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A prospective study of medicolegal autopsies to establish profile of burn deaths

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ABSTRACT

Burns injuries have been a one of the major cause of concern since prehistoric time to the present era of modern medicine. Burn is considered to be the commonest cause of unnatural death in India. Burns are injuries produced by application of dry heat such as flame, radiant heat or some heated solid substance like metal or glass to the body. Dry heat, application of hot bodies, licking by flames resulting in simple burns causes local injury to the body. Moist heat leading to scalds, corrosive poisons resulting in corrosive burns. Electric spark, discharges, flashes and lightning leads to electric burns. Present study aim to know the magnitude of burn deaths in the region of southern marathwada region. Two years prospective study was conducted at Government Medical College Latur. Study of medico legal autopsies to establish the profile of burn deaths was carried out. In the present study, it is found that burns are commonly found in female (72.04%) than in females. Housewives (43.52%) were common victims followed by works (9.80%). Most of the incidences took place in morning hours (45.53%). Most common place of incidence was house (83%). Kerosene (57.63%) was the most common accelerant used to cause burn. If percentage of burn increases, the survival period decreases and vice versa. Most common alleged manner of death was accident (53, 6%).

1. Introduction

Burns continue to be an important global public health problem and are the fourth most common type of injury worldwide; following traffic accidents, falls, and interpersonal violence.[1] The occurrence of burns worldwide has increased over the last decade by more than a third. The WHO estimates that there are approximately 195,000 deaths per year worldwide from fire-related burn injuries. Fire-related mortality rates are especially high in South-East Asia (11.6 deaths per 100 000 population per year), the Eastern Mediterranean (6.4 deaths per 100 000 population per year) and Africa (6.1 deaths per 100 000 population per year). The Government of India, the ministry says India records 70 lakh burn injury cases annually of which 1.4 lakh people die of burn every year. Around 70% of all burn injuries occur in most productive age group.[2] Burns can cause psychological, social and physical problems for the patient and family. It is an economic and social burden on the national health services. The patients must be cared more in hospitals.[3] Death due to burning is an important cause of unnatural death commonly encountered in Medico legal Practice. Homicidal burning of married women in India is a major concern for the Government, law- enforcing authorities, the judiciary, the police and medico-legal experts all over the country who are dealing with dowry disputes. Dowry deaths by burns was most common in India & at the same time accidental burns in females also occur often while cooking food in their kitchen. Newly married girls are abused, cruelly treated

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and tortured by the husband, in laws, relatives for purpose of dowry or any other demand. In extreme cases women may be killed by burns or any other method.[4] Burns constitute a major role in mortality and morbidity in the whole world, whether accidental, suicidal or homicidal. The exact estimation of burns incidence is very much difficult due to large population and lack of reporting. The loads of over population, illiteracy, low socio-economic status, poor standards of safety at home and at industry, etc has caused a significant rise in burns cases.[5]

2. Aims & Objectives

1. To know the burden of burn death cases.
2. To study correlation between various socio-epidemiological and other factors in relation to age and sex of victims.
3. To study the burns in relation to percentage of burns, place of incidence , location, material used to cause burns, diurnal variation, manner of cause, etc.

3. Materials and Methods

The study was autopsy based prospective cross-sectional study. This study was carried out over a period of two years from 1st October 2013 to 30th September 2015. The study was conducted at the department of Forensic Medicine and Toxicology, at tertiary care center.

Autopsies conducted on all fatal Burn cases brought for medico-legal autopsy. Detail information about death is recovered from Inquest papers, spot panchnama, Hospital papers and related documents and other relevant documents. Magnifying glass, measuring tape, scale, weighing machine, photography equipment and other instruments were required for the autopsy. Organs removal, preservation, carrier materials are used during autopsy procedure.

Compilation of data was done and presented under appropriate headings as per the guidelines of University. The findings of the study were tabulated and wherever necessary graphically represented for better understanding and inferences. Data was statistically analyzed with SPSS 20 software.

4. Result and Observations

Table 1 showed that out of total (1708) medico-legal post-mortem performed at tertiary care centre over a study period 347 cases (20.31%) were of burn deaths. and rest 1361 (79.69%). Table 2 showed that most cases were from age group 21 to 30 years (154, 44.38%), followed by age group 31 to 40 years (62, 17.87%) with minimum cases from age group below 10 years and above 70 years (7 cases, 2.01%). Table 3 showed Female preponderance (250 cases, 72.04%) over males (97 cases, 27.96%) with male to female ratio as 1: 2.57.

Table 4 showed that most of the victims of burn death were married (280: 80.68%) than unmarried (67, 19.32%). It was noted that married females (210, 60.51%) comprised more than half of the cases. The chi square test applied and found significant. (X^2= 6.28, df= 1, p= 0.01, significant)

Table 5 showed that most victims (236, 68.01%) were from rural area in both the sexes. Remaining victims (110, 31.70%) were from urban population. The Chi's square test was applied and not found significant. (X^2= 3.39, df= 1, p= 0.06, Not Significant)

Table 6 showed that most victims i.e. 151 cases (43.52%), were housewives, and followed by workers (34, 09.80%) and farmers (28, 08.07%) apart from dependents. Table 7 did not showed any seasonal variation. The more burn death cases were observed in summer (133, 38.33%) and comparatively lesser cases (90, 25.94%) were observed in rainy season.

Table 8 revealed that most of the incidences 158 (45.53%) took place in the morning hours i.e. from 06:00 Hrs to 11:59 Hrs followed by 96 incidences over the period from 18:00 to 23:59 Hrs and least (17, 4.03%) at first quadrant i.e.00:00 to 05:59 Hrs. Total percentage of incidences in day time was 67.15% (233 cases) and at night time was 32.56 % (113 cases). Table 9 showed that house was most common place of burn incidences comprising 83% (288). Incidents involving female predominantly took place in house comprising 237 (94.8%) of the total 250. Incidents involving male were more in farm, workplace, and public place than female

Table 10 shows that kerosene was the most commonly used accelerant agent which by any way (pouring over body, fall of kerosene lamp, burst of kerosene stove etc.) responsible in 200 (57.63%) cases. It was followed by boiling water in 38 (10.95%) cases and Petrol/ diesel with 34 (09.80%) cases.

Table 11 showed that as percentage of burn increases, the survival period decreases and vice versa. However in our study there were 15 cases that had 0-20% burn and died within 0-24 hours of burn. This paradox was due to the cases of electrocution. In rest of the cases other than electrocution indirect proportion was seen between percentage of burn and survival period. Out of total 347 cases, maximum cases 124 (35.74%) had 80-100% burn followed by 104 (29.97%) cases with 60-80% burn. Out of total 347 cases maximum cases 110(31.7%) survived between 3 to 7 days after burn followed by 85 cases (24.49%) between 0-24 hours of burn.

hows that most of the victims from age group 0-20 yrs and 21-40 yrs survived for >3 to 7 days (i.e. 22 & 72 cases respectively), whereas most of the victims from age group 41-60 yrs and >61 yrs survived for 0-24 hrs (i.e. 13 & 12 cases respectively). Table13 showed that out of total cases most common cause of death was septicemia (242, 69.74%) followed by burn shock (87 cases; 25.07%). Death due to electrocution was seen in 18 cases (5.19%).

hows that most common alleged manner of death was accident (i.e. 186 cases; 53.6%); out of which 60 cases (17.29%) were male and 126 cases, (36.31%) were female; followed by suicidal with 149 cases (42.94%) and least common was homicidal (12, 3.46%). Females were victims in all cases of homicidal manner.

5. Discussion

It is observed that during study period total 1708 autopsies were conducted at this centre; out of which 347 (i.e. 20.31%) deaths were due to burn injury. This showed that more than one fifth of the deaths were due to burns (Table 1). Similar finding was observed by Mangal et al (2007)[6] i.e.17.71%, Zanjad and Godbole (2007)[7] i.e. 18.2%, Gonnade and Farooqui (2013)[8] i.e. 17.53%, and Harish D et al (2013)[9] i.e. 19%The study showed that most of the victims were from age group 21-30 years (154, 44.38%), followed by age group 31-40 years (62, 17.87%) and least were from age group below 10 years and above 70 years (7 cases, 2.01%) (Table 2).Similar findings were observed by Zanjad & Godbole (2007)[7], Buchade D et al (2011)[9], Gupta R (2012)[10], Vaghela P et al (2012)[5], Gonnade and Farooqui (2013)[8], Lal S et al (2012)[11], Mazumdar and Patowary (2013)[1], Harish D et al (2013)[12], Gadge et al (2014)[13], Khandare and Pawale (2014)[4], Manish and Jyothi (2015)[14] It is observed that showed female preponderance with male to female ratio as 1: 2.57,where females were 72.04%(250 cases)and males were 27.96% (97 cases) (Table 3).Similar findings were also observed by other studies where most of the cases were from age group of 21- 30 years. Mangal et al.[6] observed that 1: 2.70 and Zanjad N P and Godbole H V (2007)[7] observed 1: 2.50.

The study showed that married victims (280: 80.68%) were more common than unmarried (67; 19.32%) and found statistically significant. (X^2= 6.28, df= 1, p= 0.01). It was noted that married females (210: 60.51%) comprised more than half of the cases (Table 4). Similar findings were observed by Mangal et al (2007)[6], Buchade D et al. (2011)[9], Gupta R et al. (2012)[10], Vaghela P et al. (2012)[5], Gonnade and Farooqui (2013)[8], Lal S et al. (2012)[11], Harish D et al. (2013)[12], Singla K et al. (2014)[15] where married victims were more than unmarried and most of them were married females. It is observed during study that most of victims (237, 68.30%) were from rural area in either sex. Remaining victims (110, 31.70%) were from urban population (Table 5). The Chi's square test was applied and not found significant. (X^2= 3.39, df= 1, p= 0.06)Similar finding was observed by Zanjad and Godbole (2007)[7], Vaghela P et al (2012)[5], Lal S et al (2012)[11], Harish D et al (2013)[12] where more victims were from rural population i.e. 76.3%,70.30%, 71.84% and 66.1% respectively. It showed the distribution of burn victims as per the occupation. It was found that most victims were housewives comprising 151 cases (43.52%), followed by workers (34, 09.80%) and farmers (28, 08.07%) apart from dependents (Table 6). Similar findings were observed by Chawala R et al (2010)[16], Harish D et al (2013)[12] and Gadge et al (2014)[13] where more victims were housewives. It is observed that there was no significant seasonal variation observed though highest cases (133, 38.33%) were observed in summer and 124 cases (35.73%) in winter and 90 cases (25.94%) in rainy season (Table 7).Khan dare and Pawale (2014)[4], Gonnade and Farooqui (2013)[8] and Gadge et al. (2014)[13] also did not observed any trend. It showed that most of the incidences occurred during day time 67.15% (233 cases) (Table 8).Similar finding was observed by Memchoubi and Nabachandra (2007)[17], Manish and Jyothi (2015)[14] and Khandare and Pawale (2014).[4] It is observed that house was most common place of incidence comprising 288 i.e. 83% (Table 9). Similar finding was observed by Afify M M (2012)[18], Gupta R et al. (2012)[10], Vaghela P et al. (2012)[5], Lal S et al. (2012)[11], Harish D et al. (2013)[12], and Manish and Jyothi (2015).[14] It showed that kerosene was the most commonly used accelerant agent (pouring over body, fall of kerosene lamp, burst of kerosene stove etc.) responsible in 200 (57.63%) cases (Table 10). Similar finding was observed by Zanjad and Godbole (2007)[7], Lal S et al. (2012)[11], Harish D et al. (2013)[12], Gupta R et al (2012)[10], and Gadge et al. (2014).[13]

The study showed thatmost victims (124 cases i.e.35.73%) were with 81-100% TBSA involved and victims with TBSA involved >61% to 100%, were 228 (65.70%) comprising major group. It also showed that number of burn death cases is directly proportional to the percentage of TBSA involved (Table 11). Observations by Zanjad and Godbole (2007)[7], Chawala R et al (2010)[16], Buchade D et al (2011)[9], Gonnade U and Farooqui JM (2013)[8], Gupta R et al (20)[10], Mazumdar and Patowary (2013)[1], and Gadge et al. (2014)[13] shows that most burn deaths are having TBSA involved >61-100%, which are in consistence with present study.

The study showed that most burn deaths were due to septicemia (242; 69.74%) followed by burn shock (87; 25.07%). Death due to electrocution was seen in 18 cases (5.19%). Septicemia was a most common cause of death (Table 13). This observation is consistent with studies by Zanjad and Godbole (2007)[7], Gul A et al. (2011)[19], Chawala R et al. (2011)[20], Gupta R et al. (2012)[10], Lal S et al. (2012)[11], Harish D et al. (2013)[12], Gadge et al. (2014)[13], Khandare and Pawale (2014)[4], and Pawar et al. (2014).[21] It is observed in the study that most common alleged manner of death was accidental in 186 cases (53.6%); both in male (60 cases, 17.29%) and female (126 cases, 36.31%), though it was closely followed in females by suicidal with 112 cases (32.27%). It was clear that least common were homicidal and all cases (12, 3.46%) recorded were of female (Table 14). The study of Gadge et al. (2014)[13] found 67.5

Table 1: Burden of burn deaths

Sr.No.	Period	Total PMs	Burn-deaths	Deaths other than burn-deaths
1.	01 Oct 13 to 30 Sept 14	841	185	656
2.	01 Oct 14 to 30 Sept 15	867	162	705
Total (Percentage)		1708 (100%)	347(20.31%)	1361(79.69%)

Table 2: Age wise distribution of burn death cases (n=347, both sexes)

Sr. No	Age group	No. of cases	Percentage (%)
1	0-10 Yr	11	3.17
2	11-20 Yr	61	17.58
3	21-30 Yr	154	44.38
4	31-40 Yr	62	.1787
5	41-50 Yr	16	4.61
6	51-60 Yr	18	5.19
7	61-70 Yr	18	5.19
8	71-80 Yr	4	1.15
9	81-90 Yr	3	0.86
10	>	0	0.00
Total		347	100

Table 3: Sexwise distribution of Burn death Cases (n=347)

Sr. No.	Sex	No. of burn death cases	Percentage
1	Male	97	27.96
2	Female	250	72.04
		347	100%

Table 4: Sexwise distribution of marital status of burn death cases (n=347)

Sr No	Marital status	Male	Female	Total percentage
1	Married	27	40	67 (19.32%)
2	Unmarried	70	210	280 (80.68%)
Total (percentage)		97(27.96%)	250(72.04%)	347 (100%)

Table 5: Distribution of burn death cases as per place of residence (n=347, both sexes)

Sr No.	Place of residence of victim	Male	Female	Total
1	Rural	59	178	237 (68.30%)
2	Urban	38	72	110 (31.70%)
Total		97	250	347

Table 6: Distribution of burn victims as per the occupation (n=347,both sex)

Sr. No.	Occupation	Burn victims	Percentage
1	Housewife	151	43.52
2	Employee	20	05.76
3	Worker	34	09.80
4	Farmer	28	08.07
5	Shop keeper & Self Employed	11	03.17
6	Mechanic	05	01.44
7	Other(vendor/ truck driver/ driver)	09	02.59
8	Not available	01	00.28
9	Dependent (Children,old age, student, Unemployed, etc.)	88	25.37
		347	100

Table 7: Seasonal variations in no. of fatal burn cases (n=347 both sexes)

Sr. No	Period/ Season	Winter	Summer	Rainy season	Total
1	1 oct 13 to 30 sept 14	61	68	56	185
2	1 oct 14 to 30 sept 15	63	65	34	162
Total percentage		124 (35.73%)	133 (38.33%)	90 (25.94%)	347 (100%)

Table 8: Distribution of fatal burn cases as per time of occurrence of the incidence (n=347)

Sr. No.	Time of Incidence	No. of Cases	Percentage
1	00:00 To 05:59 Hrs	17	04.91
2	06:00 To 11:59 Hrs	158	45.53
3	12:00 To 17:59 Hrs	75	21.62
4	18:00 To 23:59 Hrs	96	
5	Unknown	01	
Total		347	

Table 9: Distribution of fatal burn cases according to place of the incidence (n=347)

Sr No	Place of Incidence	Male	Female	Total
1	House	51	237	288(83.00)
2	Farm	20	06	26(07.49)
3	Workplace	17	05	22(06.34)
4	Public place & Road	09	02	11(03.17)
Total		97	250	347(100)

Table 10: Distribution of fatal burn cases according to the accelerant agent / material used for burn (n=347)

Sr No.	Accelerant agent/ Material used for burn	No. of Cases	Percentage
1	Kerosene (Pouring on body, fall of lamp, stove burst, etc.)	200	57.63
2	Petrol/ Diesel	34	09.80
3	Boiling Water	38	10.95
4	Gas	22	06.34
5	Domestic/ Good Fire	30	08.64
6	Raw Coal	01	00.29
7	Firework explosion	01	00.29
8	Boiler Blast	03	00.86
9	Electric current	18	05.19
Total		347	100

Table 11: Distribution of burn death cases according to percentage of burn and survival period. (n=347, both sexes)

Sr. No	% of Burn	Survival period					Total	% (Percent)
		0-24 Hr	>1 to 3 d	> 3-7 d	>7-14 d	>14 d		
1	1-20%	15	00	01	00	00	16	04.61
2	21-40%	03	00	09	05	05	22	06.34
3	41-60%	04	04	29	17	27	81	23.34
4	61-80%	11	07	35	31	20	104	29.97
5	81-100%	52	10	36	20	06	124	35.74
Total		85	21	110	73	58	347	100
%		24.49	6.05	31.7	21.04	16.72	100	

Table 12: Distribution of fatal burn cases as per survival period and the age groups of victims (n=347, either sex)

Sr. No	Age group	Survival period					Total	% (Percent)
		0-24 Hr	>1 to 3 d	> 3-7 d	>7-14 d	>14 d		
1	1-20 yrs	15 (04.32%)	06 (01.72%)	22 (06.34%)	17 (04.9%)	12 (3.46%)	72	20.75
2	21-40 Yrs	45 (12.97%)	09 (2.59%)	72 (20,74%)	49 (14.12%)	41 (11,81%)	216	62.25
3	41-60 yrs	13 (3.74%)	05 (1.44%)	10 (2.88%)	03 (0.86%)	03 (0.86%)	34	23.34
4	>61 years	12 (3.46%)	01 (0.29%)	06 (1.72%)	04 (1.15%)	02 (0.58%)	25	07.20
Total							347	100%

Table 13: Distribution of burn death cases according to cause of death (n=347)

Sr. No.	Cause of Death	No. of Cases	Percentage (%)
1	Shock due to burns	87	25.07
2	Septicemia	247	69.74
3	Electrocution	18	05.19
Total		347	100 %

Table 14: Distribution of victims according to alleged manner of incidence leading to death v/s sex. (n=347)

Sr. No.	Alleged Manner of Death	Male	Female	No. of Cases	Percentage (%)
1	Accidental	60	126	186	53.60 %
2	Suicidal	37	112	149	42.94%
3	Homicidal	00	012	012	03.46%
Total		97	250	347	100 %

% of accidental cases. However in the study of Khandare and Pawale (2014)[4] found 67.5 % accidental cases. In the present study, we observed accidental manner of death in 53.6% cases, which is nearly similar findings with other studies,

6. Conclusion

Burns deaths account for more than fifth of total deaths. Female prepondence observed more than male. Most common age group vulnerable is 21 to 31 years. Married people were more than unmarried. Most of the victims were from rural area irrespective of the gender. Most common place of incidence was house. Incidents during day time were more than during night time. Kerosene was the most commonly used accelerant. Most of the deaths were due to septicemia followed by shock. Accidental death were more common than suicides and homicide.

7. Recommendations

Deaths following due to burns are responsible for loss of life, disability and undefined impact on socioeconomic resources. Fundamental dictum being "prevention is better than cure", most of the burn incidences are preventable and should be prevented or at least reduced by drastic and combined efforts of all concerned. Prevention depends on many factors; the economic development of society, the level of education, the presence of protective legislation, both at home and in the workplace. The government needs to concentrate in this direction and the NGOs, Social groups, and workers need to put in more sincere efforts.

8. Source of Funding

None.

9. Conflict of Interest

None

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