

Medicolegal Study of Dry Thermal Burn Autopsy in Varanasi, India

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Abstract: ***Introduction:** Dry thermal burns are one of the most devastating conditions encountered in health. The dry thermal burns injury represents an assault on all aspects of the patient, from the physical to the psychological. Autopsy has previously been shown to be a useful retrospective diagnostic tool; however we challenge its reliability as a result of our study. The percentage of TBSA involved is calculated; only partial-thickness and full-thickness burns are included in this calculation. **Aim of the study:** To find out how the dry thermal burn affects prevalence, surface area, degree of burn, cause of death. To highlights problem regarding burn deaths victims. **Material and Methods:** 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 prevalence, surface area, degree of burn, cause of death. **Observations and result:** Total number of burn cases recorded for study during this period was 450(14.29%), which forms a considerable bulk and draws attention to the grievousness of this problem. In the present study it is observed that out of 450 studied cases, in 40.67% more than 91 % body surface area involved while in 8.67% cases. Fourth degree burn (Destruction of whole skin as per Dupuytren's classification) dermoepiderml (as Wilsons) involve majority of victims 416 cases i.e. 92.44%. Most common cause of death was septicemic shock in 259 cases i.e. 57.56%. **Conclusions:** Educating the people about safety measures through various programmes, television, and other media.*

Keywords: Unnatural death; Dowry death; Thermal burn; Forensic medicine, Medico legal study

1. Introduction

Medico- legal study define as study of, relating to, or concerned with both medicine and law, as when medical testing or examination is undertaken for a legal purpose [1]. Dry thermal burns are one of the most devastating conditions encountered in health. The dry thermal burns 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. 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 [2]. Mammalian tissue can survive only within a relatively within narrow range of temperature, 22-44 °C [3]. Autopsy has previously been shown to be a useful retrospective diagnostic tool; however we challenge its reliability as a result of our study [4]. In 2011 census Varanasi had population of 3,676,841 of which male and female were 1,921,857 and 1,754,984 respectively [5]. **Prevalence** or **prevalence proportion**, in epidemiology, is the proportion of a population found to have a condition (typically a disease or a risk factor such as smoking or seat-belt use). It is arrived at by comparing the number of people found to have the condition with the total number of people studied [6]. **Surface area**-The percentage of TBSA involved is calculated; only partial-thickness and full-thickness burns are included in this calculation. For adults, the percentage TBSA for parts of the body is estimated by the rule of nines (1) Rule of nines (for adults) and (2) Lund-Browder chart (for children) for estimating extent of burns.); for smaller scattered burns, estimates can be based on the size of the patient's entire opened hand (not the palm only), which is about 1% of TBSA. Children have proportionally larger heads and smaller lower extremities, so the percentage TBSA is more accurately estimated using the Lund-Browder chart 2.2 (A) Rule of nines (for adults) and

2.2 (B) Lund-Browder chart (for children) for estimating extent of burns [7]. **Degrees of Burns**-There are four basic categories of burns, ranging from first to fourth degree, with fourth degree representing the most significant level of burn. **First Degree:** – these burns only affect the outer layers of skin. In most cases, first degree burns will appear as irritations on the skin, such as a bright red skin color or blotchy marks in the burned area. Usually, first degree burns will heal on their own, within about seven to ten days, although many victims of first degree burn find comfort in using soothing or medicating rubs, including aloe based products. The most common form of first degree burn is sunburn. **Second Degree:** – when the burn permeates through the first layers of skin and causes damage to the more substantial skin layers underneath, the burn will be classified as a second degree burn. In many cases, these burns will manifest as either clear or blood-filled blisters in the burned area. Most, though not all, second degree burns will leave scar tissue in the burned area. In some cases, skin grafting may be used to alleviate scar tissue. **Third Degree:** – these burns penetrate all the way through the outer layers of skin, and cause burn damage to the subcutaneous skin layers, which sit just above the muscle and bone. In almost all third degree burn cases, the burn will leave substantial scarring throughout the affected area, and will likely require skin grafts. In extreme cases, amputation may be necessary. **Fourth Degree:** – representing the most severe of all burns, a burn will be classified as fourth degree when it pierces through all layers of the skin and causes damage to the underlying muscle, bone, or internal organs. Treatment almost always requires amputation of the burned area, and in many cases, these burns cause death [8].

2. The Aim of the Study

To find out how the dry thermal burn affects prevalence, surface area, degree of burn, cause of death. To highlight problem regarding burn deaths victims.

3. Material and Method

Present prospective study was carried out on medico legal study of burn autopsy in varanasi, India, 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 for treatment then if death at Varanasi in different hospital occur then the dead body after inquest report 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 prevalence, surface area, degree of burn, cause of death.

4. Observations and Results

Table 1: Shows the distribution of number of burn cases during the study periods, total number of different autopsy victims were 3149, total number of burn autopsy were 600(19.05%), total number of burn cases recorded for study during this period were 450(14.29%), which forms a considerable bulk and draws attention to the grievousness of this problem. **Table 2:** Shows the distribution of burn cases on the basis of involvement of body surface area .In the present study it is observed that out of 450 studied cases, in 40.67% more than 91 % body surface area involved while in 8.67% cases 41-50% body surface was burnt.6.67% cases were seen with burn involving <40% of body surface in the present study. Thus the above observation reflects that the mortality in burn cases is directly proportional to the involved body surface area i.e. greater the burnt body surface area, maximum the mortality. It also indicates the improved health facilities in this region up to successfully manage burn cases with burnt area <50%, resulting in reduced incidence of mortality. **Table 3:** Shows the distribution of burn cases on the basis of degree of burn among study group (n=450). Fourth degree burn (Destruction of whole skin as per Dupuytren's classification) dermoepiderml (as Wilsons) involve majority of victims 416 cases i.e. 92.44%, followed by third degree burn cases 13i.e.2.89%. Sixth degree burn is most severe form of burn involves d 10 fatal cases i.e. 2.22% with involvement up to bone. First degree burn victims are nil. **FIGURE 1:** Shows that distribution of burn victim on the basis of cause of death among study group (N=450).It is observed that we find most common cause of death was septicemic shock in 259 cases i.e. 57.56%, followed by secondary shock (hypovolemic shock) cases 144 i.e. 32.00%. Death due to Primary shock 25 cases i.e. 5.56%, Toxemia 25 cases i.e. 3.56%, suffocation 6 cases i.e. 1.33%.

5. Discussion

5.1 Prevalence

In our study it is observed that prevalence of death due to fatal burns victims was 600 in number i.e. 19.05 % of total cases collected from 1 January 2013 to 30 June 2014, which are the second common 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 [9] 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 [10] 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 [11, 12].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 [9, 10]. 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 [13].

5.2 Body Surface Area

In the present study we found that the distribution of burn cases on the basis of involvement of body surface area .In present study it was observed that out of 450 studied cases, in 40.67% of cases more than 91 % area of body surface involved while in 8.67% cases 41-50% in body surface was burnt. 6.67% cases were seen with burn involving < 40% of body surface. Thus the above observation reflects that the mortality in burn cases is directly proportional to the involved body surface area i.e. greater the burnt body surface area, maximum the mortality. It also indicates the improved health facilities in this region up to successfully manage burn cases with burnt area <50%, resulting in reduced incidence of mortality.

Other studies found that maximum percentage of involvement of body surface burns was seen in females as compared to males in 26% cases. In males maximum 10% of cases suffered burn to the extent of 0-50%, followed by 8% cases suffering burns to the extent of 81-90%. In females, maximum, of 26% cases fell in the category of 91-100%. Equal numbers of cases, 6% each, were charred [14]. Other study [15] observed the mean age burn surface area of 63.3% leading to death irrespective of depth.

In the study conducted by [16], it was observed that maximum cases had burns involving limbs and trunk, next in order was involvement of head, face & neck and genitalia. Other study [17] found that burns of the trunk and head were more serious to life than burns of extremities and burns of the flexures and external genitalia carried a bad prognosis, if not to life then to health. Similar observations were observed in the current study. In the study of [18], percentage of burns

was up to 25% in 3 cases, between 25-50% in 32 cases, between 50-75% in 23 cases and was more than 75% of surface area in 42 cases. Maximum deaths due to burns were because of surface area involved in the burn injury. [15] Observed the mean age burn surface area of 63.3% leading to death irrespective of depth. Other study [19] finds that suicidal cases, the extent of burns ranged from 50% to 100% of body surface.

In the other previous study [20] revealed that in 75.1% cases, burns extend more than 60% of TBSA. In 78.6% of the females, burns cover more than 80% of TBSA as compared to 55.8% of males. This finding is consistent with the study of [21, 22]. It indicate that burns extending more than 60% of TBSA are usually fatal and mortality is higher in such cases though better treatment and care are provide to the patient.

5.3. Degree of Burn

Present work Shows the distribution of burn cases on the basis of degree of burn among study group (n=450).Fourth degree burn (Destruction of whole skin) dermoepidermal burn involved the majority of victims 416 cases i.e. 92.44%, followed by third degree burn cases 13 i.e. 2.89%. Sixth degree burn is most severe form of burn involves 10 fatal cases i.e. 2.22%.First degree burn victims are nil (only involvement of epidermis and it cause erythemas and is nonfatal).

Other study contradicts and found that 1st degree burns were suffered by 6% cases in male and 8% of cases in females. 2nd degree burns were seen only in females in 4% of cases. Maximum burns were of 3rd degree in which 28% males and 54% females sustained burns [14].

Other study [19] the predominance of 3rd and 4th degree burns in his 21cases study. [23] In his study observed that the depth of burns has no relation with the fatality, rather burns of 2nd and 3rd degrees of 57.3% body surface survived more than 16 days.

Majority of the cases [24] belonged to third-degree burns (69.45%), whereas the rest (30.55%) were first and second degree. Although first-degree burn was almost equally prevalent among male and female (10.58%, 10.79%), third-degree burn was more common among female than male (71.99%, 57.69%).

5.4. Cause of Death

In the present work we observed that distribution of burn death victim on the basis of cause of death among study group (N=450). It was observed that most common cause of death was septicemia shock in 259 cases i.e. 57.56% ,followed by secondary shock (hypovolumic shock) cases 144 i.e. 32.00%. Death due to Primary shock 5 cases i.e. 5.56%, Toxemia 25 cases i.e. 3.56%, suffocation 6 cases i.e. 1.33%. This was in accordance with the findings of the studies of other author's. Thus, infection leading to secondary complications and ultimately, multi organ failure was the major cause of death in the burn cases, which could be tackled with the use of better burn care facilities.

Other studies also find similar result that septicemia was observed to be a major cause of death (50%) among the deceased. It is also find that in 39.6 % cases; more than 90 % of the body surface area was involved. Only 3.2% of the deceased were seen with burns which involved <50% of the body surface area. Septicemia was observed to be a major cause of death (50%) among the deceased [25].

In the majority of these women, [26] shock was the cause of death and only two deaths could be attributed to etiologies other than directly related to the burn itself (i.e. sepsis). [27] Reported shock as the most frequent cause of death in their series, as did [28].

The [20] study revealed that most of the patients died within one week of incidence and septicemia was most common cause of death. This finding is similar to other studies [29,30]. Though better care and treatment is provided to the burn patients, infection especially hospital acquired involving large body surface area are difficult to control in peripheral hospitals which leads to septicemia deaths.

6. Conclusion

- 14.29% which forms a considerable bulk and draws attention to the grievousness of this problem.
- Body surface area and degree of burn significant affect burn death.
- Educating the people about safety measures through various programmes, television, and other media, warning label or cautionary information accompanying the sale of gasoline, kerosene or petrol into any container.
- Intersectorial coordination.
- Running anti-dowry campaigns.

7. Acknowledgement

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8. Funding Source

This research was not financially supported by any funding agencies.

9. 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.

10. Conflict of Interest

Nil

11. Tables and Charts

Table 1: Distribution of incidence of burn autopsy (N=450):

Total number of autopsy	Total number of burn autopsy	% of total number of burn autopsy	Total number of burn victims for study	% of total number of burn victims for study
3149	600	19.05	450	14.29

Table 2: Distribution of burn cases on the basis of surface area involved among study group (N=450):

surface area (in percent)	Total No. of cases	% of total cases
40	30	6.67
41-50	39	8.67
51-60	40	8.89
61-70	47	10.44
71-80	55	12.22
81-90	56	12.44
91-100	183	40.67
Total	450	100.00

Table 3: Distribution of burn cases on the basis of degree of burn among study group (n=450):

Degree of burn	Dupuytren's	Wilson's	Total No. of cases	% of total cases
Erythema	1°	Epidermal	0	0.00
Vesicle with blister	2°	Epidermal	5	1.11
Destruction of superficial skin	3°	Dermo-epidermal	13	2.89
Destruction of whole skin	4°	Dermo-epidermal	416	92.44
Destruction of deep fascia, muscle	5°	Deep	6	1.33
Involve vessels, nerve, bone	6°	Deep	10	2.22
Total			450	100.00

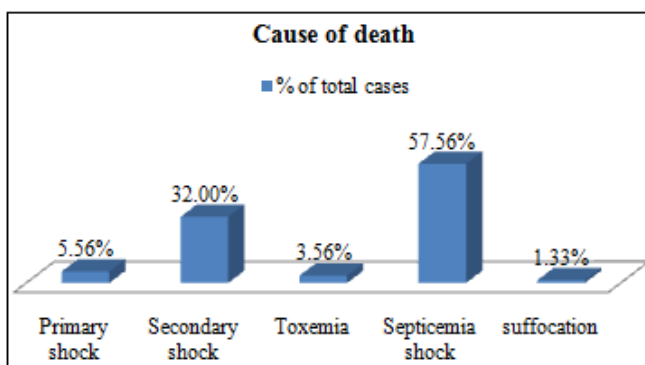


Figure 1: Column diagram shows distribution of burn victim on the basis of cause of death among study group (N=450):

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