

## Epidemiological Study of Thermal Burn Deaths at a Tertiary Care Centre in Mumbai, India

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### ABSTRACT

**Background:** Fire is a well-known double edged sword for human beings as it has served as well as destroyed mankind. Death due to thermal burns is burning topic all over the globe.

**Methods:** Total 109 cases of death due to fatal thermal burns which were brought for the autopsy examination at Seth G. S. Medical College and KEM Hospital, Mumbai, India, during the period of January 2014 to July 2015, were considered for present study.

**Results:** Out of 1771 medico-legal post-mortem examinations done during study period 109 (6.14%) were deaths due to thermal burns. Females accounted for 92 (84.4%) cases while 17 (15.6%) were males. Maximum number of cases 49 (44.95%) were seen in 21- 30 years age group. Maximum victims 87 (79.82%) were Hindus. Urban deaths accounted 81 (74.31%) whereas 27 (24.77%) were from rural area. Kitchen was the most common place of occurrence accounting for 65 (59.63%) cases. Maximum incidences occurred in winter contributing 39 (35.78%) deaths. Maximum vulnerability was observed in early evening hours accounting for 19 (17.43%) incidences. Maximum 41 (37.61%) victims survived up to a period of 3 to 7 days. Considering the level of education, maximum victims 50 (45.87%) were educated up to primary school level. Housewives 73 (66.92%) were the most vulnerable victims. Socio-economic status shows maximum cases are from upper lower and lower middle class population.

**Conclusion:** Considering the religion-wise population distribution in India, location of the study centre and exposure of Indian females to fire during cooking, all these results can be justified.

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

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### 1. Introduction:

Fire is mischievously called as a necessary evil (1). It is also called as a man's first double edged sword evidenced throughout the history. It has served as well as destroyed mankind. Burn injuries have long been described as among the most serious injuries that may affect human body (2). Burns are one of the major conditions causing serious morbidity and mortality throughout the globe. As per Government of India database published by Ministry of Health and Family Welfare (3), approximately 70 lakh people sustain moderate to severe burns in India every year. More than 7 lakh burn injuries require admissions every year. About 80% of admitted cases are due to accidents at home kitchen related mishaps. Out of which 1.4 lakh people are succumbed to death. Present study was designed to study the epidemiology of fatal thermal burn cases at a tertiary care centre located at Mumbai, India. In this study we aimed to survey the epidemiology of fatal thermal burn cases and suggest preventive measures accordingly.

### 2. Materials and Methods:

The present study was carried out at Seth G. S. Medical College and KEM Hospital, Mumbai, India during the period of January 2014 to July 2015. Ethical permission was obtained from Institutional Ethics Committee of Seth G. S. Medical College and KEM Hospital, Mumbai, prior to the onset of the study. The data obtained was identified by using case serial numbers and no personal identity was revealed. Only investigators and authorised representatives of the Institutional Ethics Committee had access to the personal records of the subjects. Out of 1771 medico-legal post-mortem examinations done at this autopsy centre during the study period, 109 (6.14%) were deaths due to thermal burns. A specially designed proforma was filled to

study epidemiology of the cases considering age, sex, religion, place of occurrence, season, survival period, level of education of victim etc. Only cases of thermal death were included and deaths due to moist heat, electrocution, radiation, chemical burns and lightning were excluded.

### 3. Results:

Out of total 109 cases, 92 (84.4%) were females and 17 (15.6%) were males. Maximum number of cases 49 (44.95%) were seen in age category of 21- 30 years. Out of these 49 cases, 46 were females. It was followed by 27 (24.77%) cases from age category of 31-40 years. Out of these 27 cases, 19 were females (Table no. 1).

Religion-wise distribution shows maximum no. of cases 87 (79.82%) were Hindus, followed by Muslims 17 (15.6%), Christians 3 (2.75%), and 1 (0.92) was Buddhist. One victim was unknown. Maximum number of cases 81 (74.31%) were from urban region followed by 27 (24.77%) cases from rural area. Place of residence of one case was unknown. Maximum incidences of burn injuries occurred in kitchen contributing 65 (59.63%) cases, out of which 60 were females. It was followed by incidences that occurred in living room contributing 34 (31.2%) cases. There were 10 (9.17%) cases which occurred outside the place of residence. No incidence at workplace was recorded.

In India, there are three seasons viz. summer (February to May), monsoon (June to September) and winter (October to January). Maximum number of incidences 52 (47.71%) occurred in summer followed by winter contributing 39 (35.78%) incidences. Least number of cases were reported in monsoon contributing 18 (16.51%).

Time period of a day was divided in three hourly sessions (Table no. 2) to compare the vulnerability of victims in different hours of the day it was observed that maximum incidences of burn injury occurred in early evening hours contributing 19 (17.43% cases) followed by early afternoon hours contributing 18 (16.51%) cases. Only 7 (6.42%) cases occurred in early night hours.

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**Table 1:** Age and sex-wise distribution

Age category	Male	Female	Total	Percentage
0-10	2	2	4	3.67
11-20	0	11	11	10.09
21-30	3	46	49	44.95
31-40	8	19	27	24.77
41-50	2	5	7	6.42
51-60	0	5	5	4.59
61-70	2	1	3	2.75
71-80	0	1	1	0.92
81-90	0	1	1	0.92
91-100	0	1	1	0.92
<b>Total</b>	17	92	<b>109</b>	<b>100</b>

Considering the survival period after infliction of burn injury, it was observed that maximum victims survived up to 3 to 7 days, contributing 41 (37.61%) cases. There were 6 (5.5%) cases brought dead to the hospital. There were 18 (16.51%) victims who died within 24 hours of incidence. There were 65 (59.63%) victims who survived for more than 3 days of incidence and 4 (3.67%) victims survived for more than a month after incidence.

Educational status of victims' shows that maximum number of victims were educated upto primary school level contributing 50 (45.87%) cases followed by 25 (22.94%) victims who were illiterates. Only 1 (0.92%) victim was educated upto graduation and educational status of 1 (0.92%) victim was unknown. (Figure no.1) It was observed that the maximum number of victims were housewives contributing 73 (66.92%) cases. It was followed by unemployed persons contributing 7 (6.42%) and persons in service contributing 7 (6.42%) cases. (Figure no. 2)

Kuppuswamy's classification was used to compare socio-economic status of victims. It

shows that maximum no. of cases 69 (63.3%) were belonging to class IV, followed by 28 (25.69%) cases of class III and 10 (9.17%) cases belonging to class II. Only 1 (0.92%) case was belonging to class V and not a single case was reported from socio-economic class I. So, maximum cases were from upper lower and lower middle class population.

#### 4. Discussion:

Death due to fatal burn injury is always a burning issue considering its social and economic impacts over the society. In present study young age women in age category of 21 years to 30 years were commonly involved. This finding is consistent with previous studies conducted by Sharma *et al* (1), Ambade V N *et al* (4), Batra AK (5) and Zanjad NP *et al* (6). It shows proneness of young population to hazards of fire. This is the most active group of people where the females are more concerned with kitchen and hence more chances of sustaining accidental burns. Also newly married females belonging to this age group are more likely to become victims of

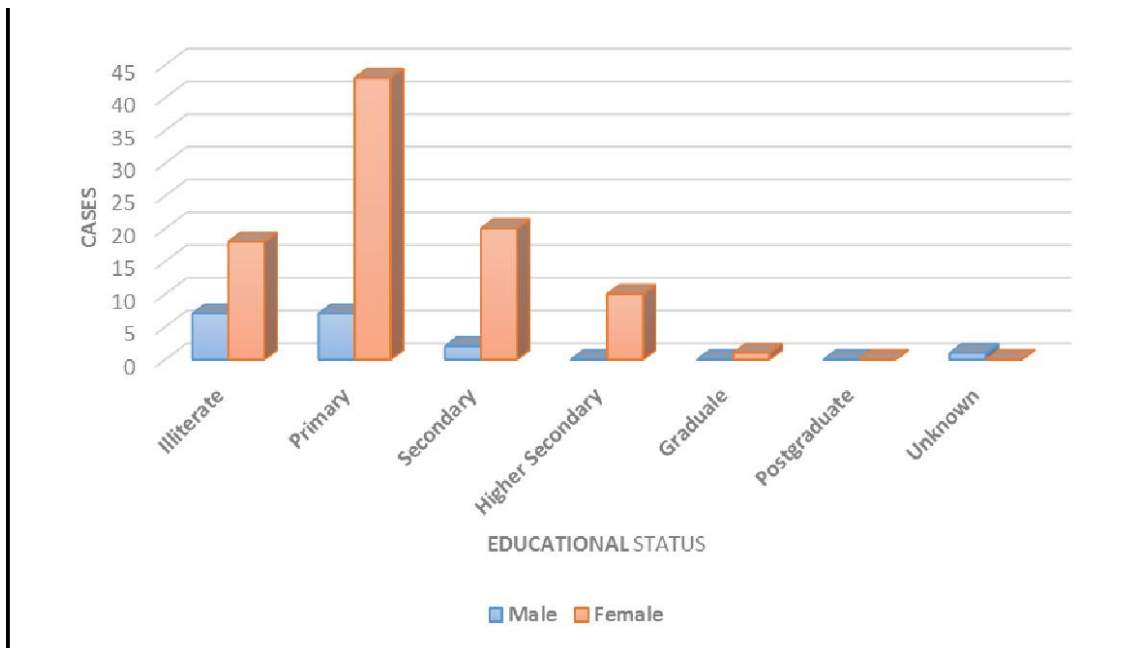
**Table 2:** Distribution of cases according to occurrence in a period of a day

Time period	Male	Female	Total	Percentage
<b>Early Morning</b> (06 TO 08:59 Hours)	2	8	10	9.17
<b>Late Morning</b> (09 TO 11:59 Hours)	3	12	15	13.76
<b>Early Afternoon</b> (12 to 14:59 Hours)	1	17	18	16.51
<b>Late Afternoon</b> (15 to 17:59 Hours)	2	10	12	11.01
<b>Early Evening</b> (18:00 to 20:59 Hours)	2	17	19	17.43
<b>Late Evening</b> (21to 23:59 hours)	3	13	16	14.68
<b>Early Night</b> (00:00 to 02:59 hours)	1	6	7	6.42
<b>Late Night</b> (03 to 05:59 hours)	3	9	12	11.01
<b>Total</b>	17	92	<b>109</b>	<b>100</b>

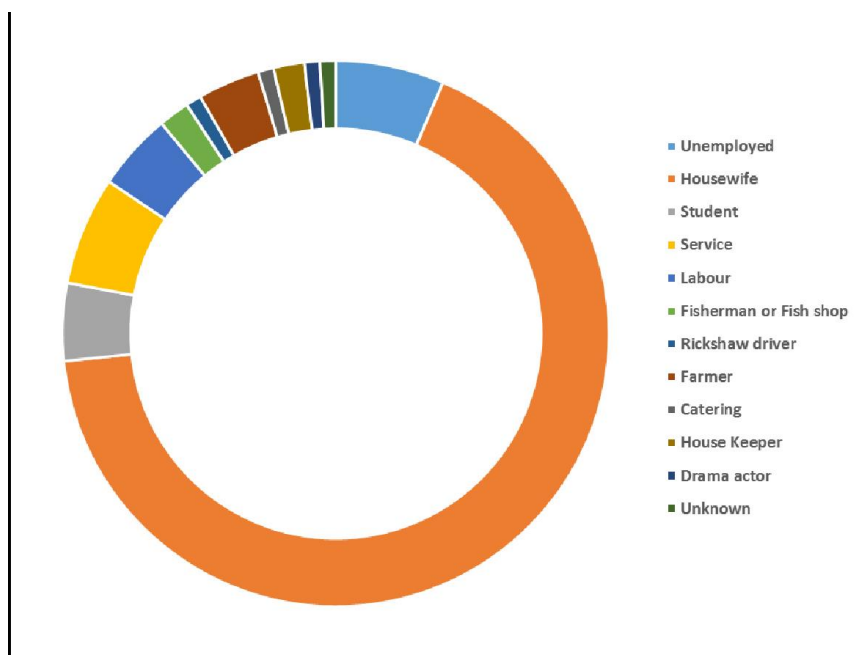
dowry death. Females outnumbered males in all age groups except in 0-10 and 61-70 age group. This is consistent with study done by Jayant Deshpande *et al* (7). This may be due to the fact that among children and elderly population, both sexes are equally and occasionally exposed to fire.

Religion-wise study shows majority of Hindus. This finding is consistent with Mohanty MK *et al* (8) and study done by Gupta RK and Srivastava AK (9). This is because of majority of Hindus in the general population which is reflected in study population by default. Though the demand of dowry is not specific to a particular religion, it is widespread in Hindus as compared to other religions. This may be

considered as an additional contributing factor for the same. Majority of urban population in present study is consistent with study done by Chawla R *et al* (10). It showed 28% cases were from rural while 72% cases from urban area. Singh D *et al* (11) showed 68% cases from urban area. This is not consistent with studies done by Batra AK (5), Zanjad NP *et al* (6) and Dasari H *et al* (12) where maximum cases were from rural region. This might be due to different geographical locations of the hospitals and accessibility to the people. Majority of incidences occurred in kitchen. This is because the housewives working in kitchen are more prone to hazards of fire. It was followed by incidences occurred in



**Figure 1.** It shows distribution according to educational status.



**Figure 2.** It shows distribution according to occupation of victims.

living room. Most of the suicidal victims prefer closed spaces like living room. This finding is consistent with studies done by Subrahmanyam M (13), Attia AF *et al* (14), Ambade VN *et al* (4), Mohanty MK *et al* (8) and Haralkar SJ *et al* (15).

In present study, it was observed that maximum number of deaths 52 (47.71%) occurred in summer, followed by 39 (35.78%) in winter and least number 18 (16.51%) in rainy season. Similar findings

were observed by Kumar P *et al* (16). However, Haralkar SJ *et al* (15) observed that maximum incidences occurred in winter season followed by summer followed by rainy season. This might be due to the fact that the study includes maximum rural population where dried up leaves and woods are used for cooking & for warmth during winter and rainy season. This increases chances of exposure to fire and consequently fire related hazards. This is because of the

difference in residence of study population. Present study includes maximum urban population, where the methods like dried leaves are less likely to be used as a means of warmth in winter.

There is no universal division of periods of a day. Hence for sake of convenience, a day was divided in three hourly periods. Maximum no of cases 19 (17.43%) were reported in early evening hours during 18:00 hours to 20:59 hours. This is usual time of cooking by housewives in India. This increases chances of exposure to hazards of fire. Minimum number of cases 7 (6.42%) were reported early night hours during 00:00 hours to 02:59 hours. This finding is consistent with studies conducted by Sharma BR *et al* (1), Singh D *et al* (11), Dasari H *et al* (12) and Gupta M *et al* (17). This is sleeping time for most of the peoples. The cases occurred during this period were due to fall of lamp over bed or body while the victims were asleep. This is not consistent with study done by Akhter JM *et al* (18), who observed maximum number of incidences 48.59% in early part of the day followed by 29.13% during evening. This might be due to the fact that Akhter JM *et al* (18) conducted study in rural part of India which involves majority of agrarian population. They are usually exposed to fire in early morning for cooking, warmth and heating water.

Considering the period of survival, it was observed that maximum number of victims survived for a period varying from three days to one month after the incidence. It is consistent with studies conducted by Sharma BR *et al* (1), Zanjad NP *et al* (6), Chawla R *et al* (10) and Dasari H *et al* (12). The delayed deaths in case of burns are mostly due to septicemia. Surface burns lead to loss of natural barrier for infection. It is difficult to control infection in burn patients despite of the critical care in a tertiary care hospital. On the contrary, prolonged hospitalisation increases chances of nosocomial infections. Comparing with the previous studies, the level of primary education was found more in present study. As the maximum number of cases were belonging to urban region, there is easy access to educational facilities.

This might be also as an effect of Right to Education Act and 'Sarv Shiksha Abhiyan' (Education for all scheme) of Government of India. Still level of education is lower than expected. Education is directly proportional to awareness. More education, more awareness and more safety measures will be actively taken. The incidences of burns are commonly found in illiterates and less educated people.

Maximum number of victims was housewives. This finding is consistent with studies conducted by Chawla R. *et al* (10), Haralkar SJ *et al* (15), Shankar Gowri *et al* (19) and Rajani *et al* (20). This might be due to fact that housewives are more commonly exposed to unguarded fire, stoves, chulhas, cooking gas, dowry related and other marital problems. This is not consistent with study conducted by Attia AF *et al* (14), which showed housewives were not commonly affected. This is due to cultural and lifestyle differences.

## 5. Conclusion:

Living and cooking in crowded houses, low level of education, poor standards of living and lack of safety measures due to low socio-economic status, contributes for maximum cases from upper lower and lower middle class population. Use of kerosene stoves for cooking by poor people makes them prone to hazards of unguarded fire.

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