

Original Research Article

THE EPIDEMIOLOGY OF BURNS

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Received : 04/01/2023
 Received in revised form : 09/02/2023
 Accepted : 25/02/2023

Keywords:
 Burns, TBSA, flames, epidemiology.

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DOI: 10.47009/jamp.2023.5.2.198

Source of Support: Nil,
 Conflict of Interest: None declared

Int J Acad Med Pharm
 2023; 5 (2); 933-937



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Abstract

Background: Burn continues to be a serious public health problem in countries such as India, despite the advances in recent years. The epidemiology of burns goes a long way in trying to answer this public health problem. **Objectives:** To study the epidemiology of burns in patients residing in Jammu and its adjoining areas. To attempt to study the epidemiological factors in depth, to notify any measures required to improve the outcome of treatment. **Materials and Methods:** This study was a prospective study and included all the patients admitted to our Department of General Surgery, with a history of sustaining burns, for a period of 12 months. The patients were assessed in detail as regards the cause, gender, age, socio-economic group, duration, and severity of burns and managed accordingly. **Result:** The majority of the patients were in the age group of 0-10 years. Male: Female ratio in our study was 2.06:1. The majority of the patients were Hindus. The majority of the patients worked as laborers and belonged to the Lower Socio-Economic class and resided in rural areas. The majority of the burns were caused accidentally and flames were the most common agent causing burns. 2% of all the patients suffered from COVID-19 infection. The Median Total Body Surface Area involved in our study was 20.0%. The mean hospital stay in our study was 18.0 days and the majority of the patients were managed conservatively. The mortality rate due to burns in our study was 3.33%. **Conclusion:** With mortality and morbidity associated with burn injuries adding up to a significant burden on the healthcare system, it becomes vitally important for proper preventive measures to be put in place. An understanding of socioeconomic status along with other demographic details can help immensely in the prevention of burn injuries and in planning better treatment protocols.

INTRODUCTION

A burn is defined as an injury to the skin or other organic tissue primarily caused by thermal or other acute trauma according to the International Society of Burn Injuries. Injuries to the skin or other organic tissues due to radiation, radioactivity, electricity, friction, or contact with chemicals are also identified as burns.^[1]

Epidemiology has a vital role in analyzing the causative factors and geographical distribution of injuries and devising strategies targeted at their prevention. An epidemiological study is the first step in planning preventive and management strategies; hence, any endeavour in this direction is appreciable.^[2]

There is a very high incidence of burn injuries in India, causing it to become a formidable public health

issue in terms of mortality, morbidity, and permanent disability to the extent that some authors view it as an endemic disease.^[3]

Like other injury mechanisms, the prevention of burns requires adequate knowledge of the epidemiological characteristics and associated risk factors. However, while much has been accomplished in the areas of primary and secondary prevention of fires and burns in many developed or high-income countries such as the United States due to sustained research on the epidemiology and risk factors, the same cannot be said of many Low- and middle-income countries.^[2,4]

In this study, an attempt was made to describe in detail the epidemiology of the burns and to establish some preventive measures.

MATERIALS AND METHODS

This study was a prospective study and included all the patients admitted to our Department of General Surgery, with a history of sustaining burns, for a period of 12 months i.e., from 1st November 2020 to 31st October 2021 after obtaining the due permission from the Institutional Ethics Committee.

The patients were assessed in detail as regards the cause, gender, age, socio-economic group, duration, and severity of burns and managed accordingly.

The patients were studied prospectively. All the personal and demographic data were noted.

A detailed history regarding the cause of burns, mode of burns, time taken for healing and treatment received; systemic illness; occupation; alcohol intake, smoking or drug abuse, medication and allergies has been taken.

The examination included site, duration, progression, and severity of burns.

The TBSA of the burn area involved was calculated using Lund and Browder chart, and the patient was resuscitated according to the standard burns resuscitation protocol. A complete hemogram, renal function tests, blood grouping, coagulation profile, serology for HIV, HBsAg, HCV, and wound swab for culture sensitivity were taken at regular intervals. Chest X-ray and ECG were done as a part of routine investigations.

Surgery, if required, was performed after preparing the patient physically as well as psychologically after explaining in detail the need for surgery, the risks involved, the stages of the surgeries and the recovery period involved.

The sequential follow-up was done at the monthly interval to assess the functional and aesthetic interval. The patients were stressed to use pressure garments, splintage, and regular physiotherapy to maintain the results achieved.

The Objectives of Our Study Were

1. To study the epidemiology of burns in patients admitted in our institute.
2. To notify the measures to improve the outcome of treatment in burn patients.

RESULTS

The majority of the patients were in the age group of 0-10 years old amounting to 34.98% of the total patients. The 21-30 years old category amounted to 21.12% of the total patients, whereas the least number of patients were in the 71-80 years category and amounted to 1.98% of the sample size.

The median age of the patient admitted with burn injuries was 24.5 years, with the youngest patient being 1-year-old and the oldest patient being 80 years old.

Males formed the majority of the patients amounting to 67.3% of the population. The Male: Female ratio in our study was 2.06:1.

Hindus constituted 68.0% of the patients whereas Muslims constituted 26% of the study group. The remaining patients belonged to the Sikh religion – 4.7%, Christianity- 0.7%, and Buddhism – 0.7%.

In our study, 29.3% of the patients were non-school-going children, 21.3% of the total population worked as laborers, 16.7% of the population consisted of females working as housewives and 14% of the patients were farmers. Students constituted 14% of our study population, 2% of the patients were tailors and carpenters constituted 2 % of our study population. Electricians constituted 2% of the total population and shopkeepers also constituted 2% of the study population.

In our study, 44% of the patients sustained burn injuries due to flames. Scalds constituted 36% of the cases and the least number of burn injuries were caused due to lightning (1.3%).

The majority of our patients resided in rural areas and constituted 82.7% of the total study group.

The socioeconomic classification of the patients was done using the Modified Kuppuswamy Socioeconomic classification system. In our study, we found that the majority of the patients (46%) belonged to the LOWER class. The UPPER LOWER class consisted of 34.7% of the patients and the remaining 19.3% of the patients belonged to the LOWER MIDDLE class.

We observed that 48% of the total patients did not use any form of first aid or local treatment before admission to the hospital. Cold water was used by 47.3% of the patients whereas 4.7% of the total patients applied toothpaste to the burn wounds before the hospital treatment.

The median time to presentation to the hospital after sustaining burns in our study group was 4 hours. The patient who reported the earliest reported after 1 hour; whereas the patient reporting last - reported after 72 hours.

The majority of our patients suffered from accidental burn injuries (96%). Suicidal burn injuries constituted 2.7% of the total patients and Homicidal burn injuries constituted the rest 1.3%.

With our study being conducted during the COVID-19 pandemic period all the patients were subjected to a COVID-19 Rapid Antigen Test or a COVID- 19 RTPCR test. In our study, 2% of the population tested positive for COVID-19.

In our study, 88% of the patients had no known comorbidities. Hypertension was found in 6% of the total population. Type II diabetes mellitus was present in 3.3% of the total population. Both Hypertension and Type II diabetes mellitus were found in 1.3% of the population. Asthma and Epilepsy were each found in 0.7% of the total study population.

THE TOTAL BODY SURFACE AREA involved was calculated using Lund and Browder chart. The Median Total Body Surface Area involved in our study was 20.0% with the minimum body surface involved being 1% and the maximum body surface area involved being 90%. Traumatic brain injury was

the only associated injury in our study, amounting to 4% of the total patients. In our study, 89.3% of the patients required no surgical intervention. Emergency tracheostomy to secure the airway was done in 1.3% of the cases. Debridement of the wound was required in 3.3% of the cases. Coverage of the post-burn raw areas by Split thickness skin grafting was done in 5.3% of the cases. One patient required debridement with amputation of devitalized digits and STSG coverage of post-burn raw areas.

The mean hospital stay in our study was 18.0 days; the minimum duration was 0 days and the maximum duration was 108 days.

A total of 78% of the patients were discharged from our hospital in a good state of health with healed burn wounds. The number of patients Leaving Against Medical Advice was 13.33% in our study. The number of patients that absconded from the hospital constituted 5.33% of the total patients. A total of 5 patients amounting to 3.33% of the total patients succumbed to the injuries suffered due to burns.

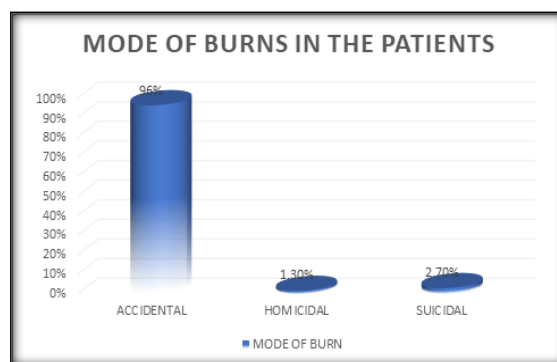


Figure 1: Age distribution of the patients

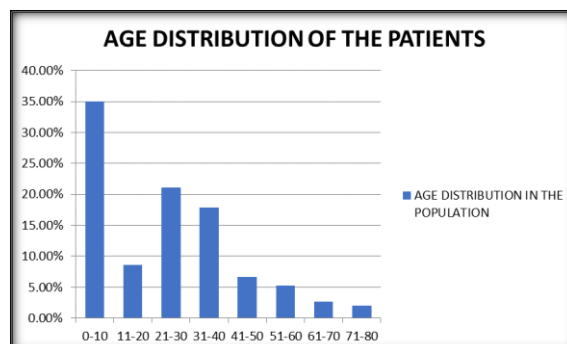


Figure 2: Mode of burn in patients

Table 1: Occupation of the patients

Occupation	Number Of Patients	Percentage Of Total
Non School Going Children	44	29.3%
Labourer	32	21.3%
Farmer	21	14%
Housewife	25	16.7%
Student	18	12%
Tailor	3	2%
Carpenter	3	2%
Electrician	2	1.3%
Shopkeeper	2	1.3%
Total	150	100%

Table 2: Agents causing burns

Agent	Number of Patients	Percentage Of Total
Flame Burns	66	44%
Scalds	54	36%
Electric Burns	25	16.7%
Chemical Burns	3	2%
Lightening Burns	2	1.3%
Total	150	100%

Table 3: Pre-existing comorbidities in the patients

Comorbidities	Number of Patients	Percentage Of Total
Hypertension	9	6%
Diabetes Mellitus	5	3.3%
Hypertension, Diabetes Mellitus	2	1.3%
Asthma	1	0.7%
Epilepsy	1	0.7%
Nil	132	88%
Total	150	100%

Table 4: Surgical intervention in patients

Surgical Intervention	Number Of Patients	Percentage Of Total
No	134	89.3%
Debridement	5	3.3%
Debridement, Amputation, Stsg	1	0.7%
Stsg	8	5.3%

Emergency Tracheostomy	2	1.3%
Total	150	100%

DISCUSSION

The present study entailed a total of 150 patients admitted to our hospital and taken care of in the Post Graduate Department of Surgery. In our study, the children aged between 0-10 years constituted the maximum number of cases (34.98%) whereas the adults in the age group of 21-30 years formed the second largest group (21.12%). A similar preponderance of burns in the younger age group has been reported by many authors. (5,6)

The Male: Female ratio in our study was 2.06:1. Multiple studies have reported an increased incidence of burns in males.^[7,8]

Hindus constituted the majority (68.0%) of the patients, 26 % of patients were Muslims, 4.7% of the patients were Sikhs, 0.7% of the patients were Christians and the rest 0.7% of patients in our study were Buddhists. In India where Hindus form the majority of the population, several authors have found the majority of patients in their study to be Hindus.^[9,10]

We found that 21.3% of the patients sustaining burns were laborers, 16.7% of the patients were housewives and 14% of the patients were farmers. Students constituted 14% of the patients, 2% of the patients were tailors, 2 % of our patients were carpenters, 2% of the patients were electricians and the rest 2% were shopkeepers. Similar findings of the increased number of burns in the Labour population in developing countries such as ours have been reported by many authors based in developing countries.^[5,11]

Flame burns (44%) were the cause of burn injuries in the majority of cases in our study group. Scalds constituted 36% of the cases. Electric burns constituted 16.7% of the total patients, Chemical burns constituted 2% of the patients whereas the least number of burn injuries were caused due to lightning (1.3%). Several authors have reported flames as the agent causing burns in the majority of the patients.^[12,13,14]

The rural population contributed to 82.7% of our study population. Only 17.3% of our population resided in urban areas. Similar rural preponderance has been reported by many authors.^[10,15,16]

In our study, we categorized the patients in socioeconomic classes and found that the majority of the patients (46%) belonged to the LOWER class. 34.7% of the patients belonged to the UPPER LOWER class and the remaining 19.3% of the patients belonged to the LOWER MIDDLE class. The stratification of the patients was done according to the Modified Kuppaswamy Classification of Socio-Economic Status. A similar predominance of burns in the lower socioeconomic groups has been reported by authors in India.^[15]

In our study, 48% of the total patients did not receive any form of first aid or local treatment before admission to the hospital. Cold water was used by

47.3% of the patients whereas 4.7% of the total patients applied toothpaste to the burn wounds before the hospital treatment. Fernandez-Morales E et al., (1997) in their study on the Epidemiology of burns in Malaga, Spain conducted over 1746 patients found that only 21.9% of the patients received adequate first aid activities in the form of application of copious amounts of cold water, application of specific neutralizers, rolling oneself around on the floor, wrapping oneself in the blanket, etc. Many authors have reported that water has been used as the primary method to extinguish fire or as a form of First Aid.^[10,14,17]

The majority of our study population suffered from accidental burn injuries (96%). Suicidal burn injuries constituted 2.7% of the total patients and Homicidal burn injuries constituted the rest 1.3%. A similar finding of burn injuries being accidental in nature has been reported by authors in India.^[18]

The median time to presentation to the hospital after sustaining burns in our study group was 4 hours. The patient who reported the earliest to us for treatment reported after 1 hour; whereas the patient reporting last reported after 72 hours. Similar to our findings many authors have reported that the majority of the patients reported to the hospital within 4 hours to 6 hours of the injury.^[14,19,20]

With our study being conducted during the COVID-19 pandemic period all the patients were subjected to a COVID-19 Rapid Antigen Test or a COVID-19 RTPCR test. In our study, 2% of the population tested positive for COVID-19.

There were variable findings in the incidence of burns during the COVID-19 pandemic with few authors reporting a slight increase in the number of burn injuries.^[21] Few authors reported a decrease in the number of burn cases as an effect of lockdown measures during the COVID-19 pandemic.^[22]

In our study, 88% of the patients had no known comorbidities. Hypertension was found in 6% of the total population. Type II diabetes mellitus was present in 3.3% of the total population. Both Hypertension and Type II diabetes mellitus were found in 1.3% of the population. Asthma and Epilepsy were each found in 0.7% of the total study population. Similar studies on burns patients have found that 18.5% - 26.4% of the patients had pre-existing comorbidity.^[23,24]

The Total Body Surface Area involved was calculated using Lund and Browder chart. The Median Total Body Surface Area involved in our study was 20.0% with the minimum body surface involved being 1% and the maximum body surface area involved being 90%. Similar mean TBSA involved have been reported by many authors.^[25,26,27]

Traumatic brain injury was the only associated injury in our study, amounting to 4% of the total patients.

The mean hospital stay in our study was 18.0 days. With the minimum duration being 0 days and the

maximum duration was 180 days. A similar mean hospital stay has been reported by many authors.^[5,13] A total of 78% of the patients were discharged from our hospital. The number of patients Leaving Against Medical Advice was 13.33% in our study. The number of patients that absconded from the hospital constituted 5.33% of the total population. A total of 5 patients amounting to 3.33% of the total population succumbed to the injuries suffered due to burns. Similar discharge and mortality rates have been observed by many authors.^[28,29]

CONCLUSION

With mortality and morbidity associated with burn injuries adding up to a significant burden on the healthcare system, it becomes vitally important for proper preventive measures to be put in place. Good cooking practices and safer fuels must be promoted. Special care should be given to the paediatric age group to reduce the disease burden. Fire safety measures and maintenance of proper electrical circuits must be given utmost importance. There should be a conscious effort towards raising awareness, especially among the rural population of the country to remove the stigmas associated with burn injuries. Patients suffering from burn injuries require adequate assessment of the burn surface area and rigorous resuscitative measures. Proper antiseptic dressings and antibiotic coverage according to the culture sensitivity reports have been known to provide excellent results in reducing the associated morbidity and mortality. An understanding of socioeconomic status along with other demographic details can help immensely in the prevention of burn injuries and in planning better treatment protocols.

REFERENCES

1. WHO BURNS FACT SHEET. [https://www.who.int/news-room/fact-sheets/detail/burns#:~:text=A%20burn%20is%20an%20injury,ho t%20liquids%20\(scalds\).](https://www.who.int/news-room/fact-sheets/detail/burns#:~:text=A%20burn%20is%20an%20injury,ho t%20liquids%20(scalds).)
2. Forjuoh S.N. Burns in low- and middle-income countries: A review of available literature on descriptive epidemiology, risk factors, treatment, and prevention. *Burns* 32 (2006) 529–537.
3. Sawhney C.P., Ahuja R.B., Goel, A. (1993). Burns in India: Epidemiology and problems in management. *Ind J Burns*. 1. 1-4.
4. Katcher ML. Prevention of tap water scald burns: evaluation of a multi-media injury control program. *Am J Public Health*. 1987 Sep;77(9):1195-7.
5. Wardhana A., Basuki A., Prameswara A.D.H., Rizkita D.H., Andarie A.A., Canintika A.F. "The epidemiology of burns in Indonesia's national referral burn center from 2013 to 2015." *Burns Open* 1 (2017): 67-73.
6. Soltani K, Zand R, Mirghasemi A. Epidemiology and mortality of burns in Tehran, Iran. *Burns*. 1998 Jun;24(4):325-8.
7. Kobayashi K, Ikeda H, Higuchi R, Nozaki M, Yamamoto Y, Urabe M et al., Epidemiological and outcome characteristics of major burns in Tokyo. *Burns*. 2005 Jan;31 Suppl 1:S3-S11.
8. Li H, Yao Z, Tan J, Zhou J, Li Y, Wu J, et al.. Epidemiology and outcome analysis of 6325 burn patients: a five-year retrospective study in a major burn center in Southwest China. *Sci Rep*. 2017 Apr 6;7:46066.
9. Bhansali CA, Gandhi G, Sahastrabudhe P, Panse N. Epidemiological study of burn injuries and its mortality risk factors in a tertiary care hospital. *Indian J Burns* 2017;25:62-6.
10. Pararay A, Ashraf M, Sharma R, Saraf R. Burns in Jammu: Retrospective analysis from a regional centre. *Current Medicine Research and Practice*.2015;5. 10.1016/j.cmp.2015.03.006.
11. He S, Alonge O, Agrawal P, Sharmin S, Islam I, Mashreky SR, et al., Epidemiology of Burns in Rural Bangladesh: An Update. *Int J Environ Res Public Health*. 2017 Apr 5;14(4):381.
12. American Burn Association. National Burn Repository 2019 Update, Report of data from 2009–2018.
13. Queiroz LF, Anami EH, Zampar EF, Tanita MT, Cardoso LT, Grion CM. Epidemiology and outcome analysis of burn patients admitted to an Intensive Care Unit in a University Hospital. *Burns*. 2016 May;42(3):655-62.
14. Shanmugakrishnan RR, Narayanan V, Thirumalaikolundusubramanian P. Epidemiology of burns in a teaching hospital in south India. *Indian J Plast Surg*. 2008;41(1):34-37.
15. Jaiswal AK, Agrawal H, Solanki P, Lubana PS, Mathur RK. Epidemiological and socio-cultural study of burn patients in M. Y. Hospital, Indore, India. *Indian J Plast Surg*. 2007;40:158-63.
16. Hemeda M, Maher A, Mabrouk A. Epidemiology of burns admitted to Ain Shams University Burns Unit, Cairo, Egypt. *Burns*. 2003 Jun;29(4):353-8.
17. McInnes JA, Cleland H, Tracy LM, Darton A, Wood FM, Perrett T, et al., Epidemiology of work-related burn injuries presenting to burn centres in Australia and New Zealand. *Burns*. 2019 Mar;45(2):484-493.
18. Wagle SA, Wagle AC, Apte JS. Patients with suicidal burns and accidental burns: a comparative study of socio-demographic profile in India. *Burns*. 1999 Mar;25(2):158-61.
19. Dongo, A.E., Irekpita, E.E., Oseghale, L.O., Ogbobor C.E., Iyamu C.E., Onuminya Snr JE. A five-year review of burn injuries in Irrua. *BMC Health Serv Res* 7, 171 (2007).
20. Subrahmanyam M. Epidemiology of burns in a district hospital in western India. *Burns*. 1996 Sep;22(6):439-42.
21. Yamamoto R, Sato Y, Matsumura K, Sasaki J. Characteristics of burn injury during COVID-19 pandemic in Tokyo: A descriptive study. *Burns Open*. 2021 Jul 3. doi: 10.1016/j.burnso.2021.06.007.
22. Akkoç MF, Bülbüloğlu S, Özdemir M. The effects of lockdown measures due to COVID-19 pandemic on burn cases. *International Wound Journal*. 2021 Jun;18(3):367-374.
23. Salehi SH, As'adi K, Abbaszadeh-Kasbi A. The prevalence of comorbidities among acute burn patients. *Trauma*. 2019;21(2):134-140.
24. Thombs BD, Singh VA, Halonen J, Diallo A, Milner SM. The effects of preexisting medical comorbidities on mortality and length of hospital stay in acute burn injury: evidence from a national sample of 31,338 adult patients. *Ann Surg*. 2007 Apr;245(4):629-34.
25. Li H, Yao Z, Tan J, Zhou J, Li Y, Wu J, et al., Epidemiology and outcome analysis of 6325 burn patients: a five-year retrospective study in a major burn center in Southwest China. *Sci Rep*. 2017 Apr 6;7:46066.
26. Tian H, Wang L, Xie W, Shen C, Guo G, Liu J, et al., Epidemiologic and clinical characteristics of severe burn patients: results of a retrospective multicenter study in China, 2011-2015. *Burns Trauma*. 2018 May 23;6:14.
27. Othman N., Kendrick, D. Epidemiology of burn injuries in the East Mediterranean Region: a systematic review. *BMC Public Health*. 2010;10: 83.
28. Tracy LM, Singer Y, Schrale R, Gong J, Darton A, Wood F, et al., Epidemiology of burn injury in older adults: An Australian and New Zealand perspective. *Scars Burn Heal*. 2020 Sep 29;6:2059513120952336.
29. Alemayehu S , Afera B, Kidanu K. Management Outcome of Burn Injury and Associated Factors among Hospitalized Children at Ayder Referral Hospital, Tigray, Ethiopia. *International Journal of Pediatrics*. 2020. Volume 2020.