limitations even after discharge [14]. The epidemiological study of childhood burns and in-depth understanding of the differences between SBs and NSBIs could provide vital information for developing strategies to reduce these mentioned burdens.

By Henriques and Moritz's study on thermophysical properties, a turning point in burn research has been reached (7-11). The time-temperature relationship, or in other words, the duration of exposure to the causative agents, accompanied by the form of the occurrence of the burn injury, are vital factors in determining the burn severity and also in the treatment planning (15). Concerning the SBs, in several studies, patients' demographic characteristics, substances, containers, and the higher prevalence among young children, their predominance has been identified for childhood burns (16-18). In contrast, fewer studies considered the actual mechanisms (4,19,20).

The observed male predominance in both SBs and NSBIs was in line with the pediatric burn injuries' well-documented/known fact of the dominance of the male gender in past epidemiological research, with the male to female ratios of 1.17:1 1.96:1, respectively. In the systematic review conducted by Brusselaers et al. (16) on severe burns injuries in Europe, it is stated that most burns occur as a result of an accident, at home, usually in the kitchen, and primarily by SBs. In parallel with these findings, SBs comprised 83.0% of the cases in this study, while NSBIs made up 17.0% of the hospitalized pediatric patients, while 93% of the burn injuries occurred most frequently at home and mainly in the kitchen. Meanwhile, most burn injuries were caused by hot water-tea with 65 percent, and the rest were by oil-sauce-soup and hot milk with the percentages of 13.0% and 5.0%, respectively. Besides, the causes of NSBIs, determined that flame-related burns were prominent at 10%, followed by, in descending order, contact, electrical and chemical burns, with percentages of 4.0%, 2.0%, and 1.0%, respectively. According to the assessment of the distribution of SBs and NSBIs by age groups, the current study's findings were consistent with indicated etiological patterns in the systematic review by Vloemans et al. (5), and SBs constituted 90.1% of the pediatric patients under five years. In contrast, there was a sharp decline in SBs' percentage with 64.9% of pediatric patients in the 5-<18 age group, while NSBIs constituted 35.1%.

In community-based scald prevention efforts, other than the attempts that set kettles to 120°F (48.9°C) in developed countries, have often failed [20]. According to a possible mechanism of rapid dilution of the source and energy (21), more in-depth burns were detected in the "hot milk/oil-sauce-soup"- compared to "hot water-tea"-sourced scalds. Also, this result was comparable with the study's findings by Yastı et al. (22), which reported that hot milk causes deeper burns than the other scalds. Additionally, as indicated in their study conducted by Keck et al. (23), related to burn pathophysiology, hot grease and oil can cause deeper dermal-and even full-thickness burns were compatible with our study's findings. Nduagubam et al. (24) reported that SBs due to hot water is more likely to cause superficial burns. In this study, the majority of SBs had superficial partial-thickness burns with nearly 71.0%; in contrast, 51.0% of burn thicknesses in NSBIs were comprised of deep partial- and full-thickness burns. Also, this study's findings were consistent with Trop et al.'s study (25), reporting that most electrical burns had deep burns with 84.6%, followed by chemical, contact, and flame-related burns, while at least was found at SBs with 16.4%.

Regarding the LOSs and TBSA % in the study, NSBIs had almost two times longer hospitalization than SBs. It was observed that NSBIs had suffered more extensive burns than SBs. Also, most hospitalizations (56.9%) consisted of pediatric patients with TBSA<10%, among the hospitalized pediatric patients with both SBs and NSBIs. Besides, 30.3% of NSBIs suffered major burns with TBSA >20%, compared to only 11.1% of SBs.

Concerning the need for surgery, approximately three times higher escharotomy/fasciotomy procedures were applied for NSBIs than SBs. Nearly one-third of NSBIs had skin grafts, while this procedure was performed solely for 14% of SBs. The most frequently affected anatomical sites among pediatric hospitalized patients with SBs and NSBIs were feet-lower extremities, followed by the hand-upper extremities.

When considering the mortality, more than two-thirds of all deaths were caused by fire-flame-related burns and were detected in pediatric hospitalized patients with NSBIs. Regarding NSBI-related deaths, no deaths due to electrical, chemical, and contact burns were found during the study period. When the burn mechanism was examined in detail in hospitalized pediatric patients with SBs, the cause of burns due to hot milk and oil-sauce-soup was found in two patients, while the remaining two cases were caused by hot water and tea. The overall mortality was 0.8% in the whole study group; increasing mortality rates regarding age groups were observed in the 0-2, 3-4, 5-9, 10-14 age groups, with percentages of 0.3%, 0.6%, 1.5, and 2.9% respectively, while it was observed as 1.5% in the 15-<18 age group.

Limitation of the study

The main limitations of this study were the retrospective file review, which only represents the inpatient population, excluding emergency department admissions. It also did not represent cases with minor burns followed-up on an outpatient basis, accounting for more than 90% of total pediatric burn injury admissions.

CONCLUSION

Although less common, in this study, the pediatric NSBIs were responsible for more than two-thirds of mortality compared to SBs. This group of patients also underwent approximately three-fold escharotomy/fasciotomy procedures. The current high trendline was maintained, with approximately two-to more than two-times increase in NSBIs for LOSs and skin grafts, respectively. The indicated position also showed continuity in burn-depth, and deep-partial and full-thickness burns were detected in more than 51% of patients with NSBIs, compared to only 28.6% of SBs. In this context, more comparative studies on the actual mechanisms of SBs and NSBIs may help develop new strategies from a different perspective regarding burn prevention programs.

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Peer-Review

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The authors declare that they have no conflict of interests regarding content of this article.

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Authorship Contributions

Concept: K.G., Design: K.G., Data Collection or Processing: K.G.; M.D., Analysis or Interpretation: K.G., Literature Search: K.G; M.D., Writing: K.G.

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