

Burn deaths: A five year retrospective autopsy study of flame burn victims in Jorhat, Assam, India

Das Kanak Chandra^{1*}, Gogoi Nitu Kumar², Gupta V P³, Phukan Swaraj⁴

¹Professor and HOD, ²Assistant Professor, ^{3,4}Demonstrator, Department of Forensic Medicine, Jorhat Medical College and Hospital, Jorhat-785001, Assam, INDIA.

Email: kanak1960das@yahoo.in

Abstract

Abstract: Burn deaths are a Major public health problem in a developing country like India. About 1,60,000 to 2,00,000 burn deaths are reported in every year in India. A retrospective study was carried out on flame burn deaths from medico legal autopsies performed in the department of Forensic Medicine, Jorhat Medical College & Hospital, Jorhat, Assam, India. The objective of the study was to record and evaluate the causes and the magnitude of the fatal burn injuries retrospectively. An analysis of autopsy records revealed 196 (07.88%) cases of flame burn injuries among the total autopsies (2488) done in 5 years period (2011 – 2015). The results revealed that majority of burn incidents were accidental (70.41%) in nature followed by suicidal (23.47%) and homicidal (3.57%) deaths. Most of the deaths (49.46%) occurred between 21 – 30 years of age group with a preponderance of females (50.62%). Most of the victims (62.25%) were married, with female dominated. The majority of incident occurred in the kitchen (86.23%) followed by bedroom (7.14%), outside home (4.59%) and bathroom (2.04%). Kerosene stove burst (36.78%) was the major source of burn injuries followed by used of chulha for cooking (11.22%) and gas stove (5.11%). The percentage of burn injuries (TBSA) over 50% were observed in most of the cases (80.61%). The majority of deaths occurred within a week (61.74%) and most of the victims died (42.35%) from neurogenic shock.

Key Words: Flame burn, burn death, neurogenic shock, asphyxia, septicaemia, pneumonia, toxemia, Jorhat.

*Address for Correspondence:

Dr. Das Kanak Chandra, Professor & HOD, Department of Forensic Medicine, Jorhat Medical College and Hospital, Jail Road, Jorhat-785001, Assam, INDIA.

Email: kanak1960das@yahoo.in

Received Date: 13/11/2016 Revised Date: 07/12/2016 Accepted Date: 05/01/2017

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 08 January 2017

INTRODUCTION

A burn is an injury which is caused by application of heat or chemical substances to the external or internal surfaces of the body, which causes destruction of tissues. The minimum temperature for producing a burn is about 44°C for an exposure of about 5 to 6 hours. At 65°C two seconds are sufficient to produce burns and full thickness destruction of skin occurs within second above 70°C.¹ Local injury to the body by heat may results from dry

heat, application of heated solid bodies or a molten metal.^{1,2} Burn injuries are recognised as important cause of injury to the human being. According to the WHO every year more than 3,00,000 individuals died of fire-related burns and 95% of these deaths occurred in low and middle income countries.³ As in other low income countries, burns in India are considered a major public health problems that are associated with high mortality and morbidity. In spite of recent advancement in medical sciences pathogenesis of burn injury is yet to be ascertained for the successful management of burn cases and to prevent death and deformity following burns. Systemic study of death following burns has not been carried out so far in this region (eastern part) of India. Therefore, an attempt has been under taken with a view to fill-up the lacuna in regards to our knowledge about burns and associated problems. The present study is based on a 5 year retrospective study (2011– 2015) of fatal burn cases at autopsy at Jorhat Medical College & Hospital, Jorhat, Assam, India.

MATERIALS AND METHODS

A retrospective study was done on burn deaths from medico legal autopsies performed in the department of Forensic Medicine, Jorhat Medical College & Hospital, Jorhat, Assam, India. A total of 2488 autopsies were performed on all types of unnatural deaths between 1st January 2011 and 31st December 2015. Out of 2488 autopsies, 196 (7.88%) were the cases of flame burns. These 196 fatal flame burn cases form the material of the study. A medico legal autopsy is mandatory in India for all unnatural deaths including deaths due to burn whether it is accidental, suicidal or homicidal. A thorough examination of the epidemiological features and medico legal aspects of the 196 burn deaths was performed in an effort to clearly understand the circumstances of these deaths. Retrospective data were collected from the

autopsy findings, case-sheets from the hospital and the inquest reports from police. All the data revealed various information pertaining to their age, sex, incident location, type of burn, manner of death, TBSA (according to Lund-Browder chart), duration of survive, cause of death etc. Data were presented as numbers and percentages by using SPSS version 18. Pearson correlation, coefficient was done and P value is considered significant at 0.05.

RESULTS

Table 1: Sex distribution of burn victims

Sex of burn victims	Number	Percentage
Male	34	17.35
Female	162	82.62
Total	196	100

Table 2: Age & sex wise distribution of burn victims

Sl No	Age group in years	A				S		H		U		Total			Total (M + F)		
		M	%	F	%	M	F	M	F	M	F	M	%	F	%	Num	%
1	00 – 10	1	4.76	4	3.42							1	2.94	4	2.47	5	2.56
2	11 – 20	4	19.04	23	19.66	1	4	2				5	14.70	29	17.90	34	17.35
3	21 – 30	9	42.86	58	49.57	6	17	4		3		15	44.12	82	50.62	97	49.46
4	31 – 40	3	14.29	18	15.38	3	11	1				6	17.65	30	18.52	36	18.36
5	41 – 50	3	14.29	5	4.27		3			2		5	14.71	8	4.94	13	6.65
6	51 – 60	1	4.76	3	2.56	1						2	5.88	3	1.85	5	2.56
7	> 60			6	5.14									6	3.70	6	3.06
	Total	21		117		11	35	00	7	02	03	34		162		196	100

Table 3: Manner of burn injuries

Sl No	Manner	Male		Female		Total (M + F)	
		Number	%	Number	%	Number	%
1	Accidental	21	61.76	117	72.22	138	70.41
2	Suicidal	11	32.34	35	21.61	46	23.47
3	Homicidal	00	-	07	4.32	07	3.57
4	Undetermined	02	5.88	03	1.85	05	2.55
	Total	34	100	162	100	196	100

Table 4: Marital status of burn victims

Sl No	Marital status	A				S		H		U		Total			Total (M + F)		
		M	%	F	%	M	F	M	F	M	F	M	%	F	%	M+F	%
1	Children	3	14.28	12	10.26	0	2	0	1	0		3	8.82	15	9.26	18	9.18
2	*Single	8	38.10	21	17.95	8	14	0	2	2	1	18	52.94	38	23.46	56	28.57
3	Married	10	47.62	84	71.79	3	19	0	4	0	2	13	38.24	109	67.28	122	62.25
	Total	21		117		11	35	00	7	2	3	34		162		196	

*Single – not married, widower, separated, divorced. A -Accidental, S -Suicidal, H -Homicidal, U – Undetermined.

Table 5: Distribution of burn victims according to location

Sl No	Location	A				S		H		U		Total			M + F		
		M	%	F	%	M	F	M	F	M	F	M	%	F	%	Num	%
1	Rural	8	38.10	33	28.21	4	18	00	1			12	35.29	52	32.09	64	32.66
2	Semi urban	4	19.05	25	21.37	3	4	00	1		1	7	20.58	31	19.13	38	19.39
3	Urban	9	42.85	59	50.42	4	13	00	5	2	2	15	44.13	79	48.78	94	47.95
	Total	21		117		11	35	00	7	2	3	34		162		196	

Table 6: Place of burn incident

SI No:	Place of incident	A		S		H		U		Total			M + F				
		M	%	F	%	M	F	M	F	M	F	M	%	F	%	Num	%
	A kitchen	12	57.14	117	100	8	26	0	5	0	1	20	58.82	149	91.98	169	86.23
	T Bedroom	0		0		3	5	0	2	2	2	5	14.71	9	05.54	14	07.14
1	H O M E																
	Bathroom	0		0		0	4	0	0	0	0	0		4	02.48	4	02.04
2	Outside home	9	42.86	0		0	0	0	0	0	0	9	26.47	0		9	04.59
	Total	21		117		11	35	00	7	2	3	34		162		196	

Table 7: Causative source (Aetiology) of burn injuries

SI No	Aetiology	Male		Female		M + F	
		Number	%	Number	%	Number	%
1	Kerosene Stove	5	14.71	71	43.85	76	38.78
2	Kerosene + Match	12	35.29	47	29.44	59	30.10
3	Chulha	1	02.94	21	12.96	22	11.22
4	Kerosene Lamp	1	02.94	13	08.02	14	07.14
5	Vehicular Accident	5	14.71	0	00	5	02.55
6	Gas Stove	3	08.82	7	04.33	10	05.11
7	Open Flame	2	05.89	0	00	2	01.02
8	Candle Flame	0	00	0	00	0	00
9	Earthen Lamp	0	00	0	00	0	00
10	Cracker	1	02.94	2	01.23	3	01.53
11	Undetermined	4	11.76	1	00.17	5	02.55
	Total	34		162		196	

Table 8: Seasonal variation of burn incident

SI No	Seasons	Number of cases	%
1	Spring (Mar, Apr, May)	59	30.11
2	Summer (Jun, July, Aug)	29	14.80
3	Autumn (Sep, Oct, Nov)	37	18.86
4	Winter (Dec, Jan, Feb)	71	36.23
	Total	196	

Table 9: Percentage of body surface area involved in burn victims

SI No	% of body surface	Accident	Suicide	Homicide	Undetermined	Total
1	00 – 30	03 (02.17%)				03 (01.53%)
2	31 – 40	15 (10.87%)	03 (06.52%)			18 (09.18%)
3	41 – 50	17 (12.31%)				17 (08.67%)
4	51 – 60	26 (18.84%)	05 (10.87%)			31 (15.82%)
5	61 – 70	19 (13.78%)	08 (17.39%)	1	1	29 (14.79%)
6	71 – 80	27 (19.57%)	07 (15.22%)		1	35 (17.86%)
7	81 – 90	18 (13.04%)	09 (19.57%)	2		29 (14.79%)
8	91 – 100	13 (09.42%)	14 (30.43%)	4 (57.14%)	3 (60.00%)	34 (17.35%)
	Total	138	46	7	5	196

Table 10: Fatal period in relation to Sex of burn victims

SI No	Fatal period	Male		Female		Total (M + F)	
		Number	%	Number	%	Number	%
1	Within 24 Hours.	15	44.13	46	28.39	61	31.13
b	24 – 48 Hors.	4	11.76	22	13.58	26	13.27
3	48 – 72 Hors.	3	08.82	12	07.41	15	07.65
4	4 – 7 days	2	05.88	17	10.49	19	09.69
5	8 – 15 days.	9	26.47	48	29.63	57	29.08
6	15 days – 1 Month	1	02.94	11	06.79	12	06.12
7	Above 1 Month	0		6	03.71	6	03.06
	Total	34		162		196	

Table 11: External appearances at the PM Examination of victims

SI No	External appearances	Number of cases	
		Present	%
1	Line of redness	149	76.02
2	Repairative changes	113	57.65
3	Secondary infection	74	37.76
4	Singeing of hairs	63	32.14
5	Vesication	45	22.96
6	Smell of Kerosene	37	18.88
7	Pugilistic attitude	5	02.55
8	Burnt clothing	21	10.72
9	Heat cracks	3	01.53
10	Ante-mortem injuries	2	01.02

Table 12: Internal appearances at the PM Examination

SI No	Internal appearances	Number of cases	
		Present	%
1	Generalised congestion	87	44.39
2	Soot in the respiratory tract	26	13.27
3	Soot in the GI tract	21	10.71
4	Generalised pallor	66	33.67
5	Carboxy-haemoglobin	25	12.76
6	Carling's ulcer	23	11.73
7	Heat fracture	3	01.53
8	Heat haematoma (Intracranial)	2	01.02

Table 13: Cause of death of burn victims

SI No	Cause of death	Number	Percent
1	Neurogenic shock	83	42.35
2	Hypovolaemic shock	45	22.96
3	Asphyxia	13	06.63
4	Septicemia	32	16.33
5	Pneumonia	7	03.57
6	Toxaemia and multi organ failure	16	08.16
Total		196	

DISCUSSION:

Burn is a major public health problem prevalent worldwide, especially in developing countries.³ Based on the available data regarding the incidence of burn victims, this is considered as a significant problem in India. Though there is no time trends (in Jorhat), yet it constitutes 7.88% of the total unnatural deaths coming for autopsy at Jorhat Medical College & Hospital, Jorhat. The higher incidence of burn victims among females was observed throughout the study period, with women in 21-30 years age group were reported to be higher risk, while in some countries (Argentina, Thailand, Uruguay and Saudi Arabia) about 70% of burn victims are males.^{5,6} In Spain burn cases were observed to be more common among males in all age groups except in the elderly,⁷ while higher incidence of burn deaths (67%) has been reported from Cairo city, Egypt.⁸ Present finding is similar to the observation of Vipul NA et.al.⁹ from Nagpur, central India, who reported female not only outnumbered the males, but the sex ratio being almost

three times higher in female in India. In the present study, the majority of the incidents are accidental (70.41%) in nature, suicidal and homicidal cases were also observed. As noted with other studies, accidental burning was the commonest manner of deaths due to burning followed by suicidal and homicidal burning.^{10, 11, 12, 13} It is observed that female victims outnumbered than the male victims. Out of 122 married victims, 109 (67.28%) were female and 13 (38.24%) were male. The region is that, comparatively married persons deal with fire more in day to day domestic affairs. The present findings are consistent with the findings of Reddy.¹⁸ The traditional kerosene stove which is extensively used in the slum areas of urban location for cooking, boiling water and other domestic affairs without any safety measures. Thus, it is believed to be responsible for much of the flame burns in urban areas. In urban areas more females met fire accident than males. This fact has been reported by the workers of the low income countries.^{22,23} From the present observation, it reveals that burn accident took place more commonly in a closed place (inside home) rather than in an open place. Our study showed that the kitchen ranked first, followed by bedroom and bathrooms. Only 9 (4.59%) cases, incident took place outside home. This comes in accordance with the findings of other reporters.^{16,20,25} The common source of flame burn is found to be kerosene stove burst (38.78%), which is consistent with the study of Anita NH et. al.¹⁴, Agarwal S et. al.¹⁵ and Ashkan G et. al.¹⁶ Flame is the major cause of burns which is consistent with the study from Manipal by Virendra K et. al.¹⁷ The present findings are not consistent with the findings of Reddy, who found that chulha responsible for 34.43% total burn victims in Varanasi area of India. Seasonal variations in the study showed that burn deaths occurred mostly in winter followed by spring, autumn and summer. A higher number of burn incidents in winter season could be attributed to the fact that the people sit together around open fire for warming up themselves and natural desire to drink hot tea or milk many times in a day. The present observations are in conformity with the findings Smith RW et. al.¹⁹, Tejerina C et. al.²¹, and Marsh D et. al.²² In the present findings, the majority (80.61%) of the victims sustained more than 50% of total body surface area burns indicating incompatibility with life even at tertiary hospital. It is also observed that in 50% of the suicidal victim's total body surface area burns were more than 80% as compared to the total victims where it is only in 32.14%. This again shows the definite mortality in suicide even in tertiary hospital. Findings of other reporters from India, Albania, and Saudi Arabia revealed that 100% mortality over 40% burn of total body surface.⁸ The present study shows 31.13% cases died within few minutes to 24 hours. More

than 60% cases died within a week, signifying that the burn injuries are rapidly fatal. Similar findings were reported by Virendra K et.al.¹⁷ Barret JP et.al.²⁵ in their study reported 40% burn deaths between 3 and 7 days of the incident. The external post mortem findings very according to the time gap between sustaining burn injuries and death. In some cases death occurs after a week or so, when the apparent picture is totally different from those found in a case of immediate death after sustaining burn injuries. In this respects, the findings are conformity with the opinions held by the authors like Modi¹, Reddy². The study also reveals that signs of vitality (soot in the airways or digestive tract) were found at autopsy 23.98% of victims died from burns. The most of the victims 12.76% with elevated carboxy-haemoglobin reveals had soot particles in their airways or digestive tract. The present observations are at variance with the findings of Mostafa M et.al.⁸ Cairo, Egypt. Curling's ulcer is a specific finding in burn cases if the victim survives for 7 -10 days. The present findings (11.73%) are slightly at variance with the findings of Law EJ et.al.²⁴ In burn injuries, death was mostly due to burn shock (neurogenic or hypovolemic) or inhalation injury.^{7, 25} Multiorgan failure was responsible for 25% of all burn deaths^{7, 25} and sepsis for 14%. Respiratory complications (pneumonia, ARDS) are a major cause of death (34%) among adults.^{7, 25} The present study shows neurogenic shock (42.35%) is the major cause of death followed by hypovolemic shock (22.96%) and septicaemia 16.33%. Virendra K et.al.¹⁷ reported that septicaemia was the leading cause of death in burn injuries. Other causes were pneumonia, asphyxia, toxemia as also mentioned in the result.

CONCLUSION

Burn has proved to be a major killer of human life causing heavy loss of human resources every year. The present autopsy based study has highlighted some important facts pertaining to burn deaths in Jorhat, Assam, India. The highest incidence rates of burn deaths (85.17%) were in adolescent and young age groups. Majority of burn victims are females. Accident is the commonest manner of death. In all categories involvement of females, engaged in domestic works are almost three times more than males. A higher occurrence of burn fatalities in winter suggests that there is a relation between people's habit and fatal burn injuries. Extensive burns involving the whole body was found in suicidal and homicidal burns rather than in accidental. Suicidal and homicidal burns were more during the first 5 years of marriage life. Married peoples were more often the victims of all types of burn. Burn shock was the commonest cause of death.

REFERENCES

1. Injuries from burns, scalds, lightning and electricity. Modi's Medical Jurisprudence and Toxicology. 23rd Ed. LexisNexis, New Delhi. Mathiharan K and Patnaik AK; 2005: p.629.
2. Thermal deaths. The Essential of Forensic Medicine and Toxicology. 33rd Ed. New Delhi: Reddy KS and Murty OP; 2014: p. 317.
3. WHO. Injuries: A leading cause of the global burden of disease.2000. World Health Organization: Geneva: 2002.
4. De Roche R, Luscher NJ, Debrunner HU, Fischer R. epidemiological data and costs of burn injuries in workers in Switzerland: an argument for immediate treatment in burn centres. Burns 1994; 20:58-60.
5. Saleh S, Gadalla S (American University in Cairo, Egypt), Fortney JA, Rogers SM, Potts DM (North Carolina USA). Accidental burn deaths to Egyptian women of reproductive age. Burns 1986, 12:241-245.
6. Chaurasia AR. Mortality from burns in developing countries. Burns 1982; 9:184.
7. Reig A, Tejerina C, Baena P, Mirabet V. Massive burns: a study of epidemiology and mortality. Burns 1994; 20:51-54.
8. Mostafa M. Afify, Naglaa F. Mahmoud, Ghada M. Abd El Azzim, Nevein A. El Desouky. Egyptian Journal of Forensic Sciences: Fatal burn injuries: A five years retrospective autopsy study in Cairo city, Egypt. 2012; 2:117-122.
9. Vipul NA, Hemant VG. Study of burn deaths in Nagpur, Central India. Burns 2006; 32:902-8.
10. Batra AK. Burn mortality: Recent trends and sociocultural determinants in rural India. Burns 2003; 29:270-5.
11. Kachare RV, Chavan KD, Goli SK. Analytical study of medico legal deaths in rural region of Beed district of Maharashtra. J ML Assoc Maharashtra 2003; 15:14-7.
12. Kumar V, Tripathi CV. Fatal accidental burns in married women. Leg. Med. 2003; 5(3): 139-45 (Tokyo).
13. Kumar V, Tripathi CV. Burnt wives; A study of homicides. Med Sci Law 2004; 44:55-60.
14. Anita NH, Somaya PM. An interim report on burns. In research in burns, Ed. By Wallace AB & Wilkinson AW, E&S Livingstone Ltd. London. 1966; 193-200.
15. Agarwal S, Agarwal SN. Analysis of causes of fatal burns. J. Ind. Aca. For. Sci. 1967; 6:40-3.
16. Ashkan G, Patel Cyra, Hyder AA. A systemic review of the epidemiology of unintentional burn injuries in South Asia. J. Pub. Health. 2013;2 (3):384-396.
17. Virendra K, Manoj KM, Sarita K. Fatal burns in Manipal area: A 10 years study. J. Firensic Leg Med 2007; 14:3-6.
18. Kanitkar S. et. al. Mortality in burns. Indian J. of burns. 1994; 2(1):67-74.
19. Smith RW. An analysis to childhood burns. Burns Incl. Therm. Inj. 1984; 11(2):117-24.
20. Gupta M. et. al. Paediatric burns in Jaipur, India. An epidemiological study. Burns.1992; 128(1):63-67.
21. Tejerina C. et.al. Burns in patients over 60 years old: Epidemiology and mortality. Burns 1992; 18(2):149-52.
22. Marsh D, Sheikh A, Khalil A, Kamil S, et. al. Epidemiology of adults hospitalized with burns in Karachi, Pakistan. Burns. 1996; 22(3):225-9.

23. El-Badawy A, Mabrouk AR. Epidemiology of childhood burns in the Burn Unit of Ain Shams University in Cairo. Egypt. Burns 1998; 24:728-32.
24. Law EJ, Dey SB, Macmillan BG. Autopsy findings in the upper gastro-intestinal tract of 81 burns patients. A review. Arch. Surg. 1971; 102:412-15.
25. Barret JP, Gomez P, Solano I, Gonzalez-Dorrego M, Crisol FJ. Epidemiology and mortality of adult burns in Catalonia. Burns 1999; 25:325-9.

Source of Support: None Declared
Conflict of Interest: None Declared