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Study of the Total Body Surface Area involved Vis-a-vis Morbidity/Mortality due to Thermal Injuries

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Abstract

Burn injury cases are one of the common emergencies admitted to any hospital. There are several social, economical, cultural and psychological factors interplaying which influence the treatment and management. Burns during pregnancy influence maternal as well as fetal outcome. Fire was perhaps, man's first double–edged sword, throughout history it has served as well as destroyed mankind.

Burns constitute a major cause of death and morbidity whatever reason may be, in the world and in this country too. Burns always have posed a threat to the sensitive human body. The loads of overpopulation, illiteracy, poor standards of safety at home further add to overwhelming rise in burn incidents. As everywhere else, the modes of sustaining burn injuries in India are the same i.e. flames, scalds, electrical. Dowry deaths by burns are most common in India and at the same time accidental burns in females also occur often while cooking food in their kitchen.

This study was carried out in the Department of Forensic Medicine and Toxicology, in association with Department of Surgery, S. P. Medical College & P.B.M. Hospital, Bikaner (Rajasthan).

Keywords: Burn injury, Lund and Browder Charting, Total body surface area

Introduction

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The loads of overpopulation, illiteracy, poor standards of safety at home and in the industry further add to overwhelming rise in burn incidents. As everywhere else, the modes of sustaining burn injuries in India are the same i.e. flames, scalds, electrical.[2]

Dowry deaths by burns are most common in India and at the same time accidental burns in females also occur often while cooking food in their kitchen.

Electrical burn injuries represent a special type of problem; it is one of the most devastating injuries and is attended by high morbidity and mortality rates.

Aims and Objectives

This study was carried out with the aims and objectives of, to study:

1. The onset of fire.
2. The pattern of burn injuries in relation to age and gender.
3. The pattern of burn injuries in relation to marital status and types of burns.
4. The manner of burn injuries.
5. The pattern of burn injuries in relation to manner of burns and area of the body burnt
6. To determine the maternal and fetal outcome in relation to burn and gestational age of fetus.
7. To analyze etiological factors and mortality of burn victims.

Material and Methods

The present prospective study was carried out in the Department of Forensic Medicine and Toxicology, in association with Department of Surgery, S. P. Medical College & P.B.M. Hospital, Bikaner (Rajasthan); on 200 burn patients brought to the surgery department.

The cases were confined into: Flame Burns, Scalds, Electrical burns, Corrosive burns.

The information was collected from the patients, accompanying relatives, hospital records to ascertain the incidence, manner and circumstances of burns. The data was collected on the basis of age, gender, percentage of burn area over the body surface, gestational age, maternal and fetal outcome.

The percentage of the total body surface area burns (TBSA) was estimated by the method of Lund and Browder chart. A meticulous examination of the total body surface area involved was done. The data was collected in a standard predetermined proforma for this study. The cases with incomplete data were excluded. On the basis of analysis and observation, results were drawn and discussed and compared with other relevant literatures.

Observations

This medico-legal study carried out on 200 patients of burns from August 2012 to January 2014 showed that most common type of burn was flame burn 144 (72%), followed by electrical burn 41 (20.5%) and scalds 15 (7.5%). There were no cases reported of corrosive burns. (Table 1)

Present study demonstrated preponderance of female 111 (55.5%) patients over male 89 (44.5%) patients. Collectively Age group 21–30 years (41%) was most commonly affected followed by 31–40 years (21.5%). Least number of patients is less than 1 year. The minimum age to suffer burns was 7 months and maximum age was 75 years. (Table 2)

Collectively, in our study 30.5% of cases fell in 26%-50% of TBSA burns involved followed by 29% of cases in up to 25% of TBSA burns involved. These two groups constitute 59.5% of the total number of cases. (Table 3)

In this study there were five pregnant burn patients in the age group of 16-30 years. Gestation age varied from 12 weeks to 28 weeks, with one case in the first trimester, two cases were in the second trimester and two cases were in the third trimester.

Maternal deaths were two due to burns. One maternal death was due to 26% to 50% of TBSA burns while another was due to 51% to 75% of TBSA burns. The maternal death was after the fetal death, which was caused eventually due to burns caused to the mother. (Table 4) Most of the burns were caused by kerosene stove (25.29%), followed by electrical burn (24.11%),

open *chullha* (8.82%), hot liquid (8.82%), Gas stove (7.05%), and gas leakage & kerosene lamp (5.29%) in our study. (Table 5)

Out of the total 200 burn patients examined, the largest number 171 (85.5%), had accidental burns followed by 10 (5%) of homicidal burns and 15(7.3%) of patients committed suicide by burning themselves.

In 4 (2%) burnings, manner of burn could not be determined. In this study total 15(7.5%) patients were found to be used kerosene/petrol/diesel as an accelerant for suicidal purpose. 100% burns were not found in any patient. (Table 6)

Present study showed that Upper limb 181(90.5%) were most commonly affected followed by abdominal 164 (82%) region of the body. (Table 7) It was evident from this study hat mortality in burns up to 25% TBSA was 1%, for 26 to 50% TBSA, it was 13.4%, for 51 to 75% TBSA, it was 23.7% and it was 62.19% for patients with 76% to 100% TBSA burns. (Table 8)

Discussion

The present study demonstrated preponderance of female 111 (55.5%) victims over male 89 (44.4%) victims which also reported by other researchers.[2-7]

The maximum cases of burns were seen in the age group of 21-30 years comprising of 41% cases out of which 16% were males and 24% were females, which is similar to most of the other studies by various authors.[4,8,9,10] Surprisingly the age group of up to 10 years was also not spared. Flame burns being most common type is also reported by other workers.[10,11]

Maximum number of patients was from rural area (71.5%) than from urban area (28.5%). This is in accordance with the Sinha et al study[12] which showed the rural preponderance probably due to style of living and low socio–economic status. Use of *chullha*, stove for cooking were seen more in rural than in urban areas. There is great rush of migratory population in the urban areas who still use stoves in the kitchen and majority of cases reported belong to poor socio–economic strata females catching fire.

There were 17 patients in which TBSA burned involved was estimated by Rule of nine to be 50–60 percent but Lund and Browder Chart TBSA ranged from 10 to about 40 percent.

Two of the individuals were reported having 65–70% burns as per rule of Nine but they had only 40%–49% burns as per Lund and Browder chart. One individual had 66% burns as per rule of nine but had only 28% of TBSA burns as per Lund and Browder chart.

Mortality increased with burns more than 25% of total body surface area and was maximum with burns more than 50%, Which is consistence with study of Rayburn et al and Cheah SH.[13,14]

Electric burn injuries affected men more than women. This is in unison with the study of Ding et al.[15]

Conclusion

Burns injuries have been a major cost of concern since pre historic days to the present era of modern medicine. Most of the burns were domestic accidents and are therefore preventable.

The approach to prevention may be accomplished by Education and awareness campaign in risk groups i.e. housewives, children and elderly persons and passing legislation for proper safe guards in household appliances, legislation for electric theft and use of less flammable garments. Safety measures and primary treatment of burn should be included in school curriculum.

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Legend Tables

Table 1: Cases According to Types of Burns

Types of Burns	Cases	Percentage (%)
Flame	144	72
Scalds	15	7.5
Electrical	41	20.5
Corrosive	0	0
Total	200	100

Table 2: Age and Gender wise Distribution

Age(Yrs)	Male (%)	Female (%)	Total
0-1	1(1.12)	1(0.90)	2(1)
1-10	7(7.87)	6(5.4)	13 (6.5)
11-20	17(19.10)	19(17.11)	36(18)
21-30	29(32.58)	53(47.74)	82(41)
31-40	22(24.72)	21(18.92)	43(21.5)
41-50	6(6.74)	7(6.31)	13(6.5)
51-60	1(1.12)	2(1.80)	3(1.5)
>60	6(6.74)	2(1.80)	8(4)
Total	89(44.5)	111(54.5)	200(100)

Table 3: Burn Extent in Relation to Gender

TBSA Burns (%)	Male (%)	Female (%)	Total (%)
Up to 25	36 (40.44)	22 (19.8)	58 (29)
26-50	25 (28.09)	36 (32.43)	61(30.5)
51-75	7 (7.8)	21 (18.91)	28 (14)
76-100	19(21.34)	34 (30.63)	53 (26.5)
Total	89 (44.5)	111 (55.5)	200 (100)

Table 4: Burn Extent in First (F) Second (S) & Third (T) Trimester of Pregnancy cases

Burn (%)	Cases			Cases who aborted			Maternal Deaths		
	F	S	T	F	S	T	F	S	T
Up to 25	1	1	0	0	0	0	0	1	0
26-50	0	1	1	0	0	1	0	0	0
51-75	0	0	1	0	0	1	0	0	1
76-100	0	0	0	0	0	0	0	0	0
Total	1	2	2	0	0	2	0	1	1

Table 5: Etiology of Burn

Causes		Male (%)	Female (%)	Total (%)
Gas leakage		1(1.35)	8(8.33)	9(5.29)
While Cooking on	Gas Stove	1(1.35)	11(11.45)	12(7.05)
	Kerosene Stove	13(17.56)	30(31.25)	43(25.29)
	Open Chullha	4(5.4)	11(11.45)	15(8.82)
Kerosene stove burst		2(2.7)	2(2.08)	4(2.35)
Kerosene lamp		4(5.4)	5(5.2)	9(5.29)

Electrical burn	37(50.0)	4(4.1)	41(24.11)
Suicidal burn by Kerosene	5(6.7)	3(3.12)	8(4.7)
Burned by Husband	NA	1(1.0)	1(0.5)
Burned by In laws	0	7(7.29)	7(4.11)
Burned by a known Person	0	2(2.08)	2(1.17)
Undetermined	1(1.35)	3(3.12)	4(2.35)
Hot Liquid	6(8.1)	9(9.37)	15(8.82)
Total	74(43.52)	96(56.47)	170

Table 6: Manner of Burn Injury

TBSA involved (%)	Homicidal (%)	Suicidal (%)	Accidental (%)	Undetermined (%)	Total (%)
0-24	4(40)	2(13.33)	55 (32.16)	0	61(30.5)
25-30	2(20)	0	10(5.85)	0	12(6)
31-40	0	1(6.67)	25(14.62)	1(25)	27(13.5)
41-50	0	2(13.33)	17(9.94)	0	19(9.5)
51-60	0	0	11(6.43)	0	11(5.5)
61-70	1(10)	1(6.67)	7(4.09)	0	9(4.5)
71-80	0	2(13.33)	12(7.02)	1(25)	15(7.5)
81-90	2(20)	2(13.33)	23(13.45)	1(25)	28(14)
91-99	1(10)	5(33.33)	11(6.43)	1(25)	18(9)
100	0	0	0	0	0
Total	10(5)	15(7.5)	171(85.5)	4(2)	200

Table 7: Distribution of Burns on the Body

Body Regions	Involved (%)	Spared (%)
Head & Neck	18 (9%)	182(91%)
Chest	163(81.5%)	137(68.5%)
Abdomen	164(82%)	36(18%)
Back	128(64%)	72(36%)
Upper Limb(Right & Left)	181(90.5%)	19(9.5%)
Lower Limb(Right & Left)	157(78.5%)	43(21.5%)
Genital	156(78%)	44(22%)

Table 8: Mortality According to Burn extent in Relation to Gender

TBSA Burnt (%)	Male (%)	Female (%)	Total (%)
Up to 25	1(5.55)	0(0)	1(1.21)
26-50	4(22.22)	7(10.93)	11(13.41)
51-75	1 (5.55)	18(28.12)	19 (21.95)
76-100	12(66.66)	39(60.94)	51(62.60)
Total	19 (21.34)	62(55.85)	81(40.5)
Total Burn Cases			200