ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF EMERGENCY MEDICINE

ASSESSMENT OF MAGNITUDE, CLINICAL PRESENTATION AND OUTCOME OF PEDIATRICS BURN INJURY AT ADDIS ABABA BURN, EMERGENCY AND TRAUMA HOSPITAL, ADDIS ABABA, ETHIOPIA.

BY: Sosina Tamre (BSC)

A RESEARCH THESIS SUBMITTED TO ADDISABABA UNIVERSITY POSTGRADUATE STUDIES IN DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER'S OF SCIENCE DEGREE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING.

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College of health sciences

Department of Emergency medicine and critical care

ASSESSMENT OF MAGNITUDE, CLINICAL PRESENTATION AND OUTCOME OF PEDIATRICS BURN INJURY AT ADDIS ABABA BURN, EMERGENCY AND TRAUMA HOSPITAL, ADDIS ABABA, ETHIOPIA.

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MASTER OF SCIENCE RESEARCH THESIS SUBMISSION FORM

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This thesis by **Sosina Tamre** is accepted in its present form by the board of examiners as a satisfying thesis requirement for the degree of master in emergency medicine and critical care.

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Department of emergency and critical care medicine advisors approval sheet

This is to certify that the thesis entitled “Assessment of magnitude, clinical presentation and outcome of pediatrics burn injury at Addis Ababa burn, emergency and trauma hospital, Addis Ababa, Ethiopia." is submitted in partial fulfillment of the MSc. with a specialization in "Emergency and Critical care nursing” to the Graduate Program of the College of Health Sciences of Addis Ababa University and has done by Sosina Tamre ID No: GSR7894/11 under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the Department.

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Name of Major Advisor Signature Date

_____ _____ _____

Name of Co advisor Signature Date

Declaration

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged.

Name: _____

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This MSc thesis had been submitted for examination with my approval as a thesis advisor.

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ACRONYM AND ABBREVIATIONS

AaBET _ Addis Ababa Burn Emergency and Trauma

AAU_ Addis Ababa University

CHS _ College of Health Science

HICs _ High income countries

LMICs _ Low and middle income countries

LOS _ Length of stay

SNNPR _ Southern nations, nationalities and peoples region

SPSS _ Statistical Package for Social Sciences

TBSA _ Total Body Surface Area

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ABSTRACT

Background: Pediatrics burn injury continues to be a major public health concern globally. Majority of cases has occurred in low resource countries. Due to children's higher susceptibility risk, burn is more prevalent among this age group and is commonly associated with a higher morbidity and mortality rate.

Objective: This study aims to assess the magnitude, clinical presentation and outcomes of pediatrics burn at AaBET hospital, Addis Ababa, Ethiopia.

Method: Institutional based retrospective cross sectional study design was conducted in AaBET hospital from July 2016-January 2020. Convenience sampling was used to review two hundred and seventy one medical records of pediatric burn victims by using a checklist. The collected data was entered into EPI info version 3.1 and was exported to SPSS version 25. Descriptive statistics and logistic regression was done for data analysis.

Result: A total of 256 patients were participated in this study with a response rate of 94.5%. Male patients accounted 130 (50.8%). The most common cause of burn are scald, flame, electric burn accounting 130 (50.8%) ,104 (40.6%) 12 (4.7%) respectively. Second degree burns were the commonest presentation 214 (83.6%) and 8.2% of the patients had co-morbidities; 93.8% of the incidents occurred in private residencies. only 2.3% of the victims had received pre hospital treatment. Total Body Surface Area burned ranged from 1% to 92% with a median TBSA of 14. Intentional burn accounted 1.2%. Length of hospital stay ranged from (1-164) days with a mean of 24.73 days. One quarter, 64(25%) of patients had developed hospital acquired infection. Eight patients were (3.1%) died. Presence of burn associated injuries [p= 0.006 AOR=0.012(0.001, 0.277)] showed significant association with the outcome death.

Conclusion and recommendation: Scald burn and flame burn are the common causes of burn injury, Majority of the incidents took in indoor settings and most of them had not received pre hospital care. Burn patients with associated injuries need more attention as they are more likely to die. For all governmental and non-governmental bodies, it is highly recommended to give priority on preventive measures and improve pre-hospital care service.

Key words: - Burn, Pediatrics, Magnitude, Outcome

1. INTRODUCTION

1.1. Background

Burn is defined as an injury to the skin or other organic tissue caused by thermal trauma, it occurs when some or all of the cells in the skin or other tissues are destroyed by hot liquids (scalds), hot solids (contact burns), flames (flame burns), or due to radiation, radioactivity, electricity, friction or contact with chemicals (1).

Burn injuries are among the most distressing assaults in life resulting in multi-aspect instabilities and sufferings to the victim. Every day, over 30,000 people suffer new burns worldwide, equating to an estimated 11 million new burns each year globally, from these 300,000 die from fire related burns (2).

Around 90% of burn cases happens in Africa and South East Asia (1). From these number, 80% of burn injuries occurs to children less than 10 years of age (3). Pediatric burns are fatal even with small total body surface area burn. In low and middle income countries as small as 20% total body surface area could be fatal (4). Where as in high income countries a pediatrics with a 60% total body surface area burn survives (5).

Pediatrics burn injury is reported to be one of the most common cause of severe childhood injury (6). There are studies in Ethiopia in agreement with global figures, showing age group of less than 10 years to cover almost half of the burn victims in the population (7). But there are still significant gaps in understanding the contributing factors that leads to burn incident and gaps in showing the actual figures of morbidity and mortality burden in the country, Ethiopia.

1.2. Statement of the problem

Globally, 3.9 pediatrics deaths accounted per 100,000 populations, putting infants in the highest risk of death as a result of burn injury (8). World Health Organization puts the annual death due to burns in LMICs is over 310,000, which accounts about 95% of all annual burn deaths (9). Of all unintentional injury deaths 10% are due to fire-related burns. The death rate related to burn in LMICs was eleven times higher than that in HICs (10).

One of the factors to be associated with poor outcome of burn injury is being in the pediatric age group. Burn by its nature tends to prone the victims to immune suppression, in addition to this, prolonged stay in hospital and the victim undergoing different procedures for the mere purpose of diagnosis or for a therapeutic use increases the risk of infection and further complications (11).

Pediatric burn injuries results in mortality and morbidity resulting in long term disfigurement, disability, stigma and discrimination of the children (7). Unfortunately the burden is not limited to the victim alone. In low and middle income countries like Ethiopia, the challenge in economy wise still cause financial catastrophe to the community. Burn management in this kind of resource limited scenarios poses a remarkable and disproportional increase in death and disability of the victim (2).

A community based study in Northern Ethiopia; Mekelle Town showed the highest incidence of burn among children. Similarly, a retrospective study done in Ayder Comprehensive Specialized Hospital, Mekelle, Ethiopia, shows the most commonly affected age group were children under 10 years of age. In both studies, scald burn and domestic settings are the predominant causes and settings responsible for burn in the pediatrics population respectively (12,13).

Inadequacy of information on the incidence is holding back the responsible bodies in legislation and policy formulation towards preventive measures, in-hospital and post-discharge care of burn (3). Even though there are some studies done in Ethiopia regarding burn injuries, showing the significant burden of pediatric burn in magnitude and outcome is very limited in scope.

2. LITERATURE REVIEW

Pediatric burn injuries can be avoided. But regardless of this fact, burn is still a challenge in terms of death and long-term disability, disfigurement and isolation especially in third world countries (2). Global figures shows death related to fire happens every 2 hours 35 minutes, and unfortunately those aged beneath 15 are the vulnerable groups. In Bangladesh, population based survey, showed annual rate of burn incident in children was 288 per 100,000 Population (14,15).

Burn incidence is higher than the combined incidences of tuberculosis and HIV infections. The greater susceptibility of children to burn is related to their developmental stages. A study done on epidemiology of burns throughout the world shows fire related burns are among the leading causes of Disability-adjusted life years lost in LMICs. Burns under 20% total body surface area cover 153 in 100,000 populations of children under15 years of age making the 5^{th} most common nonfatal childhood injury (1).

Magnitude and Socio demographic characteristics

A cross sectional study held in china showed burn domination by male children with a male to female ratio of 1.6 while over 70% of the incidences occurred in the country side at private residences (16) .

Most studies in Africa also reflected significant numbers of children burns occurs at home, particularly in the kitchen, mostly when the child is unsupervised. Poor supervision of children around homemade fireworks in festivals and some traditional acts like treating a convulsing child with fire increases the risk of burn in most of low income countries Another review of burns in sub Saharan Africa countries showed, children aged 10 years and below represented over 80% of the burn population. Children under the age of five who sustained burn injuries were 69% and over 70% of burns are sustained at home (2,3).

A study done in Malawi shows children in domestic settings are the commonest to be affected. From overall burn incidents, 80% of the cases occur in children with even distribution between male and female. A descriptive study assessing overall pediatrics injury in Aga Khan University hospital, Nairobi, shows vulnerability of 0 to 4 years children to comprise 80% of burn injury.

This study also showed that burns were more frequent among boys in private residences than girls (17,18).

A community survey done in rural part of Ethiopia showed burns were the second most frequent injury in children beneath 15 years of age. The annual incidence of severe burn, enough to hinder day to day activities was 80 per 1000 children. Burns were the commonest cause of admission for injury to pediatric hospitals and the third for pediatrics outpatient visits (22).

A 7 years retrospective review of records in Ethiopia found that burns occur more often to boys than girls. Other study in Ethiopia shows a pediatric burn injury covers up to 15% of the cases when compared to other injuries(1,20).

In a study showing the epidemiologic shifts for burn injury in Ethiopia from 2001 to 2016, 60% of the burn victims were pediatrics. Pediatric burn injuries tend to be equally distributed between girls and boys. Cross sectional study done in Ayder comprehensive specialized hospital, Mekelle shows children under 10 years of age are the primary to be affected, accounting 45.8%, while 80.5% of burn happened due to scald (21,22).

Time related and clinical characteristics

Global epidemiology's shows that scald burns are the most reported etiologic factor towards children burn. Of all unintentional injuries in children 6% are from burns under 20% of total body surface area (1). A cross sectional study in China found that winter is the most reported season with high pediatric burn incidence (16). A study in China found that the etiology and site of burn was mainly hot liquids at the trunk followed by lower limb burns. Over 65% of the children suffer from less than 10% of TBSA (16). The median LOS was 8 days (16).

In Northwestern Tanzania, Bugando Medical Centre, a three years cross sectional study on the pattern of childhood burn injuries and their management outcome showed 2.5% of cases had pre morbid medical conditions like epilepsy and others. Child abuse, intentional burns, occurred in 2.9% of children. 1.5%of the burn victims had inhalational injury requiring intubation and ventilator aid. Victims who sustained inhalational injury had 48.5% mortality rate when compared to the other victims with no inhalational injury. About 2% of victims had related fracture of head and neck, which result in prolonged LOS of greater than 14 days and higher risk

of mortality in return. The study also revealed only 6.4% of the children received appropriate first aid at the time of the incident. Majority of the victims, 89.8% presented to hospital after 24 hours (20).

A cross sectional study in Malawi reported that scald burns took the largest share, 68% of all burn etiologies. While 46% of the children suffer 11-25% TBSA, Cold and dry seasons, from June –August, had a 41% of burn incidence (19). Another study in Malawi found that 30% of the burned children present to the hospital when the burn was already more than a week old (18).

Review of the epidemiology of burn in Ethiopia revealed that electrical burns are on the rise to cause pediatric burn. But still scalds are the most frequently reported causes of burn in children mostly in domestic settings (23).

Management and outcomes of burn patients

A population based survey in Bangladesh showed while the rate of permanent disability related to pediatrics burn accounts 5.7 in 100,000 and mortality rate of 0.6 in 100,000 population is recorded (15).

A cross sectional study in Bugando Medical Centre, Tanzania found that More than 85% of the victims had conservative treatments only with anti-pain, antibiotics, tetanus toxoid, antimicrobial topical agents and wound care. The rest of them had underwent surgical treatments, skin graft was done for 65.9% while, fascictomy and escharotomy was done for 11.4% of them, the remaining of t hem went through debridement and amputation. The study showed overall morality of 11.7% of childhood burn victims (20).

A study held in Ghana showed, children under5 are frequently affected by burns resulting in Physical impairment or disability of the burn victims in 18% of the cases (17). A descriptive study in Kenya, Nairobi showed children with burns had highest rate of death than children sustaining other injuries and had the longest stay in hospital, 19 days. A review of burn epidemiologic shift held in Ethiopia found that, the average TBSA for pediatrics mortality were 58.5% (18,21).

Conceptual framework

The following conceptual framework shows the relationship between factors and the outcomes of burn injury.

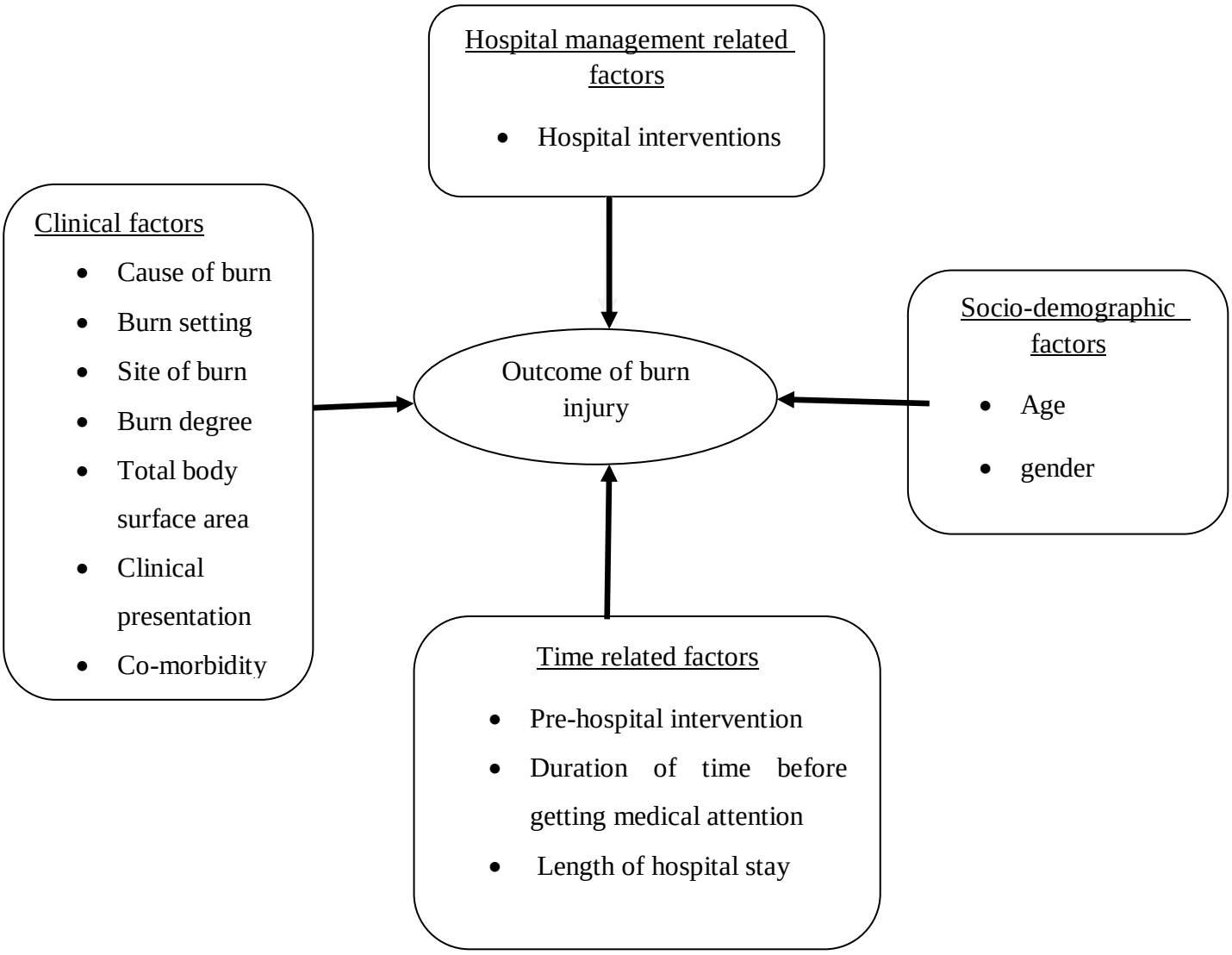

Figure 1: Conceptual framework for outcome of burn injury

3. SIGNIFICANCE OF THE STUDY

In order to define the gaps and to enhance quality care, reliable and consistent information must be easily accessible to all concerned bodies.

It is important for an institution to be certain about the burdens of pediatrics burn injury in terms of magnitude, clinical presentation and outcomes to deliver appropriate measures in both prevention and treatment approaches.

Published researches in this regard are very limited in scope. This research will serve as an input for different health officials and policy makers to allocate resources and to take corrective measures accordingly.

This study will also provide baseline information to other researchers to study further.

4. OBJECTIVES OF THE STUDY

4.1. General objective

- To assess magnitude, clinical presentation and outcomes of pediatric burn injury at AaBET Hospital, Addis Ababa, Ethiopia, From July 2016 to January 2020.

4.2. Specific objectives

- To identify the magnitude of pediatric burn injury among all burn victims at AaBET Hospital from July 2016 to January 2020.
- To assess the clinical presentation of pediatric burn victims at AaBET Hospital from July 2016 to January 2020.
- To identify the outcomes of pediatric burn victims at AaBET Hospital from July 2016 to January 2020.

5. MATERIALS AND METHODS

5.1. Study area and study period

The study was conducted at Addis Ababa Burn, Emergency and Trauma hospital, Addis Ababa, Ethiopia from November to March 2020. The actual data collection was held in May 2020.

AaBET hospital, an affiliate hospital of St Paul hospital millennium medical college, was opened by the federal ministry of health with the mission of providing burn, emergency and trauma care. The hospital serves over 7000 patients annually with a total of 250 beds.

The burn unit of this hospital is the second burn unit to be established in Addis Ababa, the capital city of Ethiopia. It has started working on July 2016 to provide tertiary level referral and treatment. This burn unit has 19 beds of which 6 of them are reserved for pediatric burn victims the burn unit has 21 trained nurses, 4 plastic surgeons, 4 general practitioners, rotating residents and an operation room.

5.2. Study design

Institutional based retrospective cross-sectional study design was used to contact this study from year of July 2016 to January 2020.

5.3. Population

5.3.1. Source population

The source population for this study was all children burn patients who had came to inpatient and outpatient departments of AaBET hospital.

5.3.2. Study population

The study population was patients 14 and less than 14 years of age who had sustained burn injury and came to AaBET Hospital from July 2016 to January 2020 whose medical records was available during data collection time.

5.3.3 Study unit

Individual pediatric burn patient's medical record was taken as the study unit.

5.4. Eligibility criteria

5.4.1. Inclusion criteria

- All patients whose age was 14 and less than 14 years patients with a diagnosis of burn injury.

5.4.2. Exclusion criteria

- Records with incomplete data will be excluded from the study.

5.5. Study Variables

5.5.1. Dependent variable

- Outcomes of burn injury

5.5.2. Independent variables

Socio-demographic factors

- Age
- Sex

Clinical factors

- Cause of burn
- Setting of burn
- Anatomic location of burn
- Degree of burn
- Total body surface area of burn
- Clinical presentation at the time of admission (Shock, Arrhythmia)
- Preexisting medical condition (Seizure, diabetic mellitus, congenital disorders)

Time related factors

- Pre-hospital intervention
- Duration of time before getting medical attention
- Length of hospital stay

Hospital management factors

- Hospital intervention (surgery, conservative treatment)

5.6. Operational definition

- Age group: Infants and toddlers= [0-24] months

  Early childhood= [25-72] months

  Late childhood= [73-168] months

- Pre-hospital care: any kind of care a patient receives before arriving at the hospital or a health care facility.

5.7. Sample size determination and sampling procedure

The sample size was calculated by using single population proportion formula by considering the following assumptions.

P=2% prevalence of burn injury among children

Level of confidence= 95%

Margin of error (d) = 50%

$n= (Z \alpha/2)^2 \times P (1-P)/d^2$

n= the minimum sample size required

p=prevalence of burn injury ≤14 years

d= Margin of error

$Z\alpha/2$= Standard normal value at (1- α) 100% confidence level

$n = (1.96)^2*0.2(1-0.2)/ (0.05)^2$

n= 246

10% contingency was added considering for incomplete cards. Hence, the minimum sample size was 271 burn patients' medical record.

5.8. Data collection procedures

The sources of data were secondary data from medical records of pediatric burn victims. A structured check list was adopted from literatures (17,25).

Data was collected by five trained BSc nurses. Prior to data collection, permission from hospital authority was obtained and the study subjects were selected.

5.9. Data entry and analysis plan

The data was taken out from the patient medical records. All checklists were checked for completeness and were entered into EPI info version 3.1 computer programs to minimize data entry error and was exported for analysis to SPSS version 25. The generated data was compiled by frequency tables, mean, medians and proportions. The results were presented by using text, tables and chart. Bivariate and multivariate logistic regression was done to analyze categorical variables.

5.10. Quality control

Data collectors and supervisors were trained for one day. The quality was assured through close supervision of data collection procedures. Supervision was carried out on daily bases to check completeness and consistency by the supervisor and principal investigator to keep high data quality. The final corrected format was collected from data collectors by supervisors and was submitted to principal investigator.

In addition to this, prior to the actual data collection, pretest was done at 5% of the study population at Yekatit 12 hospital, which was out of actual study unit and correction was made accordingly.

5.11. Ethical Consideration

Ethical clearance was obtained from the department of emergency medicine and critical care and was submitted to AaBET Hospital in order to conduct the study. All the collected data were kept confidential and the names or other personal information were not notified in any report.

5.12. Dissemination of the result

The finding of the study will be presented to Addis Ababa University, college of health science, department of emergency medicine. It will also be disseminated through presentations in different professional association meetings and annual conferences, different seminars, and workshops. The paper will also be submitted to national and international peer reviewed scientific journals for possible publication.

6. RESULTS

In the three and a half years of retrospective study from July 2016 to January 2020, a total number of 273 burn victims underneath the age of 14 were treated in AaBET hospital. From them 256 burn patient medical records were found and reviewed in this study, giving a 94.5% of response rate.

Socio-demographic characteristics

From the total 256burn victims, male children accounted 130 (50.8%). The mean age of all burn patients were 4.5 years ±3.94, ranged from 6 months to 14 years. Majority of the patients, 133(52.0%), were from Addis Ababa, 98(38.3%) were from Oromiya. (see Table 1)

Table 1: Socio-demographic distribution of pediatric burn patients at AaBET hospital from July 2016 to January 2020.

Characteristics		Frequency(n=256)	Percentage (%)
Gender	male	130	50.8%
	female	126	49.2%
Age (months)	0-24	97	37.9%
	25-72	97	37.9%
	73-168	61	23.8%
Regions	Addis Ababa	133	52.0%
	Oromiya	98	38.3%
	Amhara	9	3.5%
	SNNPR	6	2.3%
	Gambela	3	1.2%
	Somaliya	2	0.8%
	Tigray	2	0.8%
	Afar	1	0.4%
	Dire Dawa	1	0.4%
	Harar	1	0.4%

SNNPR= Southern Nation Nationality and peoples of Ethiopia

Clinical characteristics of the burn patients

In this study, scald type of burns was the most common cause, affecting 130 (50.8%) of all burn injuries followed by open flame104 (40.6%) and electrical burn12 (4.7%), while thermal contact and chemical burn accounted 7 (2.7%) and 3 (1.2%) respectively.

Regarding age factors of burns, Infants, toddlers less than two years of age (60.8%) and children in their early childhood from 2-6 years (54.1%) are majorly affected by scald burns, while those in their late childhood, from 6-12 years, are mainly affected by flame burns (49.2%). On the other hand, contact burns are seen mostly in the early childhood (4.1%), whereas, flame and electrical burns were mostly seen among children in their late childhood.

Majority of the patients 239(93.4%) visited medical attention within the first 24 hrs of the burn incident, 11(4.3%) were seeking medical care between 24 and 48 hours, while the rest 6(2.3%) presented after 72 hours of the incident. Only 6(2.3%) of them had reported to have had pre-hospital care, two of them had reported to use cold water, the rest had applied Vaseline, dough and grounded coffee at the burned site.

Table 2: Distribution of clinical characteristics of burn victims at AaBET hospital, Addis Ababa, Ethiopia.

Characteristics		Frequency (n=256)	Percentage
causes of burn	Flame	104	40.6%
	Scald	130	50.8%
	Electrical	12	4.7%
	Chemical	3	1.2%
	Thermal	7	2.7%
Degree of burn	1st degree	15	5.9%
	2nd degree	214	83.6%
	3rd degree	26	10.2%
	4th degree	1	0.4%
TBSA of burn	≤20%	181	70.7%
	20-40%	58	22.7%
	40-60%	15	5.9%
	≥60%	2	0.8%

Majority of burn incidents occurred in domestic settings, 240 (93.8%) at home, while 15 (5.9%) had occurred in the street and one flame burn occurred at school and all chemical burns happened at home due to splash of sulphuric acid and other unspecified gold cleansing chemicals while the victims were unsupervised. Majority of electrical burns (53.3%) occurred out door, at the street. The most frequently involved body part was the lower extremity 136 (53.1%), upper extremity was involved in 130 (50.8%) of patients, trunk covers 112(43.8%), while face/neck and buttock/genitalia were involved in 72 (28.1%), 43(16.8%) of the patients respectively.

Second degree burns contributed for the majority of burns 214 (83.6%). Total Body Surface Area burned ranged from 1% to 92% with a median TBSA of 14 %, mean of 17% ± 13.5 %. Majority of patients, 181(70.7%), had less than 20% of TBSA burn and only 2 patients had a TBSA of 90% and greater.

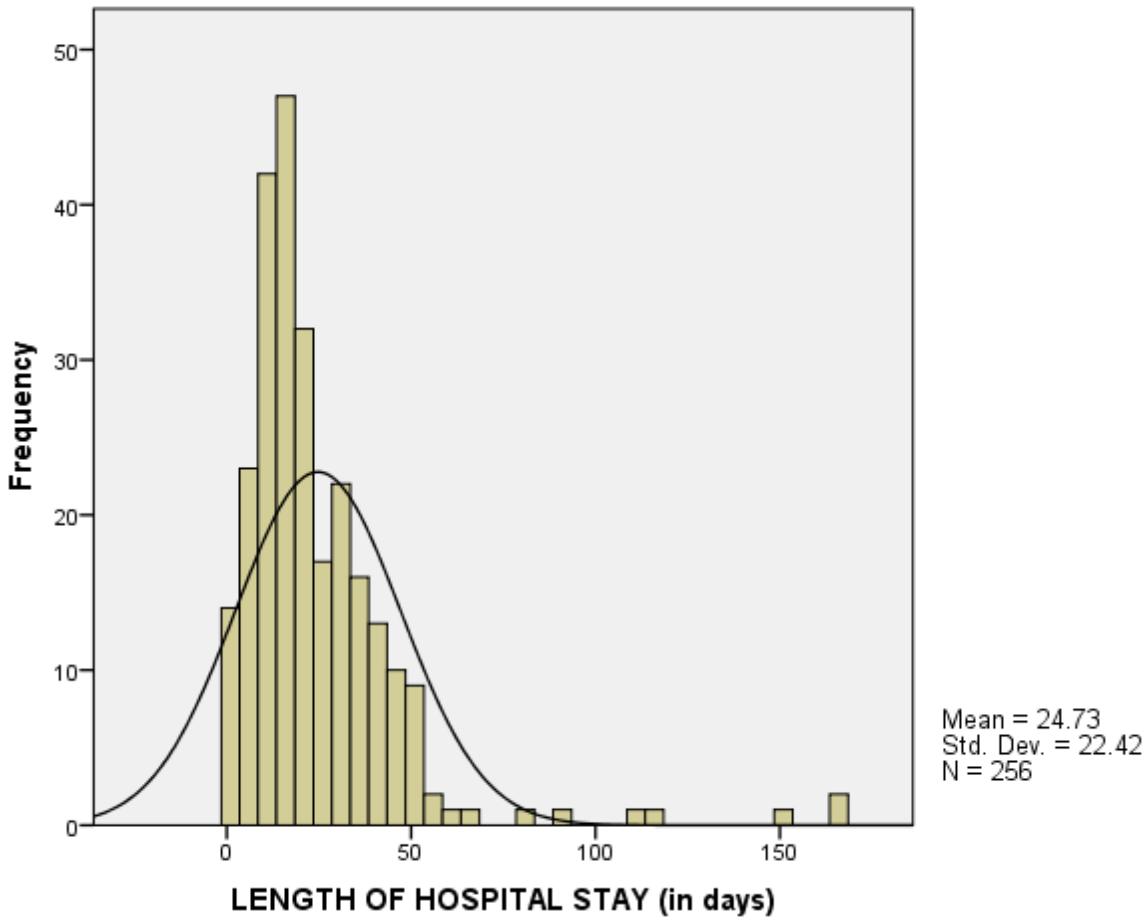

Figure 2: Distribution of burn victims according to LOS in AaBET hospital, AddisAbaba, Ethiopia

In seventy six patients (29.7%), the burn incident happened in the summer season followed by spring showing minor differences between seasons. Only 21(8.2%) of the burn victims had co-morbidities, from them, 12(4.7%) of them had convulsion, 6(2.3%) of them had Down's syndrome, the rest 3(1.2%) of the patients had diabetes mellitus. Eight patients were presented with additional burn associated injuries, 5 (2.0%) of them had inhalational injury and 3(1.2%) of them had fracture.

In 3(1.2%) of the patients, burn injury was reported to be intentional, from them 2(0.8%) was as a result of open flame intended for self harm by 14 years old females and the rest was child abuse of a 15 month female by pouring a hot fluid as a punishment. At the time of hospital presentation 11(4.3%) patients were presented with loss of consciousness, 8(3.1%) were presented with signs of shock and 7(2.7%) of the patients were presented with airway compromise and wound infection each, while the rest 5(2.0%) had dry gangrene at the time of their presentation and one patient had arrhythmia. Three patients, one fourth of the patients with electrical burn, had dry gangrene at the time of their presentation.

Management and clinical outcome of burn victims

After their presentation to AaBET hospital, all patients had received wound care, 231(90.2%) had obtained pain management, 179(69.9%) of them had acquired antibiotics, 24(9.4%) had received tetanus toxoid and 72(28.1%) had fluid replacement. Eighty six percent of patients with TBSA of 40% and more had received a fluid replacement.

Of all the burn patients, 96 (37.5%) of them had undergone surgery at least once in their hospital stay. From them 51 (19.9%) had skin graft, 48 (18.8%) had debridement, 22 (8.6%) of them had contracture release, 4 (1.6%) had under gone Escharotomie, 3 (1.2%) had under gone fasciotomy, 3 (1.2%) had undergone limb amputation, two patients had disarticulation and digital wound repair. All the three patients with chemical burn and 21 (61.5%) of patients with flame burn had under gone surgery for skin graft and 3 (25%) of patients with electrical burn had under gone surgery for limb amputation.

One quarter, 64 of patients had developed wound infection in their hospital stay, while 36 (14.1%) of the patients developed contracture. Length of hospital stay ranged from 1 to 164 days, with a mean of 24.73 days (22.42 SD). Majority of patients with first degree burn had hospital stay of less than 30 days, while 57.7% patients with third degree burn had hospital stay of greater than 30 days.

Most of the victims, 209 (81.6%), had shown improvement at the time of hospital discharge with no or minor complication. while 21 (8.2%) left the hospital against medical advice, the rest 18 (7.0%) had some form of disability/disfigurement at the time of their discharge. Death occurred to 8 (3.1%) of the patients, from this 3 of them had died within 24 hours of their

admission and two of the diseased patients had developed wound site infection at their hospital stay.

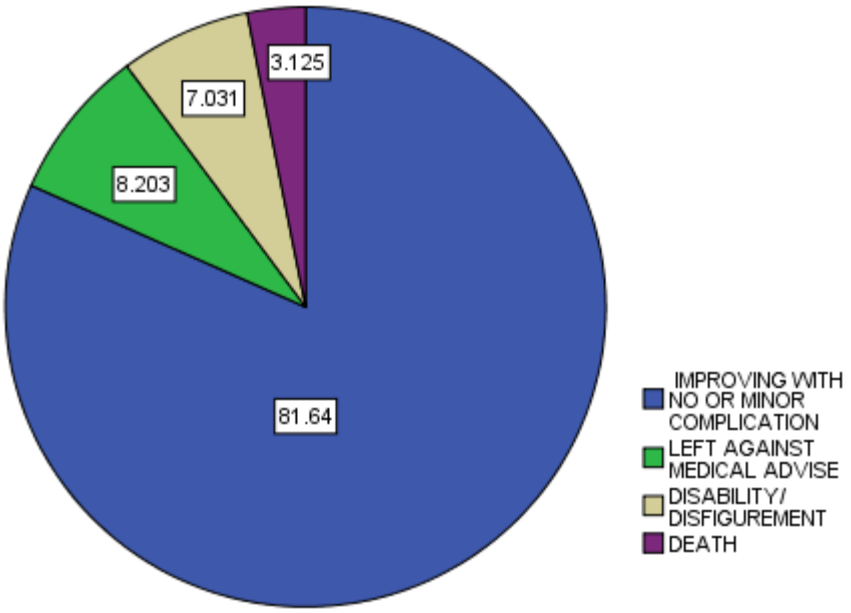

Figure 3: - Distribution of burn victims Outcome at AaBET hospital, Addis Ababa, Ethiopia. n= 256

Three fourth, six, of the diseased were females and half of them were in their early childhood. Scald (50.0%) and open flame (37.5%) burns constituted the majority for the outcome of death. More than 60% of the diseased had second degree burns and 37.5% of them had third degree burns Half of them had sustained >50 % TBSA and only 25% of them had co morbidities.

Association of factors with the burn outcome

To identify for the presence of a statistical significant association between independent variables and clinical outcome, first each independent variables were assessed individually in bivariate logistics regression analysis. Then eight variables had shown some form of association ($p<0.25$).

Then they were taken to multivariate analysis. From the results only presence of associated injuries [p=0.006, AOR=0.012], had showed significant association with the outcome death.

Patients with associated injuries are 98.8% less likely to be alive than those who had no associated injuries.

Table 3: Bivariate analysis of burn outcome with independent variables

Independent variables		Outcome			
		Death	**Alive**	**COR(95% CI)**	P
Age	**<=2yrs**	2	95	1.610(0.221,11.741)	0.638
	2-6yrs	4	94	0.797(0.141,4.486)	0.797
	6-14yrs	2	59	1.00	
Cause	**flame**	3	101	0.000(0.000,)	0.999
	scald	4	126	0.000(0.000,)	0.999
	electrical	1	11	0.000(0.000,)	0.999
	chemical	0	3	1.000(0.000,)	1.000
	thermal	0	7	1.00	
Setting	**home**	7	233	2.378(0.273,20.690)	0.433
	school	0	1	115391061.7(0.00,)	1.000
	street	1	14	1.00	
Upper limb burn		4	126	1.033(0.253,4.222)	0.964
Lower limb burn		6	130	0.367(0.073,1.855)	0.252
Trunk burn		3	109	1.307(0.306,5.589)	0.718
Face/neck burn		4	68	**0.378(0.092,1.553)**	**0.177**
Buttock/genitalia burn		3	40	**0.321(0.074,1.395)**	**0.129**
Depth	**1st degree**	0	15	1.000(0.000,)	1.000
	2nd degree	5	209	0.000(0.000,)	1.000
	3rd degree	3	23	0.000(0.000,)	1.000
	4th degree	0	1	1.00	
Season	**spring**	3	64	0.776(0.125,4.812)	0.785
	summer	3	73	0.885(0.143,5.478)	0.895
	winter	0	56	58744540.52(0.000,)	0.997
	autumn	2	55	1.00	

Intentional injury		0	3	52750199.65(0.000,)	0.999
Time before hospital	**<24**	6	233	0.000(0.000,)	0.999
	24-72	2	9	0.000(0.000,)	0.999
	>72	0	6	0.000(0. 000,)	0.999
Wound care		8	247	0.000(0.000)	1.000
Antibiotics given		4	175	2.397 (0.584,9.844)	0.225
Analgesics given		7	224	1.333(0.157,11.300)	0.792
TAT given		0	24	57695530.87(0.000,)	0.998
Fluid replaced		5	67	**0.222(0.52,0.955)**	**0.043**
Surgery		1	95	**4.346(0.526,35.881)**	**0.172**
Infection		2	62	1.000(0.197,5.083)	1.000
Contracture		0	36	60961315.64(0.000,)	0.998
TBSA	**<=20%**	4	177	0.000(0.000,)	1.000
	20-40%	0	58	1.000(0.000)	1.000
	40-60%	4	11	0.000(0.000,)	0.999
	>60%	0	2	1.00	
Gender	**male**	2	128	**0.313(0.062,1.578)**	**0.159**
	female	6	120	1.00	
Associated injury		3	5	**0.034(0.006,0.185)**	**0.000**
Co-morbidity		2	19	**0.249(0.047,1.319)**	**0.102**
LOS	**<= 30 day**	4	177	**2.493(0.607,10.242)**	**0.205**
	>30 days	4	71	1.00	

COR= Crude odds ratio, AOR= Adjusted odds ratio, CI= confidence interval
LOS=length of hospital stay ,95%CI=confidence interval ,*=p is less than 0.5 of significance

Table 4: Multivariate analysis of burn outcome with independent variables

Independent variables	Outcome				
	Death	Alive	COR(95% CI)	AOR(95% CI)	p
Face/neck burn	4	68	0.378(0.092,1.553)	0.645(0.064,6.511)	0.710
Buttock/genitalia burn	3	40	0.321(0.074,1.395)	0.205(0.019,2.259)	0.196
Fluid replaced	5	67	0.222(0.52,0.955)	0.162(0.011,2.449)	0.189
Surgery Yes	1	95	4.346(0.526,35.881)	20.179(0.661,615.862)	0.189
Gender male	2	128	0.313(0.062,1.578)	1.384(0.141,13.610)	0.781
Associated injury	3	5	0.034(0.006,0.185)	**0.012(0.001,0.277)**	**0.006***
Co-morbidity	2	19	0.249(0.047,1.319)	0.082(0.004,1.854)	0.116
LOS <= 30 day	4	177	2.493(0.607,10.242)	3.021(0.208,43.950)	0.781

7. DISCUSSION

From the total of 665 burn admissions, more than 40% are constituted by under 14 year's children. In this current study, both male and female burn victims had distributed almost equally, male victims accounted (50.8%). In agreement with this, A.Tyson et al. a retrospective study in Central Malawi showed a slight male predomination of 52%. Unlike that, a retrospective study in china by T.Wang et al. revealed that 69.7% of the burn victims were males (16,17). The possible reason to this discrepancy might be the age differences used in the studies.Various observations in Sub Saharan African countries highlighted parallel result with this study , showing a greater exposure of burn injury in males at their early childhood and in females at their late childhood (12). The probable reason for the findings might be male's active nature in their childhood and on the other hand, female's curiosity towards house hold activities in their late childhood could be the reason for their greater exposure.

Majority of burn incidents in this study area were due to contact of hot liquids (50.8%), similarly a systematic review of literatures in16 different countries by A.Parbhoo et al. showed that the most common cause of pediatric burn injury regardless of country's socio-economic status was scald burn (26). Another study conducted in Central Malawi, A.Tyson et al. also showed 68% of burn etiology was scald (17). A retrospective cross-sectional descriptive study in Ethiopia, Mekelle, M.Kidanu et al. showed 50.2% of the study population had scald as a primary mechanism of burn (7). The routine and frequent process of boiling liquids at home might contribute to scald burn predomination.

In this study, flame was the second most common etiology of burn injury accounting 40.6% and was more frequently seen among older children. This is comparable to a cross sectional study done in North Western Tanzania, P.Chalya, et al. flame burn covered 40.4% of pediatrics patients and were reported to be more frequent among children in their late childhood (23). These results might be due to children's lack of awareness to danger and their guardian's poor supervision. A prospective cross sectional study in Tanzania by Y. Ringo et al. showed an overall predominance of flame burn covering more than half of the burn incidents. This discrepancy might be because in their study adults who are more responsible to work with activities demanding fire, were included (25).

This current study found that indoor settings were (93.8%) predominantly involved in majority of burn incidents. In agreement with this, a retrospective study on pediatrics burn injury in Beijing city done by S.Wang et al. found that 68.0% of the incidents occurred at home, and the epidemiology of burn throughout the world, M.Peck et al. showed over 80.0 % of the burn incidents had happened at private residencies (1,27) This might be because of the hazardous natures of homes especially kitchens for children's. This study also showed most of the electrical burn incidents happened at a street, similarly a cross sectional retrospective study held in Yekatit 12 hospital, Ethiopia by F.Ready et al. reported that majority of electrical burns happened out door on work sites (21).various electrical infrastructures in several part of the country and their poor security might contribute for the findings.

This study showed the most frequently involved body part in pediatrics burn injury was the lower extremity (53.1%), in agreement with this a multicenter retrospective study in china by H.Tian et al. showed lower limbs were most frequently involved in burn incidents (28). But inconsistent to the current study, P.Chalya et al. in North Western Tanzania found that trunk (57.3%) was more frequently involved in pediatrics burn injury followed by head and face (69%) (23,28).

Second degree burns were the commonest presentation of burn victims to AaBET hospital, covering 83.6%. In agreement with this, a prospective study in Tanzania by Y. Ringo et al. showed 80.5% of burn victims had second degree burns (25).

In this center the mean TBSA was 17.85±13.58%. Majority of patients (70.7%) had sustained under 20% of TBSA. Comparable to this result, Y. Ringo et al. in Tanzania, found 56.1% of patients had a TBSA of 15% or less and another study in North West Tanzania recorded a median TBSA of 14% (16,25) Similarly a retrospective study in Southern Iran by B.Enfant et al. found a mean pediatrics TBSA of 21.18 ± 12.29% (29).

This study showed 29.7% burn incidents happened in the summer season followed by spring (22.3%). In consistent with this, a study in Malawi showed 41% of burn incidents happened in the summer (17). Multicenter retrospective study in china by H.Tian et al also showed summer months (June, July, and August) were the most reported seasons of burn in all population groups consisted 33.30% of cases. This might be because in the summer (kiremit), children spend most of their time playing at home than attending in school. Whereas another study by

T.Wang in Zunyi, China showed Winter was the most reported season for pediatrics burn incidences (16,28) And a study in Mekelle, Ethiopia showed spring was more frequently reported accounting 27.8% followed by summer 27.5% (7). The inconsistency with this current study might be the age differences used in the studies.

In this study 8.2% of burn victims had co-morbidities, and more than half of them had seizure disorder before their current burn incident. At the time of their hospital presentation, 2.0% of the burn victims had associated inhalational injury and 1.2% had limb fracture, in line with this, a study by F.Ready in Ethiopia found 5.7% of the burn victims had epilepsy, in Tanzania 2.5% of burn victims had a preexisting medical condition before their current burn incident. At the time of hospital presentation, 1.5% burn victims had associated inhalational injury and 2% had fractures. And in china Zuyin, 2.6% of associated inhalational burns were reported (16,21,23)

This study found 1.2% of the burn incidents were intentional , while a study in North Western Tanzania 2.9% of burn cases were intentional and another community based survey in Ghana found 5.3% of burns in under five children were intentional (4,23). Poor reporting habits of guardians might contribute to the discrepancies.

This study showed majority of the patients (93.4%) were presented to a medical center in the first 24 hours of the burn incident. In contrast to this, a study in central Malawi showed 64% and another study in North West Tanzania showed 41.5% of the patients had presented to health care facility within the first 24 hours of the burn incident (17,25). The fact that patients with major cases have a great tendency to be presented to this burn center might explain why they sought medical attentions early.

Comparing to other studies, patients in this study had the least pre-hospital care, very few of them (2.3%) had received any sort of first aid at home. A cross sectional study done at Tikur Anbessa Specialized Hospital, Ethiopia by Y.Meskere et al. found that only 16.7% of trauma patients had received pre-hospital care (30). In North West Tanzania 6.7% of the patients had received pre-hospital treatment, whereas in North India, A.Dhopte et al. reported 54.9% of pediatrics patients received first aid before their presentation to their center (23,31). Whereas in Beijing, S.Wang 70.0% of the patients had received pre hospital care (27). This may be related to the society's difference in knowledge towards first aid practices.

In this current study more than 62% of the patients had received only conservative treatments, from them 90% of them had received analgesia and all of them had wound care after their presentation, while 37.5% of the burn victims had undergone surgery. Similarly, a study done in Tanzania showed only15% of the patients had undergone surgery, the rest 85% of the patients had conservative treatments at their hospital stay. This study found that the mean hospital LOS was 24.73 days. While in Tanzania the mean LOS was 22.12 days (23).

Majority of the patients (81.64%) were discharged improved with minor or no complication, similarly in a retrospective study at Mekele, Ethiopia found around 80% of the burn victims had minor or no sequelae when they were discharged from the hospital, a community based survey by K.Nega found 89.4% of the patients had no complication when they were discharged (7,32).

In this study a mortality rate of 3.1% of pediatrics burn was recorded. A retrospective cross-sectional study in Ethiopia by F.Ready et al. found 3.8% of pediatric deaths due to burn injury, another community based study in Mekele Ethiopia by K.Nega et al. found a 1% mortality rate of burn both in pediatrics and adult population while another cross-sectional study M.Mizan found 6.0% of mortality in both pediatrics and adult age groups (7,21,32). F.Williams et al found burn pediatrics mortality rate of 2.8% in 20 years review of a single pediatrics burn center (32).

From the result, presence of associated injuries were significantly associated with burn mortality [p= 0.006 OR= 0.012(0.001, 0.277)]. Patients who had associated injuries are 98.8% less likely to be alive than those who had no associated injury. A retrospective study on severe pediatric and adult burn patients by I.Ederer et al. showed associated Inhalational injuries [p=<0.001 OR=3.21(2.04, 5.05) were associated with increased mortality risk (34).

8. CONCLUSION

Around 40% of burn patients were children's ≤ 14 years of age. The incidence of burn, more or less, was evenly distributed between the two genders. Highest proportion of burn incidents occurred in indoor settings. Scald and flame burns constituted majority of the causes. Second degree burns were predominantly common in this study population. Significant seasonal differences were not seen in the burn incidents. Even though majority of the patients hadn't got any first aid before they got to hospital, most of them had seen health facility within 24 hours of the incident. The outcomes of patients, majority of them had left with no or minor complications and 3.1% had died. From the diseased one, majority of them had sustained scald burn followed by flame burn. Patients who had burn associated injuries are 98.8% less likely to be alive than those who had no associated injuries at all.

9. RECOMMENDATIONS

Since most of the incidents were easily preventable, it is strongly recommended to work on preventive measures in both legislation and community level.

For governmental and non-governmental stakeholders : it is recommended to give priority on preventive measures and to increase availability of pre-hospital care services.

For health facility: priority needs to be given to burn patients with burn associated injuries and infection prevention measures should be promoted to prevent hospital acquired infections.

For researchers: public education should be given regarding burn prevention measures and pre-hospital care services,

10. STREANGTH AND LIMITATIONS

Strength of the study: As there is no published data on the magnitude, clinical characteristics and outcome of pediatrics burn injury after the establishment of AaBET hospital, Addis Ababa, Ethiopia, the results of this study can provide in formations to the hospital.

Limitations of the study: Since this study used retrospective study design, it was difficult to review all the necessary information's due to inconsistent documentation of patient's clinical features in the patient's card. In addition to this incomplete data of patient medical records and lack of clear information to assess some of the variables were the challenges faced.

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APPENDIX

Annex I: Information sheet

Name of the investigator: Sosina Tamre (BSC)

Title: Assessment of magnitude, clinical presentation and outcome of pediatric burn injuries at AaBET hospital from September 2016- September 2019,Addis Ababa Ethiopia.

Objective: the aim of this study is to assess the magnitude, clinical presentation and outcome of burn injuries among pediatric patients seen at AaBET hospital from September 2016- September 2019.

Study procedure: Socio demographic data, clinical presentation and management outcomes of patients will be taken from patients' medical records.

Confidentiality: the collected information will be kept confidential and used only for research purpose. No one except the members of the research team will have access to the information collected. The name and/or other personal information of patients will not be notified in any report. All paper and computer records of the study will be kept in a secured place under lock when not in use.

Person to contact: if the data collectors or other hospital administrative staffs have any question regarding the study they are free to contact me in person or by the following addresses

Sosina Tamre

Cell phone: 09 25 50 52 53

Email: sosina.tam@gmail.com

Annex 2 Hospital consent form

This is a study that will be conducted in AaBET hospital. The main objective of this study is to assess the magnitude, clinical presentation and outcome of pediatrics with burn injuries looking for medical care at AaBET hospital. Such assessment is needed for preventive and therapeutic approaches in this area. Researches on pediatric burn injuries are limited in this setting. Therefore the hospital's participation and collaboration is very much helpful in generating the required information and will be very much appreciated.

In this study, data will be collected from the patients' medical record retrospectively. Information regarding any specific personal identifiers like the name of the clients will not be collected and information generated will be disclosed in totality. In addition confidentiality of any personal information will be maintained throughout the study process and no unauthorized access to the information is allowed.

Finally, the hospital has all the right to refuse to participate in this study at any time. If you have any questions or need further information regarding the planned study you are free to get clarification from the principal investigator or from the institution or through the following address. Sosina Tamre,

telephone 0925505253 (the principal investigator).

Therefore, if you would like to participate in this study, would you please confirm it by signing here? Thank you very much.

Participant Hospital---------- principal investigator----------

Annex 3 Data collection sheet

CHECKLIST

001. Data collector: code ____

002. Date of data collection ____Time _____

003. Checked by Supervisor: Signature _____day _____

Socio-demographic data **Age**_____ **Sex**_____ **Address/ region** _____						
Cause, severity and location of burn						
1)Cause of burn	Open flame	Scald	Electrical	Chemical agents	Hot object contact	Others (specify)
2)Setting of burn	Home	School	Others (specify)			
3)Anatomic location/s of the burn	Upper extremities	Lower extremities	Trunk	Head and/ face	Perineum	
4)Degree of burn injury	First degree burn	Second degree burn	Third degree burn	Fourth degree burn		
5)Extent of burn injury (% of total burn surface area burned)_____						
6)Season of burn incident	Spring (tsedey)	Summer (keremt)	Winter (bega)	Autumn (belg)		
7)Any Co-morbidity	None	Epilepsy	Diabetic mellitus	Others (specify)		
8)Any burn associated	None	Inhalational injury	Fracture	Others (specify)		

injury						
9)Intentional burn	No	Self harm	Child abuse			
10)Presentation at admission	Airway compromise	Shock	Arrhythmia	Loss of consciousness	Others (specify)	
Management of burn						
11)Time before medical attention	<24 hrs	24-72 hrs	>72 hrs			
12)Hospital interventions	Fluid replacement	Wound management	Antibiotic	Pain management	Tetanus Toxoid	Other (specify)
13)Surgery	None	Fascioctomy	Skin graft	Contracture release	Debridement	Other (specify)
Management outcome						
14)Infection developed	Yes	No				
15)Contracture developed	Yes	No				
16)Length of hospital stay_____						
17)Discharge outcome	Improved with no/minor complication	Left against medical advice	Disability and disfigurement	Death		

Annex 4 Assurance of Principal Investigator

The undersigned agrees to accept responsibility for the scientific, ethical and technical conduct of the research project and for the provision of required progress reports as Per terms and conditions of the Research Publications Office in effect at the time of Grant is forwarded as the result of this application.

Name of the student: Sosina Tamre

Date _____ Signature _____

Approval of the Advisors

Name of the primary advisor: Dr. Tigist Bacha

Date _____ Signature _____

Name of secondary advisor: Mr. Asmamaw Abebe

Date _____ Signature _____