

A descriptive study on Epidemiology of Burns in a Medical teaching Institute of Kolkata

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Abstract

Background: Burns are a major cause of injury worldwide. According to World Health Organization (WHO) over 1 000,000 people are moderately or severely burnt every year and that more than 300,000 people die annually from fire-related burns worldwide but prevention programs are almost non-existent. **Objectives:** To investigate the causes and circumstances and severity and types of burn injuries sustained by the study population and to find out the association with different factors. **Methods:** A Prospective descriptive hospital based study was conducted in a tertiary care centre from 1st May 2012 to 30th April 2013. Cases were selected using systematic random sampling and final sample size was 403. Data were collected by interviewing the patients using pre-designed, pre-tested semi-structured schedule and also from medical records. **Results:** Mean age of participants was 29.71 years and 25.6% of them belonged 15-25 years. Most of participants were females (53.8%) and housewives (21.3%). Almost 81.8% of the injury occurred accidentally and home was most common place (69%). Majority (64.8%) of burn was due to flame and anterior trunk was the commonest (74.9%) body part affected. Most of patients (61.3%) suffered from second degree burn and 23.1% patients had involvement of body surface area $\geq 60\%$. Significant association was seen with suicidal burn and female ($P=0.002$) and Hindus ($P=0.009$), homicidal burn and Muslims ($P=0.000$), domestic burn with female ($P=0.000$). Involvement of surface area were more among female ($P=0.000$). **Conclusion:** There is a need to promote education in all aspects of burn for prevention.

Keywords: Burn; Epidemiology; Hospital.

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Introduction

Burns are a major cause of injury worldwide. The World Health Organization estimates that the lifetime incidence of severe burns is 1% [1] and that more than 300,000 people die annually from fire-related burns worldwide. [2] More than 90% of the world's deaths from burn occur in low- and middle-income countries. [3] The South-East Asia and Western Pacific Regions account for the highest number of injury deaths worldwide. [4] Member-countries of South-East Asia Region (SEAR) are passing through a major epidemiological transition, socio-demographic change & technological revolution during the past two decades. [3] In India alone, burns are the third leading cause of burden of disease and the seventh leading cause of death for school-aged children. [2] In India, exact number of burns is difficult to determine. According to WHO over 1 000,000 people are moderately or severely burnt every year but prevention programs are almost nonexistent. Estimation by Ahuja [5] suggests that India with a population of over one billion has 700,000-800,000 burns admissions annually. Burns are injuries of skin, mucous membranes and/or underlying soft tissue which may be caused by a variety of agents such as heat, electricity, radiation, and corrosive substances. According to the World Health Organization (WHO)'s International Classification of Diseases version 10 (ICD-10), burns and corrosions are described by site of injury. In terms of aetiology, burns could be caused by exposure to smoke, fire and flames, contact with heat and hot substances, exposure to electric current and lightning, exposure to corrosive

substances, intentional self-harm by smoke, fire and flames, assault by smoke, fire and flames, assault by steam, hot vapours and hot objects, and assault by corrosive substances. Therefore this definition includes scalds as well as burns caused by electrical heating appliances, electricity, flame, friction, hot air and hot gases, hot objects, lightning, and chemical burns (both external and internal corrosions). Radiation related disorders of the skin and subcutaneous tissue and sunburn are not included in the WHO classification of burns. [6] Burn injury has reached epidemic proportions and is considered as an important health care problem. Goldman [7] also describes burns as "the silent epidemic". Apart from the high mortality associated with the injury it also has catastrophic influence on human suffering, disability & financial loss. This devastating physical and psychological trauma is also associated with poor quality of life after recovery and often associated with stigma and rejection. High prevalence of burn injury and lack of highly sophisticated medical set-up of burn care has made burn injury an important public health issue in India. Like other injuries burn injury is also preventable in most of the cases. Better understanding of the underlying risk factors and by adaptation of proper preventive measures to reduce the risk, the burden of the dreaded injury can be reduced to a significant lower level. Most of the studies on burn injury focus on nature and severity of burns, though some studies done with an epidemiological point of view have recognized burn injury as a preventable health problem associated with demographic, socio-economic, behavioural and environmental risk factors. Culture and customs also play an important role in determining the type and prevalence of burn injury. But, most of these studies were undertaken in the developed world. Literature review shows very few research works on burns in India and almost none in this part of country. With this background present study was conducted to investigate the causes and circumstances and severity and types of burn injuries

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sustained by the study population and to find out the association of the causes, types and severity of burn injuries with socio-demographic and other relevant factors.

Materials & methods

A Prospective descriptive hospital based follow-up study was undertaken in the burn wards under the Department of Plastic Surgery Institute of Post- Graduate Medical Education and Research (IPGME &R) and Seth Sukhlal Karnani Memorial(SSKM) Hospital,a tertiary referral government hospital and a national research institute of the state of West Bengal and a speciality hospital which have the largest burn treatment facility of the state with total 95 beds. The study was conducted for a period of one year from 1st May 2012 to 30th April 2013 on patients of recent burn injuries whose admission and outcome (in terms of discharge or death) both occurred. Study population of the study comprised of patients admitted with burn injury in the burn wards under the department of Plastic Surgery at IPGME & R and SSKM Hospital during the study period. All the "completed cases" (patients whose admission and outcome in the form of death or discharge from hospital occurred during the study period) of recent burn injury (<7days) were considered eligible for the study. Minor cases of burns managed in casualty and Out Patient Department (OPD) were not included in this study. Every alternate patient as per the burn unit register was selected for the study .The first study subject was chosen randomly between first two admitted cases of the first day of study and then every second patient as per burn ward admission register was selected for the study (Systematic random sampling). Total 968 patients were admitted in study periods. Total 57 patients were excluded from study population due to exclusion criteria and 24 patients as outcome was not available. So Final Sample size was 403.

After initial face to face interview all the patients were followed up during their stay in the hospital and their outcome was recorded. The patients admitted with recent burn injuries (sustained burn within 7 days prior hospitalisation) and the patients or caregivers of the patients (in case of seriously ill patient) who gave consent for the study was included and the patients who admitted for reconstructive surgery with past history burn injury, the patients expired after getting admission before being subjected to the first face-to-face interview by his/her caregiver and the patients who were too morbid to respond and did not found to have any accompanying caregiver in three consecutive visits was excluded from this study.

A pre-designed, pre-tested semi-structured schedule was developed reviewing the questionnaires which have been used in similar earlier studies and different articles related to burn injury. The questions were directed towards gaining information regarding demographic data, social history, cause/intention of injury, associated medical conditions, type of burn injury, mechanism/circumstance of injury, pre-hospital care, presence of associated injury and other relevant factors related to the injury. Secondary data were collected from hospital records were regarding pathological and biochemical investigations, initial and definitive treatment, duration of hospital stay, complications, and outcome of the patient. The schedule was drawn up in English, translated into Bengali, and then retranslated in English with help of two separate linguistic experts to retain the original meaning after translation in Bengali. Thus semantic equivalence was ascertained. Pretesting done on 10 burn patients comparable with study population in order to identify any problems with the wording and feedback was obtained on potential difficulties when answering the questions. The participants were asked the same questions as the actual study participants. They were asked to comment on any difficulties they face in understanding the questions. No major adjustments were brought to the schedule after pretesting; only minor corrections were done in order to make the tool more simplified by removing ambiguity. Face validity for each item and content validity for each domain was ensured by taking suggestions from experts. The questionnaire was amended according to the suggestions. To ensure reliability, the questionnaire was pre-tested on

10 similar patients before the actual data collection was started and the internal consistency was analyzed by using Cronbach's Alpha Coefficient. The overall Cronbach's Alpha Coefficient value was 0.62. The researcher maintained a study logbook to record the identification information (name, unique interview number, bed number, and patient's registration) for all patients being interviewed day by day. Additional observations and reminders were also recorded in the logbook. In every visit the names and bed number of patients who had been admitted in burn wards since previous visit were noted down in the study logbook maintaining the sequence of admission register of burn ward. The study subjects were selected using systematic random sampling. The medical records of patients were accessed on several occasions. The patient's Bed Head Ticket (BHT) was accessed to record information regarding the admission date of admission, Total Body Surface Area (TBSA), Depth of injury, presence or absence of inhalation injury, laboratory investigations, amount of blood transfused, treatment given including surgery, complications and outcome. When the patient was discharged, transferred or died, the ward nurses sent the BHT to the record section after few days. At this stage the file was accessed by the researcher and the above-mentioned data were transcribed.

The respondents were explained in detail the full description of the research, confidentiality and voluntary participation. Data entry and statistical analysis were done using SPSS version 20.0. The questionnaires were weighed against the database to check the accuracy of the data entry a minimum of two times. Any error found was corrected before the actual analysis. Descriptive statistics (frequency, percentage, mean and standard deviation) were used primarily to summarize and describe the data to make it more graspable. For analytical statistics, Chi-square was used where appropriate. For all the statistical tests of significance, p value of <0.05 was considered to reject the null hypothesis.

Ethical Clearance: The Institutional Ethics Committee of Medical College, Kolkata reviewed the proposal for ethical consideration and approval was obtained prior to the study. Written consent was taken from all the respondents before data collection process.

Results

The mean age of the study population was 29.71 years with a SD of 19.92 years . Among 403 patients 103 (25.6%) belonged to the age group of 15-25 years. 44 (10.9%) patients were under five years of age and 32 (7.9%) patients were aged more than 65 years. Among the study population, females (53.8%) slightly outnumbered male (46.2%).

In this study Majority (75.7%) of the study population were Hindu and 22.7% were Muslims. Around 21.3% burn victims were housewives. Around 14% patients were unemployed. Total 184 (45.7%) patients under the study were currently married and 172 (42.7%) were unmarried. Spouses were dead in case of 37 (9.2%) patients. Most (59.8%) of study population belonged to joint family, rest were from nuclear family. Majority (42.9%) of the study population belonged to Upper lower socio-economic class followed by Lower middle class (30.3%). Most of victims was from rural area (54.1%). Among the 278 injury occurred in the home, separate kitchen were absent in case of 113 (40.7%) patients. Kerosene was most commonly used fuel among the study population i.e. 33.8% followed by LPG (30.9%). Total 43 (11.7%) out of 403 burn victims had any form of pre-existing visual or hearing problem. Around one fourth (24.3%) of the study population had history of any form of chronic diseases like hypertension (9.9%), Diabetes (7.7%), migraine (5.2%), epilepsy (2.5%), depression etc. Among 153 women of reproductive age group (15 – 45 years) 30 i.e. 4.7% of total study population were pregnant at the time of injury. (Table 1)

Around four fifth (81.8%) of the injury occurred accidentally either by self or others. 37 (9.2%) and 32 (7.9%) injury events were suicidal and homicidal respectively. Home was the most common place for occurrence of burn (69%). Living room (33.4%) and kitchen (27%) were the two most common place of burn injury at

home. Maximum number injury events took place in the month of June (16.4%) followed by May (12.9%) and September (9.9%). Least number of cases was reported in the month of October (4.5%). Majority (43.5%) of injury events took place in the calendar months representing rainy season (June to September) and around one fourth injury events occurred during the winter days.(Table 2)

Most (33.5%) of injury events occurred between 11am to 5pm followed by 5 - 11pm (30.5%). Around 10% injury took place between 11pm to 5 am. Direct flame (45.9%) was the commonest mode of injury resulting burn followed by explosives (18.8%) and electrocution (13.4%).Commonest type of clothing's of the burn victims during the injury episode was made of cotton (66.5%) followed by synthetic cloths. (Table 2) Kerosene stove (18.6%) was the commonest device responsible for burn injury among the study population followed by electric wire (13.4%).Fire cracker (8.9%), Candle/ Lamp (7.9%) chullah (7.7%), Acid (6.5%), hot liquid mainly water and oil (10%) were other devices responsible for burn. Majority (64.8%) of burn was due to flame followed by electrical (13.4%), Scald (11.9%), chemical (6.9%) and contact burn (3.0%). Anterior trunk was the commonest (74.9) body part affected by the

burn among the study population followed by right upper limb (69.2%). Head and Genitalia were involved in 18.6% and 8.4% cases respectively. Majority (43.2%) of patients sustained burn involving TBSA between 15 to 40%. Around one fourth (23.1%) patients had involvement of body surface area $\geq 60\%$. Most of patients (61.3%) in the study suffered from second degree burn.(Table 3)For association Chi Square test was performed. Proportion of suicidal burn was more among female (13.4%) than male (4.3%) and this difference was found statistically significant by chi-square test [$X^2=11.615$, df-2, $P=0.002$]. Proportion of suicidal burn was more among Hindus (11.2%) and others with compare to Muslims (2.2%) [$X^2=6.875$, df-1, $P=0.009$]. Proportion of homicidal burn was more among Muslims (17.6%) with compare to Hindus (5.1%) [$X^2=14.949$, df-1, $P=0.000$]. Proportion of domestic burn was more among female (87.1%) than male (47.8 %) [$X^2=72.101$, df-1, $P=0.000$]. Higher Percentage of TBSA involvement was found among females [$X^2=43.722$, df-3, $P=0.000$]. Also percentage of TBSA involvement varied with different type of burn and this association was found statistically significant [$X^2=73.79$, df-12, $P=0.000$].

Table 1: Distribution of study population according to sociodemographic profile(n=403).

	Frequency	Percentage (%)
Religion:		
• Hindu	305	75.7
• Muslim	91	22.7
• Others	7	1.7
Literacy Status : (n=359)*		
• Illiterate	47	13.1
• Below Primary	75	20.9
• Up to Middle	98	27.3
• Secondary	54	15
• HS and Above	85	23.7
(*Formal education was not started for 44 children.)		
Occupation:		
• Service	40	9.9
• Pensioner	12	3.0
• Labourer	52	12.9
• Farmer	15	3.7
• Housewife	86	21.3
• Business	27	6.7
• Unemployed	57	14.1
• Student	70	17.4
• Pre-school children	44	10.9
Marital Status:		
• Never married	172	42.7
• Currently married	184	45.7
• Divorced/ separated	10	2.5
• Spouse dead	37	9.2
Type of Family:		
• Nuclear	162	40.2
• Joint	241	59.8
Number of family member:		
• Up to 5	276	68.5
• 6 to 8	103	25.6
• >8	24	6.0
PCI/Month(Rupees):		
• <585	10	2.5
• 585-1169	173	42.9
• 1170-1949	122	30.3
• 1950-3899	68	16.9
• ≥ 3900	30	7.4
[Mean \pm SD (Range)-1735.8 \pm 1795.1(500-13000)]		
Place of Residence		
• Rural	218	54.1
• Urban	185	45.9

Type of Housing:(n=278)* <ul style="list-style-type: none"> Kutcha Pucca Mixed (*125 injuries occurred outside the residence.)	89 74 115	32.0 26.6 41.4
House Ownership: (n=278) <ul style="list-style-type: none"> Own House Rented House (*125 injuries occurred outside the residence.)	216 62	77.7 22.3
Number of Room: (n=278) <ul style="list-style-type: none"> 1 2 3 4 and more (*125 injuries occurred outside the residence.)	43 180 45 10	15.5 64.7 16.2 3.6
Separate Kitchen <ul style="list-style-type: none"> Present Absent 	165 113	59.3 40.7
Type of Fuel (n=278): <ul style="list-style-type: none"> LPG Wood Coal Kerosene Electricity *Not mutually exclusive. #125 injuries occurred outside the residence.	86 66 76 94 12	30.9 23.7 27.3 33.8 4.3
Visual/Hearing Problem: <ul style="list-style-type: none"> Visual problem Hearing problem Visual + Hearing problem No such problem 	18 14 11 360	4.5 3.5 2.7 89.3
Chronic Diseases <ul style="list-style-type: none"> Hypertension Diabetes Epilepsy Migraine Depression Others No such diseases 	40 31 10 21 10 11 305	9.9 7.7 2.5 5.2 2.5 2.7 75.7
Disabilities <ul style="list-style-type: none"> Physically challenged Mentally challenged No disabilities 	20 15 368	5.0 3.7 91.3
Pregnancy: <ul style="list-style-type: none"> Yes No Not applicable 	19 134 250	4.7 33.2 62.1

Table 2: Investigate the causes and circumstances of burn injuries sustained by the study population (n=403)

	Frequency	Percentage (%)	Comments
Cause of Burn			
Accident by self	296	73.4	Significant with gender
Accident by others	38	8.4	P=0.002
Suicidal	37	9.2	And religion
Homicidal	32	7.9	P=0.009
Place of Burn			
Home	278	69.0	Significant with gender
At work	51	12.7	P=0.000
At school	4	1.0	
Outdoors	70	17.4	
Place of burn at home			
Kitchen	75	27.0	
Living room	93	33.4	
Bathroom	34	12.2	
Yard	46	16.5	
Store room	12	4.3	
Others	18	6.5	
Time of injury			
5 am to 11 am	105	26.1	Significant with gender
11 am to 5 pm	135	33.5	X ² =19.85
5 pm to 11 pm	123	30.5	df-3

11 pm to 5 am	40	9.9	P=0.000
Season of injury Summer Rainy season Winter (Summer: February to May; Rainy season: June to September; Winter: October to January)	127 177 99	31.5 43.9 24.6	
Material Causing Burn Direct flame Contact with hot object Hot water Other hot liquid Chemicals Electrocution Explosives	185 12 24 24 28 54 76	45.9 3.0 6.0 6.0 6.9 13.4 18.8	
Type of Clothing Nylon/Synthetic Cotton Wool	125 268 10	31.0 66.5 2.5	

Table 3: Distribution of Study Participants different types and severity of burn injuries (n=403)

	Frequency	Percentage (%)	Comments
Types of Burn			
Flame	261	64.8	Significant with gender
Contact	12	3.0	$X^2 = 63.446$
Scald	48	11.9	df-4
Chemical	28	6.9	P-Value=
Electrical	54	13.4	0.000
Body parts Involved(not mutually exclusive)			
Head	75	18.6	
Neck and Face	172	42.7	
Anterior trunk	302	74.9	
Posterior trunk	256	63.5	
Left upper limb	252	62.5	
Right upper limb	279	69.2	
Right thigh	223	55.3	
Left thigh	247	61.2	
Right leg	231	57.3	
Left leg	199	49.3	
Genitalia	34	8.4	
TBSA (Total Body Surface Area)Burnt (%)			
Mean \pm SD (Range) 41.83 \pm 22.94 (8 -100)	48	11.9	Significant with gender
<15	174	43.2	$X^2=43.722$, df-
15-39	88	21.8	3,P=0.000
40-59	93	23.1	
>=60			
Depth of Burn			
First degree	38	9.4	
Second degree	247	61.3	
Third Degree	118	29.3	
Enclosed/Overwhelmed by Smoke			
Yes	67	16.6	
No	336	83.4	

Discussion

The mean age for all burn victims under the study is 29.71 years which is consistent with the findings of most of the studies from India [8-13] though two studies [14-15] from Madhya Pradesh have reported mean age lesser than the present study finding. Studies from other developing countries also found to have similar age distribution for occurrence of burn.[16-21] This reflects the fact that burn patients are mostly children and youth; Children of 0-5 years of age comprised 11% of all burns in the current study which is consistent with the WHO injury report stating that children under 5 are at the highest risk of burn injuries.[22] Pre-school children spend most of their time at home near various kinds of heating and cooking equipment and products that put them in the danger burns particularly scald and contact injuries. Females comprised 54% of

admissions in the current study. This higher proportion of female burn admissions is consistent with that of many low and middle income countries such as 53% in Egypt[23], 56% in Iran [24], 64% in Sri Lanka [25] and 67% in Turkey.[26] This preponderance of female burns in the current study is likely to be related to the role of women in the family where they take care of cooking, baking and other functions involving heating and cooking equipment. In addition, young females are more likely to be affected by intentional self-harm burns and chemical burn of homicidal intention. This interpretation becomes more convincing when we notice that 69% of burns occurred at home and majority of intentional self-harm burns were females. Flames comprised the majority of all burns (64.8%) among the patients. Scalds comprised of 12% of all burns, contact burns comprised 3% of all burns and chemical burns were responsible for

7% of burn admissions. Consistent with this study, the majority of studies from other developing countries reports a higher proportion of flame injuries than scalds amongst admitted patients ranging from 41-76% of all burns. [24,27,28] Home is the most common place where burns occurred in the current study (69%). This is similar to studies from other parts of India reporting that 72-94% of all burns occurred at home. In the current study, rainy season was the most common season of burn injuries comprising 43% all burns. Winter accounts for 28-31% of burns in several studies from other part of the world. [24,27] Majority of burn in published literature in India and other part of the world is found to be caused by accidental reasons. [16-18] But suicidal and homicidal burns are also common in India. Similar observation was found in this study too. Most of the other studies from India show more TBSA involvement in case of female which is consistent with the present study finding. [8-10]

Limitation: Major limitations were since this study was undertaken in tertiary care hospital of West Bengal, The results could not be automatically generalized to other parts of India as it is a vast country with huge socio-cultural diversity within it and as the study was undertaken in an apex referral hospital it is likely that minor burns have not attended the burns centre but reported to the other health centres in the city.

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