Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

The Epidemiology, Pattern and Outcome of Burn Injuries in a Tertiary Hospital in Southern Nigeria

Oshiozimede Quincy AIGBONOGA

quinzimed@yahoo.com

Irrua Specialist Teaching Hospital, Ambrose Alli University

Oluwafemi Olasupo AWE

Irrua Specialist Teaching Hospital, Ambrose Alli University

Andrew Akarutu OKOMAYIN

Irrua Specialist Teaching Hospital, Ambrose Alli University

Johnbull Mazor AKERELE

Irrua Specialist Teaching Hospital, Ambrose Alli University

Charles IKHIFA

Irrua Specialist Teaching Hospital, Irrua Edo State

Orume Lucky ENEGBUYA

Irrua Specialist Teaching Hospital

Kerry AZEKE

Irrua Specialist Teaching Hospital, Irrua Edo State

Stella Nneka UGWU

Irrua Specialist Teaching Hospital, Irrua Edo State

Ikhuoria EWOIGBE

Irrua Specialist Teaching Hospital, Irrua Edo State

Daniel EHILEBOH

Irrua Specialist Teaching Hospital, Irrua Edo State

Osasuyi ENOMA

Irrua Specialist Teaching Hospital, Irrua Edo State

Faustina BLACKIE

Irrua Specialist Teaching Hospital, Irrua Edo State

Miracle Onosetale EDOKPA

Asaba Specialist Hospital

Barnabas Aret Ja-Ani

Irrua Specialist Teaching Hospital, Irrua Edo State

Ikenna Charles NGWU

Irrua Specialist Teaching Hospital, Irrua Edo State

Research Article

Keywords: Burns, Burns Epidemiology, Outcome of Burns Injury

Posted Date: May 7th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9396969/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background: Burn injuries are a significant cause of morbidity and mortality worldwide. This is particularly so in the low- and middle-income countries (LMICs) where it accounts for approximately 180,000 deaths per year. There is paucity of burn epidemiologic data in Nigeria. This study aims to bridge the gap in this data vacuum by assessing the sociodemographic, clinical features, options of management, and the outcome of management in a southern Nigerian hospital.

Methodology: This is a retrospective cross-sectional study carried out with secondary data obtained from the admission and discharge register of the ISTH burns unit. Patients' demographics, burn types, severity, and outcomes were analysed. Chi-square tests were used for statistical analysis with SPSS version 25.0.

Results: In this cross-sectional retrospective design, male patients were 84 accounting for 63.2% of the total number of patients managed, while female patients were 49 and accounted for 36.8%. This represented a male-to-female ratio of 1.7:1. The age range of the patients was 7 months to 75 years with a mean age of 21.4 years. The adult group (17-64 years), and accounted for 51.9% of the patients. Aetiologically, flame injury was the commonest cause of burns accounting for 56.4% of the aetiologies of burns. However, in the paediatric age group, scald injury was the commonest cause of burns accounting for 60% of paediatric burns. The overall mortality rate is 13%.

Conclusion: Burns are preventable conditions of public health concern. The double-digit mortality rate in the study begs for more active policies to establish preventive measures at the local and national levels.

INTRODUCTION

Burns is a significant cause of morbidity and mortality worldwide.[1] It is estimated that there are 265,000 burn-related deaths annually.[2] In the low- and middle-income countries (LMICs), burns account for an estimated 180,000 deaths per year.[1] These injuries are a unique trauma that are recognised as serious public health problems both in low- and high- income countries, and they account for about 1% of the global burden of diseases and are ranked fourth among all injuries.[3,4] They are among the leading causes of loss of productive man-hours, and disability-adjusted life years (DALYs) lost in low- and middle-income countries.[5]

The incidence, prevalence, pattern, as well as the overall outcome of burn injuries differ greatly between ages, gender, cultures, socioeconomic status, geographical locations, and even within [a particular country.[5]

In this study, the authors aim to identify, determine, analyse, and update the epidemiological aspects, patterns and the outcome of management of patients with burns admitted in our burn unit during a 65-month (August

2019 to December 2025) period. Moreover, burn prevention programs imply the availability of proper epidemiological data, which are limited in most LMICs. The preventive and interventional strategies for burn management thereby, need to be tailored to and made suitable for a region being considered. As such, this study is to generate data required for evidence-based strategies to address the issue in a local, state, and national perspective.

MATERIALS AND METHODS

Research Setting and Design

This retrospective study was conducted using data available at the Burns unit of the Irrua Specialist Teaching Hospital (ISTH), Edo state, Nigeria. The unit is a four-bedded Burns unit used for the admission and management of acutely burn patients. ISTH is a 500-bedded tertiary hospital that is located in the Edo Central senatorial district of Edo state. It serves as a main-referral point for patients from the northern and central regions of the state, and neighbouring Delta, Ondo, and Kogi states of Nigeria. The hospital is affiliated and functions as the teaching hospital for the medical students of the Ambrose Alli university, Ekpoma, Edo state.

The sampling method was a non-random consecutive sampling of all burn patients admitted into the Burn unit.

Inclusion Criteria

The inclusion criteria of the study included all patients who were seen at the adult and children emergency departments of the Irrua Specialist Teaching Hospital (ISTH), and were admitted into the Burn unit of the hospital between August 2019 to December 2025, and data entered into the unit's Burn register.

Exclusion Criteria

The exclusion criteria of the study included burn patients who were dead on arrival, burn patients who died or discharged against medical advice (DAMA) at the emergency units, and those who were treated on an outpatient basis.

Ethical Clearance

In accordance with the Declaration of Helsinki, ethics approval for the study was granted by the Health Research Ethics Committee of the Irrua Specialist Teaching Hospital (ISTH) with approval number ISTH/HREC/20261902/854.

Data Collection

A retrospective approach was utilised in acquiring the data for this study. The information regarding all patients who were admitted into the burn units from August 2019 to December 2025 were retrieved from

the unit's Admission and Discharge Books. Moreso, the patients documented electronic records and folders were retrieved to confirm data obtained from the Admission and Discharge Books. All retrieved records were studied closely from period of admission till death or discharge. The medical records obtained were demographic data in the form of age, gender, aetiology of the burn injury, the burn wound depth, percentage total burn surface area (%TBSA), presence or absence of inhalational injury, and the outcome of management. The outcome measures were discharged, discharged against medical advice (DAMA), and death. The age of the patients was stratified into children (≤ 16 years), adults (17–64 years), and elderly (≥ 65 years).

The history documented in the records regarding the aetiology of the burn injury were confidentially obtained from patients and/or their relatives. The American Burn Association (ABA) admission criteria were used in absence of a reliable local system of burn patient admission criteria. The percentage total burnt surface area (%TBSA) was estimated using the Wallace "Rule of Nine", and where applicable, the "Rule of the Palm". Inhalational injury was clinically diagnosed in patients presenting with facial burns, singeing of the nasal hairs, soot in the oropharynx, change in voice, and the presence of postburn respiratory distress. On admission, the patients were resuscitated using the Advance Trauma Life Support (ATLS) protocol. Intravenous (IV) fluid (Ringer's Lactate), analgesics, antibiotics, tetanus prophylaxis, and IV omeprazole were administered. Wound cleansing and dressing, airway maintenance in patients with suspected inhalational injury were performed. Nutritional therapy was administered by estimation using the Sutherland formula. Afterwards, close monitoring of patients' vital signs, blood oxygen level (using a pulse oximeter), and urinary output was instituted. The rate of wound healing and general clinical improvement were assessed clinically and documented accordingly. Definitive treatment of the wound included skin grafting, or dressing to heal using agents such as BIODRESS, Bactigras, sofra tulle, epiprotect, and povidone iodine.

Data Analysis

Data obtained from the records were entered into and analysed using the Statistical Package for Social Science (SPSS) version 25. Descriptive statistics in the form of tables and cross tabulations were generated to understand the characteristics of the study subjects (n =). Multiple linear regression was also employed to assess predictors of outcomes of burn care among the patients with a probability value (P-value) of less than 0.05 considered to be statistically significant at 95% confidence interval.

RESULTS

The total number of patients managed during the period under review was 133. In this cross-sectional retrospective design, male patients were 84 accounting for 63.2% of the total number of patients managed, while female patients were 49 and accounted for 36.8% (Fig. 1). This represented a male-to-female ratio of 1.7:1.

In the adult age group, male patients accounted for 62.3%, while female patients accounted for 37.7% (Fig. 1). This represented a male-to-female ratio of 1.7: 1, as it is with the general population. The gender distribution for the paediatric and elderly patients had equal distribution, thus, a male-to-female ratio of 1:1 (Fig. 1).

The age range of the patients was 7 months to 75 years with a mean age of 21.4 years. The adult group (17–64 years), and accounted for 51.9% of the patients (Table 1). This represented the majority group of patients seen within the period under review.

Table 1
Age distribution of the patients (n = 133).

Age (years)	Number (n)	Percentage (%)
≤ 16	60	45.1
17–64	69	51.9
≥ 65	4	3.0

Aetiologically, flame injury was the commonest cause of burns accounting for 56.4% of the aetiologies of burns (Table 2). However, in the paediatric age group, scald injury was the commonest cause of burns accounting for 60% of paediatric burns (Table 2).

Table 2
Aetiology of Burns

Aetiology	Paediatrics		Adult		Elderly		Total/(%)
	Male	Female	Male	Female	Male	Female	
Scald	22	14	2	4	0	0	42 / (31.5)
Flame	9	11	38	13	2	2	75 / (56.4)
Chemical	0	0	4	1	0	0	5 / (3.8)
Electricity	3	1	1	1	1	0	6 / (4.5)
Contact	0	0	3	2	0	0	5 / (3.8)
TOTAL	34	26	48	21	2	2	133 / (100)

Inhalational injury was seen in 33 of the total patients with an incidence of 24.8%. It was an associated component of burns in 17.3% and 2.6% in the paediatric and elderly patients respectively.

Figure 2: Associated inhalational injury. (24.8% prevalence amongst the study population)

Moreso, all inhalational injuries were associated with patients who sustained flame injury to the face within an enclosed environment (p-value < 0.001).

The depth of burn injury seen on the patients ranged from 2%-100% with a mean depth of 32.5% (Table 3). Mixed-thickness burn injury accounted for the majority of burn wounds and was seen in 58.6% of the patients (Table 3).

Table 3
Burn wound Depth

Wound Depth	Number (n = 133))	Percentage (%)
Superficial	12	9.0
Superficial-Partial Thickness	21	15.8
Deep dermal	12	9.0
Full-thickness	10	7.6
Mixed-thickness	78	58.6

The length of hospital stay was between 1-312 days with a mean of 37.4 days.

The endpoint of management of the patients seen in this study were grouped into discharged, discharged against medical advice, and dead (mortality). Seventy-two percent (72%) of the patients were discharged home after achieving satisfactory clinical improvement (Fig. 3). Fifteen percent (15%) of the patients discharged against medical advice (DAMA), while 13% died (Fig. 3).

DISCUSSION

Styloanou, Buchan, and Dunn described burns as injuries caused by heat, electricity, radiation, or corrosive substances to the skin, and can occasionally affect the lungs, and airways.[6] It has been defined also by the International Society of Burn Injuries (ISBI) as an injury to the skin or other organic tissue primarily caused by thermal or other acute trauma.[7] The authors proposed definition of burns is coagulative and/or liquefactive necrosis of the skin and/or underlying tissues as a result of excessive transfer of energy the affected tissue(s) due to exposure to extremes of temperature (Fig. 4).

Burns are preventable public health hazards. The World Health Organization (WHO) reported that about 180,000 deaths occur annually due to burn injuries in low-and middle-income countries (LMIC).[8] As such, it was described by Goldman as “the silent epidemic”.[9] Globally, a total of 8,955,228 new cases of burns were identified in 2019, which was almost evenly split between men and women.[10] The findings of this study is in contrast with a male-to-female ratio of 1.7:1.

As the treatment of burn injuries may require months to years with repeated intervening surgical procedures, it is obvious that burn injuries continue to constitute a notable medical, economical, and social challenge for developing countries. This study aims to document the prevalent epidemiological pattern and outcome of burn injuries over a five (5) year period in a local burn unit. This is imperative for

the generation of evidence-based strategies which can be used to address this issue in a local to national perspective.

The epidemiology of burns is vital in the analysis of the aetiological factors and geographical distribution of burn injuries, and in devising preventive strategies.[7] It is also important for the planning of resource allocation.[10] An updated epidemiological study serves as the first step in planning preventive and management strategies.[7] Hence, this study aims to fill in the gap of an updated epidemiology.

Our patients' age range was seven (7) months to 75 years with a mean age of 21.4 years. This is same with a previous local study by Dongo et al.[11] who reported an age range of five (5) months to 73 years and a mean age of 26.06 years. Moghimi et al.[6] reported a mean age of 25.4 years in their study. In this study, most victims were adults in the 17–64 years age group, and accounted for 51.9% of the total patient population. This is similar to the report of Tripathee et al.[12] This predominance can be explained by the fact that this age group represents the active working population who are most exposed to hazardous environments both at home and at workplace. There was male preponderance in the study with a male-to-female ratio of 1.7:1. This finding is similar different to that of Mulatu et al.[13] who reported a male-to-female ratio of 1.23:1, but trended closer to a report of 2.1:1 by Dongo et al.[11] in a similar study carried out in the same study location.

Flame injury was the predominant burn types in the study population; this is followed by scald injury. They accounted for 56.4% and 31.5% respectively. This finding is in keeping with the finding of Dongo et al,[11] and Bayou et al.[14], and at variance with that of Igbai et al.[5] who reported scald injury as the predominant type in their study. Flame injuries are frequently associated with inhalation injuries that represent a major factor of decompensation and mortality.[12] Approximately 6%-20% of burn patients have a concurrent inhalational injury.[15] This study recorded a prevalence of 24.8% of inhalational injury amongst the study population (Fig. 2). Acutely, patients with an inhalational injury have more pronounced arterial hypotension and require additional fluid resuscitation. Consequently, the combination of inhalational injury and cutaneous injury may increase the patient's risk for increased mortality.[15] According to the American Burn Association repository, inhalational injury is present in 17% of patients with inhalational injury and increase the overall mortality rate of these patients up to 24%, while the mortality rate of burn patients without inhalation injury is 3%. Karimi et al.[8] reported a mortality rate of 17% as compared to only 6.9% for those without inhalation injury. Thus, the presence of inhalation injury has been shown to be associated with higher mortality rate.[16]

In this study, the length of hospital stay was 1-312 days with a mean hospital stay of 37.4%. A study in Ghana by Bayuo et at.[9] reported a mean hospital stay of 12.19 days. However, the authors found out that the hospital stay decreased at %TBSA greater than 50%. The reason alluded to this was that patients who presented with %TBSA of 50% or more, passed away sooner with resultant shorter hospital stay. This is a similar observation in an Bayuo et al.[6], and an Iranian study where shorter hospital stay was noticed in patients with %TBSA greater than 70% for similar reason.[6] Also, it has been reported that the

presence of smoke inhalation injury prolongs the length of hospital stay by 2.5-fold compared to those without smoke inhalation injury (24 days versus 10 days).[8]

Most of the burn injuries seen in the study were mixed-thickness burn injuries, accounting for 58.6%. This is same with the 60% finding of Iqbal et al.[4] finding amongst the Pakistani population.

The overall mortality rate in this study was 13% which is comparable to the mortality rates reported in other burn units in developing countries, but higher than burn units in high-income countries. Our mortality rate is lower than the 25.4% reported amongst the Pakistani population by Iqbal et al.[4], and higher than the Iranian study.[6] Higher mortality rate was observed in patients with flame injuries, full-thickness burns, and burns greater than 50%TBSA. The mortality rate is more in the male population. This may be due to the higher prevalence of flame injuries with associated inhalation injury amongst the male population. Generally, increasing age and %TBSA have been associated with increased mortality rate.[15] Agbenorku et al.[15] noted age and %TBSA as the most significant outcome predictions in burns.

Furthermore, burn consequences are not limited to the physical health of patients, but affect social, economic, and physiological domains as well.[8] In a previous study, the average cost of treatment of each patient, each percentage of burns, and one day stay at hospital was $2,810, $162, and $195 respectively.[6] This is equivalent to ₦3,934,000, ₦226,800, and ₦273,000.

A key strength of this study is its comprehensive analysis of burn epidemiology in a low-resource setting, which adds to the body of knowledge and literature on burn injuries in Nigeria. Another, includes setting out of the necessary requirements to enhance the care of patients with burn injuries, and provide an outline for further epidemiological studies based on validated national burns register such as the Nigerian Burn Injuries Society (NBIS) register.

The limitations of this study stem from its retrospective nature and the limited availability of data collected by mostly paper-based records that hurdled a complete inclusion of all the patients admitted into other wards other than the burn unit. There were missing folders inaccessible after discharge which hindered the accurate evaluation of burn sequelae and a falsely increased mortality rate of the study. However, to improve on this, our local hospital management launched computerisation of patients; folders recently. Also, this is a single-centred epidemiological study. Thus, more operational burn unit data should be collated and analysed to provide a comprehensive nationwide study.

While primary prevention aims at reducing the incidence of burns, secondary prevention relies on measures that mitigate the injuries caused by burns,[17] Strengthening healthcare infrastructure and promoting timely intervention are critical for improving outcomes and reducing the long-term health implications of burn injuries in low-resource setting.[18] In the last two decades, secondary prevention programs, based on building burn care centres and training of specialised personnel, has led toa significant reduction of mortality and disabilities.[17]

CONCLUSION

With morbidity and mortality associated with burn injuries adding up to a significant burden on the healthcare system, it has become important for the institution of proper local and national preventive measures. And, like other injuries of public health concern, the prevention of burns requires adequate knowledge of the epidemiological characteristics and associated risk factors. The preventive and interventional strategies should be tailored according the available resources in the region. Awareness and educational programs should be established to reduce the incidence of house-hold and occupational burns. The incidence, prevalence, pattern, as well as the overall outcome of burn injuries differ greatly between ages, gender, aetiology, and severity, geographical locations.

Declarations

Funding:

None

Conflict of Interest: None

Patient Consent: A waiver of informed consent was granted by the Irrua Specialist Teaching Hospital (ISTH) Health Research and Ethics Committee due to the retrospective nature of the study.

Author Contribution

OQA study conception and designed , data analysis and wrote the original manuscript.OOA revised the original manuscript.AAO data and manuscript review.JMA revised the original manuscript.CI revised the original manuscript.OLE revised the original manuscript.KA revised the original manuscript.SNU revised the original manuscript.IE revised the original manuscript.DE revised the original manuscript.OE revised the original manuscript.FB revised the original manuscript.MOE revised the original manuscript.BAJ revised the original manuscript.ICN data collection and revised the original manuscript.

References

1. Oladele AO, Olabanji JK. Burns in Nigeria: a Review. Ann Burns Fire Disaster. 2010;23(3):120–7.
2. Adnan A, Soomar SM, Nafees A, Aftab W, Fatmi Z. Burden and associated risk factors for unintentional household burn injuries in South Asia: A systematic review. Burns Open 2025; 1–6.
3. Dobson GP, Morris JL, Letson HL. Pathophysiology of Severe Burns Injuries: New Therapeutic Opportunities from a System Perspective. J Burn Care Res. 2024;45(4):1041–50.
4. Khan MS, Rehan M, Ali U, Iqbai T. Epidemiology of Burns: A Decade Experience. JSM Burns Trauma. 2018;3(2):1042–7.

5. Gbeneol TJ, Gbeneol P. Burn Injuries in tertiary hospital setting: risk factors and outcomes. Post Harcourt Med J. 2025;19(1):42–50.
6. Hosseini SN, Rashtchi V, Kamali K, Moghimi MH. Epidemiology and Outcome of 2,590 burned patients on Northwest Iran. Ann Burns Fire Disasters. 2017;30(2):85–90.
7. Trakroo S, Vaid M, Singh S, Khaliq M, Sharma R. The Epidemiology of Burns. Int Acad Med Pharm. 2023;5(2):933–7.
8. Alipour J, Mehdipour Y, Karimi A. Epidemiology and outcome analysis of 3030 burn patients with an ICD 10 approach. Ann Burns Fire Disasters. 2020;33(1):3–13.
9. Shrivastava PS, Shrivastava SR. An epidemiological study of adult female burns patients admitted in a tertiary care hospital. Prog Health Sci. 2012;2(2):21–9.
10. Yakupu A, Zhang J, Dong W, Song F, Dong J, Lu S. The epidemiological characteristics and trends of burns globally. BMC Public Health. 2022;22:1–16.
11. Dongo AE, Irekpita EE, Oseghale LO, Ogbebor CE, Onuminya JE. A five-year review of Burn Injuries in Irrua. BMC Health Serv Res. 2007;7:171.
12. Tripathee S, Basnet SJ. Epidemiology and Outcome of Hospitalised Burns Patients in Tertiary care Centre in Nepal. Two-year retrospective study. Burns Open: 2017: 16–9.
13. Mulatu D, Zewdie A, Zemede B, Terefe B, Liyew B. Outcome of burn injury and associated factor among patients visited at Addis Abab burn, emergency and trauma hospital: a two years hospital-based cross-sectional study. BMC Emerg Med. 2022;22(1):1–14.
14. Bayuo J, Agbenorku P, Amankwa R. Study on Acute Burn injury survivors and the associated issues. J Acute Dis. 2016;5(3):206–9.
15. Agbenorku P, Agbenorku M, Bayuo J, Asare NYO. Epidemiology and Outcome of suspected inhalational burn injury in a Ghanaian tertiary hospital. Burns Open. 2019; 45–50.
16. Amouzou KS, Kouevi-Koko TE, Egbehou P, Tchetike P, Jounmenou AKF. Epidemiology and outcomes of in-hospital acute burn patients in Togo. A retrospective analysis. Burns Open. 2019; 141–6.
17. Mobayen M, Ghaffari ME, Shahriari F, Gholamrezaie S, Dogahe ZH, Chakari-Khiavi A et al. The epidemiology and outcome of Burn injuries in Iran. A ten-year systematic review and meta-analysis. Research Square.
18. Mba CM, Onuchukwu CL, Nwachukwu OP. Yearly Trends in Burn Injury Outcome: A Nigerian Regional Burn Centre Experience. East Afr Scholars J Med Surg. 2025;7(8):233–40.

Figures

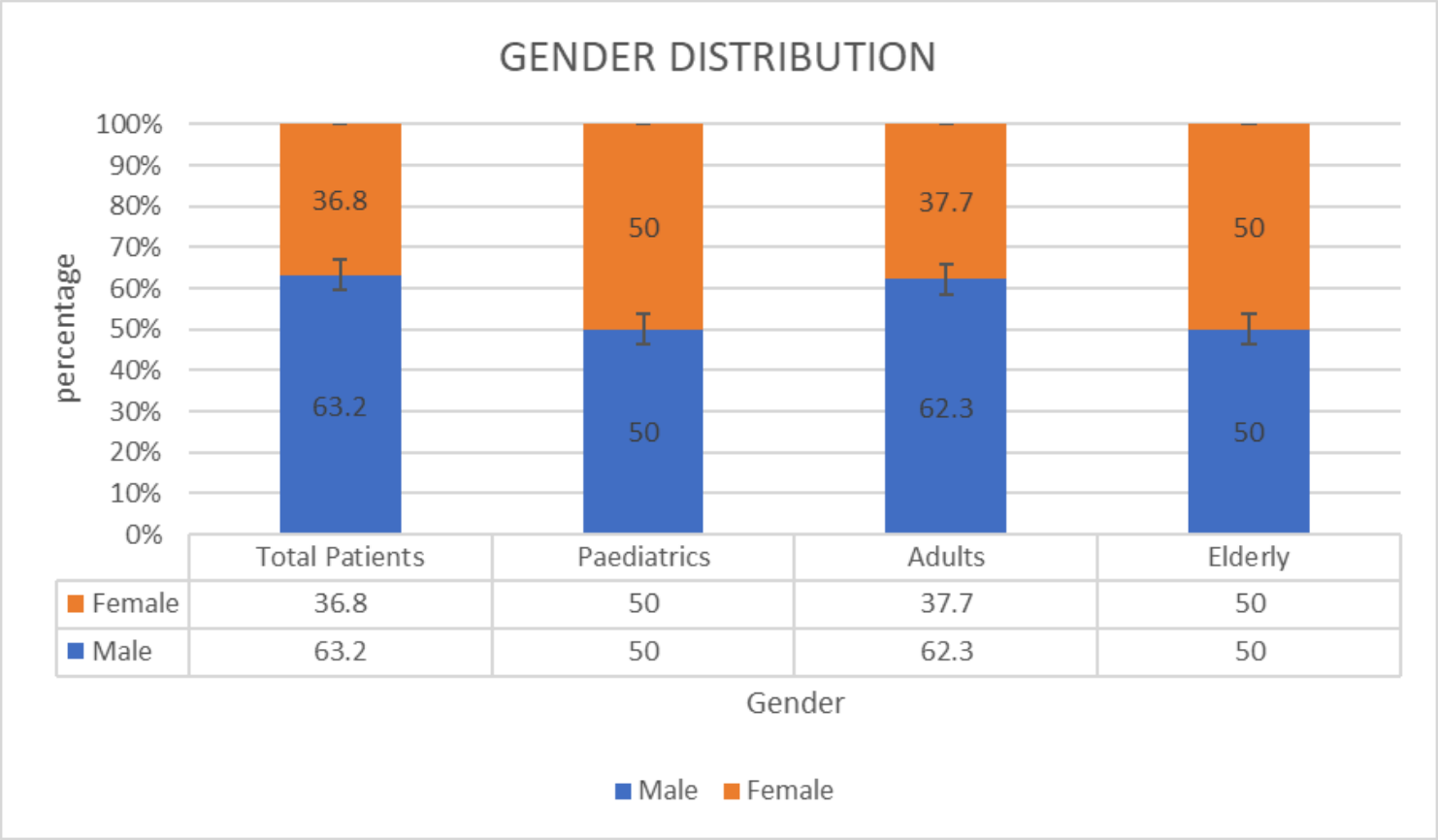


Figure 1

Gender distribution of patients (n=133).

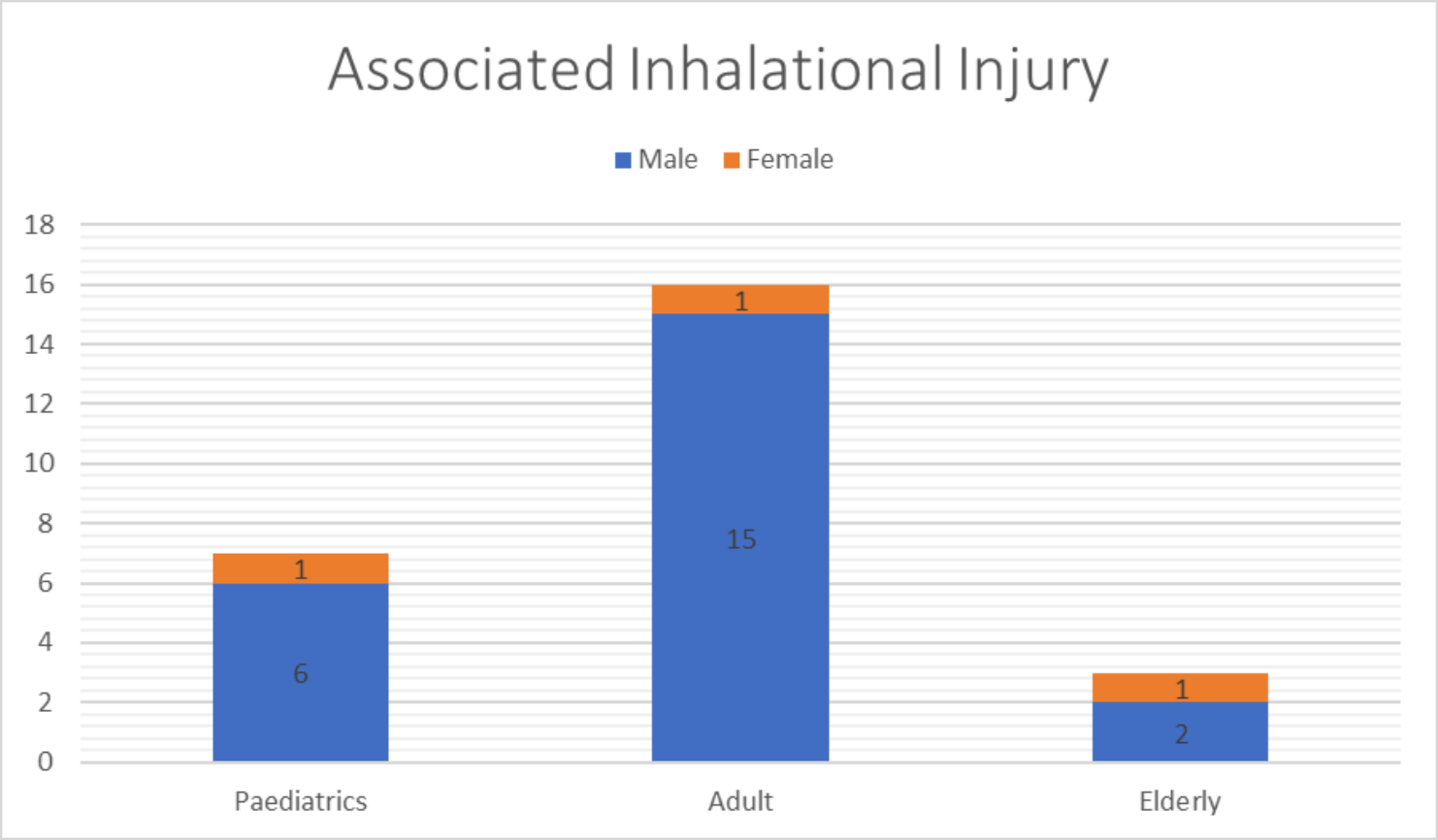


Figure 2

Associated inhalational injury. (24.8% prevalence amongst the study population)

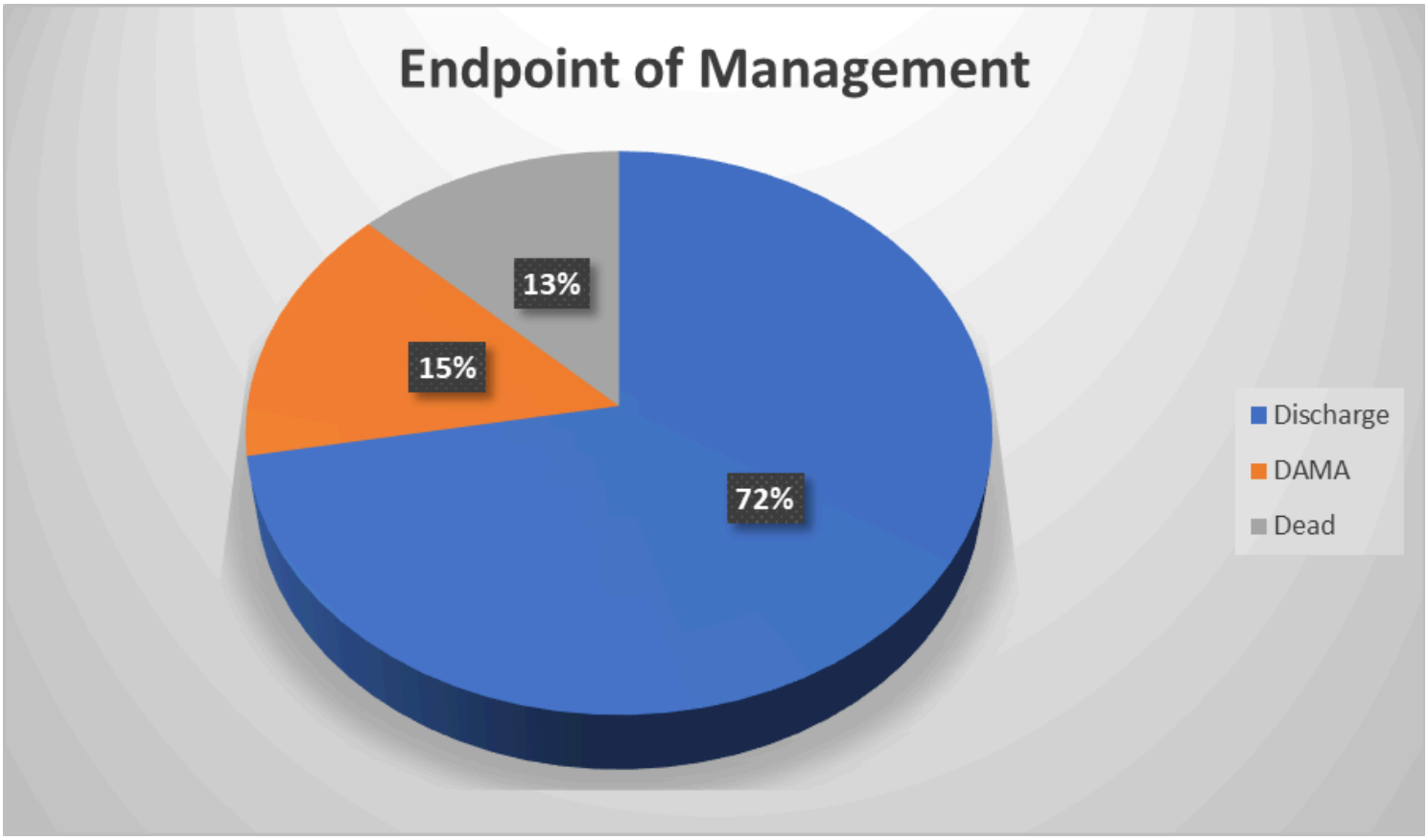


Figure 3

Endpoint of Management of the patients (n=133). The statistical correlation between Percentage Total Burnt Surface Area (%TBSA) and mortality was significant with a p-value <0.001.



Figure 4

Flame injury following gas explosion.