Section: Surgery

Original Research Article

A COMPREHENSIVE STUDY OF PEDIATRIC BURNS EPIDEMIOLOGY AND PATIENT OUTCOMES IN A TERTIARY CARE CENTER

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ABSTRACT

Background: Pediatric burns are a major public health issue, particularly in developing countries, where they are a leading cause of injury and death. This study aimed to analyze the epidemiology, clinical management, and outcomes of pediatric burns at a tertiary care center to better understand trends and improve care strategies. **Materials and Methods:** A retrospective observational study was conducted at Guntur Government General Hospital, focusing on pediatric patients (aged 0-15 years) admitted with burn injuries. Data collected included demographic information, burn characteristics (severity, mechanism, and location), treatment approaches (initial care, surgical interventions), and patient outcomes. Patients were categorized based on burn severity, mechanism of injury, and clinical outcomes. **Results:** The study included 113 pediatric burn patients, with a mean age of 5.23 years (±3.6). Scald burns were the most common (66.4%), followed by flame burns (21.2%) and electrical burns (12.4%). The total body surface area (TBSA) involved ranged from 2% to 90%, with 60.2% of patients having second-degree burns and 39.8% third-degree burns. Management included collagen dressing (60.2%) and surgical interventions (33.6%). Of the 113 patients, 91.2% recovered fully, while 8.8% died. Mortality was higher in younger children and those with larger burns. **Conclusion:** Pediatric burn injuries, particularly scalds in younger children and thermal/electrical burns in older children, are prevalent and often preventable. Key factors affecting recovery include burn severity and timely interventions. Preventive strategies, such as parental education on household safety and first aid, are crucial. A well-equipped multidisciplinary burn unit and strict treatment protocols are essential to improve outcomes and reduce mortality.

INTRODUCTION

Burn injuries are a significant public health concern, particularly among pediatric populations, due to the vulnerability of young skin and the high incidence of burns in domestic and recreational environments. Despite advances in burn care, pediatric burns continue to present complex challenges in terms of both treatment and long-term patient outcomes. Understanding the epidemiology of pediatric burns, as well as the factors that influence recovery and complications, is essential for improving clinical interventions and optimizing healthcare resources. Burns is a global health problem, accounting for an estimated 310,000 deaths annually. The global incidence (all ages) is 1.1 per 100,000, and it varies with geographic location, socio-economic status, ethnic group, age and sex.[1] Over 95% of burns occur in low & middle income countries, with highest incidence occurring in World Health Organization (WHO) Southeast Asia region.[2] In India, over 1,000,000 people are moderately or severely burnt every year.[3]

Burns in children are reported to be among the most prevalent traumatic injuries around the world. In developing countries, it is reported to be the third most common cause of death in children aged between 5 and 14 years.[4] However, the global incidence of hospitalized paediatric burn patients is unknown.[5]

This study aims to provide a comprehensive examination of paediatric burn injuries at a tertiary care centre, focusing on their epidemiological trends, management strategies, and patient outcomes. By analysing data from a specialized burn unit, this research seeks to identify key demographic, clinical,

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and socioeconomic factors that affect both the incidence of paediatric burns and the progression of recovery. Furthermore, the study will explore the effectiveness of current treatment protocols, and analyse the outcomes in acute paediatric burn care.

Through this investigation, the study will contribute to the growing body of knowledge surrounding paediatric burns, with the ultimate goal of enhancing prevention strategies, improving clinical care, and informing policy decisions that can reduce the burden of burns in children.

Objectives

Primary Objectives

The primary objectives of this study are:

1. To examine the epidemiology of paediatric burn injuries: To analyse the demographic characteristics (age, sex) mechanisms of injury (scald, flame, electric, chemical &others), and the incidence of paediatric burns in a tertiary care centre over a defined period.
2. To assess the clinical management of paediatric burn patients: To evaluate the treatment protocols used for paediatric burn cases, including initial assessment (% of burns, burn type, depth), wound care and surgical interventions.
3. To evaluate patient outcomes following paediatric burns: To investigate short-term and long-term patient outcomes, including the incidence of complications, recovery times, and the impact on quality of life.
4. To identify factors influencing recovery and complications: To explore the role of demographic, clinical, and socioeconomic factors in determining the prognosis and outcome of paediatric burn patients.
5. To provide recommendations for improving care and prevention: Based on the findings, to propose strategies for improving clinical care, prevention initiatives, and resource allocation for paediatric burn injuries in tertiary care settings.

MATERIALS AND METHODS

Study Type: Retrospective study

Study Setting: Guntur Government General Hospital

Study Groups: The study will be divided into the following key groups to ensure a comprehensive analysis of paediatric burn injuries and their outcomes:

Paediatric Burn Patients: This group will include all children aged 0 to 15 years who were admitted to the tertiary care centre with burn injuries during the study period. Data will be collected on demographic details (age, sex, ethnicity), burn characteristics (severity, depth, location), and treatment modalities (initial care, surgical interventions).

Severity-Based Subgroups: Patients will be categorized according to the severity of their burns based on the total body surface area (TBSA) affected and burn depth (superficial, partial-thickness, full-thickness). This will allow for a detailed assessment of treatment approaches and outcomes in relation to burn severity.

Mechanism of Injury Subgroups: Burn injuries will be categorized based on the mechanism of injury, including thermal (flame, scald), electrical, chemical, and contact burns. This subgrouping will help identify specific trends and risk factors associated with each type of burn injury.

Outcome-Based Subgroups: Patients will also be analysed based on their clinical outcomes.

Inclusion Criteria

1. **Paediatric Patients:** Children aged 0 to 15 years who are admitted to the tertiary care centre with a burn injury during the study period.
2. **Burn Injury Diagnosis:** Patients who have sustained any type of burn injury, including thermal (flame, scald), electrical, chemical, or contact burns.
3. **Admission to the Burn Unit:** Patients who were admitted to the burn unit for initial treatment or ongoing management.
4. **Availability of Complete Medical Records:** Patients whose medical records contain comprehensive data, including demographic information, details about the burn injury, treatment protocols, and documented outcomes.

Exclusion Criteria

1. **Non-Paediatric Patients:** Individuals over the age of 15 or those whose burn injuries occurred in the neonatal period (0-30 days) and require specialized neonatal burn care outside of the study's focus.
2. **Burns with other injuries:** Patients with other injuries like head injury, blunt abdominal trauma, chest injury and long bone fractures are excluded
3. Referred patients after receiving acute burn care elsewhere: Patients treated for burn injuries at other healthcare facilities and referred for surgical management

Methodology: This study employs a retrospective observational design to analyse the epidemiology, clinical management, and patient outcomes of paediatric burn injuries at a tertiary care centre. The methodology is divided into several key phases: data collection, participant selection, data analysis, and ethical considerations.

Study Design: This is a retrospective cohort study that reviews the medical records of paediatric patients who sustained burn injuries and were admitted to the tertiary care centre over a specific time period of 2 years(JAN 2022-DEC 2024). The data will be collected from hospital databases, patient charts, and burn unit records.

Study Population: The study population consists of all paediatric patients aged 0 to 15 years who were diagnosed with burn injuries and admitted to the burn unit during the study period. Inclusion and exclusion criteria will be applied to ensure the homogeneity and relevance of the sample.

Data Collection: Data will be extracted from hospital records and will include the following:

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Demographic Information: Age, sex, ethnicity, and socioeconomic status (where available).

Burn Injury Characteristics:

- Mechanism of injury (e.g., flame, scald, electrical, chemical).
- Type of burn (thermal, electrical, or chemical).
- Burn severity (total body surface area [TBSA] affected, burn depth, presence of inhalation injury).
- Location of burns (e.g., head, arms, trunk, legs).

Clinical Management:

- Initial assessment and treatment protocols (e.g., fluid resuscitation, wound care, surgery).
- Duration of hospital stay and need for intensive care.
- Surgical interventions (e.g., debridement, grafting).
- Rehabilitation and follow-up care.

Outcomes:

- Short-term outcomes such as infections, complications, or discharge status.

Study Variables

The study will analyse the following key variables:

Independent Variables:

- Demographic factors (age, gender, socioeconomic status).
- Mechanism and severity of burns (TBSA, burn depth).
- Treatment protocols (initial management, surgical interventions).

Dependent Variables:

- Patient outcomes (infections, complications, recovery time).

Data Analysis

The collected data will be analysed using appropriate statistical methods:

- Descriptive Statistics: Frequencies, percentages, means, and standard deviations will be used to describe demographic data, burn injury characteristics, treatment modalities, and outcomes.
- Comparative Analysis: Statistical tests (such as chi-square tests for categorical variables and t-tests for continuous variables) will be used to compare the characteristics of different subgroups, such as burn severity or mechanism of injury, in relation to clinical outcomes.

Ethical Considerations

This study will adhere to ethical guidelines for medical research:

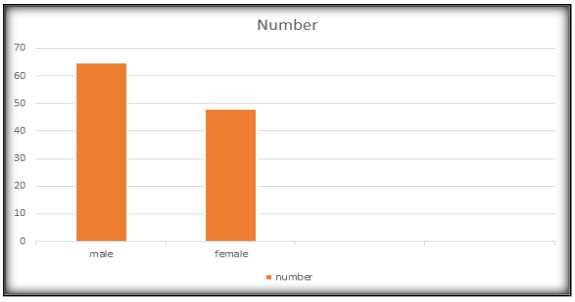
- **Informed Consent:** As a retrospective study, patient consent will not be required for data collection; however, informed consent for the use of patient data will be obtained from the institutional ethics committee.
- **Confidentiality:** Patient confidentiality will be maintained by anonymizing data and ensuring that only authorized personnel have access to the study records.
- **Data Security:** All data will be stored securely in electronic databases, and appropriate measures will be taken to ensure compliance with institutional data protection policies.

Limitations: While this study provides valuable insights into the epidemiology and outcomes of paediatric burns, potential limitations include:

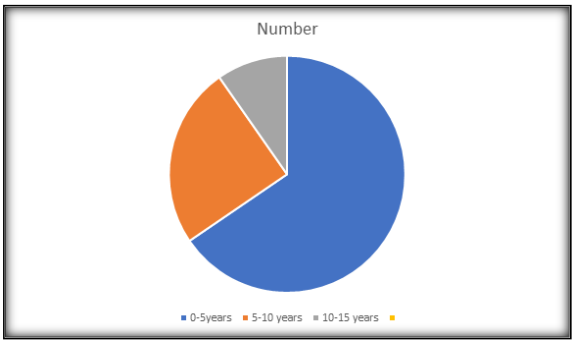
- **Retrospective Nature:** As a retrospective study, there may be limitations in the completeness and accuracy of the data, particularly with regards to long-term outcomes.
- **Generalizability:** Results may be specific to the tertiary care centre studied and may not be directly applicable to other healthcare settings, especially in areas with differing resources.

RESULTS

A total of 113 patients were included in the study. The age of the patients ranged from 1 to 15 years with a mean age of 5.23 years (± 3.6). There were 65 males (57.5%) and 48 females (42.5%).



Age is subcategorized into 3 different groups up-to 5 years,5 to 10 years & 10-15 years. The incidence of burns is predominant among less than 5 years age group (65%), Among 5-10 years &10-15 years incidence is of 24.7% & 9.7% respectively.



Burn Characteristics: The most common type of burn was scald, seen in 75 patients (66.4%), followed by flame burns in 24 patients (21.2%) and electrical burns in 14 patients (12.4%). For ease of data tabulation cracker blast injuries included under flame burns. Hot liquid (Scald) was the most common mode of injury in infants and toddlers (0-5 years), mainly due to tipping over or accidental fall into containers with boiling liquids or bathing accidents. Whereas, in older children (6 to 15 years), thermal (flame) burns

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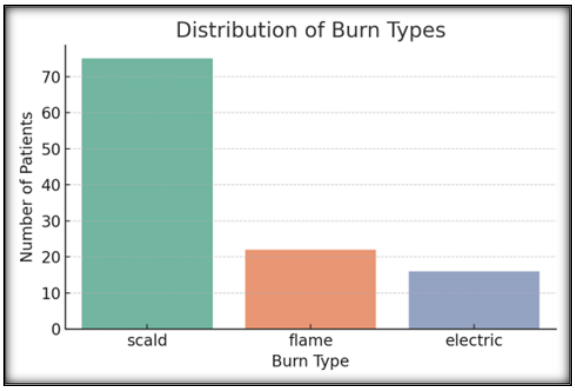
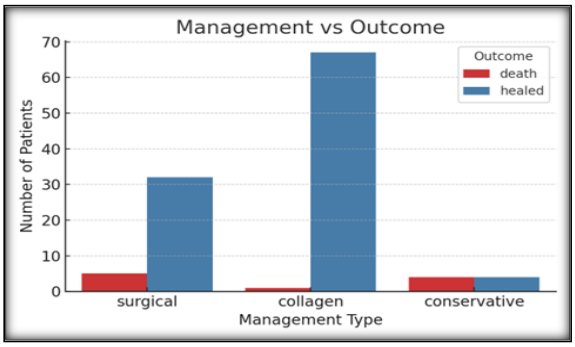
was the most common mode of injury followed by electrical burns.

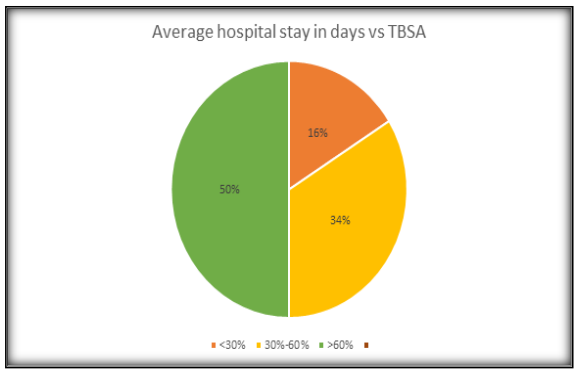


The Total Body Surface Area (TBSA) involved ranged from 2% to 90%, with a mean of 27.74%. Burn depth revealed that 68 patients (60.2%) had second-degree burns while 45 patients (39.8%) had third-degree burns &majority being mixed burns.



Management and Outcome: Among the management strategies, collagen application was the most frequently used, seen in 68 cases (60.2%), followed by surgical intervention in 38 cases (33.6%) and conservative treatment in 7 cases (6.2%). All the 2nd degree burns and even 3rd degree burns are initially covered with collagen dressing within 24 hours. Most of the 2nd degree burns healed without complication. Meshing of collagen is needed in case of underlying collection. 3rd degree burns needs surgery in the form of skin grafting. Allograft/cadaveric graft not available at our institute, precarious donor areas are managed with stamp grafting. Stamp grafting's also yielded good results. All collagen dressings aren't disturbed until they themselves separated from the wound bed after wound healing or due to discharge from wound bed. Lesser the TBSA, 2nd degree and younger age have faster recovery compared to opposite. Most of the collagen is placed under GA and in the same sitting we request anaesthetist to place central line. Most of the scald burns rarely required escharotomy or fasciotomy but the management of electric burns is completely different. They require fasciotomy and later needs flap cover. cracker blast injuries usually involves hand most of the times ends with finger amputations.

The number of days stayed in hospital increased with percentage of burns. With <30% burns mean average days stay is of 09 days which increased to 19 & 28 days in 30%-60% &>60% burns respectively.



Outcomes showed that 103 patients (91.2%) healed, while 10 patients (8.8%) succumbed to their injuries. It was noted that high mortality rates was seen in younger age groups irrespective of the percentage of burns. And also, the mortality rate was directly proportional to the extent of burns in all age groups of children. Death rate in this study was 8 % with a total of 10 deaths.

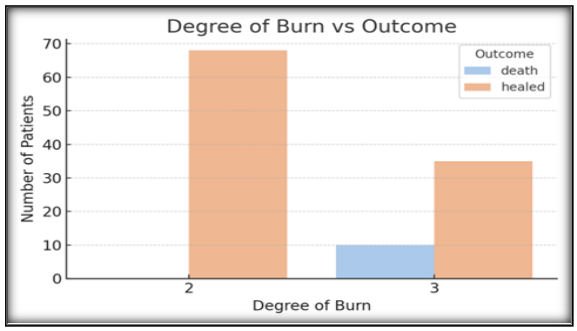


Figure 1: shows emergency collagen placement under GA

Figure 2: shows follow-up after 1 month

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Figure 3: shows in mixed burns pt healed 2nd degree burns but residual 3rd degree burns undergoing stamp dressing

Figure 4: showing flap cover in situ for electric burns patient post fasciotomy.

DISCUSSION

Burns in paediatric group is mostly accidental. Accidents can be prevented if appropriate awareness created in the community.in olden days survival of severe burns is a myth. With improved multidisciplinary care the outcomes are so satisfactory. Fluid resuscitation, application of collagen (prevents further evaporative loss, pain free& also promoting early rehabilitation of child) securing central line and monitoring nutrition as well as urine output are the pillars in management of severe burns.[6-10]

This study included 113 paediatric burn patients, aiming to evaluate epidemiological patterns across age groups and identify factors influencing their management and outcomes. It also seeks to propose preventive strategies, particularly those achievable through public education, to reduce the incidence of paediatric burns.[11,12]

The data suggests that most of the burns in younger group who are enthusiastic when unmonitored by parents accidentally got contact with hot liquids, boiling water resulting in scald burns.in older group being adventurous they had more towards cracker blast injuries followed by electric burns. All are mostly accidental which can be prevented. Average hospital stay significantly increased with increase in percentage of TBSA.[13]

Male children are more prone to burn injuries in younger age group (0-5 years), predominantly scald burns. As mentioned above adequate fluid resuscitation, collagen application, antibiotic, analgesic support promote early recovery. With increased TBSA more complications, prolonged recovery and required multiple surgical interventions. Collagen had more promising results with pain free hospital stay as it avoided routine burn dressings, maintaining sterile environment along with preventing evaporative fluid loss. Major burden in dealing with burns is fluid loss which causes a cascade of problems like electrolyte imbalance, acute kidney injury, paralytic ileus and chain of events goes on. Halting the evaporative loss prevents all this events and gives better outcomes.[14,15]

Our data significantly supports mortality was able to kept very low following all the protocols mentioned above.

CONCLUSION

Infants and toddlers are more prone to scald burns, while older children often suffer from thermal and electrical burns, mostly occurring at home. Parental education on household safety and first aid is vital.

Preventive measures include safer home designs, keeping hot liquids out of reach, firecracker safety, supervised use of electrical appliances, and mental health support for adolescents at risk of self-harm.as we all know prevention is always better than cure.

A well-equipped, multidisciplinary burns unit with strict treatment protocols is essential to improve survival and ensure full physical, psychological, and social recovery. Application of collagen had significantly improved the outcomes. With this we like to conclude that apart from following routine burn protocol utilizing collagen yields better results.

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