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RESEARCH ARTICLE

EPIDEMIOLOGICAL CHARACTERISTICS OF BURN DEATHS IN VARANASI UTTAR PRADESH, INDIA

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ABSTRACT

Introduction: Fire was perhaps man's first double-edged sword, evidenced throughout history; it has served as well as destroyed mankind. Burns are one of the most devastating conditions encountered in medicine. The injury represents an assault on all aspects of the patient, from the physical to the psychological.

Aim of the study: To find out how dry thermal burn affect epidemiological factors and to height problem regarding burn deaths.

Material and Methods: Present study conducted at forensic medicine department, institute of medical science, Banaras Hindu University. Study data was collected and analyzed prospectively for the duration from 1st January 2013 to 30 June 2014. During this period total of 450 burn death cases were recorded out of 3149 medico-legal postmortem conducted.

Observations and Result: Prevalence of fatal burn victims were 14.29%. Most of the victims of burn deaths were recorded at 21-40 year with peak incidence at 21-30 year 44.89%.The male-to-female ratio were 1:4.6 i.e. male 81(18%) and female 369 (82%). Showing married females (84.01%) outnumbered the unmarried female (15.99%), in male, married (80.22%) outnumber the 19.33 % unmarried male. Majority of studied burn victims like 90.67% were from rural area and 9.11% are from urban area. Studied cases like 91.11% were Hindu and 8.22% are Muslims. Majority of the burn victims (30%) were uneducated i.e. illiterate, followed by education obtained up to junior high school level cases were 93 in No. i.e. 20.67% and primary school level include 13.33%. Maximum number of cases in summer season 53.33%. Most of the victims were housewives 67.11% followed by students 11.33%. Most of the burn victims were from upper lower SESS 245 cases (54.44%).

Conclusion: Educating the people about safety measures. For cooking food using domestic liquefied petroleum gas (LPG) and solar cooker and need to discourage the use of kerosene burner. Encouraging anti-dowry campaigns by registration of burn cases and maintaining legal procedures.

INTRODUCTION

Burns are one of the most devastating conditions encountered in medicine. The injury represents an assault on all aspects of the patient, from the physical to the psychological. It affects all ages, from babies to elderly people, and is a problem in both the developed and developing world. Fire was perhaps man's first double-edged sword, evidenced throughout history; it has served as well as destroyed mankind (Mathiharan, ?). Burn injuries are dry thermal injury caused due to contact with dry heat such as flame, radiant heat or some heated solid substance like metal or glass, to the body surface (Narayan Reddy, ?). Mammalian tissue can survive only within a relatively within narrow range of temperature, 22-44 ^{oC} (Pekka Saukko and Bernard Knight, ?). The reason behind this action may be personal, domestic, occupational or social tragedy and more recently dowry deaths.

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Married female burn death where death of female occurs below 30 year and within 7 years of her marriage such death cases investigated by Magistrate under Cr.P.C 176 (Dowry death) and other female burn and male burn deaths as routinely investigated by police as per section 174 of Cr.P.C. In India below 7 year married female burn deaths are linked with Dowry death, where a young married women attempt or commits suicide in consequent to their being subjected to harassment by their husband or in-laws or his relative or cruelty constitute the offence of Dowry death, a monstrous social evil is widely prevalent and deep rooted in society in spite of most of the awareness programmers but this is due to adequate legal system but her implementation and administration are not stringent (Arun Agnihotri, ?). Autopsy has previously been shown to be a useful retrospective diagnostic tool; however we challenge its reliability as a result of our study (Krishnan *et al.,* 2012). Social Forensic Message - Safety first in fire situations and always x-ray burnt human remains. Scene Visit-As indicated and felt necessary and crime

Scene evaluation report by Police as necessary (Murti and Moh Shah Mahmood, ?).

The aim of the study

To find out how dry thermal burn affect incidence, age and sex, marital status, inhabitant, religious, education, seasonal variation, occupation, and socioeconomic status. To highlights problem regarding burn deaths.

MATERIALS AND METHODS

Present prospective study was carried out on the unnatural burn death cases brought by police to the Department of Forensic Medicine, Institute of Medical Sciences, Banaras Hindu University, from Varanasi itself and nearby districts and western part of Bihar and Madhya Pradesh for treatment then if death at Varanasi in different hospital occur then the dead body after inquest send to institute of medical science Banaras Hindu university for medico-legal autopsy examination. Study data was collected for the duration from 1st January 2013 to 30 June 2014. During this period total of 450 burn death cases were recorded out of 3149 medico-legal postmortem conducted. Data was analyzed prospectively in respect of incidence of burn deaths in, age group, sex habitat of death religion factor, manner of death and other relevant data.

RESULTS AND OBSERVATION

Table 1: Shows the distribution of number of burn cases during the study periods, total number of different autopsy cases were 3149, total number of burn autopsy were 600 i.e. 19.05%, total number of burn cases recorded for study during this period were 450 i.e. 14.29%, which forms a considerable bulk and draws attention to the grievousness of this problem. Table 2: Distribution of burn cases in different age group with sex among the studied burn cases (N=450) shows that maximum of the victims of burn deaths were in the age group 21-30 year followed by 31-40 years. Most of the victims of burn deaths were recorded at 21 - 40 year (which is more than half of the total burn death) with peak incidence at 21-30 year 44.89%. Extremes of ages are least involved as compared to adult age group as seen in tables for age and sex incidence. X^2 =32.44, DF = 7, P = < 0.001 and there is significant association with age. Distribution of burn cases on the basis of gender among the studied burn cases (N=450) .The male-to-female ratio was 1:4.6 i.e. male 81(18%) and female 369(82%). The predominance of female deaths was observed throughout the study period. Table 3: Describe the marital status of the studied victim showing married female (84.01%) outnumbered the unmarried female (15.99%)), in male married 80.22% outnumber the 19.33 % unmarried male.X2 = 24.64; DF = 2; P = < 0.001 and there is significant association with marital status.

Table 1. Distribution of incidence of burn autopsy

Total number of different autopsy cases	Total number of burn autopsy cases	% of total number of burn autopsy cases	Total number of burn cases for study	% of total number of burn cases for study	Total No. of autopsy due to other cause	% of total No. of autopsy due to other cause
3149	600	19.05	450	14.29	2549	80.95

Table 2. Distribution of burn cases in different age group with sex

Age group (in year)	Total No of cases	% of total cases	Male		Female	
			No. of cases	% of cases	No. of cases	% of cases
0-10	19	4.22	9	11.11	10	2.71
11-20	87	19.33	11	13.58	76	20.60
21-30	202	44.89	25	30.86	177	47.97
31-40	93	20.67	18	22.22	75	20.33
41-50	27	6.00	11	13.58	16	4.34
51-60	12	2.67	5	6.17	7	1.90
61-70	7	1.56	2	2.47	5	1.36
>71	3	0.67	0	0.00	3	0.81
Total	450	100	81	18.00	369	82.00

Table 3. Distribution of burn cases on the basis of marital status and gender

Marital status	Total No. of cases	% of total	Male cases	% of male	Female cases	% of female
Married	361	80.22	51	62.96	310	84.01
Unmarried	87	19.33	28	34.57	59	15.99
Unknown	2	0.44	2	2.47	0	0.00
Total	450	100.00	81	18.00	369	82.00

Table 4. Distribution of burn cases on the basis of inhabitant with gender

Inhabitant	Total No. of cases	% of total cases	Male cases	% of male cases	Female cases	% of female cases
Rural	408	90.67	71	87.65	337	91.33
Urban	41	9.11	9	11.11	32	8.67
Unknown	1	0.22	1	1.23	0	0.00
Total	450	100.00	81	18.00	369	82.00

Table 5. Distribution of burn cases on the basis of religion with gender

Religions	Total No. of cases	% total No. of	No. of Male	% of male	Female cases	% of female
Hindu	410	91.11	72	88.89	338	91.60
Muslim	37	8.22	8	9.88	29	7.86
Christian	1	0.22	0	0.00	1	0.27
Unknown	2	0.44	1	1.23	1	0.27
Total	450	100.00	81	18.00	369	82.00

Table 6. Distribution of burn cases on the basis of seasonal variation with gender

Season	Total No. of cases	% of total cases	Male No. of cases	% of male cases	Female No. of cases	% of female cases
Summer (March-June)	240	53.33	49	60.49	191	51.76
Rainy (July-October)	116	25.78	14	17.28	102	27.64
Winter (Nov.-December)	94	20.89	18	22.22	76	20.60
Total	450	100.00	81	18.00	369	82.00

Table 4: Show that the majority of studied victims like 90.67% were from rural area, 9.11% are from urban area and 0.22 % case for which locality is unknown. It is noted that among rural gender females outnumbered but urban habitat male outnumber. $X^2 = 5.09$; DF = 2; P = 0.08 showed there is no association between inhabitant and gender. Table 5: Show that majority of the burn victim's death of the studied case like 91.11% was Hindu and 8.22% are Muslims but 0.44% of unknown case whom their religions' are not known. Hindu female outnumber i.e. 91.60% Hindu male 88.89%, but Muslim male outnumber i.e. 9.88%, Muslim female 7.86%.$X^2 = 2.0$; DF = 3; P = 0.58 showed that there is no significant association between religions and gender. Table 6: Show that more number of cases in summer season 53.33% followed by rainy season 25.78% and less number of cases were in winter 20.89%. Male cases are outnumbered in summer than female, but female victims are outnumbered in rainy season. In winter there is slight difference.$X^2 = 3.80$; DF = 2; P = 0.15, find that there is no significant association between seasonal variation and gender.

DISCUSSION

Incidence

In our study it is observed that incidence of death due to fatal burns is 600 in No. i.e. 19.05 % of total cases collected from 1 January 2013 to 30 June 2014,which is the second commonest cause of death next to road traffic accidents. Every year there is slight increase in burn death cases because numbers of patient are also increasing every year. In a previous study by (Sharanabasavappa Karaddi, 2008) he found that deaths due to burning accounted for 25.41% of the total medico legal autopsy deaths cases which was greater than the present study. In another study done by (Zanjad, 2007) it was observed that death due to burns accounted for 18.20% of all medico legal autopsy cases which was more or less similar to present study. This finding is consistent with the study of (Batra, 2003; Ambade and Godbole, 2006; Gupta *et al.,* 1993). The difference in the percentage is due to differences in the region from where study was carried out. Again it indicates that burn autopsies comprises of major bulk of medico–legal autopsies in India. The present study is in conformity with the study conducted by (Sharanabasavappa Karaddi, 2008; Zanjad, 2007). Burn has been reported to be the second most common cause of death in all medico legal cases. Existing dowry system plays its own part in such deaths (Shinde and Keoliya, 2013).

AGE

In our study I observed that 21 to 30 years is the most commonly involved age group burn death (44.89%) followed by 31 to 40 years i.e. (20.67%) with preponderance of female, other study conducted by (Rahul Chawla, ?; Virendra Kumar *et al.,* 2007). The high mortality in this age group 21 to 30 year can be due to young adolescent in this age group fail to stand the stress of examination and job failure. Other study (Gupta and Srivastava, 1988) revealed age distribution of cases as more than half (108 cases, 60%) of the victims were young adults in the age groups 21-30years (Dalbir Singh *et al.,* 1998; Soltani and Mirghasemi, 1998) in India. The study revealed that the peak incidence of burn deaths was reported in the young age group of 21-30 years (50 cases,45.45%) followed by age group of 31-40years (26 cases,23.64%) (Shinde and Keoliya, 2013). High burn mortality among young females has also been reported by (Malla *et al.,* 1982) the maximum incidence of burns was in age group of 21-30years with 30% of cases. (Batra, 2003) Observed that mostly affected group is 21-30 years (39% cases) of deaths, 41.2% females belonged to age group 21-30years and maximum male burns deaths (33.1%) were in age group31-40 years. (Gupta and Srivastava, 1988) Revealed age distribution of cases as more than half (108 cases, 60%) of the victims were young adults in the age groups 21-30years (Dalbir Singh *et al.,* 1998; Soltani and Mirghasemi, 1998) in India. Other study (Agrawal and Agrawal, 1967) reported similar findings in their study of 84 female burn patients of which 70% were between 15 and 30 years of age. Similarly, (Agha and Benhamia, 1979) found twice as many women as men burn victims between the age of 16 and 40 years. (Soltani *et al.,* 1998) Reported the highest incidence of burn injuries in Tehran in the 16–25 year age group, while **(**Mzezewa *et al.,* 1999**)** found that 30% of female burn victims were between 21 and 40 years old in Harare.

Gender

Table 3: Shows that distribution of burn cases on the basis of gender among the studied burn cases (N=450) .The male-to-female ratio was 1:4.6 i.e. male 81 (18%) and female 369 (82%). The predominance of female deaths was observed throughout the study period. Other previous study shows higher incidence of burn deaths females which was a constant feature throughout the study period. The females outnumbered males in all burning deaths with over all male to female ratio of 1:5.87 (Shinde and Keoliya, 2013). Other study, out of 456 of burns deaths, 327 (72.1%) were females and 129 (28.3%) were males with male: female ration 1:2.5 (Zanjad, 2007). Similar findings were reported by other Indian authors (Batra, 2003; Ambade and Godbole, 2006; Gupta and Srivastava, 1988; Shinde and Keoliya, 2013; Subrahmanyam, 1996; Singh *et al.,* 1998). The reason for the predominance of the female may be for most of the housewives, kitchen and kitchen related activities place them at high risk of fatal burn accidents. Again

in Indian society, dowry related deaths either suicidal or homicidal remain the most common cause for female deaths and burning is common mode used for committing suicide and homicide. On the other hand, male predominance was observed in studies carried out at China (Tang *et al.,* 2006; Yonggiang *et al.,* 2001; Song and Chua, 2005; Chien *et al.,* 2003). This may be explained by the fact that because of rapid industrialization in these countries, male become more susceptible to fatal burns at work place as compared to females. Other study finds that male: female ratio 1:1.88 (Rahul Chawla *et al.,* ?).

Marital status

Our study find that married female burn death more common i.e. 84.01%, than unmarried females i.e.15.99%.Other study also find similar result i.e. housewives are more common by involved in the study conducted by (Shinde and Keoliya, 2013; Rahul Chawla *et al.,* ?). As in the (Ambade and Godbole, 2006; Vipul Namdeorao Ambade and Hemant Vasant Godbole, 2006) study, other Indian studies too reported a predominance of married victims in deaths due to burning with preponderance of female victims (Singh *et al.,* 1998; Agarwal *et al.,* 1987). This is probably because of increasing familial stress due to day to day problems like jobs, cooking, children, etc. and hurrying through in an overcrowded room with minimal amenities inviting frequent accidents. Moreover in the developing country like India, females are married earlier than the males in the family and are more exposed to social and family stress much earlier than males. (Batra, 2003) Reported 82.3% of the burn victims were married, of which 85.5% victims were females; such a high percentage of married female burning is very rare event elsewhere in the world.

Habitat

In our study most of the burn death is from rural locality (90.67%) than from urban (9.11%) locality, previous study 76.3% also observed that death caused due to burn in rural area over urban (Zanjad *et al.,* 2007**)** which was similar to present study. But another study contrasts to this and show that urban area much more common involved than rural population **(**Rahul Chawla *et al.,* ?**). (**Batra, 2003**)** Who performed study at rural health district of **(**Kusa Kumar Shaha Sachindananda Mohanty 2006**)** that performed study at MKCG Medical College, Berhampur, Eastern India in their studies also reported 75% and 72% of victims respectively who lived in rural areas. In the other, about similar study, it was found that 92(83.63. %) victims belonged to rural areas and 18(16.37%) to urban areas **(**Shinde and Keoliya, 2013**).** In the study of **(**Batra, 2003**),** 75% of the cases were from rural area which is consistent with the present study. However this is in contrast to the studies carried out by **(**Shinde and Keoliya, 2013) which is 35.6%, (Singh *et al.,* 1998) 38%. The reason for increased incidence of burn cases among rural population in present study may be Government Medical College & Hospital, Nanded acts as a referral centre for nearby vast rural population attached to it and therefore medico–legal postmortems conducted on burn cases, which are referred to this institute are higher.

The (Richa Gupta *et al.,* 2012) study revealed that the maximum number of victims were from rural areas, which was in accordance with the findings of other studies from various regions of India (Zanjad *et al.,* 2007; Gupta *et al.,* 1993; Singh *et al.,* 1998).

Religion

I find that majority of the burn death victim of the studied case is from Hindu population i.e. 91.11% and only 8.22% belong to Muslim; reason behind it is the Hindu dominant population in Varanasi area. These finding are in conformed by (Virendra Kumar *et al.,* 2007; Kusa Kumar Shaha Sachindananda Mohanty, 2006). The dowry system is more prevalent within the Hindu community than the Muslim or Christian groups, where divorce is more difficult to obtain and less socially acceptable. This study demonstrated an overwhelming pro-portion of Hindu women, a finding confirmed by (Rai, 1987) but contrasting the findings of (Devadas, 1988) who saw many suicides in the Christian community too within Bangalore city. Perhaps, the religious mix differs with the distribution within the community as a whole. They belonged to the Hindu community mostly and the reason behind this was the Hindu dominant population in the Varanasi region, which was in conformity with the findings of other previous studies which were carried out in this region (Dasgupta and Tripathi, 1984; Kumar *et al.,* 2007). A previous study from the same region had reported nearly equal numbers of victims (54%) from the rural and (46.7%) the urban areas.

Seasonal variation

In the present it was observed study that more number of burn death recorded cases in summer season i.e. 53.33% followed by rainy season 25.78% and least number of cases were recorded in the month of winter i.e. 20.89 %. Male burn death cases were outnumbered in summer than female; whereas female victims are more involved in rainy season. In winter there is slight difference between involved sexes. Male % of burn death cases was more in summer than female percentage. Our findings were in conformity with those of other studies show that more number of cases in summer season 43.5% followed by winter season 34.7% and less number of cases were in rainy 21.80% (Richa Gupta *et al.,* 2012).

Conclusion

- Educating the people about safety measures through various programmes, television, radio, newspaper, warning label or cautionary information accompanying the sale of gasoline, kerosene or petrol into any container.
- For cooking like domestic liquefied petroleum gas (LPG) and solar cooker.
- Discouraging the use of kerosene burner and other open burner to reduce the incidence of burns fatality.
- Using clothes or garments, which are of non-inflammable material during exposure to fire?
- Intersectorial coordination.
- Running anti-dowry campaigns.

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Ethics statement

The present study was approved by "Institutional Ethics Committee" of Institute of Medical Sciences, Banaras Hindu University. All the information has been taken under consideration of medical ethical committee.

Conflict of interest: Nil

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