Original Article

JHSMR Journal of Health Science and Medical Research

Epidemiology of Burn Injury in the Southern Border Provinces of Thailand

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Received 11 August 2022 ● Revised 21 October 2022 ● Accepted 29 October 2022 ● Published online 27 March 2023

Abstract

Objective: This study aimed to investigate burns, from any situation, and the treatment in the Burn Center of Yala Hospital.

Material and Methods: This research was a retrospective study in the Burn Center of Yala Hospital; from April 1, 2019 to May 31, 2021.

Results: Enrollment consisted of 161 burn patients (male 65.8%, female 34.2%). Most burns in children were scalds (67.3%); whereas, in adults and the elderly they were flame burns (51.0% in adults and 66.7% in the elderly) (p-value<0.001), which were usually <20% of total body surface area (p-value<0.001). Most burns were superficial second degree burns. Patients in all age groups required surgical intervention (p-value=0.003). The median length of hospital stay was approximately seven days (IQR4-17); however, the elderly required intensive care more often than other age groups (p-value=0.003). All enrolled cases survived.

Conclusion: The most common cause of burns in adults and the elderly was burning from flames, while burns from scalds occurred most in children. Burns in the elderly were more severe, and required admission to the intensive care unit more than any other age group.

Keywords: burns, Thailand

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J Health Sci Med Res 2023;41(4):e2023942
doi: 10.31584/jhsmr.2023942
www.jhsmr.org

Introduction

Annually, the incidence of burn injury causes more than 180,000 fatalities[1]. It mainly affects low-income people in both developed and developing countries[1–9]. However, mortality is more prevalent in central and southeast Asia[6]; including Thailand. Moreover, it can result in long-term disability. These conditions often require significant resources to manage, and directly affect the patient's physical and mental health[1,3–9].

Burns and other injuries caused by exposure to fire, heat, and hot substances can be severely disabling and even fatal, despite the availability of medical care. In addition to the importance of injury prevention and safety programs in mitigating burden, the role of medical services should also be considered. The total body surface area of burns greater than 55 of total bady surface area, with blood creatinine levels greater than 1.2 milligrams per deciliter, and facial burns were factors linked to higher mortality in a prior study[10]. If these factors could be avoided, the outcome might be improved[10]. The severity spectrum of such injuries may necessitate complex treatment by burn surgeons and intensive care services, which are not consistently accessible in all regions of the world. Medical and surgical care innovations; such as, split-thickness skin grafting in select anatomical locations, fluid, electrolyte repletion and infection control have emerged as essential components of care for burns victims, as they can mitigate the risk of death and long-term disability in some cases[11]. Consequently, a healthcare system should include a comprehensive medical infrastructure to treat burn injuries. A thorough epidemiological analysis of the morbidity and mortality that can result from fire, heat, and hot substances is essential, given the care requirements that severe injuries can necessitate. Moreover, these injuries may become more prevalent as greater emphasis is placed on ensuring that all regions of the world have access to standard-of-care interventions, which has improved patient outcomes across multiple domains of illness and injury in resource-rich environment[3].

Understanding the incidences as well as their underlying causes will result in advances in treatment and prevention. As each region's lifestyle and standards of living are different, it is necessary to conduct research in each area to analyze the data and correctly apply it[1,2] as well as to analyze trends in burns in the region over the last decade. Nowadays, Yala Hospital is a referral center for patients with burn injuries in the southern border provinces of Thailand, under the supervision of a plastic surgeon during the year 2018. Therefore, problems associated with burns should be further studied, so as to utilize and develop treatments and preventions of burn injury; including educating people on self-protection and the protection of those around them.

Material and Methods

This research is a retrospective study of patients with burn injury, treated at the Burn Injury Center, Yala Hospital; from 1 April 2019 to 31 May 2021. After approval by the Yala institutional review board, patients were tracked, using the ICD 10 code for burn (T30.0); from 1 April 2019 to 31 May 2021. All patients with burn injury enrolled in this study were considered as having provided informed consent. Additionally, parental consent was required for patients under the age of 18. Patients with incomplete data or no follow-up treatment were excluded from the study.

The criteria for burn patients to be admitted are partial thickness burn injuries that are more than 10%, full-thickness burns, electrical burns, chemical burns, inhalation injuries, burn injuries with numerous comorbidities, burn injuries with multiple trauma and burns in children that require specialized medical care.

In this study participants ages were divided into: children aged 0 to 14, adults aged 15 to 60 and the elderly aged over 60 years. Data were collected according to gender, cause of burn injury, affected body area, wound depth, number of days in the hospital, surgery and treatment, length of stay in the intensive care unit and condition after treatment.

All data were analyzed by statistical package for the social sciences (SPSS) for Mac version 21, released 21.0.0.0. Kruskal-Wallis test, chi-square test or Fisher's exact test were used for data analysis, with statistical value of statistical significance at p-value<0.05.

Results

Over the two-year-long study period, 161 (106 males and 55 females) burn injuries were admitted to Yala Hospital Center. The average age was total four years, with the most common cause of burn injury being scalding: accounting for less than 20% of body surface area. The majority of them had second-degree burns (superficial partial-thickness burns). The average hospital stay was approximately seven days. Additionally, it was revealed that all the patients survived: as shown in Table 1.

After classifying patients into three groups: group 1: children 0-14 years old, group 2: adults 15-60, and group 3: the elderly over 60. Group 1 had a total of 101 patients (62.7%), group 2 had 51 patients (31.7%), and group 3 had 9 patients (5.6%), respectively. In all three groups, there were no statistically significant difference between genders. Group 1 consisted of children younger than 14 (67.3 percent), with scald being the most common of burn injuries. According to Table 1, fire was most common cause of burn injury for adults aged 15 to 60 (51%) and people over 60 (66.7%) (p-value<0.001).

The area of burns was distinct in each age group. The third group of patients, those older than 60, had a median body area of burn injury 22.5 percent, greater than the other groups (interquartile range 3.5-55). Group 1, consisting of children aged 0-14 years, had a median of 6% of their bodies affected by burn injuries (interquartile range 2-12); whereas, adults aged 15-60 years had a median of 10.5% of their bodies affected by burn injuries (interquartile range: 5-20) (p-value=0.001): as shown in Table 1. The majority of burn injuries in this study were second-degree burns (superficial partial-thickness burns): as shown in Table 1.

Surgical treatment and wound care for burn injuries

In the study, surgery was performed on all age groups: group 1 comprised of 59.4%, group 2 had 86.3%, and group 3 comprised of 66.7% (p-value=0.003): as shown in Table 2. The median number of surgery was 1 (interquartile range 1-3); however when considering age it was discovered that the median number of surgeries for adults aged over 60 this was 1.5. (interquartile rage 1-2). In the second group, adults aged 15 to 60 years, the median number of surgical procedures was 1. (interquartile rage1-2). The median number of surgery was 2 (interquartile range 1-3), in the group of children aged 0 to 14 compared to the group of adults aged over 15 year (p-value=0.008): as shown in Table 2. As indicated in Table 2, wounds in groups 1 and 2 were closed with skin grafts at the rates of 10.9% and 17.6%, respectively, while the operation was not performed in group 3 (p-value=0.250).

In all age groups, combination dressing (47.83%); such as conventional dressing and advance wound dressing, was used more frequently than either conventional dressing (32.92%) or advanced wound dressing alone (19.25%) (p-value=0.045): as presented in Table 3.

Table 1 Demographic, event and injury characteristics for patients with burn injuries

Variables	Total (n=161)		0-14 years (n=101)		15-60 years (n=51)		>60 years (n=9)		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
Gender									
Male	106	(65.8)	63	(62.4)	38	(74.5)	5	(55.6)	0.264
Female	55	(34.2)	38	(37.6)	13	(25.5)	4	(44.4)	
Cause									
Flame burn	45	(28.0)	13	(12.9)	26	(51.0)	6	(66.7)	<0.001
Scald burn	84	(52.2)	68	(67.3)	14	(27.5)	2	(22.2)	
Chemical burn	3	(1.9)	0	(0.0)	3	(5.9)	0	(0.0)	
Electrical burn	19	(11.8)	11	(10.9)	7	(13.7)	1	(11.1)	
Contact burn	10	(6.2)	9	(8.9)	1	(2.0)	0	(0.0)	
Burn (%), Median (IQR)	8	(3-18)	6	(2-12)	10.5	(5-20)	22.5	(3.5-55.5)	<0.001
0-19%	122	(75.8)	85	(84.2)	33	(64.7)	4	(44.4)	<0.001
20-39%	30	(18.6)	15	(14.9)	13	(25.5)	2	(22.2)	
≥40%	9	(5.6)	1	(1.0)	5	(9.8)	3	(33.3)	
Degree burn									
First degree burn	1	(0.6)	1	(1.0)	0	(0.0)	0	(0.0)	0.723
Second superficial degree burn	131	(81.4)	83	(82.2)	40	(78.4)	8	(88.9)	
Second deep degree burn	14	(8.7)	10	(9.9)	4	(7.8)	0	(0.0)	
Third degree burn	15	(9.3)	7	(6.9)	7	(13.7)	1	(11.1)	
Length of stay (days), Median (IQR)	7	(4-17)	7	(5-14)	10	(3-23)	7	(4-17)	0.883
<14	112	(69.6)	73	(72.3)	33	(64.7)	6	(66.7)	0.620
≥14	49	(30.4)	28	(27.7)	18	(35.3)	3	(33.3)	
Death									
Yes	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	NA
No	161	(100.0)	101	(100.0)	51	(100.0)	9	(100.0)	

NA=data not applicable
Data are presented as n (%) or median (interquartile range)
p-value corresponds to Kruskal-Wallis test, Chi-square test or Fisher's exact test
IQR=interquartile range

Silver sulfadiazine (42.11%) was the most commonly used dressing material across all age groups. However, silver-impregnated dressing material (Acticoat) was the most common material used in age group 2 (17.95%), and the age group 3 (28.57%) when hydrofiber was preferred in the pediatric age group (38.71%).

Duration in the intensive care unit; condition after treatment and scar management

In this study, the elderly over 60 years of age (group 3), were admitted to the intensive care unit at the rate of 33.0%, which was higher than the other groups. This was followed by group 2, adults aged 15-60 years old (15.7%) and group 1, children aged 0-14 years old (4.0%) (p-value=0.003). The

Table 2 Surgical intervention in 161 burn patients

Variables n (%)	Total (n=161)		0-14 years (n=101)		15-60 years (n=51)		>60 years (n=9)		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
Procedure									
Yes	110	(68.3)	60	(59.4)	44	(86.3)	6	(66.7)	0.003
No	51	(31.7)	41	(40.6)	7	(13.7)	3	(33.3)	
Number of operation (n=110), Median (IQR)	1	(1-3)	2	(1-3)	1	(1-2)	1.5	(1-2)	0.008
Skingraft/flap									
Yes	20	(12.4)	11	(10.9)	9	(17.6)	0	(0.0)	0.250
No	141	(87.6)	90	(89.1)	42	(82.4)	9	(100.0)	

Data are presented as n (%) or median (interquartile range)
p-value corresponds to Kruskal-Wallis test, Chi-square test or Fisher's exact test
IQR=interquartile range

Table 3 Dressing material used in 161 burn patients

Variables	Total (n=161)		0-14 years (group1) (n=101)		15-60 years (group2) (n=51)		>60 years (group3) (n=9)		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
Type of dressing									
Conventional	53	(32.92)	36	(35.64)	15	(29.41)	2	(22.22)	0.045
Advanced	31	(19.25)	17	(16.83)	11	(21.57)	3	(33.33)	
Combination	77	(47.83)	48	(47.52)	25	(49.02)	4	(44.45)	
Dressing material									
Silver sulfadiazine	104	(42.11)	71	(45.81)	28	(35.90)	5	(35.71)	0.007
Ointments	29	(11.74)	16	(10.32)	12	(15.38)	1	(7.14)	
Tulle	17	(6.88)	3	(1.94)	11	(14.10)	3	(21.43)	
Acticoat	21	(8.50)	3	(1.94)	14	(17.95)	4	(28.57)	
Hydrofiber	72	(29.15)	60	(38.71)	11	(14.10)	1	(7.14)	
Hydrogel	4	(1.62)	2	(1.29)	2	(2.56)	0	(0.00)	

Data are presented as n (%)
p-value corresponds to Kruskal-Wallis test, Chi-square test or Fisher's exact test

average length of stay in the intensive care unit was 7 days (interquartile range 5-24), as shown in Table 1. All patients in the pediatric age group (group 1) were taken care of until their discharge home when the discharge figures were 98.0% and 88.9% in the age group 2 and group 3, consequently. Each remaining 1 case in group 2 and group 3 needed to be transferred to other hospitals.

The most popular scar-management strategy in this study was conservative therapy (92.55%); followed by surgical therapy (5.59%) and then medical therapy (1.86%) (p-value=0.017): as shown in Table 5.

Discussion

This study compared patients of different ages with burn injuries. The burn injuries were compared by collecting gender characteristics, causes of scalds, areas of the body where the burn occurred, degree of burn injuries, treatment, length of hospital stay and treatment in intensive care units for each age group. The first group consisted of children 0-14 years old, the second of adults 15-60 years old, and the third of the elderly over 60 years old. There were more males than females in this study; however, the difference was not statistically significant. These characteristics varied from previous research[1]. Unlike prior studies[5], the majority of burn injuries happened to children, since in deep south of Thailand, people typically go to a traditional doctor due to long-held beliefs when an adult has a burn injury. Children who suffer from various burn injuries are taken to the hospital by their parents out of worry for them. Burns from fire related injuries were most common in adults aged 15 to 60 and the elderly over 60 years old. As a result of this study's findings, regarding scalds in children aged 0 to 14 years, the researchers should educate locals, by urging them to watch out for children 0-14 years old when being exposed to hot water. Adults aged 15 to 60 and older than 60 should avoid fire or heat exposure to prevent the risk of burns injury: these causes were similar when compared to earlier studies[2,8,9].

Most burn injuries affected less than twenty percent of the body's surface area. However, research indicates that older adults over 60 are more likely to experience major burn (>40% burn) than other groups. This may results from age-

Table 4 Intensive care unit (ICU) admission and discharge position

Variables	Total (n=161)		0-14 years (n=101)		15-60 years (n=51)		>60 years (n=9)		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
ICU admission									
Yes	15	(9.3)	4	(4.0)	8	(15.7)	3	(33.3)	0.003
No	146	(90.7)	97	(96.0)	43	(84.3)	6	(66.7)	
ICU (Days; n=15), Median (IQR)	7	(5-24)	19	(8-28)	6.5	(4-11)	5	(4-20)	0.319
Discharge position									
Home	159	(98.8)	101	(100.0)	50	(98.0)	8	(88.9)	0.038
Refer	2	(1.2)	0	(0.0)	1	(2.0)	1	(11.1)	

NA=data not applicable

Data are presented as n (%) or median (interquartile range)

p-value corresponds to Kruskal-Wallis test, Chi-square test or Fisher's exact test

Table 5 Scar management in this study

Variables	Total (n=161)		0–14 years (group1) (n=101)		15–60 years (group2) (n=51)		>60 years (group3) (n=9)		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
Treatment									
Conservative Treatment	149	(92.55)	95	(94.06)	46	(90.20)	8	(88.89)	0.017
Surgical Treatment	9	(5.59)	3	(2.97)	5	(9.80)	1	(11.11)	
Medical Treatment	3	(1.86)	3	(2.97)	0	(0.00)	0	(0.00)	

Data are presented as n (%) or median (interquartile range).
p-value corresponds to Kruskal-Wallis test, Chi-square test or Fisher's exact test.

related physical deterioration in the elderly: slow movements and slow reactions to threats. In the elderly, burns injury had more severity than that of other age groups; resulting in severe dehydration. Consequently, elderly patients suffer more severe burns than patients of different age groups[3,7]. Based on this information, the researcher must be aware of the importance of providing care for the elderly; particularly when exposed to fire or hot items, to prevent burns and scalds. Second-degree burns (superficial partial-thickness burns) were the most common type of burn injury in all age groups. These usually require surgery; such as wound scrubbing or debridement, because it cannot be performed outside of the operating room due to a lack of material, staff and patient coordination. However, only a minority of individuals, at any age, require a skin graft for wound closure. Unlike previous studies[3,6,7], this study found that most of the older adults did not require skin grafts due to burn injuries; however, they required more intensive care than the other age groups. Combination dressing materials were the most common type of dressing material used in this study. In the early stages of burn injury care, conventional dressings; such as, silver sulfadiazine or ointment were used. This was because the care providers needed to monitor the wound's progress every day. However, once the burn wound was stabilized, they switched to advanced dressings; because they can shorten hospital stays, ease pain, reduce staff workload and enhance quality of life. Advanced wound dressing in group 1 (0–14 years old) typically used hydrofiber, while groups 2 and 3 (over 15 years old) typically used Acticoat. This is because in adults, care providers want to change the wound dressings every 5–7 days, and Acticoat adheres more to wounds when it is time to change the dressing. Additionally, this requires both patient cooperation and time to remove the old dressing. However, children rarely cooperate when it came time to change their dressing, and even though the hydrofiber had changed to a jelly form, making it simple to remove, they were still required to be changed every 3 to 4 days.

The average hospital stay was approximately seven days. In addition, patients over the age of 60 years were typically admitted to intensive care units. Consistent with this study's findings, the elderly over 60 years had more body areas affected by burn injuries than the other age groups, making their symptoms more severe than those of other age groups. However, the risk factors for intensive care unit admission in patients with burn injuries may require further investigation. The majority of post-treatment conditions for burn injuries were treated at home; except for two patients who were referred to the primary hospital for additional care due to comorbid diseases.

Most scars in this study were managed with conventional methods; such as, a pressure garment or silicone application. Children with keloid or hypertrophic scars received medical treatment with steroid injections, while patients with scar contracture deformity, ectropion, and organ functional deficits underwent surgery with scar release and coverage.

Limitations in this study were the retrospective nature of this study, which posed limitations in terms of data gathering. Additionally, the lack of case fatality may make longer-term research necessary to address the issue.

Conclusion

According to studies, educating health care professionals and locals is crucial for preventing burn injury in children under 14 years old from boiling water, and adults should be careful around fire and heat. Furthermore, burn injuries are more severe in the elderly than in other age groups.

Acknowledgement

This research was supported by the Department of Surgery at Yala Hospital, the ward staff of the burn injury unit care, and the faculty members in plastic surgery and preventive medicine.

Conflict of interest

The authors declare no conflicts of interest in this study.

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