

An autopsy study of fatal burn injuries in Dhaka Medical College

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Abstract:

Introduction: Burn deaths are an important public health problem in a developing country like Bangladesh. It is a considerable cause of death in Bangladesh. Females, rural dwellers and populations of low socioeconomic condition are more vulnerable to burn injury. **Objectives:** The purpose of this study was to record and evaluate the causes and the magnitude of the fatal burn injuries retrospectively. **Methods:** This retrospective cross-sectional study was conducted among the burn death victims at Dhaka Medical College, Dhaka Morgue, during the period of February 2019 – January 2020. **Result:** An analysis of autopsy records revealed 436 (10.92%) cases of burn injuries among the total 3993 autopsies done over 1-year period (February 2019 – January 2020) in the mortuary of Dhaka medical College. Among the total burn cases the flame burns were seen in 76.83% of the victims, out of these fires was the commonest cause (71.79%). The majority of deaths (22.02%) occurred between 31 and 40 years of age group with a preponderance of males (66.97%), male female ratio being 2.03:1. Most of the victims died from neurogenic shock (54.82%) followed by septicemia (23.39%). The majority of deaths occurred within a week (81.88%) and the percentages of burns (TBSA) over 50% were observed in most of the cases (83.03%). Accidental death was the most common manner of burn death accounting for 357 (81.88%) and the commonest location for burn deaths was home locations 283 (64.91%). Highest incidence of burn occurred in winter 183 (41.97%) regarding variations in burn injury with time of day, the incidence is high in night 235 (53.9%), day night ratio being 1:1.2. **Conclusion:** The results of this study provide the necessary information to address it as a public health problem and develop proper burn prevention programs, thereby reducing the frequency of burns and burn-related deaths.

Key words: Burn deaths, Flame burns, Neurogenic shock, Septicemia, TBSA

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Introduction:

Burn is commonly encountered in forensic pathology and sometimes provides a challenging problem in the distinction between ante-mortem and post-mortem burning, which may have serious criminal aspects¹. Burn injury is a common type of traumatic injury, causing considerable morbidity and mortality². Moreover, burns are also among the most expensive

traumatic injuries, because of long hospitalization and rehabilitation, and costly wound and scar treatment^{3,4}. Burns are injuries produced by application of dry heat such as flame, radiant heat or some heated solid substance like metal or glass to the body. Local injury to the body by heat may result from dry heat, application of hot bodies, licking by flames resulting in simple burns, moist heat leading to scalds, and

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corrosive poisons resulting in corrosive burns. Electric spark, discharges, flashes and lightening leads to electric burns⁵.

Burn injuries account for the greatest length of stay of all hospital admissions for injuries⁶. According to the World Health Organization, 238,000 individuals died of fire-related burns in 2000, and 95% of these deaths occurred in low and middle-income countries^{7,8}. The approach to burn prevention, to be effective in a particular area, should be based on a sound knowledge of etiological patterns of burn injuries and must take into account the geographical variations and socio-economic differences in burn epidemiology⁹.

As in other low-income countries, burns in Bangladesh are considered as major health problems that are associated with high mortality and morbidity. Dhaka, the capital of Bangladesh, is one of the most crowded cities in the world. The population of Greater Dhaka, according to the most recently published statistics is 21.005 million inhabitants.¹⁰

The aim of this study was to record and evaluate the causes and the magnitude of the fatal burn injuries retrospectively.

Materials and Methods:

This retrospective cross-sectional study was conducted among burn death victims at the Dhaka Medical College Morgue during the period of February 2019 – January 2020. Of the 3993 autopsies performed on all types of unnatural deaths between February 2019 – January 2020, 436 (10.92%) were the cases of burns. These 436 fatal burn cases form the material of this study. Various identification data of the study subjects were noted from the inquest report accompanying the dead bodies, information from the victim's attendants and 3rd copy of post mortem reports preserved in the Forensic Medicine Department of Dhaka Medical College. From ethical points of view necessary consent of doctors who performed the autopsies and relatives of victims have been taken. The data collection technique and approval were taken from Dhaka Medical College ethical clearance committee.

Results:

A total of 3993 cases of unnatural deaths were autopsied in DMC Morgue, number of deaths by burn were 436(10.92%). Among the total burn cases flame burn

was the commonest cause 335(76.83%), out of these fires was the commonest cause 313(71.79%) followed by electric burn 85(19.5%) (Table-1).

Table 1: Distribution of causative agents of burning (n=436)

Causative agents	No. of victim	Percentage
Fire	313	71.79%
Pouring of kerosene	22	5.04%
Electric burn	85	19.5%
Scald	00	00%
Chemical burn	16	3.67%
Total	436	100%

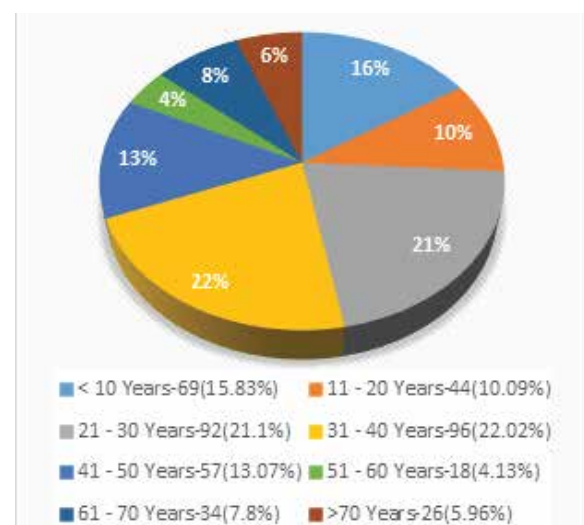
Among the burn deaths, 292(66.97%) out of 436 were male and 144(33.03%) were females with male female ratio being 2.03:1 (Table-2).

Table-2: Sex distribution of burn victims (n=436)

Sex	No. of victim	Percentage	Ratio Female : male
Male	292	66.97%	1 : 2.03
Female	144	33.03%	
Total	436	100%	

Highest incidence of burn was found in 31-40 years age group 96 (22.02%) (Figure-1) followed by 21-30 age group of 92 (21.1%).

Fig-1: Age distribution of burn victims (n=436)



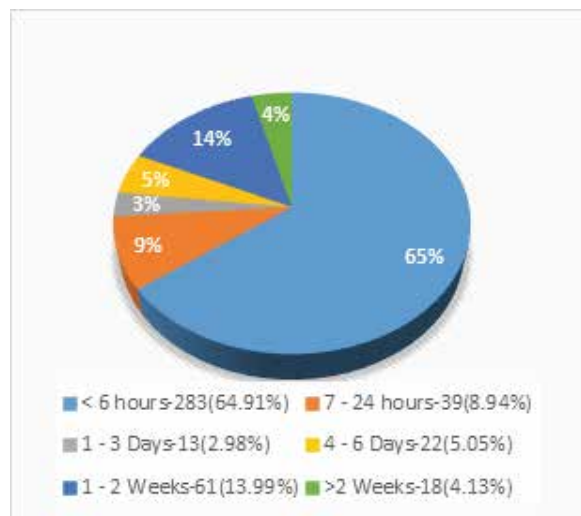
The study shows that majority of burn victims were died due to neurogenic shock 239 (54.82%) (Table-3) followed by septicemia 102 (23.39%).

Table 3: Cause of death in burns (n=436)

Cause of death	No. of victim	Percentage
Neurogenic shock	239	54.82%
Septicaemia	102	23.39%
Hypovolemic shock	52	11.93%
Asphyxia	26	5.96%
Multi organ failure	17	3.90%
Total	436	100%

The majority of deaths (81.88%) due to burns occurred within a week of the incident. During this period the maximum number of deaths were 283(64.91%), occurred within 6 hours. 61(13.99%) deaths occurred within 1-2 weeks post-injury period as shown in figure-2.

Fig 2: Duration of survive of the victim (n=436)



It was observed that the percentages of burns (TBSA) over 50% were in most of the cases (83.03%) and maximum number of victims 175(40.14%) were sustained 50-70% of total body surface area (TBSA) burns (Figure - 3) & (Table - 4) followed by 109(25%) victims sustained 71-90% total body surface area (TBSA) burns.

Fig 3: The median burn percent (TBSA) (n=436)

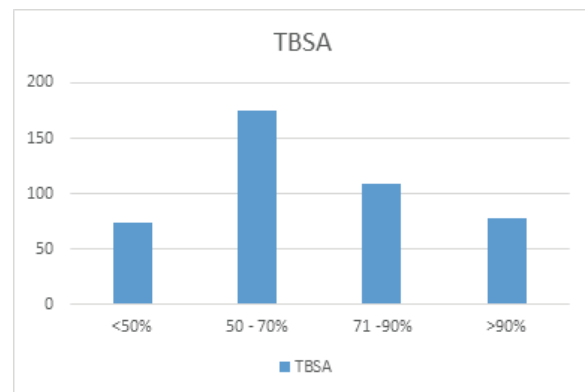


Table 4: Distribution of total body surface area (TBSA) (n=436)

TBSA	No. of victim	Percentage
<50%	74	16.97%
50 – 70%	175	40.14%
71 – 90%	109	25.00%
>90%	78	17.89%
Total	436	100%

Accidental death was the most common manner of burn death accounting for 357(81.88%) (Table-5) followed by suicidal death were 57(13.07%).

Table 5: Manner distribution of burn victims (n=436)

Manner	No. of victim	Percentage
Accidental	357	81.88%
Suicidal	57	13.07%
Homicidal	22	5.05%
Total	436	100%

Table-6 shows the commonest location for burn deaths was home locations 283(64.91%), followed by work locations 118(27.06%) and a small percentage in outdoor locations 35(8.03%).

Table 6: Burn victims in relation to location (n=436)

Manner	No. of victim	Percentage
Home	283	64.91%
Work place	118	27.06%
Outdoor	35	8.03%
Total	436	100%

Highest incidence of burn occurred in winter 183(41.97%) (Table-7), followed by summer 105(24.08%). Regarding variations in burn injury with time of day, the incidence is high in night 235(53.9%) more than day 201(46.1%) with day night ratio being 1: 1.2 (Table-8).

Table 7: Seasonal variation of burn deaths. (n=436)

Season	No. of victim	Percentage
Autumn	78	17.89%
Winter	183	41.97%
Spring	70	16.06%
Summer	105	24.08%
Total	436	100%

Table 8: Diurnal variation of burn deaths. (n=436)

Time of Day	No. of victim	Percentage	Ratio
Day	201	46.1%	Day : Night 1 : 1.2
Night	235	53.9%	
Total	436	100%	

Discussion: Burn is a problem prevalent worldwide, especially in developing countries^{11, 12}. Based on the available information regarding the incidence of burns and burn deaths, this should be considered as a significant problem in Bangladesh. Though there is no time trend in Dhaka Governorates, yet it constitutes 10.92% of the total deaths coming for autopsy at mortuary. In the present study, flame is the major cause of burns (96.33%), which is consistent with the study from Manipal¹³. The higher incidence of burn deaths among males (66.97%) was observed and the sex ratio being almost two times higher in male throughout the study period, while in Sri Lanka burn cases were observed to be more common among males in all age groups except in the elderly¹². Contrarily in India burn is the only unnatural cause in which female not only outnumbered the males, but the sex ratio being almost three times higher in female¹⁴. In the present study, about 66.28% of the victims were in the age group of 11–50 years with peak incidence between 21 - 40 years (43.12%), which are similar to the observation of Singh et al. from Chandigarh who

reported two thirds of fatal burn cases in the young age group (21–40 years)¹⁵. In other countries such as Iran 93% of burn victims were below 60 years with peak incidence between 16 and 25 years¹⁶.

Respiratory complications (pneumonia, ARDS, pulmonary embolism) are a major cause of death responsible for up to 34% among adults, and even up to 45% among the elderly^{17, 18}. In the present study, the major cause of death was neurogenic shock in 54.82% cases, followed by Septicemia – (23.39%), while septicemia was the leading cause of death as reported by Rahul et al. and Stefan^{19, 20}. Other causes were hypovolemic shock, asphyxia, multi organ failure, etc. as also mentioned in the result. In the current study, 73.85% cases died within a few minutes to 24 h, 8.03% cases within a week signifying that the burns are rapidly fatal. Similarly, Virendra et al. also reported death from burns within a week in 60.8% victims¹³. In the present series, the overwhelming majority (83.03%) of the victims had more than 50% of total body surface area (TBSA) burns indicating the incompatibility with life even at a tertiary care center. Similarly 80% mortality rate in burns over 40–50% TBSA has been reported from India¹³. Though the majority of the incidents are accidental in nature (81.88%), suicidal and homicidal cases were also observed. As noted with other studies, accidental burning was the commonest manner of deaths due to burning followed by suicidal and homicidal burning^{21, 22}. Regarding accident location, our study showed that the home ranked first (64.91%), followed by work, then outdoor locations. This comes in accordance with the findings of other reporter²³. Seasonal variations in our study showed that burn deaths occurred mostly in winter (41.97%) followed by summer. This might be due to the fact that, in winter, there is more need for hot water for bathing. The traditional kerosene stove; which is extensively used in the slum areas for cooking and providing the necessary boiling water for bathing; lacks any safety measures. Thus, it is condemned to be responsible for much of the flame and scald burns in

our country. This fact has been previously highlighted by the study from other low income country²⁴, and diurnal variation in our study showed that burn deaths occurred mostly at night (53.9%) and day night ratio being close almost (1:1.2), in which reports from developed countries had attributed winter peaks in hospital admissions to the greater use of heating during colder and longer nights²⁵.

Conclusion:

Burns have always been considered as one of the most destructive injuries, causing not only death but also major economic and psychological impacts and long-term somatic sequelae as well. Burns have always been considered as one of the most destructive injuries, causing not only death but also major economic and psychological impacts and long-term somatic sequelae as well. The present autopsy-based study has highlighted some important features pertaining to burn deaths in Bangladesh which provide the necessary information to address it as a public health problem and develop proper burn prevention programs, thereby reducing the frequency of burns and burn-related deaths. For prevention of burn incidence, we should take steps for improvement of public awareness by the concern authority, training of communities in first aid, modernized health equipment and proper implementation of law. Developed countries have made tremendous progress in lowering the rates of burn deaths, through a combined action of prevention strategies and improvement in the treatment pattern of burn affected people.

References:

1. Knight B, Pekka S. Knight's Forensic Pathology. 3rd ed. London: Arnold; 2004.p.312.
2. H. Sadeghi-Bazargani, H. Maghsoudi, F. Ranjbar, H. Mashadi-Abdollahi. Stress disorder and PTSD after burns injuries: a prospective study of predictors of PTSD at Sina Burn Center, Iran. *Neuropsychiatr Dis Treat*, 2011; 7: pp. 425-429
3. J.L. Sanchez, S.B. Pereperez, J.L. Bastida, M.M. Martinez. Cost-utility analysis applied to the treatment of burn patients in a specialized center. *Arch Surg*, 2007; 142: pp. 50-57.
4. R. de Roche, N.J. Luscher, H.U. Debrunner, R. Fischer. Epidemiological data and costs of burn injuries in workers in Switzerland: an argument for immediate treatment in burn centres. *Burns*, 1994; 20: pp. 58-60
5. Modi NJ, Injuries from burns, scalds, lightning and electricity. *Asphyxiants*. Modi's Text Book of Medical Jurisprudence and Toxicology. 20th Ed. Bombay: NM Tripathi; 1983: p. 182, 762.
6. M.H. Toon, D.M. Maybauer, L.L. Arceneaux, J.F. Fraser, W. Meyer, A. Runge, et al. Children with burns injuries – assessment of trauma, neglect, violence and abuse. *J Inj Violence Res*, 2011; 3(2): pp. 98-110.
7. World Health Organization. Injury: A leading cause of the global burden of disease, 2000. World Health Organization: Geneva; 2002.
8. S.N. Forjuoh. Burns in low- and middle-income countries: a review of available literature on descriptive epidemiology, risk factors, treatment, and prevention. *Burns*, 2006; 32(5): pp. 529-537
9. C.C. Liao, A.M. Rossignol. Landmarks in burn prevention. *Burns*, 2000; 26(5): pp. 422-434
10. Bangladesh Bureau of Statistics: World Urbanization Prospects; 2018. P. 36. Dhaka
11. Ahuja RB, Bhattacharya S. Burns in the developing world and burn disasters. *British Medical Journal*, 2004, 329:447-449.
12. Lau YS. An insight into burns in a developing country: A Sri Lankan experience. *Public Health*, 2006, 120:958-965.
13. K. Virendra, K.M. Manoj, K. Sarita Fatal burns in Manipal area: a 10-year study, *J Forensic Leg Med*, 2007; 14: pp. 3-6
14. N.A. Vipul, V.G. Hemant. Study of burn deaths in Nagpur, Central India. *Burns*, 2006; 32: pp. 902-908
15. D. Singh, A. Singh, A.K. Sharma, L. Sodhi. Burn mortality in Chandigarh zone: 25 years autopsy experience from a tertiary care hospital of India. *Burns*, 24 (1998), pp. 150-156

16. K. Soltani, R. Zand, A. Mirghasemi. Epidemiology and mortality of burns in Tehran, Iran. *Burns*, 1998; 24: pp. 325-328
17. M.F. Khadim, A. Rashid, B. Fogarty, K. Khan. Mortality estimates in the elderly burn patients: the Northern Ireland experience. *Burns*, 2009; 35: pp. 107-113
18. K. Rao, S.N. Ali, N.S. Moiemem. Aetiology and outcome of burns in the elderly. *Burns*, 2006; 32: pp. 802-805
19. C. Rahul, C. Ashok, R. Hukumat, A.D. Aggarwal, S. Harnam, S. Gaurav. Clinico-Pathological profile in deaths due to burns. *J Indian Acad Forensic Med*, 2011; 33: pp. 971-973
20. J. Stefan. Burn Injuries: contemporary and previous findings. *Soud Lek*, 2004; 49(4): pp. 57-62
21. A.K. Batra. Burn mortality: recent trends and sociocultural determinants in rural India. *Burns*, 2003; 29: pp. 270-275
22. R.V. Kachare, K.D. Chavan, S.K. Goli. Analytical study of medicolegal deaths in rural region of Beed district of Maharashtra. *J ML Assoc Maharashtra*, 2003; 15: pp. 14-17
23. R. Anlatici, O.R. Ozerdem, C. Dalay, E. Kesiktas, S. Acarturk, G. Seydaoglu. A retrospective analysis of 1083 Turkish patients with serious burns. *Burns*, 2002; 28: pp. 231-237
24. Sanghavi P, Valla K, Das V. Fire Related Deaths in India in 2001 – A Retrospective Analysis of Data. *Lancet*, 2009; 373(9671): pp1282-88.
25. Peck Md. Epidemiology of Burns throughout the World. Part 1: Distribution and Risk Factors of Burns. *Journal of the International Society for Burn Injuries*. 2011; 37(7): pp1087-1100.