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The Magnitude, Clinical Presentation and Consequences of Patients with Burn Injuries Admitted to Tertiary Care Hospital, Kurunegala, Sri Lanka: A Prospective Analysis



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عدد المرضى المصابين بحروق ممن تم قبولهم في مستشفيات الرعاية من الدرجة الثالثة في كورنيغالا بسيرلانكا،

والعرض السريري لهم والتبعات التي تعرضوا لها: تحليل استطلاعي

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Abstract

This prospective analysis is based on clinical forensic examinations and clinical case records of the victims who sustained burns and were admitted during a one-year period since 2017.

Of the 90 patients (34 children and 56 adults), 54 % were male with ages ranging from 1 month to 80 years. Males below the age of 20 years (48 %) were highly vulnerable. Education status revealed that most of the patients have an education level below O/L representing 52 % (Ordinary Level/ O/L is similar to the General Certificate of Secondary Education/ GCSE in Cambridge Education System in United Kingdom) and the majority were married (52%). Scalds were seen in 52 %, while flame burns in 28 % cases. Most of the incidents had taken

المستخلص

يعتمد هذا التحليل المستقبلي على الفحوصات الجنائية السريرية وسجلات الحالات السريرية للضحايا الذين تعرضوا لحروق وتم قبولهم خلال فترة عام واحد منذ 2017. ومن بين 90% من المرضى (الذين كان عددهم 34 طفلاً و56 بالغاً)، شكل الذكور نسبة 54% وتراوحت أعمارهم بين شهر واحد و80 عاماً. حيث كان الذكور الأقل من 20 عاماً (48%) معرضين لمخاطر شديدة. فقد كشفت حالة التعليم أن غالبية المرضى مستواهم التعليمي أقل من المستوى العادي ويشكلون نسبة 52% (المستوى العادي "O/L" مشابه للشهادة العامة للتعليم الثانوي المسماة اختصاراً "GCSE" في نظام كامبردج التعليمي في المملكة المتحدة) وغالبيتهم كانوا متزوجين (نسبة 52%). ولوحظ وجود سفعات في نسبة 52% من المرضى، بينما كانت هناك حروق ناتجة عن اللهب في نسبة 28% من الحالات. وقد وقعت غالبية

Keywords: Forensic Science, Burns, Forensic Analysis, Injury Pattern, Paediatric Age, Risk Factors

الكلمات المفتاحية: علوم الأدلة الجنائية، الحروق، التحليل الجنائي، نمط الإصابة، عمر الطفل، عوامل الخطر



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place at home (92%). Burn injuries were most frequently observed on upper extremities (47 %) and the majority were of first degree in nature. Furthermore, this study revealed that 57 % recovered without any complications, while 34 % resulted in scarring or disfigurement.

It was highlighted that children are the most vulnerable to in sustaining burns, especially with hot water in domestic settings. The study recommends increasing awareness among parents/guardians regarding safe handling of hot water to minimize such incidents.

الحوادث في المنازل (92%)، ولوحظ أن إصابات الحروق غالباً ما تكون في الأطراف العلوية (47%) وغالبيتها كانت من الدرجة الأولى. علاوة على ذلك، كشفت هذه الدراسة أن نسبة 57% من الحالات قد تعافت دون أي مضاعفات، في حين تعرض 34% لندوب أو لتشوهات. كما أبرزت الدراسة أن الأطفال كانوا الأكثر عرضة لمخاطر الحروق، لا سيما تلك الحروق الناتجة عن الماء الساخن في البيئات المنزلية. وبالتالي توصي الدراسة بزيادة مستوى الوعي بين الآباء أو الأوصياء فيما يتعلق بالتعامل الآمن مع الماء الساخن للحد من هذه النوعية من الحوادث.

1. Introduction

Though fire has been the most useful agent in the evolution of humankind, it has also proved to be one of the most destructive agents. Burns are common in developing countries than in developed countries [1, 2]

According to the source, burn injuries are categorized as cold burns (frostbite), dry burns (e.g. flame burns, burns caused by heated objects, flash burns, and radiation burns) and moist burns (e.g. scalds) [3]. The circumstance of the burn injury could be accidental, suicidal, or homicidal [4]. Most of the accidental burns are preventable and there are vulnerable groups such as those with epilepsy, ischemic heart disease, cerebrovascular accidents, alcoholics, disabled, and extremes of age. The severity of the burn injuries could range from very minor to life-threatening [5,6].

The prognosis of the burn injury depends on the total body surface area affected by the burn, the depth of the burn [7], age, built, nutritional status and other natural illnesses of the victim, and other circumstantial injuries caused by falling masonry and poisonous gas inhalation, etc. [8,9].

Most of the patients who suffer from burn injuries have to be resuscitated with intravenous fluids, blood, and products of blood [10]. Subsequently, they have to undergo surgical procedures, like multiple wound toilets and skin grafting, resulting in prolonged hospital stay [11].

Burns are regarded as a major health and economic

concern worldwide as it has serious outcomes, requiring long hospital stay at a huge cost to self and government leading to permanent disabilities with consequent loss of manpower and burden the society [12].

In Sri Lanka, most of the accidental burns are preventable as they occur due to the persistent use of traditional unsafe oil lamps [13]. Moreover, peaks of admissions due to fireworks during festival seasons remain prevalent. Burns can be considered as one of the most common causes of morbidity and mortality in the world and it can result in physical damage, significant disfigurement, loss of working capacity, psychological problems, and considerable economic problems. However, studies related to burns addressing this area are lacking in Sri Lanka and this leads to poor implementation of a preventive program among vulnerable populations. Prevention of burns is considered the best strategy to reduce this overall burden. Therefore, it is vital to have a better understanding of burn injuries. Therefore, we are inspired to evaluate the magnitude, clinical presentation, and outcome of patients with burn injuries admitted to Teaching Hospital Kurunegala, Sri Lanka

2. Materials and Methods

This prospective descriptive study was conducted on patients who were admitted to Teaching Hospital Kurunegala with burn injuries. This study was carried out on the findings of the clinical forensic examination and the information of clinical case records supported by

data collection sheets of examinees. The study period was for thirteen months, from March 2017 to March 2018. All the patients who were admitted with burn injuries during the study period were enlisted in the study.

However, patients who were having injuries that were inconsistent with burns, following traditional treatment, incomplete or unclear clinical presentation on admission were excluded from this study.

After applying the exclusion criterion, the resulting sample size was 90. A data collection sheet was formulated as the data collection tool and data were collected using a questionnaire. The socio-demographic profile and injury pattern of the individuals were included in the study and informed written consent of examinees/ next of kin was obtained during the study. To maintain accuracy, 10% of the records were cross-checked against hospital medical records. Data were analyzed using Microsoft excel 2013 and Statistical Package for Social Sciences (SPSS version 22). Ethical approval for this project was granted by the Teaching Hospital, Kurunegala, Sri Lanka (PGH/HIRU/ERC/2019/1).

3. Results

3.1. Socio-demographic profile

3.1.1. Age and gender

During the study period, 5475 patients had visited

Teaching Hospital Kurunegala. Among those, 2% (n=90) had sustained a burn injury. Within the study population of 90 patients (34 children and 56 adults), 54% were male, ages ranging from 1 month to 80 years. It was observed that patients below the age of 20 years (48%) were highly vulnerable to burns and among them, the majority were below 10 years (38%). Burns were highest among males, aged between 0-11 years (20%) and more female victims were seen after the age of 60 years (Figure-1).

3.1.2. Educational level

Results revealed that most of the patients had an educational level below O/L (52%) and approximately 22% of the individuals have been educated up to A/Ls according to the Sri Lankan school education system (Figure-2).

[Ordinary Level/ O/L is similar to the General Certificate of Secondary Education/ GCSE and Advanced Level/ A/L is similar to the General Certificate of Education Advanced Level /GCE A/L in Cambridge Education System in the United Kingdom]

3.2. Pattern of burns

3.2.1. Causative agent

Analyzing the causative agent of burns, scalds (moist

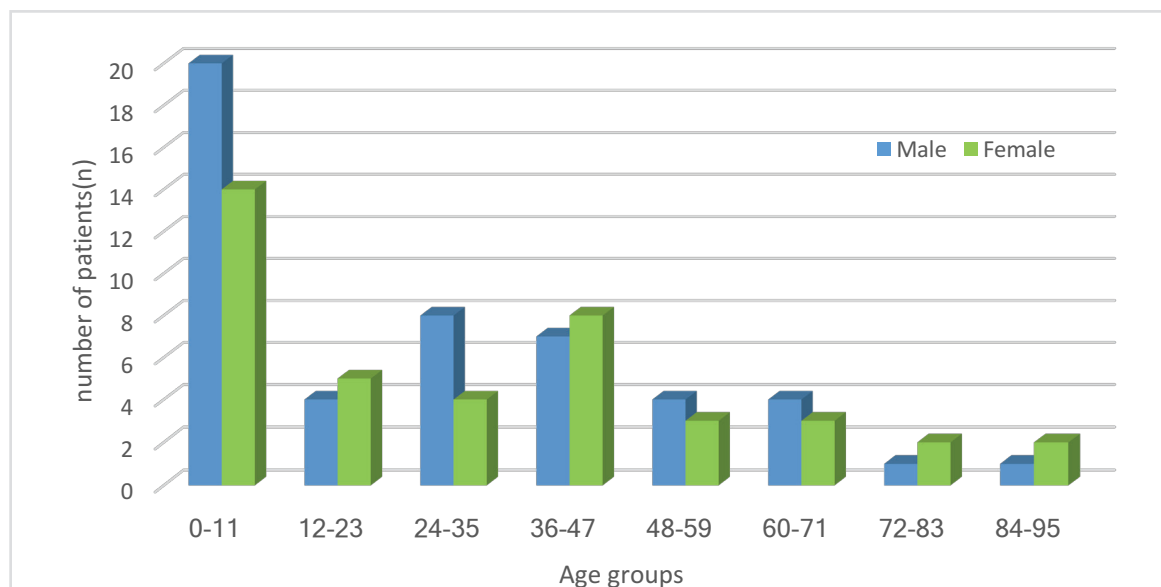


Figure 1- Burn injuries among the different age groups (years) and gender.

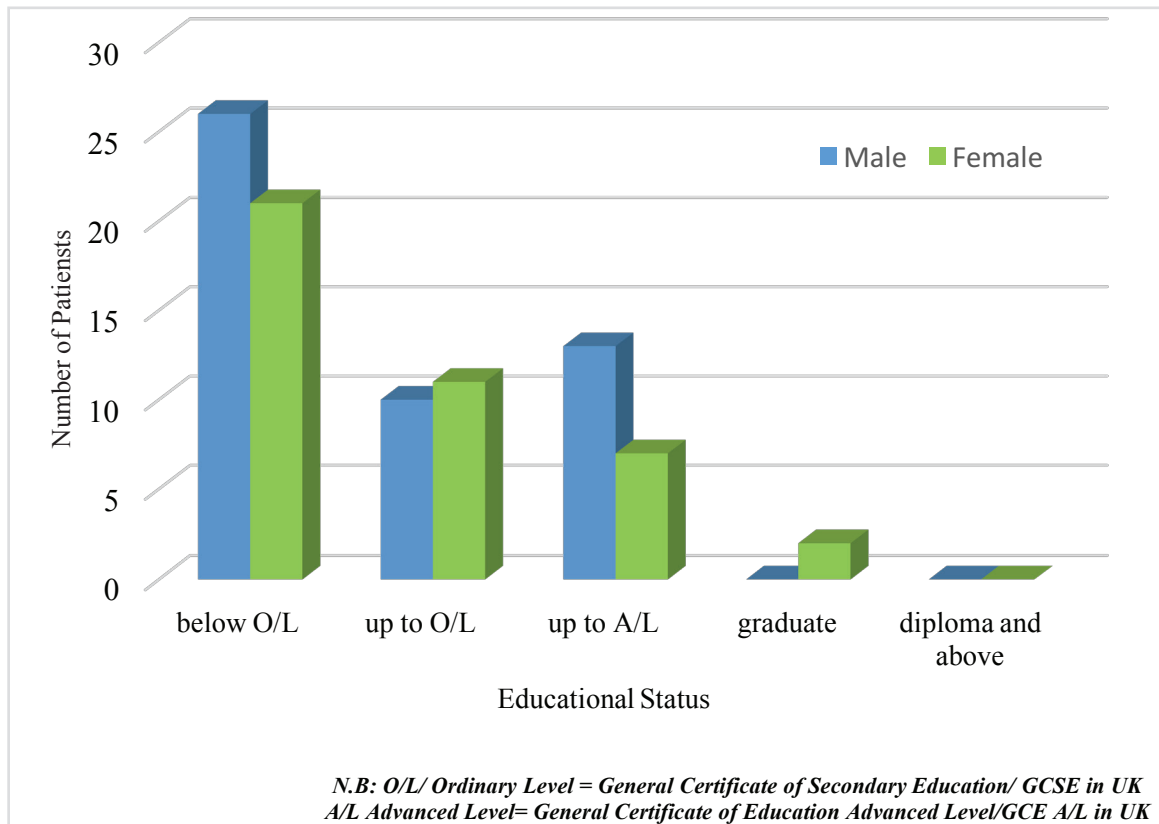


Figure 2- Burn injuries among the patients according to the educational status.

burns) were seen in 59% of cases, while flame burns appeared in 28% of cases. Other causes (13%) included electricity, chemicals, melted polythene/melted plastic bottles, charcoal, hot oven, hot stones, etc.

3.2.2. Setting of injury

Most of the incidents had occurred at home (92%) in which the majority had taken place in the kitchen (70%), followed by the workplace (3%). Few had taken place at temples, churches and on the road.

3.2.3. Anatomical location, severity, outcome, and manner

The majority of the victim (47 %) sustained burns on upper extremities combining with other regions (Figure-3). Furthermore, it was revealed that most patients (83.3%) were with burns less than 20% of total body surface area (TBSA) and 9% were having 21-40% of TBSA. There was one death with 2% TBSA and it was in a diabetic patient who came late to the hospital with an infected burn injury with severe sepsis.

Table 1- Outcome of the patient after burn injury vs circumstances of burn.

Manner of Burns	Recovery without any complication	Contracture	Scarring or disfigurement	Contracture, scarring and disfigurement	Scarring disfigurement with impaired vision	Death
Accidental	51.1 % (46)	0 % (00)	15.6 % (14)	1.1 % (01)	0 % (00)	1.1 % (01)
Suicidal	2.2 % (02)	0 % (00)	8.8 % (08)	0 % (00)	0 % (00)	2.2 % (02)
Homicidal	3.3 % (03)	0 % (00)	10.0 % (09)	0 % (00)	1.1 % (01)	3.3 % (03)
Total	57.0 % (51)	0 % (00)	34.0 % (31)	1.1 % (01)	1.1 % (01)	6.7 % (06)



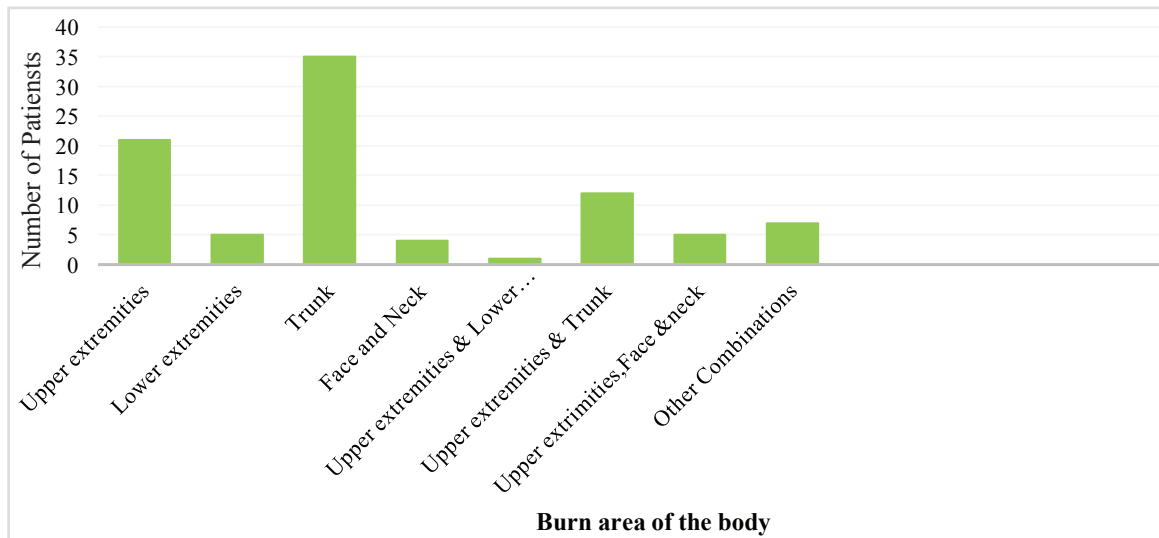


Figure 3- Anatomical Location of burn injuries.

Half of the patients (50%) spent 30 minutes to 1 hour to seek medical attention. Furthermore, this study revealed that 57% of the injured patients recovered without any complications while 34% resulted in scarring or disfigurement and 6.7% were fatal.

The current study revealed that 69% had accidental burns, 13% had self-induced/suicidal burns, while 17% had assault/homicidal burns. It was observed that accidental burns were highest among the age group of 0-11 years (27.7%), while suicidal and homicidal burn injuries were highest among the age groups of 24-35 years (5.6%)

and 36-47 years (5.6%), respectively. Analysis of the correlation between the circumstances of burn with the age revealed that accidental burn injuries decreases with age (Figure-4). Accidental cases are common among females (41.1%), while suicidal (7.8%) and homicidal (12.2%) cases are commoner in males (Figure-5). Furthermore, it was observed that the percentage of fatal outcomes was highest among the cases with burns due to assault/homicidal intention (3.3%), followed by burns due to suicidal intention (2.2%) (Table-1).

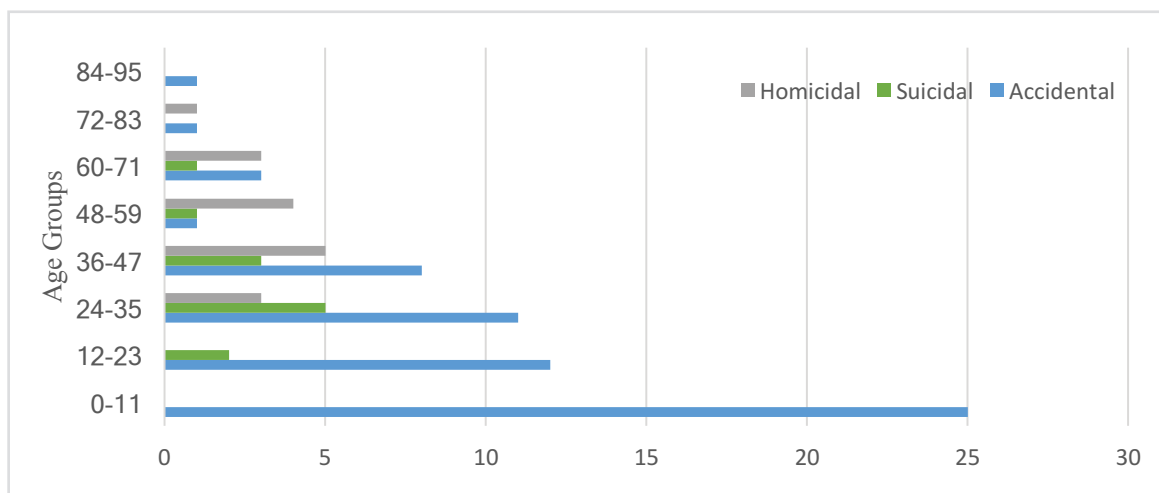


Figure 4- Manner of burns related to the age.

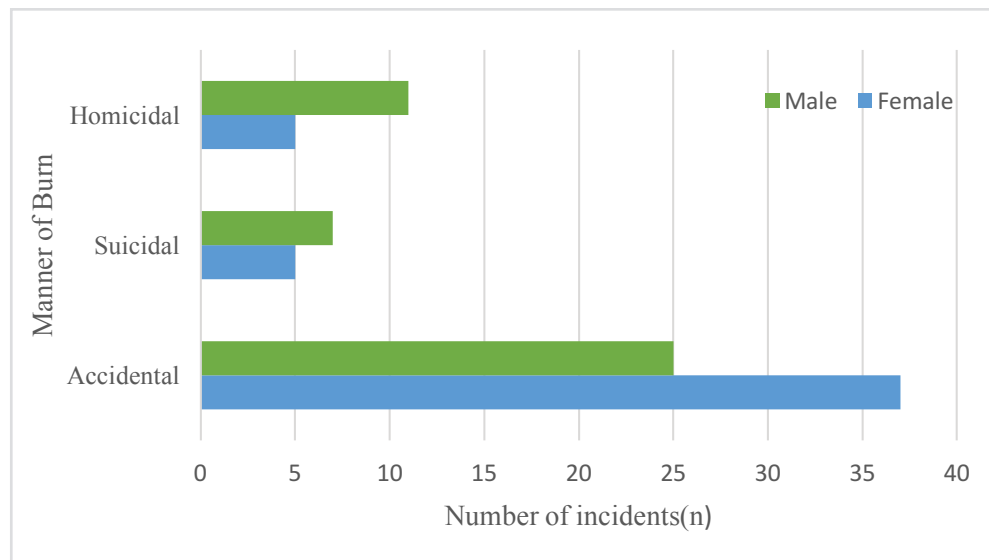


Figure 5- Manner of burns related to gender.

4. Discussion

The current study revealed a greater risk of burn injuries in the young age and male gender in this study population. It was observed that the frequency of burn injuries concerning age and gender does not differ greatly from most of the other similar studies in the literature. The male gender is more frequently injured and is similar to other studies done in South Asia and China [8, 14-19].

It is highlighted that victims below the age of 20 years were highly vulnerable to burns and majority among them were below the age of 10 years. This is consistent with previous studies done in Asia, Africa, and South America [15, 16, 20-24].

A similar study conducted in South Africa revealed that children have a higher burn incidence than adults [25]. Burn injuries in children is a significant public health concern and represent an extremely painful experience for both the victim and their families. However, several studies in Europe and South Asia have shown that burn injuries occur frequently in men at young adult age [26-29]. Some of the studies showed a high predominance in elderly females [26,27-29] and a similar pattern is also seen in our sample, especially, females above the age of 60 years, possibly due to engagement in domestic chores, like cooking with fire-wood. The use of alcohol, the use of faulty and unsafe electrical equipment, low

socioeconomic status, unemployment, housing without proper health and safety measures are all reported as risk factors for burn injuries [28, 30]. However, those factors were not included in our study, but the educational level was assessed.

Majority of our cohort, educational background of victim or the family environment had below ordinary level (O/L) qualification (which is similar to the General Certificate of Secondary Education (GCSE) in Cambridge, UK system). Proper education regarding burns among this vulnerable group is very important to reduce the morbidity and it is identified in few studies including Shi et.al. and Mashreky et.al. [31, 32].

A similar study conducted by Kolaei et al. in Iran showed that demographic factors such as age and education may have an effective role in the consequences of burns and a higher number of burns was observed in patients with a low level of education [33].

In several countries, the prevalence of burns in children depended on numerous socio-demographic factors such as low income, living in underprivileged regions, young parents, and single-parent families [34].

The current study has shown that scalds are more frequent, followed by flame burns. These results correlate with most of the other European and Middle-East-

ern studies [35- 37]. One reason is that the majority of our victims belonged to the pediatric age group. Some Iranian and Turkish studies showed flame burns are the commonest type of burns [38, 39], but it was less than one-third of total burns in the present study.

The unsafe environment in the kitchen and carelessness due to low education was found to be responsible in most of the cases. According to the American Burn Association Reports (2000– 2017), the proportion of burn center admissions due to scald burns has continued to increase each year (from 29.8% to 34.7%). These reports highlight that scald burns comprise 35% of overall burn injuries admitted to U.S. burn centers and 61% of these were sustained by children less than 5 years of age [40].

The current study showed that most of the incidents had taken place at home followed by the workplace. This observation is consistent with the findings of other similar studies, especially which were done in Europe [36, 37, 41- 44].

According to the World Health Organization 2018 reports, burns occurred mainly at homes and at workplaces. Moreover, community surveys in Bangladesh and Ethiopia [25] showed that 80–90% of burns occurred at home. Children and women are usually burned in domestic kitchens [44-46], from disturbed receptacles containing hot liquids or flames or from cooking explosions. A similar finding was observed in our cohort as well. Furthermore, pre-school children form a vulnerable group for scalds, as they can move around and spend most of their time in their homes with grandparents who are weak to watch them. Besides, children are often left unattended at home, playing in the vicinity of the kitchen, which leads to the spilling of hot liquids or foods. Men are most likely to get burnt in the workplace due to fire, scalds, chemical, and electrical burns.

The upper extremity is more vulnerable than other regions of the body and a similar pattern was seen in several similar studies, including a study by Aksoy et.al [47,48]. This pattern is mainly due to the handling of burning agents manually and most of the time, the circumstance is accidental.

Furthermore, the current study identified that the majority sustained burns less than 20% TBSA. This is in parallel with previous studies conducted in low and mid-

dle-income countries [49, 50].

It was observed that the TBSA of burn-related fatalities ranged from 25% to 80%. As expected, it was revealed that an increase of the TBSA of the burn led to an increased risk of mortality among victims. There was one death with only 2% total body surface area, however, it was in a diabetic patient who presented late to the hospital with a burn site infection resulting in severe sepsis. These findings are consistent with other studies which analyzed the etiology and outcome of burns in different geographical areas of the Middle-East, Africa, and Asia [51-54]

The extent and magnitude of scarring is directly related to the severity of the burn injury. Post-burn scars are unavoidable, even when managed with the best care [55] and it was seen in 45. 6% in our cohort.

Contractures are another common complication following severe burns according to Schneider et al. [56] and it was around 1.1% in our study.

Our study highlighted the accidental burns were highest, followed by assault/homicidal burns and self-inflicted/suicidal and it is consistent with previous studies [57, 58]

The self-inflicted/ intentional burns were 13% in our study, but this fraction is striking in some demographic areas like Iran, Egypt [59-62].

A similar study conducted among burn patients in Batticaloa, Sri Lanka in 2011 showed that the majority of burns occurred accidentally [13]. Accidental burns in the current study were mainly scalds among children in a domestic setup, due to the poor socio-economic and educational status. Concerning suicidal burns, the study conducted in Batticaloa of Eastern Province of Sri Lanka shows a higher suicidal burn rate than the current study. This may be due to the study being carried out in 2011 when Sri Lanka was affected by war [13]. Furthermore, the current study was confined primarily to the Kurnegala area, which does not fully represent the multi-ethnic, cultural, and socio-economic groups in the island.

It was observed that the percentage of fatal outcomes was higher in burns due to assault/homicidal intention, followed by suicidal burns. The lowest percentage of fatal outcomes was in accidental burns in this study pop-

ulation. These results are on par with mortality rates reported in a study carried out in Brazil, concerning total mortality rate and mortality rate in accidental burns [63]. The amount of the affected TBSA, improper pre-hospital interventions, and delay in presentation play a significant roles in events leading to higher fatalities of victims due to intentional burns. Furthermore, the current study shows that TBSA in burn-related fatalities range from 25% to 80%, except for one death with 2% burns, complicated by pre-excising disease and delayed presentation

We believe that results of this study highlighted the issue of burn injuries in Sri Lanka. Our study is based on burn cases presented to a teaching hospital, Sri Lanka and the findings can be generalized to the national level to improve primary care services and burn prevention interventions.

There are a few limitations to the current study. The present study was conducted at a teaching hospital and it is recommended to collaborate with many health facilities of the country at regular intervals for better results and identifying the trends. Furthermore, this analysis does not include the cases admitted into private health institutions.

5. Conclusion and Recommendation

It is highlighted that children are the most vulnerable to sustain burn injuries especially with hot water in a domestic setting. It is recommended that raising awareness among parents/guardians regarding safety precautions and safe handling of hot water is important to minimize such injuries. Moreover, effective awareness programs should be tailor-made to the population most vulnerable to such hazards. Awareness can be created through intensive campaigns such as media advertisements and public outreach programs. Special attention should be given to the training of the general population in giving proper first aid to a burn victim.

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Conflicts of interest

There are no conflicts of interest

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