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Original Research Article

Burn injury as a public health problem in Odisha: clinico-epidemiological study of patients admitted in a tertiary care hospital and prospects for control

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ABSTRACT

Background: Burn injuries continue to pose a significant and preventable global health challenge, with developing countries like India experiencing a troubling rise in cases. This study aimed to investigate the socio-demographic characteristics and patterns of burn injuries among patients admitted to a tertiary care hospital's.
Methods: Over a six-month period, a hospital-based cross-sectional study was conducted using semi-structured questionnaires, with prior consent from patients or their caregivers. Clinical assessments were also conducted to determine the percentage of total body surface area (TBSA) affected and the most severely affected body part.
Results: 145 patients included in the study, the females were (56.55%), primarily aged between 21 and 40 years. Hindus (58.62%), lived in rural areas (63.45%), and were married (66.90%). Accidental burns accounted for 81.38% of cases, mainly occurring at home (84.83%). Flame burns were more common among females, while electric burns were more prevalent among males. The majority of burn injuries covered up to 30% of TBSA (44.83%), with the upper limbs being the most severely affected (42.76%). Alarmingly, only 36.55% of patients were admitted on the same day as the injury. Infection (55.86%) and amputation (8.97%) were the most common complications observed, and 14 deaths (9.66%) occurred during the study period.
Conclusions: This study highlights the vulnerability of females to flame burns, often stemming from unsafe cooking practices. Delayed hospital admissions were associated with a higher mortality rate. Efforts to promote safety and awareness, particularly in rural areas, are crucial to reducing the burden of burn injuries in India.

Keywords: Burn injury, Healthcare-seeking behaviour, Hospital admission, Injury pattern

INTRODUCTION

Burn injuries, a prevalent form of harm that can be prevented, continue to pose a significant global public health challenge despite advancements in medical care. Each year, approximately 180,000 deaths occur due to burns, with the majority happening in low- and middle-income countries. The WHO African and South-East Asia regions account for almost two-thirds of these fatalities. Burns also rank high among the causes of disability-adjusted life-years (DALYs) lost in low- and middle-income countries.[1]

In India, the world's second most populous nation, the incidence of moderate to severe burn cases exceeds one million annually. Shockingly, one person dies from burn-related injuries every four minutes in the country, with household injuries being the primary cause. Women are

particularly vulnerable due to factors such as unsafe stoves, open fire cooking, cylinder explosions, and interpersonal violence.[3] Infants and children, who rely on caregivers for their safety, are significantly affected by burn injuries as they are unable to recognize hazardous situations. Burns are, in fact, the fifth most common cause of non-fatal childhood injuries.

The older population is also more susceptible to burn injuries due to various factors associated with advanced age. These factors include reduced reaction time, decreased mobility, difficulties in accurately assessing risks, impaired senses, and a higher incidence of pre-existing conditions such as chronic debilitating diseases, alcoholism, the effects of medication, senility, as well as neurological and psychological disorders.[4]

Burns present significant medical, social, and psychological challenges in all societies. However, in developing countries like India, these challenges are even more pronounced due to inadequate medical facilities, a lack of safety measures, limited public awareness, cultural practices like dowry, poverty, and high illiteracy rates. These factors greatly impact the outcomes of burn injuries, resulting in significant mortality and morbidity rates.

Burn injuries remain a complex issue, exacerbated by the lack of access to proper medical facilities, insufficient safety measures, limited community awareness, and the socioeconomic burdens of poverty and illiteracy. Additionally, burns have social implications and can be linked to accidental, suicidal, or homicidal causes.

Epidemiological studies serve as the initial step in comprehending precautionary and management strategies, playing a vital role in identifying risk factors and high-risk populations. These studies are crucial for understanding the prevalence, distribution, and determinants of burn injuries, which in turn guide the development of effective preventive and management approaches. By examining patterns and analysing data, epidemiological studies provide valuable insights that contribute to the identification of risk factors and vulnerable groups, ultimately informing targeted interventions and improving overall burn care.[10]

Despite the significant impact of burns on both clinical and social aspects, there is a notable lack of research material concerning burns in India.

The study aimed to achieve two primary objectives: a) To investigate the socio-demographic and clinical profile of burn patients specifically in Odisha. b) To evaluate the outcomes of burn patients.

METHODS

This study was conducted as a hospital-based cross-sectional study, spanning a period of six months from January 16th to June 15th 2023. The study included all patients admitted to the burn unit of AIIMS, Bhubaneswar during this timeframe. Data collection was performed using a semi-structured questionnaire.

The socio-demographic profile of the patients was described using variables such as age, sex, religion, occupation, residence, marital status, income, and education. The Modified B G Prasad Classification 2017 was used to classify the socioeconomic status of the participants.

The burn profile assessment involved evaluating various factors such as the burn's mode, cause, location, and the type of clothing worn during the incident. To determine the extent of the burn in terms of the total body surface area (TBSA) affected, a physical examination was conducted, using Wallace's "Rule of Nine" for adults or the "Lund and Browder" chart.

To gather outcome and complication details, the patients' medical record folders were reviewed. Prior informed consent was obtained, and interviews were conducted with either the patients themselves or their accompanying individuals.

Inclusion criteria

The study included all patients admitted to the burn unit of AIIMS, Bhubaneswar during this timeframe.

Exclusion criteria

Those patients are not willing to participant and those are admitted out side the mentioned timeframe.

Statistical analysis

The collected data were entered into an MS Excel spreadsheet and analyzed using SPSS. The statistical significance of the findings was assessed using the chi-square test, considering a p-value less than 0.05 as statistically significant.

RESULTS

During the study period, a total of 145 patients were admitted to the burn unit of the surgery ward. There was a higher proportion of females, with 82 patients (56.55%), compared to males, who accounted for 63 patients (43.45%). The most common age group among the patients was 21-40 years, comprising 56.55% of the total. Among the religious affiliations, Hindus were the majority at 58.62%, followed by Muslims at 26.21% (38 patients) and tribes at 11.03% (16 patients). More than half of the patients were married, with 97 individuals (66.90%), while the remaining were unmarried.

Among the burn victims, 92 individuals (63.45%) were from rural areas, and an equal number, 92 patients

(63.45%), belonged to the working population, out of which 53 individuals (36.55%) were unemployed. Approximately 43.45% (63 patients) belonged to the lower class, while only 1.38% (1 patient) belonged to the upper class. In terms of education, around 46.21% (67 patients) had attained primary education, while 24.83% (36 patients) were illiterate (refer to Table 1 for further details).

Table 1: Socio-demographic profile of burn patients (n=145).

Characteristics	Frequency	Percentage
Gender		
Males	63	43.45
Females	82	56.55
Age (years)		
0-20	14	9.66
21-40	82	56.55
41-60	31	21.38
>60	18	12.41
Religion		
Hindu	85	58.62
Muslim	38	26.21
Christian	6	4.14
Tribal	16	11.03
Residence		
Urban	53	36.55
Rural	92	63.45
Type of family		
Joint	37	25.52
Nuclear	108	74.48
Marital status		
Married	97	66.90
Unmarried	48	33.10
Education		
Illiterate	36	24.83
Primary education	67	46.21
Secondary education	17	11.72
Higher secondary & above	25	17.24
Employment		
Employed	92	63.45
Unemployed	53	36.55
Socioeconomic status*		
Class 1	2	1.38
Class 2	5	3.45
Class 3	28	19.31
Class 4	47	32.41
Class 5	63	43.45

*According to Modified BG Prasad classification 2017.

Table 2: Pattern of burn injury (n=145).

Characteristics	Frequency	Percentage
Place		
Home	123	84.83
Workplace	22	15.17
Mode		
Accident	118	81.38
Homicidal	27	18.62
Cause		
Flame	83	57.24

Continued.

Characteristics	Frequency	Percentage
Electricity	27	18.62
Kerosene oil/petrol	14	9.66
Scald/ hot water	21	14.48
Type of cloth worn		
Cotton	47	32.41
Synthetic	56	38.62
Woollen	25	17.24
Others	17	11.72
% of TBSA involved		
0-30	65	44.83
31-60	53	36.55
61-90	19	13.10
>90	8	5.52
Severely affected body site		
Trunk	55	37.93
Upper limb	62	42.76
Lower limb	17	11.72
Head and neck	2	1.38
Others	9	6.21
Day of presentation		
Same day	53	36.55
2-4 days	43	29.66
5-7 days	34	23.45
>7 days	15	10.34
Complications		
Infection	81	55.86
Amputation	13	8.97
No complications	51	35.17
Outcome		
Discharged	76	52.41
LAMA	55	37.93
Death	14	9.66

According to the data, the majority of burn incidents (n=123) occur at home, accounting for 84.83% of the cases. The most common cause of these burns is flames, representing 57.24% of the incidents, followed by electricity at 18.62%, scalds from hot water at 14.48%, and kerosene oil/petrol at 9.66%. A significant portion of those affected (83.7%) live in kutcha houses. In terms of clothing, synthetic fabrics are worn by 38.62% (n=56) of the individuals, while cotton is worn by 32.41% (n=47), woollen by 17.24% (n=25), and the remaining 11.72% (n=17) wear other materials like nylon or silk. Accidental cases account for the majority at 81.38% (n=118), while homicides make up only 18.62% (n=27) of the cases. There were no reported cases of suicide. The extent of burn injuries varied, with 65 cases (44.83%) involving up to 30% of the total body surface area (TBSA), and only a small percentage (5.52%) having more than 90% of TBSA involved. The upper limbs were the most severely affected body part in 42.76% (n=62) of cases, while severe head and neck injuries accounted for only 1.38%. A gap between the time of the incident and admission to the hospital was observed. Approximately 23.45% (n=34) of cases experienced a 5-7-day delay, and 1.34% had a delay of more than 7 days. Complications arising from burn injuries included infection in 55.86% of cases and amputation in 8.97% of cases. However, 35.17% of individuals did not experience any complications. Severe burns and infection led to death in 9.66% of cases, while 37.93% left the hospital against medical advice. About 52.41% of all burn cases were discharged from the hospital after receiving complete treatment (Table 2).

A statistically significant difference was found between gender and the cause of burns ($p<0.0001$). Thermal burns were the most common cause among females (61.86%), while electrical burns accounted for 70.37% of cases among males (Table 3).

Table 3: Association between cause of burn and gender (n=145).

Cause of burn	Male (n=63) Frequency (%)	Female (n=82) Frequency (%)	P value
Thermal*	45 (38.13)	73 (61.86)	p<0.0001
Electricity	19 (70.37)	8 (29.62)	

*Including scald, kerosene/petrol and flame.

Table 4: Association of % TBSA with cause of burn and type of cloth worn (n=145).

Variables	% of TBSA		p value
	0-60%	**>60%**	
Cause			
Thermal*	92 (77.96)	26 (22.03)	p<0.0001
Electricity	9 (33.33)	18 (66.66)	
Type of cloth worn			
Cotton and synthetic	84 (81.55)	19 (18.44)	p<0.75
Others*	28 (66.66)	14 (33.33)	

*Including scald, kerosene/petrol and flame, #others include woollen clothes and silk.

A majority of electrical burns (66.66%) resulted in an involvement of over 60% (>60%) of the Total Body Surface Area (TBSA), whereas thermal burns predominantly caused involvement of less than 60% (<60%) of the TBSA (77.96%). The analysis revealed a significant difference in the relationship between the cause of burn and the percentage of TBSA involved (p<0.0001). However, there was no significant association found between the type of clothing worn during the incident and the percentage of TBSA involved, as shown in Table 4.

DISCUSSION

A recent study conducted at a tertiary care hospital in Bhubaneswar, Odisha shed light on burn injuries in the region, although limited information is available on this topic. The study had a relatively small sample size but revealed important patterns in burn injuries among reported cases. One significant finding was the female-to-male patient ratio, which was 2.6:1, indicating a higher vulnerability of females to burn incidents. This trend of female predominance has been observed in other studies conducted in various regions of India, while some studies in other countries have reported male predominance.[3-7] It is important to note that the substantially higher female preponderance observed in this study might be attributed to the small sample size.

The majority of the population in Odisha resides in rural areas, where females are primarily engaged in household activities as housewives. Unsafe cooking practices such as the use of traditional stoves (chullas) and kerosene lamps are common in these rural areas, exposing women to flame burns and kerosene-related injuries. These factors could contribute to the higher number of female patients reporting burn incidents to the hospital.

The most commonly affected age group in this study was between 21 and 40 years, which is consistent with findings from numerous other epidemiological studies on burns conducted in different parts of India.[11-16] It is worth mentioning that 84.83% of the burn incidents in this study occurred at home, which aligns with the findings of a study conducted in Delhi by Lal et al.[4]

In most studies, a significant proportion of burn victims were found to be illiterate. However, in our study, nearly half of the patients had attained primary education, which deviates from the common observation.[4-5] Nevertheless, our study's findings regarding the literacy status of patients were similar to those observed in a study conducted by Zopate et al in Central India.[17]

In the current investigation, the majority of patients exhibited less than 30% (<30%) total body surface area (TBSA) involvement as a result of burn injuries, followed by 30-60% TBSA involvement. Kumar and colleagues reported a higher incidence of over 40% (>40%) TBSA involvement in their study.[3] In our research, we observed that the upper limbs and trunk were the most frequently affected sites of burn injuries among the patients reported. This finding aligns with the observations made by Lal et al from Delhi.[4]

A significant proportion of patients in our study suffered from accidental burn injuries, while there were only a few homicidal cases, and no suicidal burn cases were reported. This contrasts with the findings of Kumar et al from Lucknow, where suicidal cases were predominant.[18] It is possible that there was underreporting of suicidal cases in our study, and similar may have been the case with homicidal cases, which might have been reported as accidental cases. Shanghavi et al have reported a similar pattern in a previous study.[19]

In our study, we observed that approximately one-third of the patients sought medical care at our tertiary hospital on the same day as the burn injury occurred. However, the majority of patients resorted to home remedies such as turmeric or crushed peepal root, while a few visited unqualified practitioners. These findings suggest a lack of awareness about burn injuries and the distant location of tertiary care hospitals as potential reasons for this behavior. Unfortunately, the delayed presentation of burn patients to the hospital often leads to worsened situations, as they may have developed multiple infections.

Furthermore, our study revealed that thermal injuries, primarily occurring at home, were most prevalent among individuals belonging to the lower socioeconomic class. This vulnerability is especially prominent in the rural population, which tends to delay seeking healthcare, resulting in complications. These findings underscore the importance of educating people, particularly females, about safe handling of household appliances.

However, it is crucial to acknowledge the limitations of our study. Firstly, it is a single-center study with a small sample size, which restricts the generalizability of the findings. Conducting a multicenter study with a larger sample size would provide a more comprehensive understanding of the epidemiology of burn injuries in the state. Additionally, we have limited information regarding homicidal and suicidal burns in our study. Exploring these aspects would contribute to a more comprehensive analysis of burn incidents.

CONCLUSION

The study highlights the heightened vulnerability of females to burn injuries, which can be attributed to unsafe cooking practices and the prevalence of traditional cooking methods in rural areas. Therefore, it emphasizes the need for awareness campaigns and preventive measures targeting the most affected age group.

In summary, our study emphasizes the importance of addressing the lack of awareness regarding burn injuries, the distant location of tertiary care hospitals, and the socioeconomic factors contributing to delayed healthcare-seeking behaviour. It underscores the necessity of education, particularly targeting females, on safe practices for handling household appliances. However, to gain a more accurate understanding, future research should involve larger sample sizes and explore the different factors associated with burn incidents, including homicidal and suicidal burns.

Recommendations

There are misbeliefs and lack of knowledge related to management of dog bite cases. As rabies is 100% preventable disease health education activity for the rural population to be taken for creating awareness about management of dog bite to prevent deaths occurring due to rabies.

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