

## Original Research Article

## A Study of Female Deaths Due to Thermal Burns at a Tertiary Care Centre in Mumbai, India

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**Abstract:** Burns are one of the major conditions causing serious morbidity and mortality throughout the globe. The burning topic in India is burn deaths of young newly married females for demand of dowry. A prospective observational study was conducted during a period of January 2014 to July 2015, considering medico-legal autopsies of 92 females who died due to fatal thermal injury. All these cases were analysed considering multiple parameters like their age groups, religion, area of incidence, place of incidence, period of day, educational status, socioeconomic status, marital status, method of burn injury, manner of death, cause of death, survival period and extent of burn injury. All the data was analysed by using Microsoft excel and tabulated for better understanding. Various conclusions were obtained and justified.

**Keywords:** Forensic sciences, Forensic Medicine, Burns, Female deaths, Dowry deaths.

**INTRODUCTION**

The burning topic in India is burn deaths of young newly married females for demand of dowry. The burning topic in India is burn deaths of young newly married females for demand of dowry [1]. Burning usually occurs due to contact with flame either accidentally or purposefully. Burn deaths have a great medico-legal importance. Often the manner of death is kept as a mystery [2]. Literature shows that most of the accidental burns are among females cooking in a kitchen as they are exposed to fire regularly [3-5]. Sometimes suicidal or homicidal burns are also presented as accidental by in-laws in India [2].

**MATERIALS AND METHODS**

A prospective observational study was conducted considering medico-legal autopsies of 92 females during a period of January 2014 to July 2015, who died due to fatal thermal injury. Ethical permission was obtained from Institutional Ethics Committee prior to the onset of the study. A specially prepared proforma was filled by using the data obtained from the documents supplied for autopsy by investigating officers. All cases were analysed considering their age groups, religion, area of incidence, place of incidence,

period of day, educational status, socio-economic status, marital status, method of burn injury, manner of death, cause of death, survival period and extent of burn injury. All the data was analysed by using Microsoft excel and tabulated for better understanding.

**OBSERVATIONS AND RESULTS**

Age-wise distribution of the cases shows maximum victims i.e. i.e. 46 (50 %) out of 92 females were from 21 to 30 years age group followed by 19 (20.65 %) cases from 31 to 40 years age group. There were 11 (11.96 %) cases from 11 to 20 years age group and 5 (5.43 %) from 41 to 50 and 51 to 60 age group each. Only 4 (4.35 %) cases were reported from 61 years to 100 years age group.

Religion-wise distribution of the cases shows maximum females belonging to Hindu religion accounting for 74 (80.43 %) cases, followed by 14 (15.22 %) cases of Muslim females. Along with these, 3 (3.26 %) were Christians and 1 (1.09 %) was Buddhist.

Maximum i.e. 67 (72.83 %) incidences occurred in urban area and 25 (27.17 %) incidences occurred in rural area. Kitchen was the most common

place of occurrence contributing 60 (65.22 %) cases, followed by living room contributing 34 (36.96 %) cases. Six incidences occurred outside the place of living while not a single incidence was reported at workplace in working women.

There is no universal distribution of various periods of a day. A day was divided into three hourly periods for convenience and comparison with previous studies (Table no. 1). Early afternoon and early evening hours combined together accounted for 34 (36.96 %) of incidences. Least number of incidences i.e. 6 (6.52 %) were reported in early night hours.

**Table 1: Distribution of cases as per time of incidence**

Time period	Female	Percentage
<b>Early Morning (06 TO 08:59 Hours)</b>	8	8.7
<b>Late Morning (09 TO 11:59 Hours)</b>	12	13.04
<b>Early Afternoon (12 to 14:59 Hours)</b>	17	18.48
<b>Late Afternoon (15 to 17:59 Hours)</b>	10	10.87
<b>Early Evening (18:00 to 20:59 Hours)</b>	17	18.48
<b>Late Evening (21to 23:59 hours)</b>	13	14.13
<b>Early Night (00:00 to 02:59 hours)</b>	6	6.52
<b>Late Night (03 to 05:59 hours)</b>	9	9.78
<b>Total</b>	92	<b>100</b>

Educational level of maximum victims i.e. 43 (46.74 %) was up to primary school level. Secondary and higher secondary school level was found in 30

(32.61 %) cases. Only one victim had completed graduation and 8 (8.7 %) were illiterate. None of the victim was post-graduate (Table no. 2).

**Table 2: Distribution of cases according to educational status**

Education	Female	Percentage
<b>Illiterate</b>	18	19.57
<b>Primary school</b>	43	46.74
<b>Middle school certificate</b>	20	21.74
<b>High school certificate</b>	10	10.86
<b>Graduate</b>	1	1.09
<b>Postgraduate</b>	0	0
<b>Total</b>	92	<b>100</b>

Housewives were the major group among the victims contributing 73 (79.35 %) cases. Among remaining 19 cases, 5 (5.43 %) were in service sector, 4 (4.35 %) were student, 3 (3.26 %) were farmers, 1 (1.09 %) was labour and caterer each and 5 (5.43 %) were dependant persons.

Socio-economic status of the victims was done by using Kuppaswamy's scale. It was observed that maximum victims i.e. 57 (61.96 %) were belonging to Socio-economic class IV, followed by 25 (27.17 %) cases from class III. Remaining 9 (9.78 %) were of class II and 1 (1.09 %) was from class V. None of the victims was belonging to socio-economic class I.

Marital status of the victims' shows, 77 (89.7 %) were married and 8 (8.7 %) were unmarried. Remaining 4 (4.35 %) were widows, 1 (1.09 %) was divorced and 2 (2.17 %) had history of second marriage. Out of total 77 married females, 45 (48.91 %) died within seven years of marriage. Alleged history of dowry demand prior to the incidence was reported in 4 (5.19 %) cases among the married females who died within seven years of marriage.

Accidental burns was the most common alleged manner of death observed in 63 (68.48 %) cases. Suicidal death was claimed by relatives in 24 (2.61 %) cases and homicide was alleged in 4 (4.35 %) cases. Manner of death was not known in a case as the

victim was unknown and was found in burnt condition. Dying declaration was recorded in 12 (13.04 %) cases by investigating police officer.

There was history of psychiatric illness in 4 (4.35 %) cases. History of chronic systemic illnesses such as diabetes, hypertension etc. was reported in 5 (5.43 %) cases. Addiction to alcohol, tobacco chewing and smoking was a known fact in 4 (4.35 %) cases.

Explosion of kerosene stove was the source of fire in maximum i. e. 28 (30.43 %) cases, followed by suicide by pouring of kerosene over body in 23 (25 %) cases. Contact with flame while working was the source of fire in 18 (19.57 %) cases. History of use of accelerant was reported in 30 (32.61 %) cases. Smell of inflammable substance was perceived in 28 (30.43 %) cases. Shock was cause of death in 33 (35.87 %) cases and septicaemia was ascertained as a cause of death in 59 (64.13 %) cases.

Out of the total 92 victims, 4 (4.35 %) were brought dead. Victims survived for a varying period after infliction of burn injury. Survival period was about 6 hours to 12 hours in 6 (6.52 %) cases, 12 hours to 24 hours in 8 (8.7 %) cases, 24 hours to 48 hours in 9 (9.78 %) cases and 48 hours to 72 hours in 8 (8.7 %) cases. Maximum number of victims i.e. 37 (40.22 %) succumbed to death during a period of 3 days to 7 days. Sixteen (17.39 %) survived for a period of 7 days to 1 month. Only 4 (4.35 %) victims died after one month of sustaining burns.

Considering the total body surface area involved, it was observed that 71 (77.17 %) had sustained burn more than 50 % of total body surface area. Whole body burns i.e. 100 % of total body surface involvement was observed in 4 (4.35 %) cases.

## DISCUSSION

Present study shows maximum i.e. 46 (50 %) victims were from 21 to 30 years age group followed by 19 (20.65 %) cases from 31 to 40 years age group. Similar findings were obtained in study done by BR Sharma *et al* [2] Ambade V N *et al* [5], Batra AK [6], Zanjad NP *et al* [7], Mohanty MK *et al* [8] and Gupta RK and Srivastava AK [9]. 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 hence more chances of sustaining accidental burns. Also newly married females belonging to this age group are more likely to become victims of dowry death. On the other hand, K.D. Chavan and R V Kachare [10] noted in their study that most common age group involved was 19-25 (41.42%). Patetta MJ *et al* [11] showed that majority of victims in extremes of ages. These findings are inconsistent with present study

due to difference in study population as the studies were conducted in different geographical locations.

Maximum number of cases i.e. 74 (80.43 %) were of Hindu religion in present study. 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 study population. 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 a contributing factor for Hindu majority in victims of burn death. On the contrary, Memchoubi and Nabachandra [12] studied burn deaths in Imphal, Manipur state, where they observed maximum number of cases from Nonmanipuri religion i.e. 53.85% followed by Meitei contributing 36.92%, Muslims 6.15% and least tribals i.e. 3.07%. Difference in the observations was on virtue of the different geographical locations and pre-existing religious distribution of study population.

In present study, it was observed that maximum i.e. 67 (72.83 %) incidences occurred in urban area and 25 (27.17 %) occurred in rural area. This is consistent with Chawla R *et al* [13] which showed 28% cases were from rural while 72% cases from urban area. Singh D *et al* [14] showed 68% cases from urban area. This is not consistent with studies done by Batra AK [6], Zanjad NP *et al* [7] and Dasari H *et al* [15] where maximum cases were from rural region. This might be due to geographical location of the hospital and accessibility of hospital to people from different regions.

Kitchen was the most common place of occurrence contributing 60 (65.22 %) cases, followed by living room contributing 34 (36.96 %) cases. This is because the housewives working in kitchen are more prone to hazards of fire. Most of the suicides prefer closed and isolated places like living room. This finding is consistent with study done by Ambade VN *et al* [5], Mohanty MK *et al* [8], Subrahmanyam M [16] and Haralkar SJ *et al* [17].

Maximum number of incidences occurred in early afternoon and early evening hours totalling 34 (36.96 %) of the incidences. This period is consistent with cooking hours of housewives in India; where they are more chances of them being susceptible to hazards of fire. Least number of incidences i.e. 6 (6.52 %) were reported in early night hours. This finding is consistent with Sharma BR *et al* [2], Singh D *et al* [14], Dasari H *et al* [16] and Gupta M *et al* [18]. During this period of most of the people are sleeping and only few people are working. 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* [19], who observed maximum number

of incidences i.e. 48.59% in early part of the day followed by 29.13% during evening. This might be due to this study was conducted in rural part of India which involves majority of agrarian population. They are usually exposed to fire in early morning for cooking, warmth and boiling water.

Educational level of maximum victims i.e. 43 (46.74 %) was up to primary school level. The level of primary education is more than in previous studies. Because maximum number of cases were belonging to urban region where 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) 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; so the incidences of burn are commonly found in illiterates and less educated people. This finding is consistent with Attia AF *et al* [4], who observed 96.4% cases educated up to secondary school level, Jayaraman V *et al* [20], where 87.21% victims were educated upto matriculation and Shankar Gowri *et al* [21] where 40% victims were educated up to secondary school level. This is not consistent with study done by Awdesh Kumar and Surendra Kumar Pandey [22], who observed maximum number of illiterate people contributing 30% of the victims. This might be due to different geographical location and accessibility to education.

Housewives were the major group contributing 73 (79.35 %) cases. This finding is consistent with Chawla R. *et al* [13], Haralkar SJ *et al* [17], Shankar Gowri *et al* [21] and Rajani *et al* [23]. This might be due to fact that housewives were more commonly exposed to unguarded fire, stoves, chulha, cooking gas, dowry related and other marital problems. This is not consistent with study of Attia AF *et al* [4] which showed housewives were not commonly affected. This is due to cultural and lifestyle differences.

Maximum victims i.e. 57 (61.96 %) were belonging to Socio-economic class IV of Kuppaswamy's scale, followed by 25 (27.17 %) cases from class III. So, maximum cases are from upper lower and lower middle class population. This is consistent with BR Sharma *et al* [2], Memchoubi Ph. & H. Nabachandra [12], Subrahmanyam M [16], Haralkar SJ *et al* [17], Gupta M *et al* [18], Jayaraman V *et al* [20] and Awdesh Kumar and Surendra Kumar Pandey [22]. 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 the same. Use of kerosene stove for cooking by poor people makes them prone to hazards of unguarded fire. On the other hand, Akhter JM *et al* [19] observed maximum victims from lower class contributing

70.31%, middle class 20.16% and high class 9.53%. This might be due to difference in geographical location, occupation and availability of earning resources.

Marital status of the victims' shows 77 (89.7 %) were married. This finding is consistent with Ambade VN *et al* [5], Batra AK [6], Zanjad NP *et al* [7], Gupta RK and Srivastava AK [9], Dasari H *et al* [15], Awdesh Kumar and Surendra Kumar Pandey [22], Mangal HM *et al* [24] and G V Tasgaonkar *et al* [25]. This is indicator of social problems among married people, especially females, who have all household responsibilities. Also younger and newly married females may become victim of dowry demand and domestic violence.

Accidental burns was the most common alleged manner of death in 63 (68.48 %) cases. This finding is consistent with Zanjad NP *et al* [7], Gupta RK and Srivastava AK [9], Mangal HM *et al* [24], Singh D *et al* [14], G V Tasgaonkar *et al* [25] and Dhiraj Buchade *et al* [26]. This might be due to the fact that maximum victims in present study are housewives who were more prone to accidental contact to fire while working in kitchen, particularly in small and crowded houses. This is not consistent with study of Anamika Nath *et al* [27] which shows maximum burn deaths i.e. 177 (81.94 %) which were suicidal followed by 35 (16.20 %) homicidal and least cases 4 (1.85 %) were accidental. This study was performed in tribal area where there is different lifestyle and culture.

Similar to the present study, Akhter JM *et al* [19] observed psychiatric illness in 1.54% cases and chronic illnesses in 5.18% cases. Chawla *et al* [13] observed alcoholism and addiction to smoking both together in 22% and only alcoholism in 2% of male victims whereas 2% female victims were smokers. In the study done by Leth PM *et al* [28], 51% of house fire deaths were due to tobacco smoking in combination with alcoholism or handicap. This shows few problems related to urban lifestyle. These factors might contribute the victim's proneness to fire related hazards. Awareness to use safety measures is impaired due to these conditions.

Explosion of kerosene stove was the source of fire in maximum i. e. 28 (30.43 %) cases, followed by suicide by pouring of kerosene over body in 23 (25 %) cases. This finding is consistent with Ambade VN *et al* [5], Gupta RK and Srivastava AK [9], Chawla *et al* [13], Gupta M *et al* [18] and Harshwardhan Khartade *et al* [29]. It is not consistent with Patetta MJ *et al* [11] which showed in maximum cases (33%) heating instrument involved followed by smoking (26%) and then by cooking (9%). It may be due to different geographical areas and safety measures while cooking.

Similar to present study, smell of kerosene was perceived in 4% cases in study done by Chawla *et al* [13]. As the duration of hospital stay increases, the chances of perceiving smell of inflammable smell decreases due to their volatile nature and cleansing by hospital staff.

Maximum number of victims i.e. 37 (40.22 %) succumbed to death during a period of 3 days to 7 days. Shock was cause of death in 33 (35.87 %) cases and septicaemia was ascertained as a cause of death in 59 (64.13 %) cases. It is consistent with Sharma BR *et al* [2], Zanjad NP *et al* [7], Chawla R *et al* [13] and Dasari H *et al* [15]. The delayed deaths in case of burn is mostly due to sepsis. Surface burns lead to loss of natural barrier for infection. It is difficult to control infection in burn patients despite critical care in a tertiary care hospital. On the contrary, prolonged hospitalisation increases chances of nosocomial infection. On the contrary, Anamika Nath *et al* [27] observed shock as the cause of majority deaths i. e. 65.74 %, followed by septicemia 28.7 % cases. In study done by G. V. Tasgaonkar *et al* [25], observed 3.38 % deaths due to neurogenic shock, 36.38 % cases due to oligemic shock, 29.54 % cases due to septicemic shock and 30.46 % cases due to acute tubular necrosis and complications of septicemia. This is due to larger number of cases declared dead before admission or maximum cases with lesser duration of hospital stay.

In present study, 71 (77.17 %) cases had sustained burn more than 50 % of total body surface area. This is consistent with study done by, Zanjad NP *et al* [7], Chawla R *et al* [13], Mangal HM *et al* [24], G V Tasgaonkar *et al* [25] and Anamika Nath *et al* [27]. This is also consistent with study done by Jayant Deshpande *et al* [30] who observed that 34.6 % females of their study exceeded 75 % of TBSA. This might be due to the fact that study population was largely contributed by females. Indian females mostly wear sarees which are not easy to remove if they catch the fire.

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