## **Original Research Article**

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# **Epidemiological study of burn patients in a tertiary care hospital, Sidhipet district, Telangana**

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#### **ABSTRACT**

**Background:** Burns is a global public health problem, accounting for an estimated 180000 deaths annually and over 1,000,000 cases in India. The exact epidemiological features of burns in each area vary and depends on geography, demography, culture, customs, occupations and several unknown factors. Hence in the present study effort was made to find out epidemiological features and causes associated with burns.

**Methods:** It was a descriptive study, study period been 1 April 2018 to 31 March 2021 (3 years). The study area was a tertiary care hospital in Sidhipet district, Telangana. The sample size was 170 on calculation with the formula. Data was collected from the medical records and reports attached in the file of the patient in the hospital. Ethical issue: Written informed consent or assent and ethical clearance from institutional ethical committee was obtained. Data was analyzed, using microsoft excel version 2019.

**Results:** Majority were from 21-30 years (35.32%), females (66%) and many were flame burns (74%). Major source of flame burns was cooking appliances (62%). Majority of burns have taken place at home (91.9%) and were accidental (86%). Case fatality rate calculated was 8.08%. 96% of wound swabs were positive for bacteria.

**Conclusions:** Mortality due to burns was significantly associated with burns which were suicidal/homicidal in nature, with more burn surface area of >30% and 3rd and 4th degree burns.

Keywords: Demographic characteristics, Epidemiology, Burn patients

#### INTRODUCTION

A burn is an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals.<sup>1</sup>

Thermal (heat) burns occur when some or all of the cells in the skin or other tissues are destroyed by hot liquids (scalds), hot solids (contact burns) or flames (flame burns).<sup>1</sup>

Burns are a global public health problem, accounting for an estimated 180000 deaths annually. They are the fourth most common type of trauma worldwide, following traffic accidents, falls and interpersonal violence.<sup>2,3</sup> Burns are among the leading causes of disability-adjusted life-years (DALYs) lost in low and middle-income countries. Non-fatal burns are a leading cause of morbidity, including prolonged hospitalization, disfigurement and disability, often with resulting stigma and rejection.<sup>1</sup>

In India, over 1,000,000 people are moderately or severely burnt every year. In a developing country like India, burn injuries continue to be a challenging problem due to poor medical facilities, lack of safety measures, absence of public awareness, dowry, poverty and

illiteracy. Burns-related injuries are frequent during the festival of lights in India.<sup>4</sup>

The treatment of burns and its sequelae is a major drain on the public health system and also a financial burden for the family. The mean cost per patient, including the social and labor costs was estimated to be as high as US \$1060 to treat burn victims in North India.<sup>5</sup> Even though a person survives burns, the extent of social stigma and disability undergone post recovery is high. Therefore, international strategies have been deployed to strengthen means to prevent burn accidents.<sup>6</sup> But still the cases were increasing and is more in middle and low-income countries like India hence it is important to know the exact epidemiological features and actual cause of burns in each area as they vary with geography, demography, culture, customs, occupations and several unknown factors and can only be elicited by conducting epidemiological studies. Although research studies on epidemiological features regarding burns are available, but on literature search, articles related to epidemiological features in Telangana were not available.

Hence in the present study effort was made to find out epidemiological features and causes associated with burns in a tertiary care hospital, Sidhipet district.

#### **METHODS**

## Type of study

It was a descriptive study.

#### Study period

The study period was from 1 April 2018 to 31 March 2021 (3 years).

## Study area

The study was conducted in a tertiary care hospital in Sidhipet district, Telangana. The burn unit in tertiary care center has facilities for treatment of all types of major as well as minor burn injuries. Burn unit is having 6 bedded burn ward, well equipped burn intensive care unit and burn OT with a skin homograft storage facility, capable surgeons and plastic surgeons, intensivists, nursing staff and lab facilities.

## Study population

All burn patients who have attended to the hospital during the study period for seeking opinion or for treatment for burns either on OP basis, inpatient basis or ICU basis.

## Sample size

Z  $\alpha$  is the standard normal deviate, which is equal to 1.96 at 95% confidence interval,

p is the prevalence of burns, Indian prevalence was calculated as moderately or severely burnt every year were 100,0000. Indian population was considered as 1390285200.8.

Prevalence calculated=0.072%.

e=Absolute precision taken as 4%.

1-p=(1-0.072).

Sample size (n)=
$$\frac{z^2 \times p (100-q)}{e^2}$$

Sample size (n)=
$$\frac{(1.96)^2 \times 0.072 (1-0.072)}{(0.04)^2}$$
,

Sample size estimated was 170.

Total 235 patients attended the hospital during the study period (3 years) and all were included in the study as all have come under inclusion criteria.

#### Data collection

Data was collected from the medical records and reports attached in the file of the patient in the hospital and if any clarification was required information was collected by phone number available in records.

Data abstraction form was prepared to get the information from the records which has 4 parts, 1st part is demographic information like age, gender, religion, education, occupation and comorbidities like hypertension, diabetes or any chronic illness, if present; 2nd part was to collect information regarding etiology of burns, like type, source, time of burn, place of burn, cause of burn; 3rd part was characteristics of burn like percentage of burn surface area, area most affected, grade of burn, average length of stay in hospital and 4th part was data regarding bacterial profile of burn wound.

#### Protocols in the hospital

In the hospital burn surface area was calculated according to the principal of rule of nine and were graded as 10.

First-degree (superficial) burns affect only the outer layer of skin, the epidermis. Second-degree (partial thickness) burns involve the epidermis and part of the lower layer of skin, the dermis. Third-degree (full thickness) burns destroys the epidermis and dermis. Fourth-degree burns go through both layers of the skin and underlying tissue as well as deeper tissue, possibly involving muscle and bone.

Skin swab and blood sample were taken during first visit and after 1 week if wound does not improve. Length of stay in hospital was considered from day of admission to day of discharge.

#### Research variables

#### Independent variable

The independent variables of the present study were age, gender, religion, education, occupation.

#### Dependent variable

The dependent variables were cause of burns, characteristics of burns, bacteria profile of wound.

#### Inclusion criteria

All ages and case records of burns ward in the hospital between 1 April 2018 to 31 March 2021 for seeking treatment for burns as per records were included in the study.

#### Exclusion criteria

Case reports from burns ward were studied and cases who did not sustain any burn injuries and incomplete (>20%) records were excluded.

Data was collected with the help of a team consisting of medical officer (1) and nursing staff (3) working in burns ward after training them about the purpose, objectives and about details in data abstraction form.

#### Ethical issue

The study data was included only after obtaining written informed consent or assent from the persons or their guardians (if study participant was child less than 18 years) or closest relatives (if person died due to burn). The study was conducted after obtaining ethical clearance from institutional ethical committee of tertiary care hospital in Sidhipet district.

#### Data analysis

All data from the data abstraction form was entered in to excel sheet. From the excel sheet the data was analyzed, using microsoft excel version 2019. Percentages and proportions were calculated and compared with other studies. Chi square test was used to know the association between characteristics of burn and mortality and p<0.05 was considered as statistically significant. Data was presented using tables.

#### **RESULTS**

In the present study, epidemiological features of out patients, inpatients and patients admitted in ICU since last 3 years in a tertiary care hospital in Sidhipet district were observed and studied.

Table 1 describes about demographic characteristics of all burn patients, majority were from 21-30 years (35.32%) and 31-40 years (25.11%) age group. More number of females were affected (66%). Majority of burn patients were illiterate or primary school (45.5%) or have studied till 10th (42.9%). Very few post graduates (4.3%) among burn patients. Most of the burn cases were either housewives (49.8%) or were unskilled workers (42.1%). Many of the burn patients did not have any comorbidities (77.44%).

Figure 1 is describing the time trends of outpatient, inpatient and ICU burn patients attending to the hospital for the year, 2018-2020. As shown in the figure the number of outpatients were more during 2018 September to December period and almost zero during 2019 July to September and almost constant during remaining periods. There was an increasing trend in regards to burn patients admitted in ICU, greater number of patients were admitted in the month of April to June 2020. In respect to burn inpatients, there was sharp increase during October to December 2019 and April to June 2020 and showing uniform trend during remaining period.

Table 2 describes about etiology of burns in burn patient, regarding type of burns, majority that is 74% were flame burns, 14% were scald burns and the remaining were electrical burns (8.5%), smoke inhalation injury (2.1%), radiation burns (0.9), chemical burns (0.4). Out of the flame burns (74%), source of burns was from cooking appliances (62%), fireworks (25%), kerosene oil (8%), warming appliances (3%) and kerosene lamp (2%). Majority of burns have taken place at home (91.9%). Cause of burn in 86% of patients was accidental, in 7% cause couldn't be determined, in 5% cause was suicidal and in 2% it was homicidal. Majority have occurred in the morning hours (6am-12pm) that is 53.2%. Most of the patients (57.4%) have come to the hospital between 6-12 hours and 15.3% have come to the hospital between 24-48 hours.

As shown in table 3, in 75% of burns patient were between 10-20% of burn surface area and in 13% it was <10% and in 5%, 4%, 1.4%, 1.6% of burn patients 21-30%, 31-40%, 41-50% and >50% of burn surface area was affected, respectively. With regard to most commonly affected area for burns, trunk was affected in majority (45%), then followed by wrist and hands (37%) and next head, face and neck (10.6%). In regards to grade of burns, majority were grade 2 (80%) burns. Average length of stay in the hospital was 6.3 days.

Immediately, that is within few minutes after fire accident, most of the patients (65.3%) were responded by flooding water to stop the fire and also on the burnt area, 32.3% responded by covering the patient with cloth and remaining 2.4% of burn patients couldn't receive any response for 30 minutes due to either non availability of water/clothing or due to lack of awareness.

In the present study, considering last 3 years burn patients, the total cases were 235 and among those 19 died due to burns and its complications making a case fatality rate of 8.08%.

Table 4 describes some of the important burn characteristics and their significant association with burn

mortality was determined and it was found that mortality due to burns was significantly associated with burns which were suicidal/homicidal in nature, with more burn surface area of >30% and 3rd and 4th degree burns and no significant association with mortality was found with early attendance to hospital.

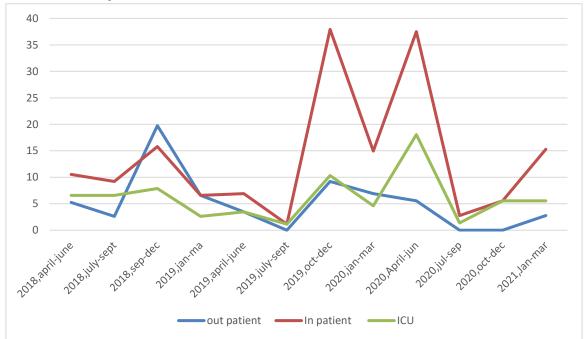


Figure 1: Burn patients.

Table 1: Demographic characteristics of the patients.

Demographic characteristics	Number	Percentage (%)
Age range (in years)		
0-10	38	16.17
11-20	32	13.62
21-30	83	35.32
31-40	59	25.11
41-50	9	3.83
51-60	7	2.98
60 and above	7	2.98
Sex distribution		
Male	80	34
Female	155	66
Religion		
Hindu	136	57.9
Muslim	75	31.9
Christian	24	10.2
Education		
Illiterate or primary school (1-4 standard)	107	45.5
5 to 10 standard	101	42.9
Intermediate and degree	17	7.2
Postgraduate	10	4.3
Occupation		
Unemployed	5	2.1
Housewives	117	49.8

Continued.

Demographic characteristics	Number	Percentage (%)
Unskilled workers	99	42.1
Skilled	7	3
Semi professional	5	2.1
Professional	2	0.9
Co-morbidities		
Absent	182	77.44
Present (diabetes/hypertension/psychiatric disorders)	53	22.55
Total	235	100

Table 2: Etiology of burns in burn patients.

Type and source of burns	Number	Percentage (%)
Flame burns	174	74
Cooking appliances	108	62
Fire works	43	25
Kerosene oil and matches	14	8
Warming appliances	5	3
Kerosene lamp/lamp	4	2
Scald burns (hot water/oil/milk/tea)	33	14
Electrical burns (short-circuit)	20	8.5
Smoke inhalation injury	5	2.1
Radiation burn	2	0.9
Chemical burn	1	0.4
Place of burn		
Workplace	10	4.3
Home	216	91.9
Others	9	3.8
Cause of burn		
Accidental	202	86
Suicidal	12	5
Homicidal	5	2
Undetermined	16	7
Time of burn		
Morning (6 am-12 pm)	125	53.2
Afternoon (12 pm-6 pm)	54	23
Evening (6 pm-10 pm)	56	23.8
Time from burns to admission to hospital (in hours)		
<6	54	23
6-12	135	57.4
12-24	10	4.3
24-48	36	15.3

Table 3: Characteristics of burns.

Characteristics	Number	Percentage (%)
Burn surface area (BSA) (%)		
<10	31	13
11-20	176	75
21-30	12	5
31-40	9	4
41-50	3	1.4
>50	4	1.6
Area		
Head/face/neck	25	10.
Trunk	106	45

Continued.

Characteristics	Number	Percentage (%)
Hands and wrist	87	37
Feet and ankle	7	3
Multiple organs	4	1.6
Inhalation	7	2.8
Grade of burns		
1st degree	5	2.1
2nd degree	188	80
3rd degree	18	7.7
4th degree	24	10.2
Average length of stay in hospital		6.3 days

Table 4: Comparison of burn characteristics with mortality due to burns.

Burn characteristics	Number of deaths (%)	Number recovered (%)	Total (%)	Chi square value and p value
Cause of burn				Chi square
Accidental	25 (12.37)	177 (87.6)	202 (85.96)	value=33.741;
Suicidal/homicidal/undetermined	18 (54.54)	15 (45.45)	33 (14.04)	p<0.0001
Time from burn occurrence to a	dmission to hospital (	in hours)		
<6 to 6-12	35 (18.51)	154 (81.48)	189 (80.43)	Chi square
12-24 to 24 hrs-48	8 (17.39)	38 (82.6)	46 (19.57)	value=0.031; p>0.05
Burn surface area (BSA) (%)				
<30	28 (12.79)	191 (87.21)	219 (93.19)	Chi square
>30	15 (93.75)	1 (6.25)	16 (6.81)	value=65.381; p<0.001
Grade of burns				
1st and 2nd degree	5 (2.59)	188 (97.4)	193 (82.13)	Chi square
3rd and 4th degree	38 (90.48)	4 (9.52)	42 (17.87)	value=178.213; p<0.001
Total	43	192	235	

Table 5: Bacterial profile of burn wounds.

Isolated organisms from the burn wound-pus/tissue/wound swab swabs	Number	Percentage (%)
Pus/tissue/wound swab swabs positive out of 230 swabs sent	221	96
Gram positive bacteria	72	30.64
MSSA	45	19.2
Streptococcus epidermis	22	9.36
MRSA	5	2
Gram negative bacteria	153	65.1
Pseudomonas aeruginosa	83	35.3
Acinetobacter baumannii	24	10.2
Escherichia coli	22	9.36
Klebsiella pneumoniae	12	5.1
Proteus mirabilis	12	5.1

As shown in Table 5, bacteria found from wound swab of burn wound were, gram positive bacteria (30.64%) and gram-negative bacteria (65.1%). In 62 (26.38%) patients' combination of gram positive and gram negative bacteria were present. Among gram positive bacteria, organisms found were MSSA (19.2%), *Streptococcus epidermidis* (9.36%), MRSA (2%) respectively and among gram negative bacteria, bacteria found were *Pseudomonas* 

aeruginosa (35.3%), Acinetobacter baumannii (10.2%), Escherichia coli (9.3%), Klebsiella pneumoniae (5.1%), Proteus mirabilis (5.1%) respectively.

#### **DISCUSSION**

Over the years, there is a change in the pattern of demographic, clinical as well as microbiological profile of patients affected with burns.<sup>11</sup> Burn injuries and their related morbidity, disability and mortality represent a public health problem of increasing importance in developing countries.<sup>12</sup> Hence in the present study epidemiology of burns patients since last 3 years were studied.

Most of the burn cases were from 21-30 (35.32%) years of age group, followed by 31-40 (25.11%) years and least above 50 years (6%) respectively similar to Deshpande et al study and Ebenezer et al study but in Honnegowda et al study in Manipal, 41-60 years (43.4%) were more affected, Lauri et al study in Behrain more number of above 50 years burn patients were seen and in Kazemzadeh et al study in Iran, 2-4 years children were more affected. 5.6,13-15

Females (66%) were more affected in the present study, similar to Deshpande et al study, Tripathee et al study, Gowri et al study, Khan et al study, Ahuja et al study and Honnegowda et al study, but in Ebenezer R et al study in Chennai, Behrain study, Kazemzadeh et al study males were more affected. <sup>4,6,13-19</sup> More number of females may be due to their engagement in cooking activities. Most of the cases have occurred at home (91.9%) similar to study in Manipal (50%) and study in Loni (94%). <sup>4,13</sup>

There was sharp increase of burn inpatient cases during October to December 2019 and April to June 2020. This sharp increase might be due to firecrackers related burn accidents (October to December) and summer related sunburns (April-June).

Out of burn patients 57.9% were Hindus and 31.9% were Muslims. In Honnegowda et al study 80.1% were Hindus this varied percentages can be due to different demographic distribution. In the present study, majority were either illiterate (45.5%) or studied maximum up to 10th class (42.9%), a greater number of illiterates compared to Honnegowda et al study in manipal. 49.8% were house wives in the present study similar to Manipal study (50.25%) 77.44% did not have any comorbidities similar to study in Manipal (73.4%). 22.55% had comorbidities and main comorbidities found were hypertension (14.89%), diabetes (10.63%) and depression (9.78%), comorbidities found were similar to Manipal study. Manipal study.

In the present study 86% of burn patients sustained injury accidentally similar to Deshpande et al study (80%) and more number compared to study in Chennai (35%). <sup>4,6</sup> In 5% of patients cause was suicidal similar results were seen in Chennai study and Deshpande et al study (6%) where as in Ganesamoni et al study and Kumar et al study, suicide was found to be common cause. <sup>6,4,20,21</sup>

Some females do not reveal the true cause of burn but instead blame it on some accidental reason as cause of their burns. It may be due to pressure of relatives and because of anxiety, patients initially confess to have sustained accidental burns.<sup>22</sup>

In the present study, 74% sustained flame burns similar to Honnegowda (80.1%) et al study and Deshpande et al study (91%) more proportion compared to Ebenezar (49%) et al study and Louri et al study (46%), 14% sustained scald burns, less than Ebenezar et al study (21%). 4.6.13,14 Very few sustained electrical burns (8.5%) compared to Chennai study (26%). 6

Cooking appliances contributed to 62% of flame burns higher compared to Honnegowda (24.4%) et al study and lesser compared to Deshpande et al study (80%), this can be due to unsafe cooking practices, dim light, long working hours, stress.<sup>4,13</sup>

75% of the burn's patients had 11-20% of burns similar to Louri et al study in Bahrain (60.6% were having <10% BSA) and Oman study (75% having <10% BSA) but unlike Chennai study where majority (59.57%) sustained 21-60% burns and only 13.83% sustained less than 20% burns and also in a study conducted in Loni where 60.5% were having more than 35% burns. 4,6,14,23 Lesser percentage of burns in the present study might be due to early awareness and immediate first aid measures. In the present study there was significant association with percentage of burns and mortality similar to Ebenezar et al study.<sup>6</sup> In the present study, majority (80%) sustained 2<sup>nd</sup> degree burns, unlike Ebenezar et al study, where majority (55%) sustained 3rd degree burns.<sup>6</sup> 10.2% of the patients sustained 4th degree burns, lesser compared to Ebenezar et al study (19%).6

Regarding time of presentation to hospital afterburns, majority (57.4%) presented between 6-12 hours, 23% presented within 6 hours in contrast in Chennai study, where 46% presented within 6 hours and 26% between 6-12 hours.<sup>6</sup> In majority delay presentation in the present study is seen might be due to lack of awareness of requirement of early treatment or due to confidence that home remedies will subside the damage. 96% of the wound swabs were positive for bacteria, similar to study in south India (96.6%).<sup>6</sup>

In 26.8% of patients, both gram positive and gram negative bacteria were found similar to Ebenezar et al study (24.5%).<sup>6</sup> 65.1% and 30.64% of wound swabs were gram negative and gram positive respectively similar to Ebenezar et al study (60.63% gram positive and 12.76% gram negative).<sup>6</sup>

In the present study, *P. aeruginosa* was found in 35.3% of wound cultures similar to Honnegowda et al study (35.3%) but lesser percentages of positivity are seen with respect to other bacteria.<sup>13</sup>

Case fatality rate estimated in the present study was 8.08%, better compared to Ebenezar et al study in Chennai (37%), study in Solapur, Maharashtra (56.5%)

study from Ahmedabad, Gujarat (58.26%) study from Chennai, Tamil Nadu (52.33%).<sup>6,24-26</sup> Study from Madurai, South India (57.33%) and worser than Iran study (4.5%).<sup>15,27</sup> As India moving forward in its quest for growth, development and economic prosperity, the dark and ugly side of this progress is rapidly emerging due to the absence of accompanying safety systems.<sup>28</sup> Hence awareness among community is utmost important regarding safety measures, first aid measures and immediate attendance to hospital for care of burn patients so that mortality and morbidity will be reduced.

#### Limitations

Study was a hospital based study and based on hospital records, hence elicitation of few important risk factors would have been missed. Study findings may not be generalizable to the general population, as the study population was from tertiary care hospital and not from population hence it is recommended to conduct population based longitudinal (COHORT) follow up studies in future for better identification of risk factors.

#### **CONCLUSION**

Majority of the burn patients were from 21-30 years (35.32%), females (66%), illiterate or primary school (45.5%), housewives (49.8%) or were unskilled workers (42.1%). In etiology of burns, majority were flame burns (74%). Major source of flame burns was cooking appliances (62%). Majority of burns have taken place at home (91.9%) and were accidental(86%). Most of them (57.4%) have come to the hospital between 6-12 hours of burn. In 75% of burns patient, 10-20% of BSA was affected. Majority were grade 2 (80%) burns. Case fatality rate calculated was 8.08%. Mortality due to burns was significantly associated with burns which were suicidal/homicidal in nature, with more BSA of >30% and 3rd and 4th degree burns. 96% of wound swabs were positive for bacteria.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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