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**Research Article**

# Study of Trends of Burn Deaths at Aurangabad Region in India

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**Abstract:** In ancient times, people considered fire one of the basic elements of the universe, along with water, air, and earth. Fire can be a friendly, comforting thing, a source of heat and light, as anyone who has ever sat by a campfire in the dark of the night knows. Yet fire can also be dangerous and deadly, racing and leaping like a living thing to consume all in its path. Death due to burns was one of the commonest unnatural deaths found in society. A prospective study of 325 cases from January 2010 to December 2010 of death due to burns was conducted. In our study, female predominance was observed who mostly housewives were. Accidental manner was most common.

**Keywords:** Burns, Females, Accidental, Aurangabad.

## INTRODUCTION

Among all discoveries made by men, only a few, such as cultivation of soil, speech and writing, have borne such eventful developments as are finding out how to make fire. Manufacturing, transportation, practically all phases of modern industrial life, sprang from the discovery of fire and its tremendous force [1].Whereas it took a man a long, long time to understand, appreciate, and reproduce these occurrences, it took him no time at all to realize that fire can hurt and hurt badly [1]. Burns is injuries produced by application of dry heat, such as radiant heat, flame or any other heated solid substance like metal or glass to the surface of the body [2]. Burns is the 4th most common type of trauma in the world, subsequent traffic accidents, falls, and interpersonal violence. The present study attempts to study various factors related burn deaths in Aurangabad region.

## MATERIAL AND METHODS

A prospective study of burn deaths during the period of 01 January 2010 to 31 December 2010 was carried out at the Forensic Medicine Department, Government Medical College, and Aurangabad. A total 2363 autopsies were conducted at the autopsy center out of which 325 (13.75%) autopsy cases were of death due to burns. All deaths associated with burn injuries resulting from electrocution, radiation, chemical burns are excluded.

A standardized proforma specially designed for this purpose was used and filled in each case after detailed interviews with the investigating officials and the relatives/friends of the deceased & hospital records etc. to gather information regarding various factors.

## RESULTS

Distribution of Burn deaths, according to the age & sex is shown in Table No. 1. It was observed that 93 cases (28.61%) were male and 232 (71.39%) were female. Maximum number of cases belonged to 21-30 years age group - 146 (44.92%), followed by those in 31-40 years – 73 (22.46%), and 11-20 years – 54 (16.62%), while on the extremes of ages incidences are less.

Distribution of Burn deaths, according to percentage of burn (Rule of nine) is shown in Table No.2. It was observed thatin 296 cases (91.08%) more than 50 % of body surface area were involved while in 21 cases (6.46 %) 40-50 % body surface area was burnt and in only 8 cases (2.46%) the involved body surface area was less than 40%.

**Table 1: Age and sex distribution**

| Age( yrs) | Male | Female | Total | % |
|---|---|---|---|---|
| 0-10 | 2 | 2 | 4 | 1.23 |
| 11-20 | 3 | 51 | 54 | 16.62 |
| 21-30 | 38 | 108 | 146 | 44.92 |
| 31-40 | 27 | 46 | 73 | 22.46 |
| 41-50 | 18 | 13 | 31 | 9.54 |
| 51-60 | 2 | 6 | 8 | 2.46 |
| 61-70 | 2 | 5 | 7 | 2.15 |
| 71-80 | 1 | 1 | 2 | 0.62 |
| Total (%) | 93(28.61) | 232(71.39) | 325 | 100 |

**Table-2: Distribution of cases according to involvement of surface burn**

| Body surface area involved | Male | Female | Total |
|---|---|---|---|
| 1-29% | 1(0.31%) | 2(0.62%) | 3(0.92%) |
| 30-39% | 2(0.62%) | 3(0.93%) | 5(1.54%) |
| 40-49% | 9(2.77%) | 12(3.7%) | 21(6.46%) |
| 50-59% | 13(4.0%) | 19(5.85%) | 32(9.85%) |
| 60-69% | 16(4.92%) | 31(9.54%) | 47(14.46%) |
| 70-79% | 13(4.0%) | 35(10.77%) | 48(14.77%) |
| 80-100% | 39(12.0%) | 130(40%) | 169(52%) |

**Table 3 period of survival and extent of burns**

| Period of survival | Body surface area involvement | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% | 80-89% | 90-100% | Total |
| Spot | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 8 |
| Way to hospital | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 |
| <24hrs | 0 | 0 | 2 | 1 | 5 | 5 | 10 | 50 | 73 |
| 1-3days | 1 | 1 | 1 | 2 | 5 | 4 | 7 | 24 | 45 |
| 4-7days | 0 | 2 | 5 | 13 | 18 | 14 | 20 | 24 | 96 |
| >7days | 2 | 2 | 13 | 16 | 19 | 24 | 13 | 10 | 99 |
| Total | 3 | 5 | 21 | 32 | 47 | 48 | 52 | 117 | 325 |

**Table 4: distributions of cases according to nature of burns**

| Cause | Cases | % |
|---|---|---|
| Neurogenic Shock | 11 | 3.38 |
| Oligemic shock | 118 | 36.31 |
| Septicemic shock | 96 | 29.54 |
| ATN + Septicemic complications | 99 | 30.46 |
| Other | 1 | 0.31 |
| Total | 325 | 100 |

**Table 5: burn deaths associated with mechanical injuries**

| Mechanical injuries | Cases | % |
|---|---|---|
| Present | 6 | 1.85 |
| Absent | 319 | 98.15 |
| Total | 325 | 100 |

**Table 6: Causes of death**

| Nature of burns | Cases | % |
|---|---|---|
| Ante-mortem | 324 | 99.69% |
| Post-mortem | 1 | 0.31% |
| Total | 325 | 100 |

**Table-7: Manner of death in relation to sex of cases**

| Manner | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Married | Unmarried | Married | Unmarried | Married | Unmarried |
| Accidental | 35 | 7 | 140* | 24 | 175* | 31 |
| suicidal | 33 | 5 | 31 | 1 | 64 | 6 |
| Homicidal | 3 | 0 | 18 | 0 | 21 | 0 |
| Uncertain | 9 | 1 | 16 | 1 | 25 | 2 |
| Total | 80 | 13 | 205 | 26 | 285 | 39 |

**Table -8: Crime registration**

| | |
|---|---|
| 302 | 4 |
| 304(B), 498(A) | 17 |
| 307, 34 | 7 |
| 302, 304(B), 498(A), 307, 34 | 10 |
| 306 | 1 |
| 366(A), 363, 34 | 1 |
| Total | 40 |

The study shows that in maximum No.of cases 324, the burns were ante-mortem in nature while only 1 case, burn was post-mortem in nature. In the present study out of 325 cases of burn deaths, only 6 cases (1.85%) were associated with mechanical injuries.

As shown in table No. 6, only 11 cases died due to Neurogenic shock, maximum cases 118 (36.31%) died due to Oligemic shock and septicemic shock & ATN+Septicemic complications as cause of death in 96 cases (29.54%) & 99 cases (30.46%) respectively. In a 1 case, the cause of death was strangulation. It has been found that more extent of burns over body was associated with higher mortality.

On comparing manner of death in relation to sex of cases showed that maximum cases were accidental 207 cases, out of that male cases were 42 cases (12.92%), while female were 165 cases (50.77%). Out of suicidal cases, 70 cases, 38 cases (11.69%) were male, while 32 cases (9.85%) were female. Out of homicidal cases, 21 cases, 3 cases (0.92%) were male, while 18 cases (5.54%) were female. In all manner of deaths, married cases were quite more than unmarried, while in homicide all cases were married.

In 20 cases crime was registered before autopsies, while in 305 cases it was not registered. Out of 305 cases, in 20 cases crime was registered after a few days while, in 165 cases it was not registered and for remaining 120 cases we could not get information, because most of these cases were from other rural areas of peripheral districts for treatment, so it was not possible to track these cases.

## DISCUSSION

### Age and sex distribution

It was observed that maximum number of cases belonged to 21-30 years age group - 146 (44.92%), followed by those of 31-40 years – 73 (22.46%), and 11-20 years – 54 (16.62%), while on the extremes of ages incidences are less. So, most of the cases (84%) are in 11-40 years age group with peak incidence in 21-30 years age group, with female predominance.

Ambade VN *et al.*; [3] observed that 47.1% cases in 21-30 years age group. Mangal HM *et al.;* [4] observed that 40% cases in 21-30 years age group. Zanjad NP *et al.;* [5] observed that 40.38% cases in 21-30 years age group. Memchoubi Ph. & H. Nabachandra *et al.;* [6] observed that 38.46% cases in 21-30 years age group. Dasari H *et al.;* [8] observed that 43.5% cases in 21-30 years age group.Chawla R *et al.;* [9] observed that 52% cases in 21-30 years age group. Present study's findings are similar with studies of the above mentioned authors. It shows that adolescent and young people are main working hands and are exposed to hazards of fire.

Hilal A *et al.;* [9] showed thatthe majority of the victims (175 cases, 35.9%) was in the 0–5 age group, followed by 21–30 age group with 83 cases. Patetta MJ *et al.;* [10] showed that majority of victims in extremes of ages.Bang RL *et al.;* [11] showed that the high mortality amongst two age groups 0-5 years (39 deaths, 16.7%) and 16-35 years (109 deaths, 46.6%). These findings are not consistent with present study due to different geographical areas and life styles of people.

Inthe present study, we found that amongst 325 study cases, 93 cases (28.61%) were male and 232 (71.39%) were female. The male to female ratio was 1:2.5. Such similar findings with ratio of female predominance were found in studies like Mangal HM et al (2007)[4] showing 1:2.7 ratio; Ghaffar UB *et al.;* [12] showing 1:1.13 ratio, Zanjad NP et al (2007)[5] showing 1:4.86 ratio; Ambade VN *et al.;* [3] showing 1:2.87 ratio; Haralkar SJ *et al.;* [13] showing 1:2.10 ratio; Dasari H *et al.;* [7] showing 1:2.2 ratio.This may be due to large no. of housewives and their social & 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 Shirkhoda M *et al*.; [14] showing 1.2:1 ratio; Memchoubi Ph. & H. Nabachandra *et al.;* [6] showing 1.03:1 ratio; Olaitan PB, Jiburum BC *et al.;* [15] showing 2:1 ratio; Hilal A *et al.;* [15] showing 1.7:1 ratio; Hariadiapuranto *et al.;* [16] showing 1.18:1 ratio. This may be due to different lifestyles and culture.

**Burn surface area**

Distribution of burns cases, according to involvement of body surface area shows that in 296 cases (91.08%) more than 50 % of body surface area were involved while in 21 cases (6.46 %) 40-50 % body surface area was burnt and in only 8 cases (2.46%) the involved body surface area was less than 40%.This is consistent with Zanjad NP et al (2007)[5] showing 84.4% cases having surface burns more than 50%. Also, Mangal HM *et al*.; [4] and Chawla R *et al.;* [8] showed 77.34% & 86% cases respectively for surface burns more than 50%.

**Period of survival and extent of burns**

When the burn cases in the present study were analyzed by percentage of burns and the survival time it was found that out of 61 cases in which the burn percentage was less than 59%, there were 8 deaths (13.11%) which occurred within three days, remaining 53 (86.89%) cases survived more than three days.

Similarly, it was also observed that of 264 cases in which the burn percentage was more than 60% there were 122 deaths (46.21%) within three days and remaining 142 cases (53.79%) survived more than three days. Thus, it is obvious from our study that larger the body surface area involved, lesser the survival time.

Zanjad NP *et al.;* [8] observed that 75.1% cases having body surface burns more than 60% were fatal & with high mortality. Mangal HM *et al.;* [4] observed that 60.67% cases died on the first day of incidence with body burn surface area more than 50%. It shows that extent (%) of burn surface area decides mortality of patients. Though better attention and treatment is provided to the burn patients, infection, especially hospital acquired, involving large body surface area is difficult to control infection.

**Nature of burns**

The present study shows in maximum no. of cases 324, burns are ante-mortem in nature while only in 1 case; burn is post-mortem in nature in which there was strangulation. It is consistent with Chawla R *et al.;* [17] which showed post mortem burns in 4 cases. It is found in cases where criminal had tried to conceal by burning dead bodies.

**Burn deaths associated with mechanical injuries**

In the present study out of 325 cases of burn deaths, only 6 cases (1.85%) were associated with mechanical injuries. Sang Do Shin *et al.;* and Chawla R *et al.;* [17] observed that 3.5% & 10% cases were associated with injuries respectively. Mechanical injuries in burns are most of the times related to crime.

**Cause of death**

The present study shows that 11 cases died due to Neurogenic shock, maximum cases 118 (36.31%) died due to Oligemic shock and septicemic shock & ATN+Septicemic complications as cause of death in 96 cases (29.54%) & 99 cases (30.46%) respectively. In a 1 case, the cause of death was strangulation.

BR Sharma *et al.;* [19] observed that 4.38% cases died due to neurogenic shock, 27.71% cases died due to burn shock while 67.91% cases died due to septicemia & its complications. Dasari H *et al.;* [7] observed that 11.9% cases died due to burn shock, 8.7% cases died due to burn shock & toxemia while 79.5% cases died due to septicemia & complications. Chawla R *et al.;* [17] observed that 22% cases died due to primary shock, 10% cases died due to oligemic shock while 56% cases died due to septicemic shock and 12% cases died due to injuries.

Cases with spot & brought dead were associated with Neurogenic shock while, cases with survival <24hrs & 1 – 3days were associated with Oligemic shock. The burn wound is the cause of all harsh effects, local and systemic, in a burn patient, as the burn injury causes devitalisation of tissues and produces extensive raw areas. In these cases, the infection is difficult to control due to the presence of dead and denatured burn eschar, damp environment, depression of the immune system, prolonged hospitalization- exposing the already susceptible patient to resistant strains; and invasive therapeutic and diagnostic procedures. A burn wound is more susceptible to invasion by the micro-organisms because of extensive disruption of the skin barrier and suppression and alteration of the cellular and humoral immune responses. Septicemia is more prevalent after 3days, death was associated with either septicemic shock or acute tubular necrosis and Septicemic complications such as pneumonia, embolism etc.

**Manner of death in relation to sex of cases**

In all manners of death, commonest manner was accidental. In the present study, females are more than males, married male and female were more common in accidental and suicidal deaths while in homicidal all cases were married.

Singh D *et al.;* [20] observed that 80% cases, accidental while 16.2% & 4.1% cases were suicidal & homicidal. Batra AK *et al.;* [21] observed that 50.7% cases, accidental while 47.8% & 1.5% cases were suicidal & homicidal. Ambade VN *et al.;* [3] observed

that 75% cases, accidental while 19.3% & 2.6% cases were suicidal & homicidal. Mangal HM *et al.;* [4] observed that 61% cases, accidental while 35% & 4% cases were suicidal & homicidal.

Indian females are mostly involved in fire related deaths from long ago and it is still happening. Most of the cases are accidental due to insecure environment in kitchen, but, most of times, it is the history given by relatives, in laws, neighbors that tragedy was due to the alleged bursting of the stove, saree/ chunni grasping fire, etc.; despite now days maximum persons use cooking gas as fuel. So, there are possibilities such homicidal cases will be regarded as suicide or accidental. Suicidal and homicidal deaths were more common in married females. It may be due to deep-rooted custom of dowry and marital disharmony which compel the married females either to commit suicide or they may be killed by their in-laws and husbands.

In males, most deaths were of suicidal & accidental in manner and most of the cases were married. It may be because of less experience in kitchen work leading to exposure to unguarded fire. It may also be due to small economy, more dependence on parents, marital disharmony leading to suicides. Out of 93 cases of male, there was history of alcohol intake in 13 cases (13.98%). Out of that, 12 cases and 1case were of suicidal and homicidal in nature respectively.

**Crime Registration**

The present study shows that out of 325, in 20 cases crime was registered. After a few days, in the remaining 305 cases, crime was registered in 20 cases, while, in 165 cases, it was not registered and no information got for remaining 120 cases. In 40 cases, various sections were applied. No such study is available to compare the findings.

## CONCLUSION AND SUGGESTION

Findings in the present study are mostly similar and consistent with the pattern found in other Indian studies. Housewives mostly aged in third decade were found as most common victims of accidental burn deaths in which oligemic shock was the most common cause of death.

In all manners of death, females outnumbered males, married male and female were more common in accidental and suicidal deaths while in homicidal all cases were married.

In 20 cases crime was registered before autopsy and out of the 305 remaining cases, in 20 cases crime was registered after a few days. It shows that complaints can be lodged in burn cases even after a few days so post mortem examination of burn cases should be done carefully.

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