

Original Research Article

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The epidemiology of burns in a tertiary care center of Rajasthan

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ABSTRACT

Background: The aim of the present study is to determine the epidemiological pattern and outcome of burn injuries in a tertiary care centre of Rajasthan so that effective evidence based burn prevention programs can be generated and strong burn emergency health system can be established.

Methods: This study includes retrospective data analysis of patients conducted over 2 years from January 2020 to December 2021 at burns and plastic surgery department of Sawai Man Singh (SMS) Hospital Jaipur situated in Rajasthan.

Results: Total patients managed in SMS hospital were 2007 in 2 years. 65% were males and 35% were females. Most commonly affected age group was 25-39 years with 29% patients. Flame burns was most common mode with 49.6% cases among all age groups and both genders. Median TBSA was 35% as per this study. 37% patients were operated in same admission and definitive reconstruction was done. Mortality was there in 26.7% cases.

Conclusions: Our study addresses the need of not only increasing the expenditure over prevention and education programs but also developing resources to improve the survival of burn patients in Rajasthan state. This study may contribute to establishment of strong infrastructure to prevent and treat severe burn injuries.

Keywords: Epidemiology, Burns, Tertiary care centre

INTRODUCTION

Burns are a significant public health issue globally. Not only burn injuries are physical illness but also psychological and economical trauma. Also It is the second most common non natural cause of death after road traffic accidents. Though the burden of burn has shown decreasing trends in developed countries, it still creates a major bulk of hospital admissions in underdeveloped and developing countries. According to WHO, an estimated 180 000 deaths every year are caused by burns-the vast majority occur in low- and middle-income countries. Our country India holds rank 79 worldwide in world health rankings of cause of deaths due to fires with rate of 1.84/100,000.¹ It is a major health concern with a high

incidence and prevalence across the country. It is estimated that millions of burn injuries occur in the country every year. This may be due to domestic accidents, including cooking-related incidents, hot water scalds, contact with open flames, or accidents with hot objects. The use of open fires or traditional cooking methods in some areas contributes to the incidence of burns. Cooking at the ground level, use of kerosene stove and using chulha are common in rural India and contribute to burn accidents significantly.² During festivals like Diwali, there is an increase in fire-related accidents, including burns, due to fireworks and other activities involving fire. Improper handling of fireworks and inadequate safety measures contribute to the incidence of burns during such occasions.³ Socioeconomic factors play a role in burn

incidence in India. Limited access to safe cooking facilities, inadequate housing conditions, lower levels of education, and economic disparities contribute to increased burn risks in certain populations. Study of epidemiology of burn is a crucial step towards understanding of various causative factors, development of preventive measures and strengthening of our health care system against emergency conditions. The aim of this study is to determine epidemiology of burns in our Center, Sawai Man Singh hospital, located in Jaipur City Rajasthan. It is a tertiary health care centre receiving large burn population as primary or referral centre. It covers almost 60% of burn emergencies burden of the state Rajasthan. Understanding the epidemiology of burn patients of such tertiary centre can help state and local authorities in planning prevention methods and development of stronger emergency services for this debilitating illness.

METHODS

This retrospective study was performed in department of burns and plastic surgery, Sawai Man Singh hospital, Jaipur, Rajasthan from January 2020 to December 2021. In this statistical analysis, demographic characteristics of 2007 indoor patients were evaluated. Assessment of common modes of burn, average duration of hospitalisation and need of operative procedures was also done.

Inclusion and exclusion criteria

Acute burn of both genders and all age groups and Indoor patients were included. Patients managed on outdoor basis and secondary post burn raw areas and defects were excluded.

The collected data were subjected to statistical analysis. Data collection was conducted within the study period and analysed by SPSS software (Version 20, Chicago, IL, USA). Descriptive data is presented as mean \pm SD. Numerical data were presented using mean \pm SD or medians and ranges if not normally distributed, whereas percentages were used for categorical data. Department of burns and plastic surgery of SMS hospital is a well staffed and well equipped centre for burn care comprising of burn ICU facilities. All the dressings are done under aseptic precautions in properly stocked and well lit dressing rooms. Patients get treatment by specialised team of plastic surgeons. Burn wound evaluation is done on daily basis to make further plan of treatment. If indicated special type of dressing materials are also being used to optimise the outcome.

RESULTS

The mean age of 2007 patients hospitalised in the our burn centre was 25.5 ± 2.6 (Range: 0-95) years. The range of less than 1 year group was 51 (2.5%), 1-10 year age range was 408 (20.3%), 11-18 year age range was 237 (11.8%), 19-

25 year age range was 261 (13%), 25-39 year range was 582 (29%), 40-59 years range was 360 (18%) and over 80 age group was 108 (5.4%). The highest burn incidence was observed in the 25-39 age group, and the lowest in infant age group (Table 1).

Table 1: Age distribution (n=2007).

Age (years)	%
<1	2.5
1-10	20.3
11-18	11.8
19-24	13.0
25-39	29.0
40-59	18.0
>60	5.4

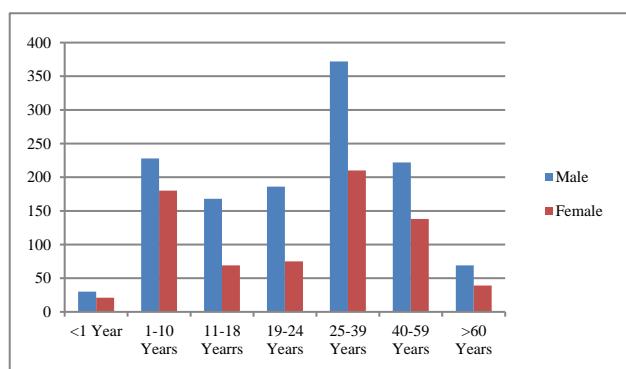


Figure 1: Gender and age based distribution.

Of the patients, 702 (35%) were female, 1305 (65%) were male, and the female/male ratio was 1/1.85. Burns were the most common in men in all age group. Distribution of sex according to age has been shown in (Figure 1). The most commonly mode of burns were respectively; flame (996 cases - 49.6%), electric (603 cases-30%), scald burns by hot water, tea and milk (387 cases-19.3%), chemical (21cases-1.1%) (Figure 2). According to age groups, when the mode of burns were studied; it was found that 0-10 year age group was most commonly affected by scald burns. Out of 459 patients of this age group 317 (69.0%) patients presented with scald burns. Meanwhile age group 25-39 carried maximum number of electric burns. 337 (55.9%) of 603 electric burns came for this age group only. When total body surface area of burn was compared, it was found that 56.3% (1130) patients belonged to the category with less than 25% TBSA burns. 28.7% (576) patients suffered 26-50% TBSA burns. 51-75% TBSA burns was there in 10% (202) patients. Rest 5% (99) patients fell into category of >75% TBSA burns. Median TBSA was 35% (Table 2). The line of treatment was also examined of the patients whether the patient was managed conservatively in form of dressings alone or any surgical intervention was done. In our study total 1390 operative procedures were done on 741 patients (34%) to optimise the outcome. This makes 1.8 surgery per patient. This data accounts for surgical intervention done in same admission. Burn is

something that needs lifelong interventions due to devastating functional and structural deformities it brings.

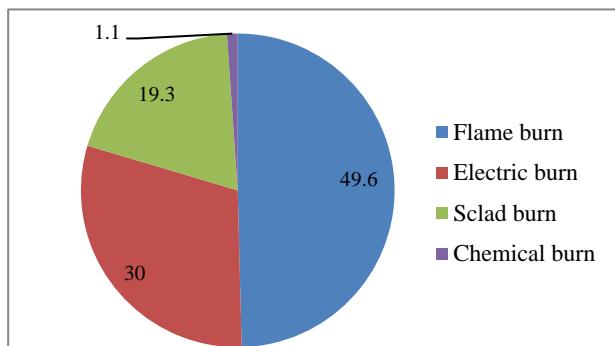


Figure 2: Mode of burn distribution.

Table 2: TBSA assessment (n=2007).

Percent TBSA	%
<25	56.3
26-50	28.7
51-75	10
>75	5

Out of total patients 12 patients (0.6%) had to be tracheostomized in view of severe airway compromise. Out of 741 patients who were operated, 452 (61%) patients underwent debridement before any definitive surgical procedures, 300 patients (40.4%) were candidates of debridement and STSG. Most of these patients were flame and scald burn groups. Electric burns were majorly managed by fasciotomies, flap covers or amputations. Fasciotomy was done in 393 (65.1%) of electric burn patients. Almost all these patients had history of electric contact burn. Fasciotomy was limb salvaging for 107 (27.2%) patients who eventually managed by STSG or flap cover. 233 patients of total electric burn patients (59.2%) suffered upper limb or lower limb loss. Out of 233 amputations 5 (2.2%) patients lost both upper limbs at below elbow level, 111 (47.7%) patients underwent unilateral below elbow amputation. Above elbow amputation was also done in 66 patients (28.3). 30 (12.8%) patients were disarticulated at shoulder level unilaterally and 4 (1.7%) patients bilaterally. Lower limb amputation were significantly lower than upper limb amputations. 13 (5.6%) patients had to be amputated below knee and 4 (1.7%) patients above knee (Table 3). It is to be taken into notice here that 13.6% patients of all the fasciotomies done, 13.6 % lost follow up due to death or LAMA. Outcome of the burn patients was divided in discharge, LAMA and death. 973(48.5%) patients were discharged after conservative or surgical management. 537 (26.7%) patients expired during treatment and 465 patients (23.1%) left hospital against doctor's advice. As the time periods in which study was done also included COVID pandemic 1st and 2nd wave. 32 (1.7%) were found to be COVID positive during treatment so transferred out to COVID dedicated centres for further management. 1170 (58.3%) patients stayed in the hospital for less than 1 week.759

(37.8%) patients (37.8%) between 1-3 weeks and 78 (3.9%) patients for more than 3 weeks.

Table 3: Pattern of limb amputation in burn patients (n=233).

Type of Amputation	%
Unilateral below elbow amputation	47.7
Bilateral below elbow amputation	2.2
Unilateral shoulder disarticulation	12.8
Bilateral shoulder disarticulation	1.7
Unilateral above elbow amputation	28.3
Unilateral below knee amputation	5.6
Unilateral above knee amputation	1.7

DISCUSSION

Burn is one of the under appreciated causes of morbidity and mortality globally especially in underdeveloped and developing countries. Countries like India carries high burden of this preventable illness. It is attributed to illiteracy, low socioeconomic groups who have limited access to healthcare, lack of awareness about burn prevention and first aid. Poverty and inadequate infrastructure contribute to the higher incidence of burn injuries.⁴

Age prevalence

Our retrospective study through the review of medical records revealed that the age group 25-39 years is most vulnerable to burn injuries for both genders which is consistent with findings from other studies.⁵⁻⁹ This demographic feature is highly dependent on social, cultural and behavioural factors so it may vary study to study. Most common cause of this age group being most vulnerable to burn accidents in our area is that this age group is exposed to domestic and occupational sources of burn.

Sex prevalence

If we talk about gender disparity, male burn patients make up a significant portion of the burn population. In our study 65% of affected patients were male. Certain occupations, such as fields, construction, welding, manufacturing, or firefighting, may expose men to a higher risk of burns. Factors such as inadequate safety protocols, lack of protective equipment, or working in high-risk environments can contribute to the incidence of burn injuries among male workers. Men may engage in riskier behaviours or be more likely to take risks compared to women, which can increase their susceptibility to burn injuries. This can include activities such as handling flammable substances, participating in extreme sports, or being involved in accidents related to reckless driving or substance abuse. It is crucial to mention here that where male burns are associated with occupational hazards, female burns are usually domestic. Domestic violence in Indian low socioeconomic households is very common

and leads to an increased number of cases of female burn. Women are susceptible to burns while engaged in cooking due to clothing catching fire or gas leaks causing explosions. Diya lightening practices are done in almost each and every hold of Rajasthan and women of rural Rajasthan wear traditional flare dresses adding to increased risk of catching burns. High number of burn cases of young female patients who are newly married indicates domestic violence due to dowry demand. Male to female ratio is 1:1.85. This pattern of male predominance in burn incidents was also seen in various studies.¹⁰⁻¹³ Opposite to this, female preponderance was there in studies done in south India, Uttar Pradesh, West Bengal and Pakistan.¹⁴⁻¹⁹

Etiology of burn

Flame burn was found to be the most common mode of burns in our study which goes similar to studies done in Telangana, Meghalaya, Karnataka and many more studies done in various Indian states and underdeveloped countries like Pakistan.^{6,20,21} Contrary to this developed countries carry the most burn cases of scald.^{22,23} It is must to mention that electric burn is showing an increasing trend for the last 2 decades.

Total body surface area

In our study, median TBSA was 35% which correlates with study done by Bain et al, Shanmugakrishnan et al and Akther et al.^{14,24,25} However, in high income countries mean TBSA was 11.5-19.5% and only 4-8.2% cases had 30% or more TBSA burn.^{26,27}

Surgeries

It's important to note that the severity and extent of burns can vary depending on the mode of injury, duration of exposure, and other factors. Operative procedures in burn patients are performed to manage and treat specific aspects of burn injuries. The surgical interventions may vary depending on the severity, location, and depth of the burn, as well as the overall condition of the patient. Not much consensus is available regarding statistical analysis of surgical management of burn patients. Our study found an average of 1.8 surgeries per patient which correlates with Indonesia, Taiwan and Hong kong.²⁸⁻³⁰ Maximum patients in our study underwent fasciotomies followed by surgical debridement; similar results were also shown in the study done in Hong Kong by Chien et al.³⁰ STSG followed Debridement as in the study done by Wardhana et al in Indonesia, It is important to note that the specific operative procedures and techniques used in burn patients can vary based on individual factors and the expertise of the treating healthcare team.²⁸ The decision to perform surgical interventions is made on a case-by-case basis, considering the patient's overall condition, burn characteristics, and the goals of treatment. Burn-related mortality in India is a significant public health concern. Unfortunately, obtaining real-time and precise data on burn mortality rates in India

is challenging due to various factors, including underreporting, variations in data collection methodologies, and limited access to healthcare facilities in certain regions.

Mortality

Burn-related mortality in India is among the highest globally. According to estimates from the Global Burden of Disease study, India accounted for a significant proportion of the global burn-related deaths. In our analysis, mortality was seen in 26.7% cases which was 39.47% in Madhya Pradesh, 33.3% in Maharashtra, 12.7% in Uttarakhand.³¹⁻³³ Majority of burn patients were discharged as also reported by Hamid et al and Palak Agarwal et al in their study.^{34,35}

Length of stay

The duration of hospital stay for burn patients can vary widely depending on several factors, including the severity and extent of the burn, the presence of complications, the patient's overall health, and the treatment approach. Burns involving smaller areas of the body and superficial layers which required only a few dressings and were amenable to heal with dressings only stayed less than 7 days. Patients who left against medical advice within initial 7 days were usually the scald burn cases where parents were stressed over their kid's medical condition and electric burn cases who initially couldn't accept the fact that affected limb will have to be amputated. 58.3% patients of our study stayed for less than a week. The average length of stay varied in different states of India like 5.8 days in Pune, 22 days in Punjab and less than 3 days in Madhya Pradesh.³⁶⁻³⁸ When compared to the average duration of stay of other countries, in Iran it was 3.36 days, in Taiwan it was 18 days, in Oman it was 15.3 days.^{29,39,40} Moderate burns, which involve larger areas of the body or deeper layers of tissue, required more extended hospital stay. Patients with moderate burns underwent procedures such as debridement, skin grafting, or wound dressings under the care of a burn specialist. The hospital stay for moderate burns ranged from several days to a couple of weeks, depending on the progress of wound healing and the need for ongoing care. Severe burns, such as those involving a large percentage of total body surface area (TBSA) or deeper layers of tissue required prolonged hospitalisation and specialised burn care. Patients with severe burns may need intensive care unit (ICU) admission to monitor and manage potential complications, such as respiratory distress, infection, fluid and electrolyte imbalances, and organ dysfunction. The hospital stay for severe burns can extend from weeks to months, depending on the extent of the injury and the complexity of the treatment required.

Limitations

The time period of the study includes the COVID pandemic period which affected the total admission number.

CONCLUSION

So, it is to be concluded that in states like Rajasthan where 70% of the population is rural, people live a low socioeconomic life. Shortage of residential spaces and crowding, cooking at ground level, working in fields etc exacerbated the risk of burn injury. Paediatric age groups are mostly victims of scald burn where adults most commonly suffer flame burns. Males face the burn accidents common than females as they are more exposed to the risk. Working age group is affected maximum. In our study we tried to focus on the fact that burn patients might have to undergo immediate surgical procedures like tracheostomy, escharotomy, excision and grafting and amputations. This needs strong infrastructure which should be considered when planning protocols for burn management. Discharge rate is high and that too with a short duration of stay.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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