Epidemiology of Burn Deaths in Aurangabad Region, India

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ABSTRACT

Background: Amongst all discoveries by men, barely few like cultivation of soil, speech and writing, have borne such significant developments as has finding out how to make fire. From the discovery of fire and its tremendous force, manufacturing, transportation and practically all phases of modern industrial life emerged out. Burns are injuries often produced by contact with dry heat, such as flame, radiation, or some solid heated material like metal or glass to the body.

Methods: This study was conducted prospectively on 325 cases of death due to burns in the period from January 2010 to December 2010.

Results: Hindu married females belonging to rural background were most common victims of burns. Maximum cases were observed in the evening with involvement of cooking apparatus most of the time.

Conclusion: The present study has findings more or less consistent with the findings of the other Indian studies. Rising incidences of burns can be prevented by awareness and education about the hazards of fire and safety measures also upgrade of social and educational standards of population.

►*Implication for health policy/practice/research/medical education:* Epidemiology of Burn Deaths

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1. Introduction:

Fire, water, air and the earth are considered basic elements of the universe since ancient era. Fire could be comforting as a source of light or heat, but could be equally menacing and deadly to humans (1). Burns are the fourth most common type of trauma worldwide, following a road traffic mishaps, falls, and violence among people. A majority of incidences of burns occur in countries or regions which lack the basic infrastructure and setup to reduce the incidence and severity of burns (2).

In India, burn injury is one of the major causes of death, specifically in females. The problem of burns in developing countries like India is more as a result of different and varied socio-cultural factors present in the

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country. Some of these factors may be poor housing conditions, inadequate maintenance of electric appliances, ethnicity of wearing Sarees or Dupatta, dowry, poor literacy, poverty and ignorance. The exact assessment of the incidence of burns is not easy due to overpopulation and less reporting. The loads of ever expanding population, poor literacy, lower socioeconomic status, insufficient safety standards at home and in industry, corruption etc. have caused a significant increase in cases of burns (3).

This study attempts to assess various epidemiological factors related burn deaths in Aurangabad region.

2. Materials and Methods:

This study was conducted prospectively on 325 cases of death due to burns in the period from January 2010 to December 2010 at the Department of Forensic Medicine, Government Medical College, Aurangabad.

Out of 2363 autopsies conducted at autopsy center, 325 (13.75%) autopsy cases were of death due to burns. All deaths resulting from burn injuries due to radiation injury, electrocution and chemical burns are excluded.

A standardized checklist was prepared for this purpose and filled in each case after thorough interviewing of police officials and the near ones of the deceased and detailed inspection of treatment records etc. to collect information regarding various contributing factors.

3. Results:

Figures number 1 and 2 shows the distribution of deaths due to burns, according to the age and sex. In this study, 28.61% of cases were male i.e. 93 cases and 71.39% were female i.e. 232 cases. Highest number of cases were belonging to age group of 21-30 years, i.e. 146 cases (44.92%), followed by those belonging to 31-40 years, i.e. 73 cases (22.46%), and to 11-20 years in 54 cases (16.62%), whereas incidences were less in extremes of ages .

According to table 1, maximum 198 cases (60.92%) are from a rural region, while 127 cases (39.08%) from urban region.

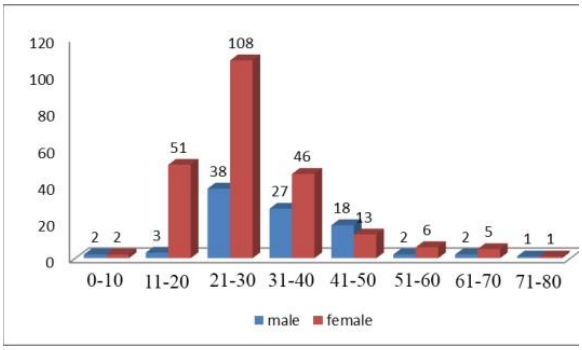

Fig. 1. Agewise distribution.

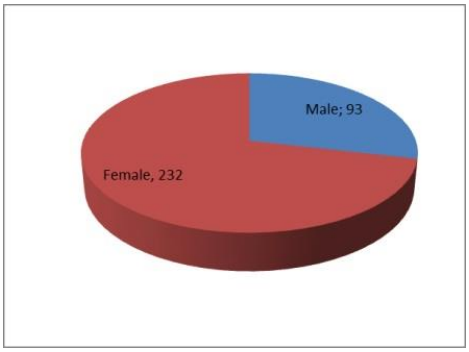

Fig. 2. Sexwise distribution.

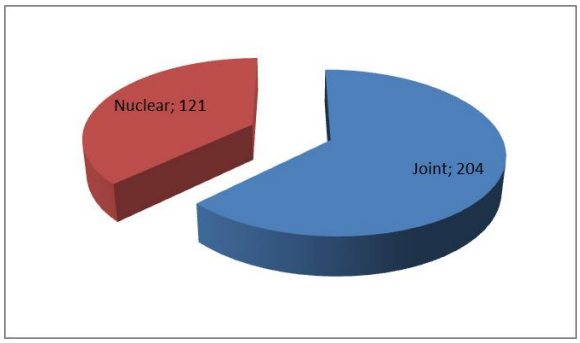

Fig. 3. Distribution of study cases according to type of family.

Table 1: Regionwise Distribution.

Region	Male	Female	Total	%
Urban	46	81	127	39.08
Rural	47	151	198	60.92
Total	93	232	325	100

Table 2 shows that maximum number of cases were from Hindu religion 203 cases (62.46%), followed by Buddhists 87 cases (26.77%). 34 cases (10.46%) were from Muslim and 1 case (0.31%) was from the Christian religion.

Table 3 shows that 50 (15.39%) study cases were illiterates, and 274 (84.30%) were literates comprising matriculate (Secondary) and less than matric 239 cases (73.53%) and

Table 2: Religion wise distribution.

Religion	Hindu	Buddhist	Muslim	Christian	Total
Cases	203	87	34	1	325
%	62.46	26.77	10.46	0.31	100

Table 3: Distribution of study cases according literacy.

Literacy	Cases	%
Illiterate	50	15.39
Primary	89	27.38
Middle	100	30.76
Secondary	50	15.39
High Secondary	26	8
Graduate	9	2.77
N. A.	1	0.31
Total	325	100

Table 4: Distribution of study cases according occupation of victim.

Occupations	Cases	%
Housewife	183	56.3
Agriculture/ Labourer	50	15.39
Student	18	5.54
Dependent	14	4.3
Business	8	2.46
Employed	39	12
Unemployed	12	3.7
Other	1	0.31
Total	325	100

above matriculate 35 (10.77%). One case is not applicable as per literacy status.

According to Table 4, occupation of victims: house wives comprised 183 cases (56.3%), followed by Agriculture/Labourer 50 cases (15.39%), 39 cases (12%) employed, 18 cases (5.54%) students, 14 cases (4.3%) dependent, 12 cases (3.7%) non-employed, 8 cases (2.46%) business. Other or not applicable was 1 case (0.31%).

Distribution of burn cases, according to marital status showed that the incidences were higher in married people 232 cases (71.39%) as compared to unmarried people 93 cases (28.61%) as mentioned in table 5. Out of married couples 63.08% victims were female while the rest 24.61% were male. 1 is widowed.

According to figure 3, maximum number of cases were seen in joint families 204 cases (62.77%), followed by nuclear family 121 cases (37.23%).

According to Table 6 showing socioeconomic status, maximum number of the cases belong to class IV, i.e. 197 cases (60.61%), followed by 101 cases (31.08%) in class V and 25 cases (7.69%) of the cases belong to class III. 1 case each (0.31%) was from class II and class I.

According to Table 7, maximum number of cases belongs to the involvement of cooking apparatus 162 (49.84%), followed by 89 cases (27.38%) from matchstick with accelerant, 35 cases (10.77%) from the fall of lamp group, followed by 19 cases (5.85%), 20 cases (6.16%) from any other and unknown source group.

Study shows maximum number of cases, i.e. 129 occurs in evening and late evening hours between 5:01 PM-11:00 PM, while minimum cases i.e. 30 occur in night hours between 11:01 PM-5:00 AM. The time for peak incidence of burns among the females was in evening hours that is during 5.01 PM to 11.00 PM (88 cases), whereas the burn incidence in females was comparatively less in the late evenings and night that is during 11.01 PM to 5.00 AM (17 cases), which was found to be same in case of male burns (41 cases) in evening and (13 cases) in night.

4. Discussion:

Age and sex distribution

It showed that the cases belonging to 21-30 years age group were maximum 146 (44.92%), followed by those in 31-40 years age group 73 (22.46%), and then in 11-20 years age group 54 (16.62%), whereas incidences were less in extremes of ages. Hence, most of the cases, i.e. (84%) are in

Table 5: Distribution of study cases according marital status of the victim.

Marital status	Male (%)	Female (%)	Total (%)
Married	80 (24.61)	205 (63.08)	285 (87.69)
Unmarried	13 (4.00)	26 (8.00)	39 (12.00)
Widow/Widower	0 (0.0)	1 (00.31)	1 (00.31)
Total	93 (28.61)	232 (71.39)	325 (100)

Table 6: Distribution of study cases according Socio-economic status.

S. E.	Male	Female	Total	%
I	0	1	1	0.31
II	0	1	1	0.31
III	12	13	25	7.69
IV	60	137	197	60.61
V	21	80	101	31.08
Total	93	232	325	100

Table 7: Distribution of study cases according Source of fire.

Source of fire	Male (%)	Female (%)	Total (%)
Matchstick with accelerant	41 (12.61)	48 (14.77)	89 (27.38)
Cooking apparatus	23 (7.07)	139 (42.77)	162 (49.84)
Fall of lamp	12 (3.70)	23 (7.07)	35 (10.77)
Any other	9 (2.77)	10 (3.08)	19 (5.85)
Unknown	8 (2.46)	12 (3.70)	20 (6.16)
Total	93 (28.61)	232 (71.39)	325 (100)

11-40 years age group with a peak in between 21-30 years having female predominance.

This is similar to the observations of Ambade VN *et al* (4), Mangal HM *et al* (5), Zanjad NP *et al* (6), Memchoubi Ph. and H. Nabachandra (7), Ghaffar UB *et al* (8), Dasari H *et al* (9), Ahmed I *et al* (10), Khajuria B *et al* (11), Chawla R *et al* (12). It shows that adolescent and young people are main working hands and are exposed to hazards of fire. Female preponderance is due to the fact that female in India is more likely to expose to fire and hence more susceptible to burns. Also peak incidence in females in the age group of 21 to 30 is attributed to the heinous crime of dowry deaths in India.

Table 8: Time of incidence.

Time	Male	Female	Total
5:01am-11:00am	15	75	90
11:01am-5:00pm	24	52	76
5:01pm-11:00pm	41	88	129
11:01pm-5:00am	13	17	30
Total	93	232	325

Hilal A *et al* (13) showed that the majority of the victims (175 cases, 35.9%) were in the

0–5 age group, followed by 21–30 age groups with 83 cases. Patetta MJ *et al* (14) showed that majority of victims in extremes of ages. Bang RL *et al* (15) showed that the high mortality amongst two age groups 0-5 years (39 deaths, 16.7%) and 16-35 years (109 deaths, 46.6%). Because of the difference in geographical areas and lifestyles of people, the findings are not consistent with the present study.

In the present study, we found that amongst 325 study cases, 93 cases (28.61%) were male and 232 (71.39%) were female with the ratio of the male to female being 1:2.5. Such similar findings with ratio of female predominance were found in studies like Ahmed I *et al* (9), Khajuria B *et al* (11), Mangal HM *et al* (5), BR Sharma *et al* (16), Zanjad NP *et al* (6), Ambade VN *et al* (4), Chawla R *et al* (12). This may be due to large number of housewives and their social and family problems like cook, children, job, working crowded rooms, and dowry related problems.

There are some studies where the ratio of male predominance was found which are not consistent with our study. It was found in studies of Memchoubi Ph. and H. Nabachandra (7), Niekerk AV *et al* (17), Olaitan PB, Jiburum BC (18), Hilal A *et al* (13), Hariadiapuranto (19). This may be due to different lifestyles and cultural differences as these studies are conducted abroad.

Region wise distribution

In the present study, maximum 198 cases (60.92%) are from a rural region, while 127 cases (39.08%) from urban region. This is consistent with Batra AK (20), Zanjad NP *et al* (6) and Dasari H *et al* (9). Chawla R *et al* (12) showed 28% cases were from rural while 72% cases from urban and Singh D *et al* (21) showed 68% cases from urban. Above findings are not consistent with the present study. The reason for the increased incidence of burn cases among rural population in the present study may be our Medical College and Hospital acts as a referral center for nearby vast rural population attached to it and therefore medico–legal post-mortems conducted on burn cases, which are referred to this institute are higher.

Religion wise distribution

This study shows that maximum number of cases were from Hindu religion 203 cases (62.46%), followed by Buddhists 87 cases (26.77 %). 34 cases (10.46%) were from Muslim and 1 case (0.31%) was from the Christian religion. This finding is consistent with Gupta RK and Srivastava AK (22), Pandey A (23), and Mohanty MK *et al* (24).

Literacy wise distribution

The present study shows that 50 (15.39%) study cases were illiterates, and 274 (84.30%) were literates comprising matriculate (Secondary) and less than matric 239 cases (73.53%) and above matriculate 35 (10.77%). One case is not applicable as per literacy status. Up to secondary including illiterates are maximum cases 289 (88.92%).

This finding is consistent with M. K. Doibale (25) 90.36% cases up to secondary, Jayaraman V *et al* (26) – 87.21% cases and 96.4% cases up to secondary for Attia AF *et al* (27). Education attributes to more awareness, responsible behaviour, more knowledge and practice of safety measures. Hence incidence of burns among illiterates was found to be maximum than educated.

Occupation wise distribution

The present study shows that house wives comprised 183 cases (56.3%), followed by Agriculture/Labourer 50 cases (15.39%), 39 cases (12%) employed, 18 cases (5.54%) students, 14 cases (4.3%) dependent, 12 cases (3.7%) non-employed, 8 cases (2.46%) business. Other or not applicable was 1 case (0.31%). It shows that total 69.84% cases are unemployed while 29.85% cases are employed. This finding is consistent with Chawla R. *et al* (12) and Haralkar SJ *et al* (3) as housewives are more commonly exposed to unguarded fire, stoves, chulha, cooking gas and dowry related other marital problems. It was not consistent with M. K. Doibale (25) which showed housewives and children were commonly affected and also not consistent with Attia AF *et al* (27) which showed housewives were not commonly affected. Varied life style and culture might be the reasons for it.

Marital status distribution

The distribution of cases of burn according to marital status shows that the incidences in married people are higher, i.e. in 232 cases (71.39%) as compared to unmarried people in 93 cases (28.61%). Out of married people, 63.08% victims were female while the rest 24.61% were male. 1 was widowed. This finding is consistent with Gupta RK and Srivastava AK (22), Batra AK (20), Ambade VN *et al* (4), Mangal HM *et al* (5), Zanjad NP *et al* (6) and Dasari H *et al* (9). It is due to social and family related problems observed more in married persons especially in females. Also married females are victims of the heinous crime of dowry deaths practiced in India.

Family type distribution. The present study shows that maximum numbers of cases were seen belonging to the joint families i.e. 204 cases (62.77%), followed by nuclear family in 121 cases (37.23%).

This is consistent with Gupta M *et al* (28) and Pandey A (23). Most of the cases found in married females who were subjected to more work in crowded joint families leading to accidents, torture by in laws and other family conflicts and dowry related problems leading to suicide and homicidal burns.

Socio-economic distribution. It showed that maximum number of cases belongs to class IV, 197 cases (60.61%), followed by 101 cases (31.08%) in class V and 25 cases (7.69%) of the cases belong to class III. 1 case each (0.31%) was from class II and class I. So, maximum cases are in the lower middle and lower class population. This is consistent with Gupta M *et al* (28), Jayaraman V *et al* (29), Subrahmanyam M (30), BR Sharma *et al* (16), Memchoubi Ph. and H. Nabachandra (7) and Haralkar SJ *et al* (3). Unemployment, partial or total dependence of husband on parents, poor education and low socioeconomic status lead to poor standards of living. Poor measures for daily chores contribute to the significant number of hazards.

Source of fire. The present study showed that maximum number of cases involves cooking apparatus, i.e. 162 (49.84%), followed by 89 cases (27.38%) from matchstick with accelerant, 35 cases (10.77%) from the fall of lamp group, followed by 19 cases (5.85%), 20 cases (6.16%) from any other and unknown source group. Cooking apparatus in India includes usually chulha, coal fire, stoves, and gas. Another group includes catching fire while saving the other, bursting of can filled with accelerant etc. Cases, where history was uncertain or unknown, included in unknown group. This finding is consistent with Gupta RK and Srivastava AK (22), Gupta M *et al* (28), Pandey A (23) and Ambade VN *et al* (4). It is not consistent with Patetta MJ *et al* (14) which showed in maximum cases (33%) involving heating instrument followed by while smoking (26%) and then by while cooking (9%). It may be due to different geographical areas and safety measures while cooking.

Time of incidence. In the present study, maximum number of cases, i.e. 129 occurred in evening and late evening hours between 5:01 PM - 11:00 PM, while minimum cases, i.e. 30 occurred in night hours between 11:01 PM - 5:00 AM. The time for peak incidence of burns among the females was during evening hours that is during 5.01PM to 11.00PM (88 cases), whereas the burn incidence in females was comparatively less in the late evenings and night that is during 11.01 PM to 5.00 AM (17 cases), which was found to be same in case of male burns (41 cases) in evening and (13 cases) in night. This finding is consistent with Gupta M *et al* (28), Singh D *et al* (31), Pandey A (23), BR Sharma *et al* (16) and Dasari H *et al* (9). It may be due to kitchen related work mostly done in morning and evening hours

5. Conclusion:

The present study has findings more or less consistent with the findings of the other Indian studies. It revealed higher incidences of burns among housewives with a peak in the 3rd decade of life, mostly belonging to lower socioeconomic status and with less literacy. Such incidences can be prevented by awareness and education about the hazards of fire and safety measures to be taken particularly through school education and other means. Measures should be aimed at up gradation of social and educational

standards of population belonging lower socioeconomic strata which will help improving their mentality for discouraging heinous dowry practices.

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