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# Prevalence and Treatment Outcome of Burn Injury among Pediatric Patients Attending Pediatric Emergency OPD of Hawassa University Comprehensive Specialized Hospital, Hawassa, Southern Ethiopia

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## *Abstract*

***Background:*** *Burn injury is one of the most common and devastating forms of trauma and a major health problem of pediatric morbidity and mortality worldwide resulting in substantial physical, psychological and economic loss. Burn-related injuries are a significant burden in children, particularly in low and middle-income countries (LMICs), where more than 90% of burn-related pediatric deaths occur [1]. The aim of this study was to assess the prevalence and treatment outcome of burn injury among pediatric patients attended pediatric emergency OPD of Hawassa University comprehensive specialized hospital, Hawassa, Southern Ethiopia.*

***Methods:*** *A hospital-based retrospective cross-sectional study was conducted from May 01 to Jun 30, 2018 on a sample of 395 patient medical records who were treated from burn injury for five consecutive years from September 2012 to September 2017. The patient records were selected using systematic random sampling and pretested structured checklist was used to collect the data. Data entry was done using EPI Info 3.5.4 and exported to SPSS version 20.0 software package for analysis.*

***Results:*** *In this study, the five years' prevalence of burn injury among pediatric patients attended at emergency OPD of Hawassa University comprehensive specialized hospital was 9.79% (95% CI: 5.9–13.7). Majority (62.5%) of burn injury affected children aged 0–5 years and the prevalence of burn injury decrease as the pediatric age increase in this study. Almost all burn injury occurred at home (97%), accidental (94.2%) and the most common cause was scald (59.7%). More than half (56.7%) of the children suffered from second degree burn. About 10–20% burned total body surface area was common and faced by 47.1% children. Almost two-third (74.4%) of the victims recovered without complication and six of them died.*

***Conclusion:*** *The prevalence of burn injury among pediatrics was high relative to other findings.*

***Keywords:*** *Prevalence, burn injury, pediatrics, Ethiopia*

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## INTRODUCTION

Burn injury is one of the most common and devastating forms of trauma and a major health problem of pediatric morbidity and mortality worldwide resulting in substantial physical, psychological and economic loss. Burn-related injuries are a significant burden in children, particularly in low and middle-income countries (LMICs), where more than 90% of burn-related pediatric deaths occur [1].

In Africa, children under the age of five years have almost three times the incidence of burn deaths than children worldwide. The burden of burn injury is highest among those children who live in poverty. In sub-Saharan Africa, it was estimated that between 18,000 and 30,000 children under the age of 18 years die annually because of burn-related injuries [2].

Recently, burns have risen to be a major cause of morbidity and mortality in LMICs ranking 4th among all injuries. It accounts for 1.1 per 100,000 of the global burden of diseases and causes more than 265,000 deaths in developing countries annually [2, 3].

Thermal burns are the most common type of burn injury in children under 4 years of age and are often associated with destructive

  

consequences. Such injuries are largely preventable, and the implementation of preventive and safety protocols would prevent the occurrence of most of these events [4].

Burns are generally preventable. Treatment depends on the severity of the burn and superficial burns may be managed with little more than simple pain medication, while major burns may require prolonged treatment in specialized burn centers.

There are so many factors related to outcome of burn injuries, such as preexisting medical condition, extent of burn injury, cause of burn injury, management and depth of burn injury.

The most common complications of burns involve infection, tetanus, contractures, scar and death. Since many burns that occur in the first two decades of life are accidental and preventable, there is, still insufficient published data concerning the prevalence and treatment outcome of burn injury among pediatric in Ethiopia in general and in Hawassa in particular.

## METHODS

### Study Design, Study Periods and Study Area

A hospital-based retrospective cross-sectional study was conducted from May 01–June 30, 2018. Hawassa is situated at the eastern shoreline of Lake Hawassa and is located 275 km to south of Addis Ababa, the capital city of the country. Hawassa University comprehensive specialized hospital is located in south part of Hawassa town. Hawassa University comprehensive and specialized hospital has been treating patients from especially Sidama zone and from neighboring Oromia region and it is the only hospital giving breast cancer treatment in SNNPR. The services were increased gradually during the past time. Currently the hospital has around 350 inpatient beds; different service giving units including secondary eye unit, physiotherapy unit, ENT unit, dermatology unit, pathology unit, Oncology unit and dental clinic. The hospital is also center for different initiated projects. The vision is to make the hospital a center of training and research for tropical diseases in addition to curative services.

### Sample Size and Sampling Procedure

Sample size was determined by using single population proportion formula with 95% confidence interval, 5% margin of error and adding 5% contingency for illegible handwriting and incomplete medical records.

By using the proportion of prevalence of burn injury (50%) as no published data were obtained from previous study, the sample size was calculated as follows:

$$n = \frac{(z)^2 P(1-P)}{d^2} n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = \boldsymbol{384}$$

Therefore, by adding 5% for possible eligible handwriting and incomplete medical records, the final sample size was =403.

A total of 14, 596 pediatric emergencies were treated at Hawassa University comprehensive specialized hospital for 5 years from September 2012–September 2017 and 1430 cases were burn injury. From 1430 pediatric burn cases, 395 patient medical records were selected using systematic random sampling and eight were rejected because of illegible handwriting and incomplete medical records.

### Data Collection Tools and Procedures

A pretested structured checklist which included sociodemographic characteristics and clinical information was used to collect data.

Data collection tool to review each child's medical record was adopted from previous similar studies [5] and also was developed by investigators. The final approved tool was pretested prior to the actual data collection among 5% of the actual sample size at Adare Hospital, a nearby government hospital in Hawassa, Ethiopia and corrections and adaption of the tool was made including addition of certain important points.

Data were collected from the medical record by four experienced B.Sc. nurses who were working at pediatric emergency outpatient department with data collection experience. The data collectors were trained for one day on data collection methodology and related issues prior to the start of data collection and were closely supervised during the data collection. Filled checklists were checked on daily bases for

completeness, clarity and accuracy. Data cleaning was undertaken before entry and analysis.

### Data Management and Analysis

Data entry was done by using EPI Info 3.5.1 and exported to SPSS version 20.0 software package for analysis. We did descriptive analysis to compute proportions for describing the basic characteristics of the study participant and the prevalence of burn injury. Logistic regression was used to identify factors associated with outcome of burn injury and 95% confidence intervals (CI) was used to judge the presence and strength of association between different factors.

### Ethical Consideration

A written ethical clearance was obtained from the Institutional Review Board at the College of Medicine and Health Sciences of Hawassa University, Hawassa, Ethiopia. Formal letter of cooperation was written to the Hawassa University comprehensive specialized hospital and permission was obtained prior to the beginning of data collection.

***Table 1:*** *Sociodemographic Characteristics of Pediatrics Patients with Burn Injury Attending Pediatric Emergency OPD of Hawassa University Specialized Comprehensive Hospital, Hawassa, SNNPR, Ethiopia, from September 2012–September 2017 (n=395).*

| Sociodemographic characteristics | Frequency | Percent |
|---|---|---|
| **Age (in years)** | | |
| 0–5 | 247 | 62.5 |
| 6–10 | 99 | 25.1 |
| 11–14 | 49 | 12.4 |
| **Total** | 395 | 100.0 |
| **Sex** | | |
| Male | 173 | 43.8 |
| Female | 222 | 56.2 |
| **Total** | 395 | 100.0 |
| **Residency** | | |
| Rural | 285 | 72.2 |
| Urban | 110 | 27.8 |
| **Total** | 395 | 100.0 |

## RESULTS

### Sociodemographic Characteristics of the Study Participants

A total of 395 patients' medical records were selected and the mean age of respondents was 6.3 years. The most burn-affected age group was 0–5 years (62.5%) and the prevalence of burn injury decreased as the pediatric age increased in this finding. Female victims were (56.2%) and majority of them were from rural areas in residency (72.2%) (Table 1).

***Table 2:*** *Characteristics of Burn Injury of Pediatrics Patients Attended Pediatric Emergency OPD of Hawassa University Specialized Comprehensive Hospital, Hawassa, SNNPR, Ethiopia, from September 2012–September 2017 (n=395).*

| Characteristics of burn injury | Frequency | Percent |
|---|---|---|
| **Motive of burn injury** | | |
| Accidental | 372 | 94.2 |
| Intentional | 23 | 5.8 |
| **Total** | 395 | 100.0 |
| **Place of burn injury** | | |
| Home | 383 | 97.0 |
| School | 5 | 1.3 |
| Street | 7 | 1.8 |
| **Total** | 395 | 100.0 |
| **Anatomic location of burn injury** | | |
| Upper extremities | 89 | 22.5 |
| Upper extremities and anterior trunk | 41 | 10.4 |
| Upper extremities and posterior trunk | 14 | 3.5 |
| Lower extremities and perineum | 39 | 9.9 |
| Lower extremities | 67 | 17.0 |
| Anterior trunk | 38 | 9.6 |
| Posterior trunk | 26 | 6.6 |
| Upper and lower extremities | 24 | 6.1 |
| Anterior and posterior trunk | 15 | 3.8 |
| Head, neck and face | 33 | 8.4 |
| Head | 9 | 2.3 |
| **Total** | 395 | 100.0 |
| **Depth of burn injury** | | |
| Superficial thickness/1$^{st}$ degree | 134 | 33.9 |
| Partial thickness/2$^{nd}$ degree | 224 | 56.7 |
| Full thickness/3$^{rd}$ degree | 37 | 9.4 |
| **Total** | 395 | 100.0 |
| **% of total surface area of burn injury** | | |
| 5–10% | 163 | 41.3 |
| 11–20% | 186 | 47.1 |
| 21–30% | 38 | 9.6 |
| 31–40% | 8 | 2.0 |
| **Total** | 395 | 100.0 |

### Prevalence of Burn Injury

A total of 14, 596 pediatric emergencies were treated at Hawassa University comprehensive specialized hospital for 5 years from September 2012–September 2017 and 1430 cases were

burn injury therefore, the 5 years' prevalence of burn injury among pediatric patients was (9.79%) (95% CI: 5.9–13.7).

**Characteristic of Burn Injury**

Majority of victims suffered from accidental burn injury (94.2%) while 5.8% were established as intentional and almost all (97.7%) burn injury occurred in home. Upper extremities were the more affected body part by burn injury (22.5%). About 56.7% of children suffered from partial thickness (second degree burn) and 47.1% of them suffered from 11–20% total body surface area (Table 2).

The most common cause of burn injury for the overall age group was scald (59.7%). Also the result of this study showed that the magnitude of cause of burn injury is different in different age group. Scald was common in age group 0–5 years old (73.7%), chemical for 6–10 (40.0%) year age group and electricity for 11–14 (66.7%) year age group (Figure 1).

**Clinical Presentation and Hospital Management of Burn Injury**

Victims presented with shock to the emergency were (8.9%) and with loss of consciousness (10.6%). Majority of the respondents (83%) stayed home for 30 minutes to 6 hours before getting medical advice and 47.6% have got prehospital first-aid intervention and cold water and egg were applied to 34.9% of burn victims.

Majority of them (24.6%) stayed 11–20 days and 3.5% of the victims stayed more than 2 months in the hospital for burn treatment. Most of the victims (63.8%) received antipain, fluid, TAT, antibiotics and wound care without surgery and the rest (36.2%) received additional surgical intervention. From surgical interventions, debridement alone (38.3%), contracture release (15.8%), skin graft (13.1%) and Fascioctomy (4.6%) were intervened.

**Treatment Outcome of Burn Injury**

Concerning treatment outcome of burn injury, majority of victims (74.4%) recovered without complication, 22.8% developed scar and six of them died during treatment giving the mortality rate (1.5%) (Figure 2).

Mortality rates related age of the patient 0–5, 6–10 and 11–14 years old were 66.6%, 16.6% and 16.6%, respectively and there was significant association between treatment outcome and age of the patient ($p<0.005$).

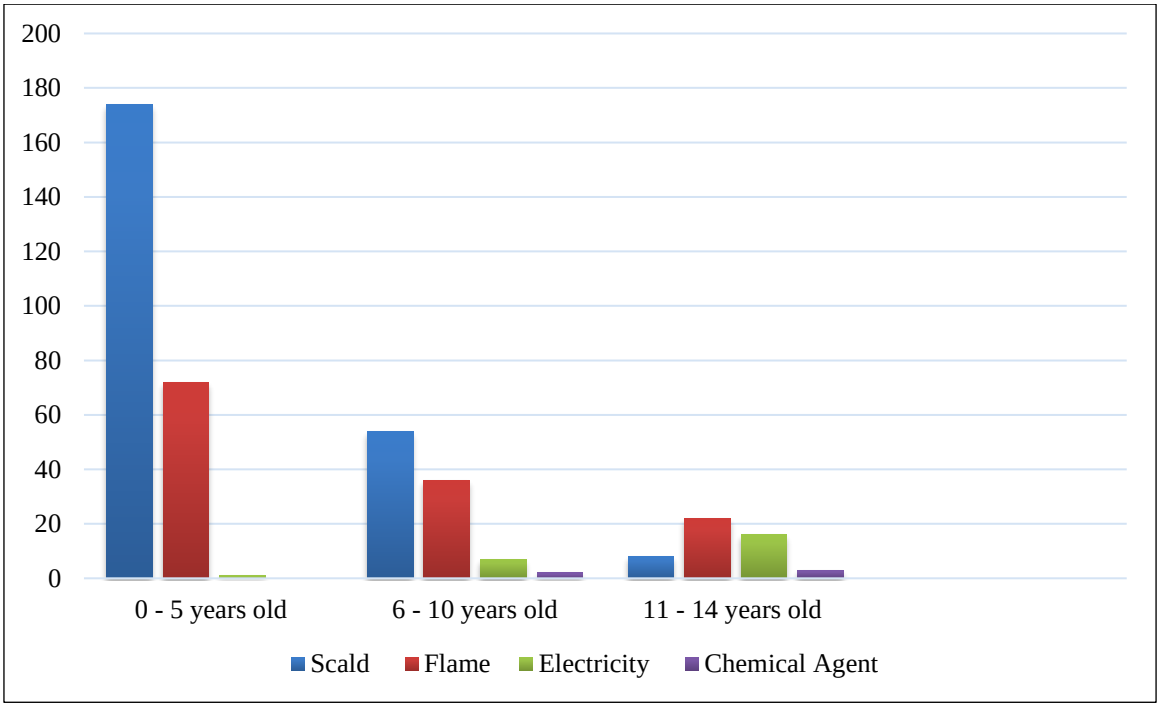


***Fig. 1:*** *Cause of Burn Injury of Pediatrics Patients with Burn Injury Attending Pediatric Emergency OPD of Hawassa University Specialized Comprehensive Hospital, Hawassa, SNNPR, Ethiopia, from September 2012–September 2017 (n=395).*

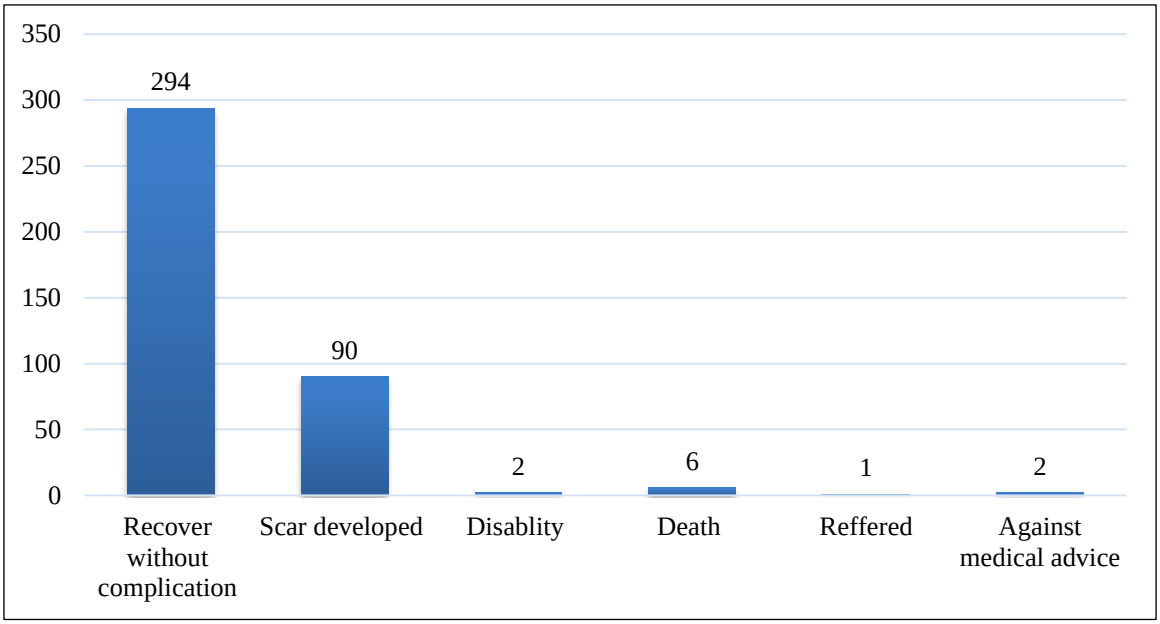


***Fig. 2:*** *Treatment Outcome of Burn Injury of Pediatrics Patients with Burn Injury Attending Pediatric Emergency OPD of Hawassa University Specialized Comprehensive Hospital, Hawassa, SNNPR, Ethiopia, from September 2012–September 2017 (n=395).*

Recovery without complication related with chemical agents, scald, flame and electrical burns were 100%, 78.4%, 71.5% and 45.8%, respectively and there was no significant association between treatment outcome and cause of burn ($p = 0.38$).

Mortality rates associated with superficial, partial thickness and full thickness were scalding, flame and electrical burns were 0%, 25% and 75%, respectively and there was significant association between treatment outcome and depth of burn injury ($p < 0.005$).

## DISCUSSION

This study gives information about prevalence and treatment outcome of burn injury among pediatric patients admitted to the stated hospital. Burns are a major cause of unintentional injuries to children particularly in developing countries. Burn injuries as a cause of childhood mortality as well as the impact on quality of life in terms of negative cosmetic and psychosocial effects make them a major public health concern.

The result of this study discovered the prevalence of burn injury among pediatrics was (9.79%) relatively lower than a five-year prevalence of burn injury in Kenya was (19.2%) [5]. The difference might be due to setting, time and sample size.

The results of this study showed that the most affected children by burn injuries were those aged between 0 and 5 years old, thus making them the primary targets for prevention. These findings could be explained by the fact that in this age children do not notice what is harmful to them. This is in line with studies done in Kenya [6] and Tanzania [7]. A lack of awareness of potentially dangerous situations and substances amongst young children is a likely contributing cause. Inadequate parental/caretaker supervision in most circumstances where children are left unattended near fireplaces and hot fluids could explain the high incidence of burns in this group.

The results also showed similar sex distribution indicating that burns in children is not influenced by sex.

This study showed that almost all burn injuries are accidental (94.2%). This is in line with studies done in Kenya (98.5%) [6] and Tanzania (97.5%) [7]. Inadequate supervision of young children as reflected by our results is probably also has a negative effect. A small proportion of children (5.8%) suffered from intentional burn injury similar with the study done in South Africa as (5.7%) of burn as reported to be by parents, guardians or relatives

as a way of punishment, revenge, child abuse or false beliefs [8].

Almost all (97%) burn injuries occurred at home, in accordance with studies done in other centers of developing countries [9, 10]. This may indicate that a lower socioeconomic status reflects a lower standard of home safety in developing countries including Ethiopia.

Similar to another study done in Mekele Ethiopia [11], most patients had burn injuries involving multiple sites. The results showed that the most common sites were the upper (22.5%) and lower (17.0 %) extremities. This was in line to the study done in Mekele Ethiopia [8] and other studies done in Istanbul, Turkey [12]. The mechanism of injury is likely to be due to younger children or toddlers have a tendency to reach for objects on their hands resulting in spillage of hot liquids onto upper limbs.

Full-thickness/3rd degree burns were identified in only 9.4% of victims similar with the study done in north India (8.6%) [13]. Third degree burns result when the child can't be saved in time, resulting in extended period of contact with the cause of burn.

Almost half (47.1%) of pediatric patients suffered with moderate burn injury meaning 11–20% total body surface area and the finding is in line with different studies as majority of pediatric patients sustained burns involving less than 30% total burn surface area (TBSA) [14,15].

Similar to several studies [10, 11, 16, 17], scalds were the commonest cause of burns which ranged from 56.1–70%. The majorities were due to hot liquids indicating a health and safety issue in cooking areas such as kitchens so improved supervision must be emphasized in these areas.

In this study only 47.6% pediatrics burn victims have got prehospital/first-aid intervention lower than Indian finding (54.9%) and the difference may be due to setting, knowledge and skill of the parents. The finding points to a need for reinforcement of basic first aid intervention among household members and other caregivers to reduce morbidity and complication caused by burn injuries [13].

According to this study, about 36.2% received additional surgical intervention in line with the study done at tertiary center in a low income country (35.23%) [18].

This study identified that 74.4% patients recovered without complication which is lower than the study done in south eastern Nigeria (86%) [19]. The difference might be due to there is no special pediatric burn unit with modern management and specialized physician in burn care in Hawassa University comprehensive specialized hospital indicating healthcare facilities should be improved.

In this study, the total mortality rate was 1.5% which was lower than studies conducted in Turkey (4.3%) [20], south eastern Nigeria (3.8%) [19], Liberia (14.2%) [21] and Angola (9.1%) [22]. The difference might be due to setting, sample size and time of study period.

## LIMITATION OF THE STUDY

This study was subjected to the usual limitations of a retrospective study. Additionally, patients who didn't admit to the pediatrics emergency were not included in the study.

## CONCLUSION

Our results were similar to other studies in literature especially from developing countries for burns in the pediatric age group.

This study shows that childhood burn injuries are a challenging problem in our setting and a major cause of pediatric trauma. Children aged below 5 years were commonly affected with no sex difference. Most of these injuries were accidental; occur in the home setting with scald injuries comprising the majority. Although most of these injuries are relatively minor, they largely result in hospitalization which impacts the economy at individual, institutional and national level. Morbidity of burn injuries further extends into physical, social and psychological aspects of life due to their deleterious effects on function and cosmetic.

Prevention should be the primary area of focus. Based on the patterns of burn injuries shown by

 

the results of this study, this may take the form of health and safety education to parents and other caregivers with the aim of improving safety in the home environment as well as quality of child supervision. First-aid administration is a necessary skill for all individuals to have and may reduce morbidity as well as enable appropriate and timely treatment of these patients.

## DECLARATION

## LIST OF ABBREVIATIONS

WHO: World Health Organization; LMIC: Low-to-Middle Income Countries; IRB: Institutional review board of Hawassa University; SNNPRS: Southern Nations Nationalities and Peoples Region; OPD: outpatient department; ENT: ear, nose and throat; CI: confidence interval; SPSS: Statistical Package for Social Sciences;

## ETHICAL CONSIDERATION

A written ethical clearance was obtained from the Institutional Review Board/IRB of the College of Medicine and Health Sciences of Hawassa University, Hawassa, Ethiopia. Formal letter of cooperation was written to the hospital and permission was obtained prior to the beginning of data collection.

## CONSENT FOR PUBLICATION

Not applicable.

## AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published. We sent all data which are available; there is no remaining data and materials.

## COMPETENT INTERESTS

The authors declare no conflict of interest.

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This research was funded by Hawassa University for academic staff's fund. The role of the funding body was to expense the cost for data collection, analysis and interpretation. The study design and manuscript was designed and written by authors.

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## AUTHORS' CONTRIBUTION

FT conceived of and designed the study, participated in data collection, analyzed the data and drafted the paper. WJ critically reviewed the study protocol, participated in data acquisition and analysis and reviewed the draft manuscript. Both authors read and approved the final manuscript.

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