



Outcome of burn injury and associated factor among patient visited Addis Ababa burn, emergency and trauma hospital: A two years hospital based cross-sectional study

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A thesis submitted to the department of emergency medicine and critical care for the partial completion of specialty training

October, 2021

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Declaration of Investigator

I declare that this research project is my original work in partial fulfillment of the requirement for certificate of specialty in Emergency and Critical care Medicine. I also declare that it has never been presented in this or any other higher institution and all the resources and materials used in the research work have been duly acknowledged.

Name of resident: _____

Signature: _____

Date: _____

Approval of the primary advisors

Name of the primary advisor: _____

Signature: _____

Date: _____

Approval of the co-advisor

Name of primary advisor: _____

Signature: _____

Date: _____

Acknowledgment

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List of acronyms

AaBET – Addis Ababa Burn, Emergency and Trauma hospital

AOR- adjusted odds ratio

BMS– Burn model system

CI- Confidence interval

COR-crude odds ratio

ED- emergency department

EMCC –Emergency medicine and critical care

GC_ Gregorian calendar

HAI – Hospital acquired infection

HAP – Hospital acquired pneumonia

HIV – Human Immunodeficiency Virus

HIMS-Health information medical record system

ICU– Intensive care unit

IRB – Institutional Review Board

NDSC– National Data and Statistical Center

NIDRR– National Institute on Disability and Rehabilitation Research

N, %- number of case, percentage

SD– Standard deviation

SPHMMC- Saint Paul hospital millennium medical collage

Spo2- pulse oximetry oxygen saturation

SPSS -Statistical Package for Social science

TBSA- Total body surface area

Yr. -year

Contents

Declaration of Investigator	i
Acknowledgment	ii
List of acronyms	iii
List of tables and Figures	vi
List of tables	vi
List of Figures	vi
Abstract	vii
1 Introduction	1
1.1 Background	1
1.2 Statement of the problem	2
1.3 Significance of the study	3
2 Literature review	4
2.1 Epidemiology	4
2.2 Determinant factors for burn outcome	6
2.3 Conceptual framework	8
3 Objectives of the study	9
3.1 General Objectives:	9
3.2 Specific Objectives:	9
4 METHODOLOGY	9
4.1 Study Setting	9
4.2 study design and period	10
4.3 Population	10

4.3.1 Source population	10
4.3.2 Study Population	10
4.4 Eligibility criteria	10
4.4.1 Inclusion Criteria	10
4.4.2 Exclusion Criteria	10
4.5 Sample size and sampling method	11
4.6 Data collection process:	12
4.7 Study variables	12
4.7.1 Dependent variables.....	12
4.7.2 Independent variables.....	12
4.8 Operational definition	12
4.9 Data collection tools and procedures.....	13
4.10 Data quality control	14
4.11 Data Analysis.....	14
4.12 Ethical consideration	14
4.14 Dissemination of results.....	14
5. RESULT	14
5.1 Patient Related Factor	17
5.2 Clinical factors of outcome of burn injury	20
5.3 Management related factor	23
5.4 Time related factors.....	24
6 Discussion.....	28
7. Strength and limitation of study	32
7.1 strength	32
7.2 limitation.....	32
8 Conclusion	32
9. Recommendation.....	33
11 Annex	36

List of tables and Figures

List of tables

Table 1 Cross tabulation of referral status of burn patients and referring health facilities among patient visited AaBET hospital	16
Table 2 Socio demographic characteristics of burn patient visited AaBET hospital from April 1, 2019 to March 31, 2021	18
Table 3 cause of burn injury and related factors among patient visited to AaBET hospital from April 1, 2019 to March 31, 2021	22
Table 4 Bivariate and Multivariate analysis showing association of determinant factor and outcome of burn patient admitted to AaBET hospital from April 1, 2019 to March 31, 2021	26

List of Figures

Figure 1 Conceptual framework showing outcome of burn injury and associated factors.....	9
Figure 2 Triage category of Burn patient come to AaBET hospital from April 1, 2019 to March 31, 2021	15
Figure 3 Graphs showing distribution of address with age distribution (3A) & Age and sex distribution (3B) among burn patient visited AaBET hospital from April 1, 2019 to March 31, 2021	18
Figure 4 over all hospital stay of patient in days among patient admitted to AaBET hospital from April 1, 2019 to March 31, 2021	25

Abstract

Background: Burn is one of the critical health problem worldwide. Every day, 30,000 patients suffer new burn and annually, around 265,000 burn victims will die from fire-related burn. Developing countries of sub-Saharan and Asian populations affected more. Its mortality and non-fatal complications are depend on several factors including age, sex, residency, cause, extent of burn and time and level of care given.

Objective: The purpose of this study was to assess the outcome of burn injury and its associated factor among patients visited AaBET hospital from April 1, 2019 to March 30, 2021.

Methodology: A hospital based cross-sectional study conducted by using pretested questionnaire. Mortality and non-fatal complications of burn injury and its associated factors analyzed after data cleared, coded and entered computer by using SPSS version 25.0. Bivariate & multivariate logistic regression analyses were employed to identify associated factors

Result: 241 patients were eligible. The mean age of the patients were 18.22(SD -15.02) years. Adults(age 15 to 60 years) are most affected groups accounting for 55.2% followed by pediatric age groups (age <15 years) (43.6%) and elderlies(age > 60 years) (1.2%).Scald burn was the major cause accounting for 39 % followed by Flame burn(33.6%), Electrical burn (26.6%) and chemical burn (0.8%). The mean TBSA% was 15.49%, range from1 % to 64%. Adult male more affected by electrical while adult female and elderlies are encountered Flame burn. 78.4% patients were discharged without complication, 14.9% Discharged with complication and 6.6% died. The commonest long term complication is Amputation of extremity (19, 7.9%). Age greater than 60 years and TBSA% of greater than 30% are strong predictor of mortality with odds of 2.2 at CI of [1.32-3.69] and 8.7 at CI of [1.33-57.32] respectively.

Conclusion and Recommendation: Mortality rate show decrement from previous studies. Overall Scald burn is common in all age group but electrical burn and flame burns affected more adult and elderly age groups. Extremities were by far, the commonest affected body parts. Extent of burn injury and age of the patient independently predict mortality. Early intervention will reduce mortality and complications.

Key words: Burn, Outcome, Associated factors, AaBET hospital, TBSA%

1 Introduction

1.1 Background

Burn is a complex trauma which destroys and/or damages human skin and other underlying organs. It can be scald, thermal, electrical, chemical, contact or radiation.(1)

Based on extent of damage of body part burn can be classified as first degree (if it involve epidermis only), second degree (if it involve dermis and epidermis), third degree burn (if it involve epidermis, dermis and underlying sub-cutaneous tissue) and fourth degree burn (epidermis, dermis and subcutaneous fat plus muscle, bone and internal organ involvement)(1).

Burn size can be estimated by rule of nine and Lund-Browder diagram for estimation of resuscitative fluid. As burn depth and size increase mortality and associated non-fatal complications will also increase. Timely adequate resuscitation decrease both mortality and nonfatal complications associated with burn injury (1-3).

Burn despite being one of the preventable health problem it continued being the major cause of injury, disabilities and disfigurement. It is one of a major component of unintentional injuries causing critical health problem worldwide. According to WHO report of 2018, over 30,000 people suffer new burns worldwide every day, severe enough to warrant medical attention, equating to an estimated 11 million new burns each year globally. About 200-300,000 people die from fire-related burns annually, disproportionately in low and middle income country of African and Asian countries (4-6). Ethiopia is one of the country that suffer from devastating effect of burn. It account for about 1.5% to 9% of injuries in the all age groups and between 4% and 15% of injuries in the pediatrics population with estimated mortality rate of 11.6%.(7, 8)

Mortality and non-fatal injuries are depend on several factors including age, sex, place of residency, economic status, involved site, depth and TBSA % involved, comorbidity, time arrival to emergency department, prehospital care and presence of trained staff in giving appropriate level of care.(1, 4, 9)

The trend of burn is decreasing in most developed nations due to advancement of technologies. However, the problem is still on a rise in most of the developing countries including Ethiopia.(4, 7, 10)

1.2 Statement of the problem

A burn injury is one of domestic accidents that contribute to morbidity and mortality in communities all over the world. It has substantial effect both at individual and community level. Good outcome will be achieved by giving optimal care with personal trained for caring of burn injury patients. In developed country mortality and non-fatal complications are significantly reduced due to advancement of technology and timely management of burn injury patients including early resuscitations and advanced surgical and medical cares. But in developing country due to economic impact or/and giving low priority burn injury still one of critical health care problem.

Also, data on burn injuries from developing countries is, for the most part, unavailable. Because data registry is poor or paper based and not technology directive. In Ethiopia, burn injuries are recognized as public health problem. But there is lagging of the centers that provide such service and there is a deficiency in terms of advancement in technology used to treat such injuries which is coupled by lack of human resource trained on this area.

Reviewed literatures in Ethiopia shows that, there are few research conducted related to burn injury and they focused on pattern and causative factor mainly, not outcome of burn injury. The available information's are also somewhat incomplete(11).

1.3 Significance of the study

After burn injuries being raised as a major health problem in the country, AaBET hospital was established to give care for burn and trauma victims 6 years ago. Since then, the hospital continued to give care for such victims. Since its establishment however published data on outcome of burn injuries not yet available. Therefore the significance of this study will be to assess outcome of burn injury and its associated factor among burn patient visited the hospital.

The result of the research will be recommended for policy makers to allocate resources so as to achieve the greatest impact in preventing, treating burn injuries and rehabilitating injured person. It also help as reference for person that need further investigation.

2 Literature review

2.1 Epidemiology

Burns are a leading cause of accidental injury and death worldwide both in developed and developing world. But mortality and morbidity burdened more on developing country (7, 10, 12, 13). Each year approximately about 11 million peoples suffer from burn making almost 30,000 new burn injury per day with annual mortality rate of around 200,000 to 300,000 per year(7, 14). In USA, one million people seek medical care for burns annually, with estimated mortality rate of 3 – 5% (14).

WHO 2018 report show that, around 265,000 burn related death occur annually. Most of them occur in low and middle income African and Asian countries accounting for more than 90% of death (7, 12, 13, 15). In many high income countries, burn death rate has been decreasing, and the rate of child death from burn is currently over 7 times higher in low and middle income country than higher income country (4, 14). Non-fatal burn injuries are also leading cause of morbidity including prolonged hospitalization, disfigurement and disability often with resulting stigma and rejection (4, 15, 16)

In developed country incidence of burn injury and mortality rate is decreasing from time to time. In Europe, the in-hospital crude mortality varies between 1.4% and 18%, and is mainly dependent on differences in case-mix (TBSA %) and local economic status (2). In Sweden, a mean (SD) of 87(21) people died annually during 2001-2014 and the mortality has decreased from 1.3/100 000 inhabitants during the year 2001 to 0.7/100,000 in 2014, ($p = 0.004$) (2). For this improved survival including, advances in intensive care (fluid resuscitation, nutritional support, and treatment with antibiotics) as well as the introduction of early excision of burn wounds play significant roll (2). America, Eastern Medetrinian and the Western Pacific regions, which grouped under developed countries, account for 1.3, 0.02 and 0.6% - not even 2% combined - of global mortality due to fires related death. (7)

Asian population are one of the most affected group worldwide. Southeast Asian country are the most affected one, 184,000 burn deaths per year, or 11.6 per 100,000 population accounting for more than 50 % overall mortality worldwide(7). Study from major burn center in Southwest China show improvement from time to time as early intervention and prevention was applied. Mortality rate from the research result was 0.9 %(10).

Sub-Saharan Africa countries are also one of disproportionately affected area by burn injury. Severity and mortality rate is different in different country with average mortality rate of 17%, death of one for every five burn victim(5).For this little investment on care of burn victim at different level take a major role(5). In some African countries Mortality rate exceed the average one. E.g. Togo 24.6% (17), Malawi 27% (18)

In Ethiopia With a population of over 100 million spread across 1 million square kilometers, Yekatit 12 and Addis Ababa Burn Emergency and Trauma (AaBET) hospitals are the mainly dedicated burn units currently(8). As they are Official referral unit of burn injuries, they admit the most serious burn cases presenting for treatment country wide. Even if collecting, collecting and presenting data on patient outcomes and risk factors from these hospitals and other regional hospitals admitting burn patients should be prioritized, so as to generate evidence to support prevention interventions, there are challenges to reviewing retrospective data from tertiary level hospitals (8).

Research reviewed from 23 studies, drawn from observational and primarily hospital-based, cross sectional studies conducted in major towns of the country, estimate that burns account for about 1.5% to 9% of injuries in the all age groups and between 4% and 15% of injuries in the pediatrics population. The prevalence of burn injury in the population under study was very low and estimated in a range of between 0.1 and 1.2 %(8). Mortality rate according to study conducted at Yekatit 12 Hospital, Addis Ababa, Ethiopia, at October 2006 Was 11.6% (19)

In a rural community survey in Ethiopia, burns were the second most common injury to children under 15 years of age(14). From research done at Ayder Hospital, Mekele, Tigray, Ethiopia, almost 70% of the burns were caused by scald, and 45.3% of the burns were confined to the upper extremities. Eighty-two percent of the patients were discharged without complication. Lack of fluid resuscitation within 24 hours and malnutrition was significantly associated with the outcome of burn injury(3).

Research done at Felegehiwot Hospital, Bahirdar, Amhara, Ethiopia, on pediatric population show prevalence of 0.46% with female affected than male. Burn TBSA >20% has 42.4 times higher to recover with scar and disfigurement as compared to children with <10%. Those treated by surgical management 54.6 times higher to recover with scar and disfigurement as compared to children treated with conservative management(20)

2.2 Determinant factors for burn outcome

Outcome of burn depend on age and sex of the patient, burn surface area, depth of burn, burn site, type of burn, time of arrival to hospital, getting appropriate resuscitation, presence of comorbidities as well presence of rehabilitative center with trained practitioner (10, 15, 21-23). Inhalational injury is independent risk factor for death (22, 24)

The commonest age of burn injury is 5 -14 years with highest mortality rate in children less than 5 year and elderly greater than 70 years(12). One study from Taiwan done on elderly burn patient show that, those age over 65 years constitute 13- 20% of admissions to burn units, with the highest death rate among the overall burn population(30.3%).(9)

Females in South-East Asia have the highest fire-related burn mortality rates worldwide, followed by males in Africa and females in the Eastern Mediterranean. This indicate undelaying factor that make them vulnerable (9, 12)

Burns greater than 15% in an adult and greater than 10% in a child has poor prognosis.(4, 15). Mortality rate is higher for those that have higher TBSA%, third rather than second degree burn and inhalational injury. (7, 9, 25)

Prevention is key factor than treating burn patient. But developing nation are show low engagement rate than developed country, probably because of other competing disease need to be controlled (7). Understanding complexity of burn, requirement of long-term rehabilitation and affecting quality of life, USA develop burn model system. The Burn Model System (BMS) Program began in 1993 with funding from the National Institute on Disability and Rehabilitation Research (NIDRR) U.S. Department of Education, to improve, through research, care and outcomes for individuals with burn injuries. The BMS research programs are housed within clinical burn centers that provide a coordinated and multidisciplinary system of rehabilitation care including emergency medical, acute medical, post-acute, and long-term follow-up services. In addition to these activities, with their NIDRR funding, each BMS center conducts research and contributes follow-up data to the BMS National Data and Statistical Center (NDSC). The four BMS centers at present are: Northwest Regional Burn Model System in Seattle, Washington; Boston-Harvard Burn Injury Model System in Boston, Massachusetts; Pediatric Burn Injury Rehabilitation Model System in Galveston, Texas; and North Texas Burn Rehabilitation Model System in Dallas, Texas. Past centers include The Johns Hopkins University Burn Model System, University of Colorado Denver National Data and Statistical Center, and University of Colorado Denver Burn Model System.

Accordingly all complication is reduced and early back to school and functional work place availability is increase

2.3 Conceptual framework

Outcome of burn injury is affected by different factors. These factors divided into four groups. The Conceptual framework shown in figure below helps to summarize the relationship between Outcomes of burn injury with its associated factor.

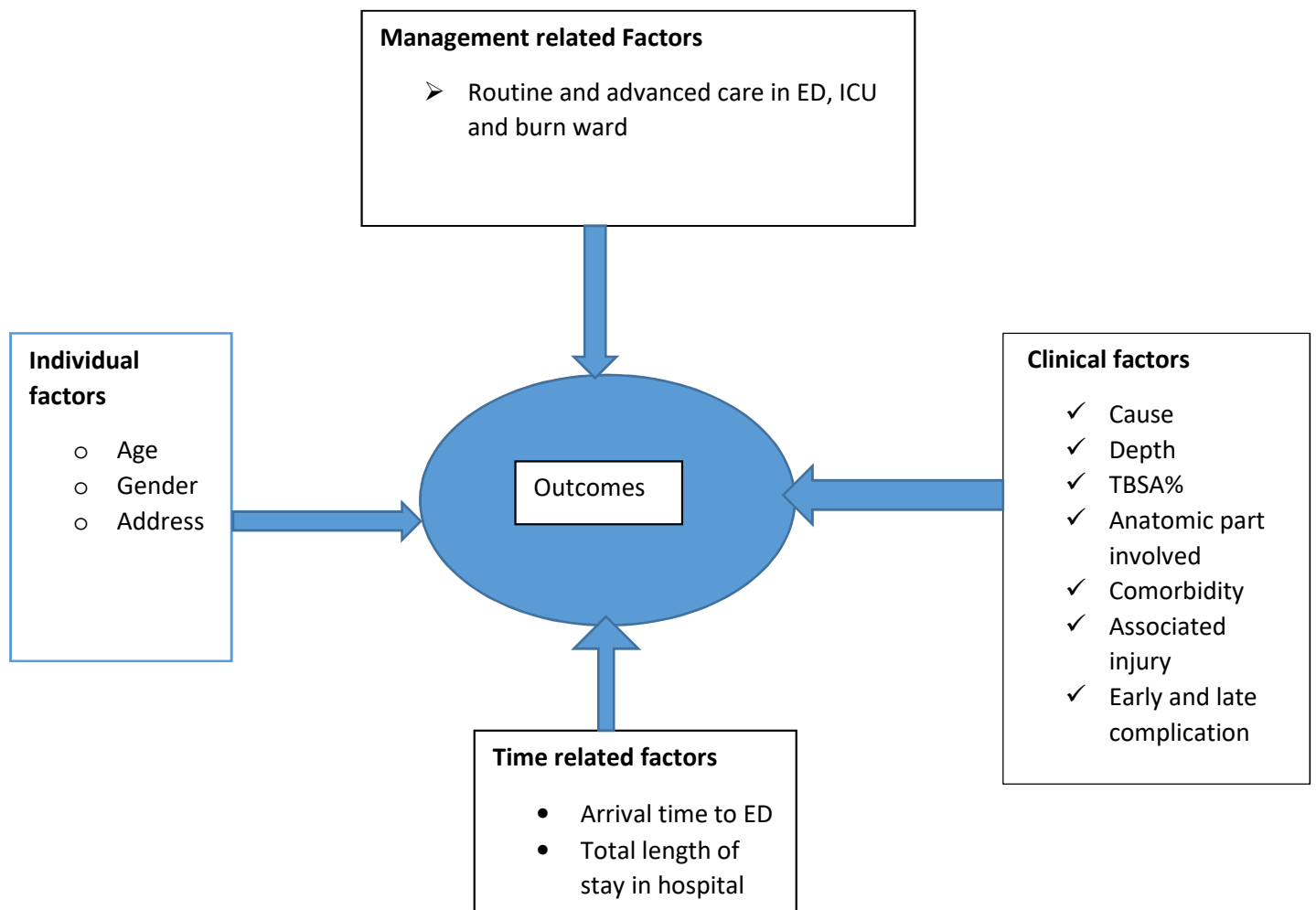


Figure 1 *Conceptual framework showing outcome of burn injury and associated factors*

3 Objectives of the study

3.1 General Objectives:

- To analyze outcome of burn injury and its associated factor among patient visited AaBET Hospital from April 1, 2019 to march 30, 2021

3.2 Specific Objectives:

- To describe socio-demographic characteristics of burn patient visited AaBET Hospital from April 1, 2019 to march 30, 2021
- To assess outcome of burn patient among patient visited AaBET Hospital from April 1, 2019 to march 30, 2021
- To assess factors associated with outcome of burn patient visited AaBET Hospital from April 1, 2019 to march 30, 2021

4 METHODOLOGY

4.1 Study Setting

This study was conducted in Addis Ababa Burn Emergency and Trauma (AaBET) hospital, located in Addis Ababa, Ethiopia. AaBET hospital had large Emergency unit labeled as Red to green area, two general ICU care setup with 11 functional bed, 3 semi-ICU bed and separate burn unit. All

burn patient 1st visit emergency unit before admission to burn unit for completing initial resuscitation. Emergency room have 5 resuscitation bed at red side, 12 beds at orange and > 12 beds at yellow green area in which, any patient can be treated. It also has separate decontamination room. Emergency and ICU setup are run by EMCC department. Interns, residents and nursing staff with supervision of EMCC consultants, manage the patient with collaboration with other department staffs. The care will be according to the patient need, from routine care to advanced cares. Burn unit is under Plastic and reconstructive surgery department with 19 functional beds (7 pediatric and 12 adults). There are 32 nurses specially trained on burn care, 6 plastic surgeons, 5 residents, 6 General practitioners and one dedicated Operation room

4.2 study design and period

A hospital based cross-sectional study conducted from May 1, 2021 to October 31, 2021

4.3 Population

4.3.1 Source population

All patients Visited AaBET hospital from April 1, 2019 to March 31, 2021

4.3.2 Study Population

All burn patients visited the hospital from April 1, 2019 to March 31, 2021 that meet inclusion criteria included in this study.

4.4 Eligibility criteria

4.4.1 Inclusion Criteria

All burn patients who visited AaBET Hospital from April 1, 2019 to March 31, 2021 and eligible for study.

4.4.2 Exclusion Criteria

- ✓ Those burn patients who was dead body on arrival and not restituted in ED
- ✓ All inadequate or incomplete files such as absence of age, sex, diagnosis, outcome, burn depth, burn surface area, management plan
- ✓ Those patient left against medical advice or transferred to other hospital

- ✓ Those treated as outpatient bases

4.5 Sample size and sampling method

All burn patients who visited AaBET Hospital from April 1, 2019 to March 31, 2021 who fulfil inclusion criteria during the study period were included

N.B The number of charts included for the study was estimated by applying a single population proportion formula with the following assumptions: α = the risk of rejecting the null hypothesis (0.05), d = degree of precision or margin of error (0.05), Z = the standard score corresponding to a 95% confidence interval and $p = 11.6\%$ (the mortality rate of burn injury which was taken from previous study done in Yekatit 12 hospital). Accordingly

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

Where:

n = required sample size

- $Z_{\alpha/2}$ = Critical value = 1.96 (normal Standard deviation usually set at 1.96 which corresponds to the 95% confidence interval)
- d = precision (marginal error) = 0.05
- $P = 11.6\%$ taken from a similar study done at Yekatit hospital.
- $n = \frac{(1.96)^2 \times (0.884) \cdot (0.116)}{(0.05)^2}$
 - = 158

By adding 10% drop out = $158 + 158 \times 10/100 = 174$

Hence the final sample size will be 174

Since the observed sample at start of data collection was about 268 samples, after discussion with advisor, it decided to take all eligible once to get good conclusion.

Sampling method- convenience sampling

4.6 Data collection process:

Structured and standardized questionnaire which developed in English language by principal investigator was used. It was tested for validity on 10% of charts before start of data collection by principal investigator. Data was collected by trained data collectors. They were trained by principal investigator on when, how and how much of data should be collected with detail explanation of variables on questioner for total of around 3 hours. Data source was hospital's HIMS registry book (at emergency, ICU & Burn ward) and patient chart.

4.7 Study variables

4.7.1 Dependent variables

- Outcome of burn patient (death or survival)

4.7.2 Independent variables

- Age
- Sex
- Address
- Triage category
- TBSA% burnt
- Depth of burn injury at admission
- Length of stay
- Cause of burn
- Arrival time to ED,
- Complication in Stay of hospital
- Comorbidity

4.8 Operational definition

Outcome of burn injury: what happen to the patient after possible treatment was given defined as death or survival

Discharge without Complication: when the patient was discharged without contracture, disfigurement, amputation, or hypertrophic skin graft or wound as documented on chart.

Discharge with Complication- when the patient were discharged with contracture, disfigurement, amputated, Hypertrophic scar of skin graft or burn wound as documented on the chart.

Dead body on arrival- burn patient dead before arrival to ED and no resuscitation was attempted

Contracture- Joint stiffness with restriction of movement result from tightening of skin due to burn scar as documented on chart

Disfigurement- bad appearance of body part resulted from burnt area as documented on chart

Amputated- complete removal of upper or lower extremity part as documented on chart

Hypertrophic Scar of skin graft or burn wound- significant scar form out of grafted skin or wound site as documented on chart

Routine care - When patient managed by IV fluids, analgesia, TAT, wound care, IV antibiotics, oxygen administration by nasal prong or face mask, inotropes use

Advanced care- Routine care plus advanced airway management requirement (like supraglottic device use, endotracheal intubation.....) or operative procedures (fasciotomy, wound debridement, amputation, skin graft and tissue flaps)

4.9 Data collection tools and procedures

Data abstraction tool was prepared by principal investigator with English by reviewing different literatures to explore the objectives of the study. Data collectors were BSc nurses and they were trained on the variables. The collected data was reviewed daily by principal investigator. The questioner's contain demographic characteristics (age, gender & address), clinical factors (cause, depth, TBSA% burnt, involved body part, comorbidity & associated injury), management related

factors (prehospital interventions, care given in hospital, early and late complication encountered and cause of death) and Time related factors (time of arrival to hospital & length of stay in ED, Burn ward and ICU)

4.10 Data quality control

All data's are checked for clarity, completeness and correct recording of all the necessary information by principal investigator. The quality of data was further ascertained during data entry and cleaning process

4.11 Data Analysis

After the data collected, all eligible once are cleared, coded and entered to computer by using SPSS version 25.0.for analysis. Descriptive analyses of independent variables are reported as number, percentages, and mean and standard deviation. Effect of independent variable on dependent variable analyzed by bivariate and multivariate logistic regression as well by Pearson χ^2 test. Finally, variables with P-value <0.05 after controlling confounders retained and labeled as significantly associated.

4.12 Ethical consideration

Ethical clearance for the research obtained from SPMCH ethical review committee. To ensure confidentiality name and other personal identities not used during data collection.

4.14 Dissemination of results

The result of the study will be given to St.Paul millennium medical college hospital community and then will be published on locally accessible or international journal and will be used as base line for subsequent researches.

5. RESULT

From two year retrospective data, from April 01, 2019 to March 31, 2021, a total of 268 patient who had been visited AaBET Hospital after sustained burn injury was found. Among that 10

charts are lost and 6 cards are incomplete and excluded from analysis. A total of 252 patients had completed chart. Among them 8 of them went against clear documented medical advice and 3 transferred to other hospital. So this patients also excluded due to difficulty of final conclusion of patient status. 241 patients were eligible for analysis.

Triage Category

Out of 241 patients 40 (16.6%) patients are triaged to red side. The remaining triaged to Orange (100, 41.5%), Yellow (84, 34.9%) and Green (17, 7.1%) (See figure 2)

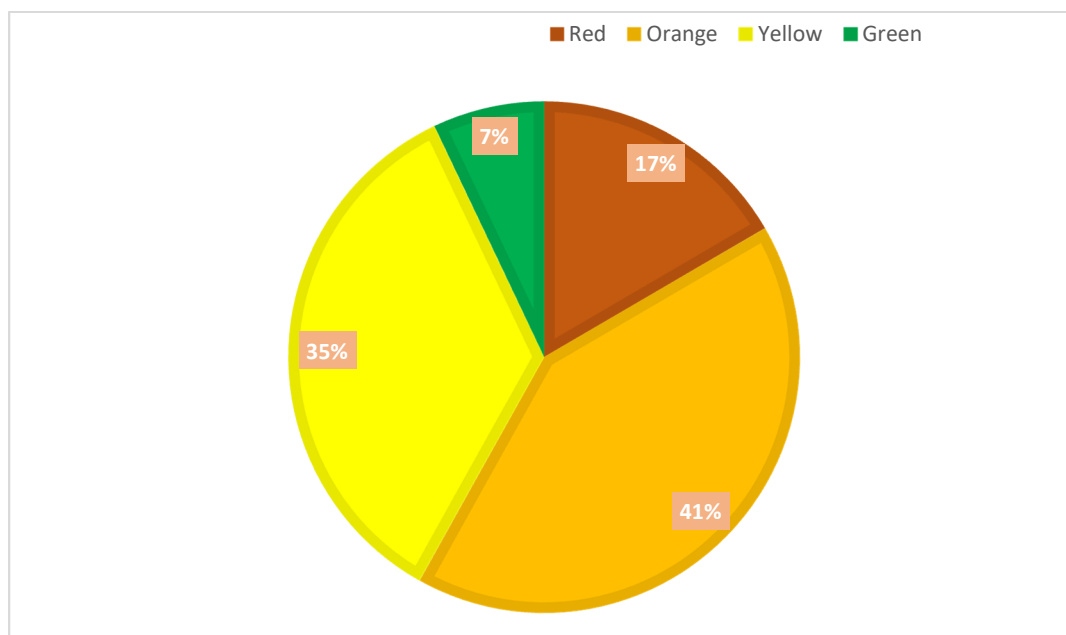


Figure 2 Triage category of Burn patient come to AaBET hospital from April 1, 2019 to March 31, 2021

Management given at referring hospital

Most of the patients came from public hospitals or public health centers accounting for (105, 43.6%) and (77, 32%) respectively. Others are either from private health facility (20, 8.3%), directly from injury site (34, 14.1%) or from home where not injury take place (5, 2.1%).

Excluding those came directly from injury site or from home, Most of the patients comes with referral after communication (122, 60.4 %). Others comes without communication (63, 31.2%)

or self-referral (4, 2%) and Referral status was unknown for 13 patients (6.4%). Those from private hospital are relatively higher percentage of referral without communication compared with referral with communication. (See table 1)

From all patients who visited any health facility 75.7% of patient took at list some kind of intervention. 45.6 % of them took IV fluid, but only 57 % took documented adequate fluid according to parkland formula (with respect to age, TBSA%, and time lapse before arrival to this hospital). 52.7% of them took analgesia and most of the time type of analgesia not mentioned (in 27.4% of case). Among documented analgesia, the widely used was paracetamol followed by tramadol and diclofenac, accounting for 19.8%, 14.2% and 13.2% respectively. Wound care done for 66.8% of patient from their primary visit. But, only 54% took documented Topical antibiotics application. Other service given from their primary visit area includes: TAT administration (15.8 %), Oxygen administration (2.5%) and Compartment release for (3.5%).

Table 1 Cross tabulation of referral status of burn patients and referring health facilities among patient visited AaBET hospital

Category		Referring health care center			
		Public health centers	Private health care facility	Public hospital	Total
	Serf referral	1	2	1	4

Referral status	Referred with communication	49	6	67	122
	Referred without communication	21	8	34	63
	Referral status unknown	6	4	3	13
	Total	77	20	105	202

After triage of the patient let see patient characteristic and other related factors depending on conceptual frame work pattern

5.1 Patient Related Factor

Socio-demographic characteristics

Among 241 patient's 132 (55.2%) patients are males and 108(44.8%) were females with male to female ratio of 1.23:1. Age range of patient was from 5 months to 77 years with mean age of 18.22(SD -15.02) years. Adults (age 15 to 60 years) are most affected groups 132(54.8%) followed by pediatric age groups (age less than 15 years) (105, 43.6%) and elderly (age greater than 60 years) (4, 1.6%) (See table 2). Except for elderly group male predominate female in all age groups (See figure 3)

Most of the patients are from Oromia region (123, 51%) and Addis Ababa (89, 36.9%) respectively. Others are from Amhara region (13, 5.4%), SNNP (9, 3.7%), Afar (3, 1.2%), Somalia (1, 0.4%), and Harari (2, 0.8) and Gamebela (1, 0.4%) (See table 2). Except for SNNP males are predominate over female in all region. In Addis Ababa Pediatric age group predominate but in other region Adult age are predominant victim. (See figure 3A)

Figure 3A

Figure 3B

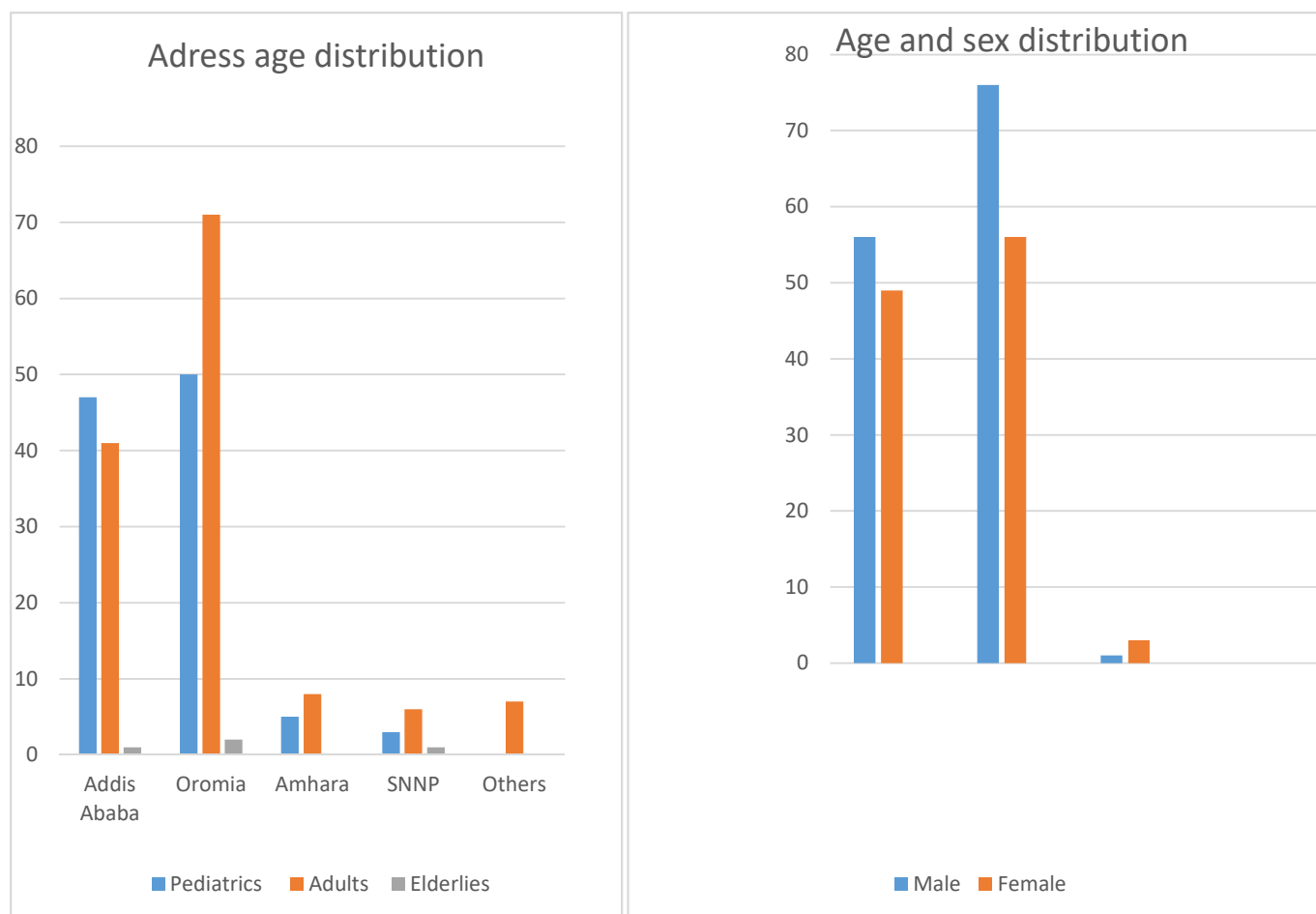


Figure 3 Graphs showing distribution of address with age distribution (3A) & Age and sex distribution (3B) among burn patient visited AaBET hospital from April 1, 2019 to March 31, 2021

Table 2 Socio demographic characteristics of burn patient visited AaBET hospital from April 1, 2019 to March 31, 2021

Category		Frequency	Percentage
Age	< 15 years	105	43.6%
	15-60Ears	132	54.8%
	> 60 years	4	1.6%
	Totals	241	100%
Sex	Male	133	55.2%
	Female	108	44.8%
	Totals	241	100%
Address	Addis Ababa	89	36.9%
	Oromia	123	51%
	SNNP	9	3.7%
	Amhara	13	5.4%
	Others	7	3%
	Total	241	100%

Others (Tigray, Hareri, Diredewa, Gamebela, Benshangul, Somalia, Afar)

5.2 Clinical factors of outcome of burn injury

Causes of burn injuries

Scald burn was the major cause (94, 39%) followed by Flame burn (81, 33.6%), Electrical burn (64, 26.6%) and chemical burn (2, 0.8%). But, Contact burn was not observed in the study. Scald burn was more common in pediatric age group than adults by 3:1 ratio. Electrical burn was caused more in adult age group with ratio of adult to pediatric by 6.7:1. Flame burn also affected adult more than pediatrics by 2:1 ratio. Elderly's burn was caused by flame (3, 75%) and Electrical (1, 25%) burn. Scald and electrical burns were the most common cause of burn in male while Flame burn was major cause of burn in female patient. Electrical burn disproportionately encountered in Adult age group and male patients. Chemical burn observed only in adult age group female patients. Both sex and age of the patient significantly correlate with cause of burn ($p < .001$) (see table 2).

Depth and Extent of burn injury

Most of burn victim had second degree superficial (96, 39.8%) followed by Full thickness (77, 32%), second degree deep (67, 27.8%) and first degree burn (1, 0.4%). Pediatric age groups mostly, experienced second degree superficial (56, 53.3%) followed by second degree deep (30, 28.6%), Full thickness (18, 17.1%) and First degree burn (1, 1%). Most adults had full thickness burn (56, 42.4%), followed by second degree superficial (40, 30.3%) and second degree deep (36, 27.3%). Elderlies encountered Full thickness (3, 75%) and second degree deep burn (1, 25%) only. Age of the patient had significant association with depth of burn ($p < .001$).

The median TBSA% was 10.5% with mean of 15.49%, SD of 13.78% and range from 1% to 64%. Most of burn patient had $< 10\%$ (119, 49.4%), followed by 10 to 20% (60, 24.9%), 20 to 30% (31, 12.9%) and $> 30\%$ (31, 12.9%). In all age group pattern is the same as percentages of categorized class but adult age groups had higher proportion for burn with $> 30\%$ of TBSA% than other age groups. Age has significant association with extent of burn ($p = .003$).

Scald burn had higher proportion of second degree superficial burn (59, 61.7%) but flame and electrical burns had more of full thickness burn (31, 40.3%) and (40, 51.3%) respectively). The commonest extent of burn in all type of burn was TBSA% of less than 10% but Flame burn cause more >30% of TBSA% burn than scald and electrical in ratio of almost 2:1. Cause of burn had significant association with Depth of burn ($p < .001$) as well Extent of burn injury ($p = .003$) (see table 2)

Anatomic Locations of Burn Injuries

Upper extremity is the most affected body part and involved in 63.1% followed by Lower extremity (56%), anterior trunk (45.6%), face (24.5%), posterior trunk (21.6%), neck (17.8%), Head (12.4%) and Genitalia (5%). In 73% of case there is involvement of two or more body part involvement. 6.2% of patients had associated inhalational injury.

Associated injury and Comorbidity

Twelve burn victim (5 %) had associated injury in which 3 person (1.2 %) had blunt chest trauma with hemothorax, 3 person (1.2%) extremity fracture (1 femoral shaft and 2 clavicular fracture) and 6 (2.5%) had mild head injury (1 victim had minimal subdural hematoma). 7.5% of all burn victim had comorbidity being epilepsy prevalent in 13 patients (5.4%). Other comorbidities include Pregnancy (3, 1.2%), HTN (2, 0.8%), psychiatric illness (2, 0.8%), DM and HIV (1, 0.4% each)

Table 3 cause of burn injury and related factors among patient visited to AaBET hospital from April 1, 2019 to March 31, 2021

		Cause of burn injury					P-Value
		Scald N (%)	Flame N (%)	Electrical N (%)	Chemical N (%)	Total N (%)	
Over all percentage		94,39%	81,33.6%	64,26.6%	2,0.8%	241,100%	
Age group	< 15years	71,67.6%	26,24.8%	8, 7.6%	0,0%	105, 43.6%	< .001
	15-60 years	23, 17.4%	52, 39.4%	55, 41.7%	2, 1.5%	132, 54.8	
	>60years	0,0%	3,75%	1,25%	0, 0%	4, 1.6%	
Sex	Male	54,40.6%	24, 18%	55,41.4%	0,0%	133,55.2%	<.001
	Female	40, 37%	57,52.8%	9,8.3%	2,1.9%	108,44.8%	
Extent of burn injury	< 10%	48,40.3%	32,26.9%	38,31.9%	1,0.8%	119,49.4%	.003
	10-20%	33,55%	17,28.3%	9, 15%	1, 0.5%	60, 24.9%	
	20-30%	7, 22.6%	16,51.6%	8,25.8%	0,0%	31, 12.9%	
	>30%	6,19.4%	16,51.6%	9,29%	0,0%	31, 12.9%	
Depth of burn injury	First degree	1,100%	0,0%	0,0%	0,0%	1,0.4%	<.001
	Second degree Superficial	59,61.5%	24,25%	12,12.5%	1,1%	96, 39.8%	
	Second degree deep	28,41.8%	26,38.8%	12,19.8%	1, 1.5%	67,27.8%	
	Full thickness	6, 7.8%	31,40.3%	40,51.9%	0,0%	77, 32%	
Total length of stay in hospital	Less than 20 days	61,58.1%	24,22.9%	19,18.1%	1, 0.9%	105,43.6%	.765
	20 to 40 days	21,45.7%	12,26.1%	13,28.3%	0,0%	46,19.1%	
	40 to 60 days	6,14.3%	20,47.6%	16,38.1%	0,0%	42, 17.4%	
	> 60 days	6, 7.5%	25,31.25%	16, 20%	1,1.25%	48, 60%	

5.3 Management related factor

Management and outcome at emergency

About 97.1 % of patient took analgesia and wound care at emergency unit. Other care given include Fluid resuscitation for about 46.5%, TAT for 24.9%, Endotracheal intubation for 3.3%, wound debridement for 1.7%, fasciotomy for 2.1%, Iv antibiotics for 21.2% of patients are given in emergency department. One patient require dialysis but not done because it was not available as well can't transfer the patient to dialysis capable center because patient was hemodynamically unstable. The mean length of stay of patient was 39.4 hour with minimum disposed within one hour and maximum stay for 21 days. Most of the patient admitted to ward (206, 85.5%) and ICU (12, 5%). 22 patients (9.1%) discharged but 1 patient (0.4%) died at emergency.

Management and outcome in ICU and burn ward

From 13 patient (including one patient from burn ward) Admitted to ICU 8 was died and 5 transferred to burn ward with improvement. Mean length of stay in ICU was 13.05 day (range from minimum of 17 hours to maximum of 78 days). Among 211 patients admitted to burn ward: 12 (5.7%) of patient continue fluid resuscitation, 78(37%) took IV Antibiotics and all patient took Analgesia and had wound care according to their need (every other day, once daily, two time per day or three time per day).

The mean length of stay for patient admitted at Burn ward is 39.6 days (range minimum of 1 day to maximum of 175 days). 167 (79.1%) of patients are discharged without complication, 36(17.1%) of patient discharged with documented complication, 1 patient (0.5%) admitted to ICU and 7(3.3%) patients died from burn unit.

Over all, among all burn patient visited at designed study period, surgical interventions were undergone for 121 (50.2%) patients. Among surgical intervention's skin graft done for 106 (44%), wound debridement for 42 (17.4%), tissue flap for 17(7.1%), contracture release for 15(6.2%) and fasciotomy done for 5(2.1%)

Early Complications during hospital stay

36.1 % of burn victim developed at least one early complications. The top complication was burn wound site infection (30.7%). Others include Burn wound sepsis (22%), HAP (10%), Septic shock (6.2%), CAUTI (4.6%), Respiratory failure (4.1%), hospital acquired infection of unknown origin (1.7%), arrhythmia (1.7%), COVID 19 infection (1.7%) and Bed sore (1.2%).

26.1% of burn victim developed anemia with hemoglobin level of less than 10 g/dl. Concerning electrolyte imbalance hyponatremia the commonest finding among those had electrolyte determination (37.5 %). Hypokalemia in 18.4%, hyperkalemia in 8.2% and hypernatremia in 10.1% are also found. Creatinine greater than 1.2(highest lab value) found in 6.2% of burn victims

5.4 Time related factors

The earliest time patient present to the hospital was 30 minute and latest time is 120 days with median of 12 hour. Only 25.7% of burn patient come in the first 24 hour of period of post burn accident. Length of stay in hospital range from 2 hours to 177 days with mean & SD of 37 days and 34.2 days respectively. Length of stay less than 20 days had highest mortality.

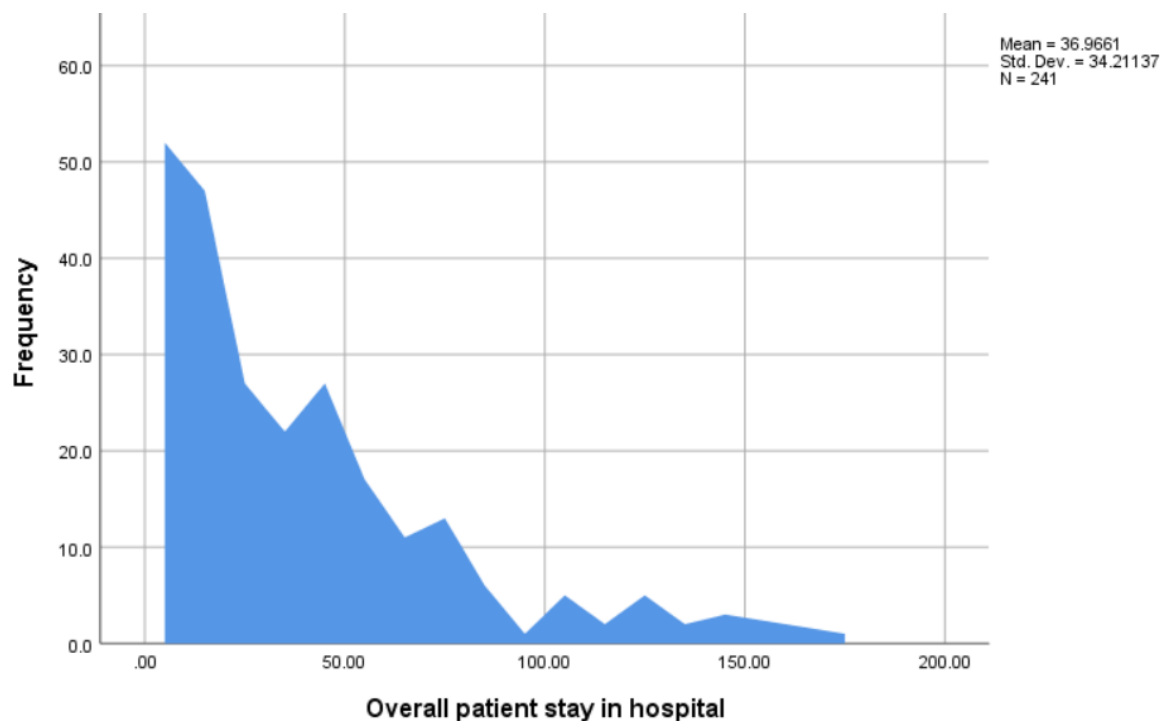


Figure 4 over all hospital stay of patient in days among patient admitted to AaBET hospital from April 1, 2019 to March 31, 2021

Factors associated to outcome

In General from 241 burn patients 189(78.4%) discharged without complication, 36(14.9%) Discharged with complication and 16(6.6%) died. The commonest long term complication is Amputation of extremity (19, 7.9%) followed by contracture (14, 5.8%) and Hypertrophic Scar of skin graft or wound (3, 1.2%). From all death septic shock was identified as immediate cause of death in 8 patients (50%) followed by MOD in 4 patients (25%), Respiratory failure in 3 patients (18.8%) and arrhythmia in 1 patient (6.3%).

In bivariate analysis adult and old age, burn TBSA% of 20 to 30% and greater than 30%, time lapse 72 hour before arrival to hospital, early complication while in hospital stay, associated injury and length of stay less than 20 days are significantly associated with p- value <.2. When multivariable analysis was done TBSA% of greater than 30% and age greater than 65 were the only variable associated with p value of < .05. TBSA% > 30% increase mortality rate by 8.7x and age > 60 year. Increase mortality by 2.2x.

Table 4 Bivariate and Multivariate analysis showing association of determinant factor and outcome of burn patient admitted to AaBET hospital from April 1, 2019 to March 31, 2021

		Outcome of burn patients					
		Death N,%	Survival N,%	COR(95%CI)	P-value	AOR 95% CI	P-value
Age	< 15 yr.	1(1%)	104(9%)	1.00	.000		
	15-60 yr.	14(10.6%)	118(89.4%)	12.34 [1.59-95.45]*	.016		
	>60 yr.	1(25%)	3(75%)	34.667[1.726-696.338]*	.012	2.206[1.323-3.69]**	0.037
Sex	Female	9(8.3)	99(91.7%)	1.00	.000		
	Male	7(5.3%)	126(94.7%)	0.611[0.22-1.698]	.345		
Cause	Chemical	0 (0 %)	2(100%)	1.00	.999		
	Scald	0(0%)	94(100%)	1.00	1.000		
	Flame	9(11.1%)	72(88.9%)	201934808.8[000...]	.999		
	Electrical	7(10.9%)	57(89.1%)	198392092[0000]	.999		
Extent of burn injury	<10%	2(1.7%)	117(98.3%)	1.00	.000		
	10 – 20%	0(0%)	60(100%)	0.00 [000]	.997		
	20-30%	3(9.7%)	28(90.3)	6.268[0.999-39.312]*	.050		
	>30%	11(35.5%)	20(65.5%)	32.175[6.63-156.2]*	<.001	8.72[1.32-57.33]*	.012

Associated trauma	Yes	3(23.1%)	10(76.9%)	4.982[1.216-20.249]*	.026		
	No	13(5.7%)	215(94.3%)	1.00	.000		
Time lapse before arrival	<24 hours	2(3.2%)	60(96.8%)	1.000			
	24 to 72 hours	0(0%)	17(100%)	.000	.999		
	>72 hour	14(8.6%)	148 (91.4%)	2.838[0/626-12.867]*	.176		
Any early complication	Yes	15(17.2%)	72(82.8)	31.875[4.13-246.0]*	.001		
	No	1(0.6%)	153(99.4%)	1.00	.000		
Any prehospital Intervention	Yes	14(9.8%)	139(90.2%)	4.835 [0.69-37.747]*	.133		
	No	1(2%)	48(98%)		.000		
Total length of stay in hospital in days	Less than 20 days	12(11.4%)	93(88.6%)	6.065[0.765-48.057]*	.088		
	20 to 40 days	2(4.3%)	44(95.7%)	2.136(.187-24.398]	.541		
	40 to 60 days	1(2.4%)	41(97.6)	1.148[.069-18.913)	.924		
	Greater than 60 days	1(2.1%)	47(97.9%)	1.00	.000		

* Significant at p: < .2 ** significant at p: < 0.05 COR- Crude odds ratio
AOR- adjusted odds ratio CI- confidence interval at 95 %

6 Discussion

According to our study conducted from review of two consecutive year (from April 1, 2019 to March 31, 2021) on outcome of burn injury, Most of burn victim were Adults whose age range is from 15 to 60 years, which account for about 54.7% of the study population. This is comparable as study done by S.Triphate & S.J.Basenet, Nepal, India which account for about 65.4%(26)Predominance of adult age also described from South Africa and Singapore. The predominance can be explained by the fact that they are the most active groups and exposed to hazardous environment both at home or at workplace. In this study male also predominate female with male to female ratio of 1.23:1. The result consistent with study of N.A. Forbinake, Cameroon, which consist for 68.3% (27). The reason may be males are more participate in hazardous work place like industry with faulty electrical wire in adult and boys are more active in nature than girls in pediatric age group. Since work place and event during the accident was difficult to access due to nature of study and not assessed in this study, we couldn't conclude specifically. In contemporary, study done by Tesfaye Mulat, Yekatit 12, Addis Ababa, Ethiopia show female predominance which consist 64.5 %(28)as well by S.Triphate & S.J.Basenet, Nepal which account for 55.6 %(26). In this studies it explained by fact that female predominantly involve in household activity that strongly correlate with fire and hot liquids like cooking and baking. On top of that, they usually handle fire on relatively open space(26, 29).

The most frequent cause of injury is scald which account for 39% followed by Flame, Electrical and chemical burn (33.6%, 26.8%, 0.8% respectively). This result was also shown in study of Tesfaye Mulat, Yekatit 12 hospital but according to S.J.Basenet, Nepal, India Flame was the commonest cause (26, 28). The variety could be due to population distribution and cultural variation. Scald burn is number one cause in pediatric population but adults affected more by electrical and flame burn. Electrical burn currently shift epidemiology from previous studies (30). Usually Male are more affected than female with Male to female ratio of 6.1:1 and adults are more prone than pediatric with ratio of 6.7:1. The children's attitude in playing (stay) at home or in the kitchen with their mother or guardians where drinks and liquid foods are being prepared with in adequate supervision and inability to protected by themselves may explain why scald commonest in children. Electrical burn as described earlier, work area exposed male adults are most commonly affected (26, 27, 29, 31).

Moreover, flame burn injuries were the second most common (33.6%) frequent cause of burn injury in this study. It account for 75% of elderly's burn and commonest cause of burn in Female patient with ratio of female to male of 2.3:1. Asa described earlier working environment will explain it well(6).

The median TBSA% was 10.5% with mean of 15.49%, SD of 13.78% and range from 1- 64%. It is slightly lower than study done by Tesfaye mulat, Yekatit 12 Hospital, Addis Ababa, in which mean was 17.2%(28). TBSA % < 10 % is most common accounting almost for half of cases (49.4%) and higher from study of Frehiwot Girma, Bahirdar Ethiopia, in which total body surface area was mean of 12.56 and SD OF 8.91%(31). Higher TBSA% (>20%) is more observed on flame burn than others(31). This may be due to the nature of the offending agent and duration of contact with it. Study by Aditya Wardhana, Indonesia show that mean TBSA% was 26.7% (range from 0.5% to 100%). This could be due to most patient were sustained flame burn (50%)(32)

The most observed degree of burn is superficial second degree burn accounting for 39.4%. Pediatric age groups encountered more superficial second degree burn while adults and elderly commonly full thickness burn. This could be due to cause of the degree of burn, in which, scald more cause first degree burn and second degree superficial while flame and electrical burn cause full thickness & Second degree burn(6, 8, 11)

Upper extremity is the most affected body part and involved in 63.1% followed by Lower extremity (56%), anterior trunk (45.6%), face (24.5%), posterior trunk (21.6%), neck (17.8%), Head (12.4%) and Genitalia (5%). In 73% of case there is involvement of two or more body part involvement. This is higher but consistent in part involved from study done in other region of Ethiopia's like 43.3% in study of Frehiwot Girma, Bahirdar, Ethiopia(31) and 45.4% in study Sielu Alemayehu, Ayder, Mekele, Ethiopia(3). This could be due to nature of offending agent and personal response to the circumstance of events.

Twelve burn victim (5 %) had associated injury in which 3 person (1.2 %) had blunt chest trauma with hemothorax, 3 person (1.2%) extremity fracture (1 femoral shaft and 2 clavicular fracture) and 6 (2.5%) had mild head injury(1 victim had minimal subdural hematoma).

7.5% of all burn victim had comorbidity being epilepsy prevalent in 13 patients (5.4%). Other comorbidities include Pregnancy (3, 1.2%), HTN (2, 0.8%), psychiatric illness (2, 0.8%), DM and RVI (1, 0.4% each). Epilepsy mentioned in various research as commonest comorbidity like in 5.6% from study of S.Triphate & S.J.Basenet, Nepal, 4.1% in study of Aditya Wardhana, Indonesia and 7.8 % in frehiwot Girma, Bahirdar, Ethiopia (26, 31, 32). This could be due risky nature of disease to end up with fall at unsafe place including on causative agents of burn.

Most of the patient come to this hospital by referral system. Among them 75.6% of patients received some sort of treatments which include, Resuscitation fluid, analgesia, wound care, oxygen administration, fasciotomy or in combination of this. Gaps are observed in handling the patient, on starting available appropriate treatment, documentation as well delay in referral system. This could affect most of unstable patients in getting definite management. Similar problem is facing in other countries like Indonesia (according to Aditya Wardhana study), in which, patients wait for longer time to get referral to territory center where the subspecialists available(32). This is due to scarcity of facility as well equipment and man power that faced most of developing countries.

In our hospital all patient had been given necessary routine care but 50% of them needed advanced care including endotracheal intubation and other surgical intervention. According endotracheal intubation (8, 3.3%), skin graft (106, 44 %), wound debridement (44, 17.1%), tissue flap (17, 7.1%), contracture release (15, 6.2%) and fasciotomy (5. 2.1%) had been done. When comparing to study of Tesfaye Mulat, Yekatit 12 hospital, Addis Ababa, surgical operation done here was low. According to this study 74.7% of patient had delayed splint skin graft. This may be due to low sample size (121), nature of the burn or improvement in care of patient in our hospital.(28)

36.1 % of burn victim develop at least one early complications while stay in this hospital. The top complication was burn wound site infection (30.7%) and Burn wound sepsis (22%) followed by Anemia of hemoglobin less than 10 g/dl (26.1%), HAP (10%), Septic shock (6.2%), CAUTI (4.6%), Respiratory failure (4.1%), hospital acquired infection of unknown origin (1.7%), arrhythmia (1.7%), COVID 19 infection (1.7%) and Bed sore (1.2%). hyponatremia in 37.5 %, Hypokalemia in 18.4%, hyperkalemia in 8.2% and hypernatremia in 10.1% are the most encountered electrolyte abnormality. 6.2% had creatinine of > 1.2g/dl which possibly suggest acute kidney injury. This result consistent with study done by N.A. Forbinake in Cameroon (27).

After all, from 241 burn patients 189(78.4%) discharged without complication, 36(14.9%) Discharged with complication and 16(6.6%) died. The commonest long term complication is amputation of extremity (19, 7.9%) followed by contracture (14, 5.8%) and hypertrophic Scar of skin graft or wound (3, 1.2%). Death rate is improved from Tesfaye Mulat study in Yekatit 12, which was 11.6% as well from most of African country like Cameroon (N.A. Forbinake study, 23.4%)(27), Malawi (G. Virich study, 26.4%)(33), Nigeria(A.O. Olandele and J.K Olabanji study, 26%) (34) and some Asian country like Indonesia (Aditya Wardhana study, 24%)(32) and Nepal (S.Triphate & S.J.Basenet study, 25.4%)(26)

From all death septic shock was identified as immediate cause of death in 8 patients (50%) followed by MOD in 4 patients (25%), Respiratory failure in 3 patients (18.8%) and arrhythmia in 1 patient (6.3%). There is agreed data from Nepal and Cameroon with commonest cause of death as septicemia with septic shock followed by MOD, ARDS as well acute renal failure and severe anemia.(26, 27)

According to this study age greater than 65 and TBSA% of greater than 30% are strong predictor of mortality with odds of 2.206 at CI of [1.323-3.69] and 8.729 at CI of [1.328-57.328] respectively.

7. Strength and limitation of study

7.1 strength

Since there was no published study from AaBET hospital since the start of the hospital, it will give information about the overall burn patient outcome. Furthermore, it will help as to identify gaps and to give solution for it.

7.2 limitation

Since the study was retrospective documentary review, there were challenges like incomplete documentation at all site of care(like subsequent day to day progress of the patients), inconsistent subsequent clinical feature of patient, un eligible handwriting and no or unclear information for some variables(type of analgesia, amount and dosage of fluid taken at pre hospital levels). Due to the nature of the study, information's that gathered by taking history, doing physical examination or simple observations are missed (like socio economic status, housing condition, circumstance while the event occur and etc.....)

8 Conclusion

The commonest cause of burn was scald burn. Electrical burn and flame burns are more common in adult and elderly age groups. Extremities were by far, the commonest affected body parts. Mortality rate decreased significantly from previous studies. But, disability up on discharge remain high. Extent of burn injury and age of the patient independently predict mortality of the patient.

9. Recommendation

Overall the mortality rate show decrement from previous studies as compared to study done at other site. But burn is still the burden of our countries. To decrease mortality and morbidity, I recommend the following

To health professionals

- I recommend early and timely aggressive resuscitation with early referral habit where best care will be given for the patient. Clear documentation at each level of care and possibly to teach epileptic patients to avoid unsafe work environment and proper medication use.

To researchers

- I also recommend the need for further community based studies that determine the risk factor, severity of burn injuries, the outcome, and quality of care given at health institutions prospectively with good over all supervision.

To Ministry of health and regional health bureau

- Time is sensitive for burn victim patient. There should be adequately trained personal experienced in management of burn patients. I highly recommend to open well equipped, both in terms of material and trained personal, burn units across all regional state. This hopefully will improve the quality of care, decrease chance of mortality and disability.

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11 Annex

1. MRN_____
2. Age in years _____
3. Sex
 - A. Male B. Female
- 4 Address
 - A. Addis Ababa
 - B. Oromia
 - C. Somalia
 - D. SNNP
 - E. Afar
 - F Amhara
 - G. unrecorded
 - H. Others specify
- 5 Where was patient triaged first at emergency
 - A) Red B) Orange C) Yellow D) Green
- 6 Place from where patient Come to Hospital
 - A. First visit
 - B. Come from public Health centers
 - C. Private hospital
 - D. Public hospital
- 7 How much time lapse before patient reach emergency unit of hospital after sustaining burn.....
- 8 Does the patient start resuscitation before arrival to Emerge
 - A Not resuscitated
 - B Resuscitated but given lower than parkland formula calculation
 - C Resuscitated according to parkland formula

9 Initial vital sign

- A) Blood Pressure -----
- B) Pulse Rate -----
- C) Respiratory Rate -----
- D) Temperature -----
- E) Spo2 -----

10 Type of burn injury up on admission

- A) Thermal
- B) Scald burn
- C) Chemical burn
- D) Electrical burn
- E) Contact burn
- F) Specifies if other -----

11 what was the depth of the injury

A. First degree B. Second degree Superficial C. Second degree deep D. Full thickness

12 Extent of burn by TBSA% burnt -----

13 Involvement of the respiratory tract (Inhalational injury) A yes B no

14 What associated trauma does the patient encountered?

- A Head injury
- B Chest injury
- C Abdominal injury
- D Extremity fracture
- E Soft tissue injury
- F Facial injury

G If other Specify here_____

15 Comorbidities that (more than one can be chosen)

A. Diabetes Mellitus

B. Hypertension

C. Cardiac disease

D. Renal disease

E. Asthma

F. COPD

G. Neoplasia

H. HIV

I. Others _____

16 What are complication encountered in hospital

A HAP

B CAUTI

C septic shock

D arrhythmia

E Respiratory Failure

F HAI of unknown origin

G Bed sore

H wound infection

I Burn wound sepsis

17 Write the Highest and lowest value of the following investigation you get on the chart

A Hemoglobin -----

B Creatinine -----

C Urea/ BUN -----

C sodium -----

D Potassium -----

E urine analysis Result-----

18 What treatment given at ED

- A. Fluid resuscitation
- B. Analgesics
- C. TAT
- D. Antibiotics
- E. Wound care
- F. Wound debridement
- G. Fasciotomy
- H. endotracheal intubation
- I. Dialysis

19 Length of stay at ED -----

20 How was the disposition of the patient from ED?

- A) Admitted to ICU
- B) admitted to burn unit
- C) Referred to private hospital
- D) Referred to other government hospital
- E) Went home against medical advice
- F) Died

21 If the answer for number 21 is “A”, for how long the patient stay at ICU? -----

22 How was the disposition of the patient from ICU?

- A) Admitted to Burn unit
- B) Referred to private hospital
- C) Referred to other government hospital
- D) Went home against medical advice
- E) died

23 If the answer for number 21 is “B”, for how long the patient stay at burn unit? -----

24 What treatment was given at burn ward

- A. Fluid resuscitation
- B. Analgesics
- C. Antibiotics
- D. Wound care
- E. Wound debridement
- F. Fasciotomy
- G. Dialysis
- H. Skin graft
- I. Tissue flap
- J. Contracture release

25 What was the final outcome of the patient from burn unit?

- A. Improved and discharged home
- B. Discharged home with disability
- C. Died
- D. Referred to private health hospital
- E. Referred to other governmental hospital
- F. Admitted to ICU
- G. Went against medical advice

27 What was the disability during discharge?

- A Contracture
- B Disfigurement
- C Amputated
- D Scar of skin graft

28 For those dead in the hospital, what was the cause of death?

A Sever sepsis

B septic shock

C respiratory failure

D Multi organ failure

E anoxic brain injury from inhalation

G Arrhythmia

F Specify it other cause _____