



Comprehensive Study of Fatal Burn Injuries: 10-year Retrospective Autopsy Study in Goa Medical College, Goa

Kankonkar R* and Karekar Chetan#

Goa Medical College, India

***Corresponding author:** Rhea Kankonkar, Goa Medical College, Goa, India; Email: kankonkarrhea@gmail.com

#Chetan Karekar, Consultant Forensic Medicine, Goa Medical College, drchetankarekar@gmail.com

Research Article

Volume 10 Issue 1

Received Date: December 19, 2024

Published Date: January 30, 2025

DOI: 10.23880/ijfsc-16000434

Abstract

Morbidity and Mortality secondary to burn injuries is a concern in developing countries as the number of fatalities are rising day by day. By definition a Burn is an injury which is caused by application of heat (by conduction or radiation) or chemical substances to the external or internal surfaces of the body, which cause destruction of tissue. The minimum temperature for producing a burn is about 44C for an exposure of about 5-6 hours. At 65 C 2 seconds are sufficient to produce burns and full thickness destruction of skin occur within seconds above 70°C. Deaths related to burn injuries have tremendous medicolegal importance as they are one of the commonest causes of unnatural deaths in India. The major aim behind this study is to understand and analyse the epidemiological, medicolegal aspects of fatal burn injuries retrospectively for a period of 10 years.

Keywords: Epidemiology; Fatal; Burns; Manner; Mortality

Abbreviations

SPSS: Statistical Package for Social Sciences; NBC: National Burn Center; TBSA: Total Burn Surface Area.

Introduction

Throughout history, Fire has perhaps been man's first double edged weapon. It has both benefitted and harmed harmony [1-3]. Burn trauma predates human history by the same period as the development of fire, when utilised carefully, it may be extremely beneficial to humanity; Nevertheless, when caution is not taken, it can cause disaster that injure people and destroy property [2]. When dry heat, such as flames or radiant heat or another hot solid material such as glass/metal is applied to the body, it may cause burns. It is difficult to determine where fire was controlled and in use by homo erectus, way before modern humans were evolved. As such there is no written

recorded history about learning to control and use fire [2]. Electric spark discharges, flashes and lightening leads to electric burns [4]. Burn injury is one of the common medical emergencies admitted to any hospital and is an important public health problem throughout the world. The obnoxious and ubiquitous practices of dowry has penetrated a new and alarming rise in mortality from burns, the so called "Dowry deaths". Homicidal burning of married women in India is a major concern for the government, law enforcing authorities, the judiciary, the police and medicolegal experts all over the country [2]. Furthermore, due to the high expense of wound and scar care, extended hospital stays, and rehabilitation, burns are also among the most expensive traumatic injuries. Furthermore, due to the high expense of wound and scar care, extended hospital stays, and rehabilitation, burns are also among the most expensive traumatic injuries [5,6]. The World Health Organization estimates that 238,000 people died in 2000 from burns connected to fires, with low- and middle-income nations accounting for 95% of these deaths



[7]. In the present retrospective study of 10 years an attempt is made to analyse the incidence and circumstances of death due to fire, age and sex distribution, marital status, etiology of burns, manner of death, surface area burns, survival period and cause of death along with various epidemiological and medicolegal aspects in the community.

Materials and Methods

Materials for the present study comprised of total number of 972 cases of death due to burns brought to the mortuary of Goa Medical College and Hospital. All the case files and record of the past 10 years were studied for fatalities among male and female victims due to burns trauma. i.e. from 2014-2023. An In-depth examination of the epidemiological features and medicolegal aspects like age, sex, marital status, type of burn, cause of death, period of survival, socio-economic status was ascertained from in-patient case sheets, in case of hospital admission, inquest reports, records from

hospital, post mortem reports of the cases.

The resulting data was tabulated and analysed. On the basis of analysis and observation, Results were drawn, discussed and compared with other relevant literature.

Observations and Results

The incidence of burns whether accidental, homicidal or suicidal case are not uncommon to Indian society since immemorial. Incidence, etiology and nature of burns vary from one community to another and depend mainly on age, sex, economic status, environmental and socioeconomic circumstances.

Total number of 972 cases were studied during the period of 2014 to 2023 which forms about 8.92% of total post mortem examination done during that period. Age group of 31-40 years was the common affected with 21.6%.

Year	No. of Autopsy Done Each Year	No. of Thermal Deaths	Percentage
2014	951	42	4.32%
2015	970	48	4.94%
2016	1072	102	10.50%
2017	992	98	10.10%
2018	1080	148	15.20%
2019	1120	94	9.70%
2020	1202	110	11.30%
2021	1182	92	9.50%
2022	1206	140	14.40%
2023	1132	98	10.10%
		Total : 972	

Table 1: Year Wise Distribution of Thermal Deaths.

Age group	Male	Female	Total	Percentage
1-10	21	24	45	4.60%
11-20	28	23	51	5.20%
21-30	50	160	210	21.60%
31-40	226	88	314	32.30%
41-50	110	134	244	25.10%
51-60	10	26	36	3.70%
Above 61	62	10	72	7.40%
			Total: 972	

Table 2: Age Wise Distribution.

Marital Status	Male	Female	Total	Percentage
Married	352	410	762	78.40%
Unmarried	120	90	210	21.60%
			Total: 972	

Table 3: Marital Status.

Socioeconomic Status	No. of Cases	Percentage
High	210	21.60%
Middleclass	605	62.20%
Low	167	17.20%
	Total: 972	

Table 4: Socioeconomic Status.

Types of burns	No. of cases	Percentage
Flame	810	83.40%
Electrical	130	13.40%
Scalds	26	2.70%
Chemical	6	0.62%
	Total: 972	

Table 5: Types of Burns.

Cause of Burns	No. of Cases	Percentage
Kerosene stove blast	298	30.67%
Kerosene/Petrol/Diesel	249	25.60%
Flame	243	25%
LPG	10	1.03%
Electric	130	13.40%
Hot liquid	32	3.30%
Blast [other]	10	1.03%
	Total: 972	

Table 6: Causes of Burns.

Percentage of Burn Area of Body	No. of Cases	Percentage
Upto 25%	55	5.66%
26-50%	205	21.10%
51-75%	410	42.20%
76-100%	302	31%
	Total: 972	

Table 7: Percentage of Surface Area Burnt [Rule of Nine].

Period of survival	No. of cases	Percentage
< 2 hours	44	4.50%
2-6 hours	10	1.03%
6-12 hours	122	12.50%
12-24 hours	210	21.60%
24-36 hours	152	15.60%
36-72 hours	144	14.80%
3-7 days	220	22.60%
More than 7 days	70	7.20%
	Total: 972	

Table 8: Period of Survival.

Possible Cause of Death	No. of Cases	Percentage
Hypovolemia	120	12.30%
Neurogenic shock	54	5.56%
Toxaemia	210	21.60%
Septic shock	586	60.30%
Delayed causes(others), like pneumonia, bed sore etc.	2	0.20%
	Total: 972	

Table 9: Possible cause of Death

Microorganisms Found	No. of Cases	Percentage
Pseudomonas	340	35%
Acinetobacter	310	31.90%
Streptococcus	102	10.50%
Staphylococcus	86	8.80%
Klebsiella	44	4.50%
E. coli	64	6.60%
Other multiple organisms	26	2.70%
	Total: 972	

Table 10: Microorganisms Found During Treatment.

Manner of Death	No. of Cases	Percentage
Accidental	410	42.20%
Suicidal	549	56.50%
Homicidal	13	1.30%
	Total: 972	

Table 11: Manner of Death.

Discussion

Humans have been suffering from burn injuries since ancient times. All cultures, developed or developing, face the medical and psychological challenges of burns, but they also have serious social and economic consequences for the patients, their families, and society at large [5].

Karradi et al. conducted a study to investigate the circumstances of death caused by thermal burns and to determine the correlation between the surface area of burns, the duration of survival, and the cause of death. A total of 698 thermal burn death cases were examined. Burn-related deaths occur at a rate of 25.41%, with the age group of 21–30 years old accounting for the highest number of deaths (44.84%). In a 3:1 ratio, women outnumbered men by roughly three times, with 74.39% of the 511 females being married and 25.61% being single. While 30.66% of victims passed away within five days of the incident and 21.63% of victims died with 80–90 burns, 17.34% of victims were unable to survive for more than twelve hours. Septicemic shock was the cause of death for the majority of victims (65.54%). Additionally, it was noted that 85.67% of the victims had unintentional burns. Burns accounted for 60.08% of all dowry death cases [8].

To provide a summary of the patterns in burn epidemiology in Manipal from 2011 to 2015, Harikumar et al. conducted research. In the study area, the mortuary connected to the tertiary care teaching hospital served as the site of the five-year retrospective study. From 2011 to 2015, their study included all cases of thermal injury-related deaths. Post mortem records were consulted for pertinent information, which was then analyzed using the Statistical Package for Social Sciences (SPSS) 21 for descriptive statistics. Thermal injury deaths accounted for 14% of all unnatural deaths that transpired during the study period. Of the victims, 68% were women. The victims' ages ranged from one to eighty years. The percentage of body surface area that was burned ranged from 22% to 100%. The period of time between the incident and the victim's death varied from one day to three months. The months of April, May, and June saw the most cases. Complications including pulmonary edema, hypovolemia, septicemia, and renal failure were among the causes of death [9].

In the Varanasi area, Pandey et al. carried out a retrospective study on cases that were brought to the Department of Forensic Medicine, IMS, BHU, Varanasi, over a two-year period, from 2009 to 2010. During the study period, burn injuries accounted for 17.98% and 17.07% of all unnatural deaths reported, respectively, indicating a relatively stable trend. Burn deaths typically involve females and dowers, with the female dying in her in-laws' home

within seven years of marriage. In a 1:4 ratio, female burn deaths outnumbered male burn deaths. The married group accounted for the majority of the dead (73.19%), followed by the unmarried (23.55%). Young adults were more likely to be involved in these kinds of deaths, as evidenced by the fact that the main age group was 21–30 years old (45.13%), followed by 11–20 and 31–40 years old, which showed nearly the same rate of about 20%. 90.28% of deaths occurred in hospitals, indicating that timely and appropriate medical care was provided, whereas only 9.72% of deaths occurred on the spot or while traveling to the hospital. Regardless of how death occurs In contrast to male burn deaths, which are investigated by police under 174 Cr.P.C. as routine cases and medico-legal postmortem examinations by a single doctor, female burn deaths are investigated by magistrates under 176 Cr.P.C. and cases registered under 304B IPC (Dowry Death) and a panel of two doctors [10].

Over a 17-year span since the National Burn Center (NBC) opened in 2006, Anna et al. examined changes in burn patient referrals, hospitalizations, treatment, and outcomes. Patients who meet the American Burn Association's requirements for a burn center referral are treated in four burn centers located around the country. The major metropolitan region is home to the NBC, which also accepts further referrals for "severe" burn injuries (such as those with a total burn surface area (TBSA) of greater than 30%). Their study presented the changing models of treatment over time and examined the burden of referrals. The average population of a US state is 5.7 million people scattered across 182, 949 km², however our entire catchment population is 5.1 million people spread throughout 268, 021 km² [11].

According to the pertinent statistics above, married persons constituted the largest group, potentially due to dowry, in-law conflicts, or other familial troubles. Married women were more adversely affected, potentially due to familial obligations, insufficient emotional support, or other issues. Kerosene and petrol were predominantly utilized due to their widespread availability in households, particularly for cooking purposes.

In Goa, the socio-economic position is exaggerated, resulting in the age group of 31-40 being the most affected, since family duties intensify during this period. This stress can subsequently lead to suicide, which is identified as a prevalent cause of death according to both existing research and our study.

The middle class was most adversely affected, likely due to a deficiency of financial and emotional support, prompting some to take the drastic step of committing suicide.

Conclusion

According to our study, the year 2016 had the highest number of thermal deaths, with 102 out of 1072 instances occurring in the year 2017 followed by 2023. The population aged 31 to 40 was the highest.

Among 314 instances of thermal fatalities, 226 involved males and 88 involved females. Married individuals constituted the greatest number at 78.4%. Of the 762 total married instances of thermal fatalities, 352 were male and 410 were female. The middle class ranked highest, with an aggregate of 62.2%. Flame burns constituted the highest percentage of 83.4%. The predominant cause of burns was kerosene stove explosions, accounting for 30.67%, followed by petrol/diesel incidents at 25%. The percentage of surface area burned was determined using the Rule of Nine and was found to be 42.2%, with 51-75% of the burn area encompassing 410 cases. The survival span peaked at 3-7 days, with a proportion of 22.6% among 220 cases. The primary cause of mortality was septic shock, accounting for 60.3% of cases, totalling 586 instances. The most prevalent microorganisms discovered during treatment were *Pseudomonas*, which accounted for 35% with 340 cases. Suicide was the most prevalent cause of death accounting for 56.5% of the 549 cases.

References

1. Narayan KS (2020) Essentials of Forensic Medicine and Toxicology. IN: 34th (Edn.), pp: 297.
2. Khalid Abdul M (2016) Fatal burn Injurie; A 5-year retrospective Autopsy study in Temple Town Tirupati; JIAFM 38(4): 455.
3. Xiang Xu R (2004) Brief introduction to history of burn medical science. Burn regenerative medicine and therapy, Kargue. In: 2nd (Edn.), pp: 1-3.
4. Modi NJ (1983) Injuries from burns, scalds, lightning and electricity, asphyxiants. Modis textbook of Medical Jurisprudence and Toxicology. In: 20th (Edn.), Bombay; NM Tripathi 182: 762.
5. Jie X, Baoren C (2003) Mortality rates among 5321 patients with burns admitted to a burn unit in China. 29: 239-245.
6. Sanchez JL, Pereperez SB, Bastida JL, Martinez MM (2007) Cost-utility analysis applied to the treatment of burn patients in a specialized center. Arch Surg 142: 50-57.
7. de Roche R, Luscher NJ, Debrunner HU, Fischer R (1994) Epidemiological data and costs of burn injuries in workers in Switzerland: an argument for immediate treatment in burn centres. Burns 20: 58-60.
8. Karaddi S (2008) Study of Deaths Due To Thermal Burns In And Around Gulbarga City.
9. Anagha H, Shankar MB, Vinod CN (2019) Profile of deaths due to thermal injuries in a coastal township in South India.
10. Pandey SK, Chaurasia N, Kumar A (2014) Thermal Burn: An Epidemiological Retrospective Study.
11. Dargan A, Wong She RB, Baker P, Damkat-Thomas L (2024) 743 Changes in Epidemiology and Outcomes in a National Burn Centre over 17 Years (2006–2023). Journal of Burn Care & Research 45(S1): 223.