A STUDY OF EPIDEMIOLOGICAL ASPECTS OF BURN INJURIES

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ABSTRACT

A study was conducted of the epidemiological aspects of 500 fresh cases of burns during the period February to August 1989. Women in the reproductive age group from the lower socioeconomic strata were the most frequently victims (52.8%). Four hundred and thirteen (82.5%) patients sustained accidental burns, 62 (12.4%) were suicidal and 25 (5%) homicidal. Majority (72%) of the accidents occurred as a consequence of garments catching fire. Though most of the subjects wore cotton garments, mortality was higher among those wearing synthetic fabric. Low socioeconomic conditions, overcrowding in the house, floor-level cooking, unsafe cooking appliances and the prevalent clothing pattern stand out prominently as risk factors for burn injury.

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KEY WORDS : Burns; Epidemiology; Risk factors.

Introduction

Ever since man first learnt to make fire, burns have become one of the most common and serious injuries [1]. The public health importance of burns lies as much in their high incidence and mortality as in the prolonged, painful and expensive treatment and the disabling sequelae with which they are often associated. Prevention of burns becomes feasible only when the risk factors are known. Experiments dealing with the aetiology of burns are not easy to perform due to ethical reasons [2]. Under such circumstances the present study of the epidemiology of burns is a step in the direction of identifying important risk factors for burn injuries.

Material and Methods

This is an observational study of 500 consecutive fresh admissions to the burn unit of Sassoon General Hospital, Pune, during the period February to August 1989. The size of the study population was preplanned. A schedule was prepared and tested on 50 cases who were later included in the study. The patients were interviewed by the authors, as soon after their admission as possible, to elicit history of the incident and its antecedent

factors. Note was also made of the clinical condition, extent and depth of burns, type of clothing, and presence of other medical conditions. The patients were followed-up till their discharge or death. The relevant information was recorded on the pretested schedule and later analyzed using a qualitative test of significance (chi square test) where necessary.

Results

Of all the hospital admissions during the study period 1.8 per cent were accounted for by burns. Burn injuries contributed 15.4 per cent of all hospital deaths during the period. The median extent of burns sustained was 61 per cent of the body surface area. Upper limbs were affected in 79 per cent cases, the chest in 69 per cent, head and neck in 68 per cent, and back and perineum in 47 per cent. The case fatality ratio was 66.4 per cent.

The age and sex distribution of the patients is given in Table 1. The median age of our study population was 27 years and 8 months. Children, arbitrarily defined as those aged less than 15 years, constituted 9.2 per cent, adult males 26.8 per cent and adult females 64 per cent of all cases. Most (82%) patients were in the age group of 15-44

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years. Mortality among females was significantly higher than among males (chi square=51.768, df=1, $p<0.001$). Males aged 45 years and above suffered higher mortality (chi square=6.598, df=1, $p<0.025$). Among female patients highest mortality was observed in the age group of 15-24 years.

The occupation of burn patients is shown in Table 2. About 57.4 per cent of all patients were housewives. The second largest group was of unskilled workers (17.6%). Seventeen children were also working, majority as unskilled workers. Many (55.6%) of our subjects were illiterate. Fifteen per cent had been educated between 1st and 5th standard. The rest (29.4%) had secondary level or higher education. The per capita income of 39.2 per cent of our subjects was less than Rs 100 per month.

Eighty nine percent of the victims had been in good health before the incident. Thirty one patients (6.2%) had consumed alcohol, 10 (2%) gave history of seizures, 6 women were pregnant and 3 subjects had other medical problems as antecedent factors.

Response of the rescuer was adjudged appropriate (e.g. stop, drop & roll or pour water) in only 4.6 per cent of the cases and inappropriate (running, trying to put out fire by hands, applying oil, ink, etc.) in the remaining 95.4 per cent. Mortality among the former group was 43.5 per cent while in the latter group it was higher (67.5 per cent).

Victims came in almost equal proportions from rural areas, urban slums and other urban areas. Most of the accidents (95.2%) were domestic. Only 2.2 per cent of burns occurred at the work

TABLE 1
Age and sex distribution of burn cases

Age (years)	Male			Female			Total		
	No of cases	Deaths	Mortality %	No of cases	Deaths	Mortality %	No of cases	Deaths	Mortality %
< 5	14	1	7.1	10	1	10.0	24	2	8.3
5-14	8	1	12.5	14	6	42.9	22	7	31.8
15-24	29	14	48.3	128	108	84.4	157	122	77.7
25-34	56	28	50.0	122	92	75.4	178	120	67.4
35-44	30	14	46.7	45	31	68.9	75	45	60.0
45-54	8	5	62.5	11	10	90.9	19	15	78.9
55-64	5	4	80.0	8	7	87.5	13	11	84.6
≥ 65	6	5	83.3	6	5	83.3	12	10	83.3
Total	156	72	46.2	344	260	75.6	500	332	66.4

TABLE 2
Occupation of burn patients

Occupation	Children		Adult males		Adult female		Total	
	Cases	%	Cases	%	Cases	%	Cases	%
Professional	—	—	1	0.2	6	1.2	7	1.4
Clerical/shop owner	—	—	15	3.0	6	1.2	21	4.2
Skilled worker	—	—	19	3.8	—	—	19	3.8
Semi skilled	—	—	39	7.8	—	—	39	7.8
Unskilled worker	13	2.6	57	11.4	18	3.6	88	17.6
Domestic Servant	4	0.8	—	—	3	0.6	7	1.4
Unemployed	29	5.8	3	0.6	—	—	32	6.4
Housewife	—	—	—	—	287	57.4	287	57.4
Total	46	9.2	134	26.8	320	64.0	500	100

place and involved adult males. The remaining 2.6 per cent occurred at other places such as road side, play ground, public park and involved children as well as adult males. Eighty three per cent of domestic burning accidents occurred in the kitchen.

Distribution of cases according to the time of occurrence in a 24-hour cycle showed a double peak, the first between 9.00 a.m. and 12.00 noon and the other between 6.00 p.m. and 8.00 p.m.

The types of burns sustained by our subjects is given in Table 3. Children suffered scalds as well as flame burns while the adult patients suffered mainly flame burns. Mortality due to flame burns was high (70.4%).

Table 4 gives the mode of sustaining burn injury. Four hundred and thirteen cases (82.6%) sustained accidental burns. In 250 cases the source of fire was a kerosene pressure stove. The proportion of suicidal and homicidal burns in our study were 12.4 per cent and 5 per cent respectively. Three

hundred and sixty cases (72%) sustained burns because their clothes caught fire. Of these 47.4 per cent were wearing long loose flowing garments such as sarees, petticoats, lungis while 15.6 per cent were wearing clothes reaching down to the knee only (e.g. kurta, frock, skirt) and 9 per cent wore short fitting dresses (e.g. shirts, blouses, vests). Majority of these persons wore cotton fabrics (64.2%). Mortality was higher among wearers of synthetic fabrics (78.2%) than of cottons (62.8%).

Approximately two thirds of the patients (65.8%) came from nuclear families and 32.4 per cent from joint families. Only nine adults (1.8%) were staying single. Sixty five per cent of the victims were staying in kutcha houses. In 87.2 per cent of the cases over-crowding was present in the house. In 94.5 per cent houses cooking was practised at floor level. Kitchen and living rooms were common in 81 per cent cases.

TABLE 3

Distribution of cases according to the type of burn

Type of burn	Children		Adult males		Adult Females		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Flame burns	21	6	122	65	317	253	460	324
Scalds	24	3	4	—	3	—	31	3
Electrical burns	—	—	7	5	—	—	7	5
Contact burns	1	—	—	—	—	—	1	—
Chemical burns	—	—	1	—	—	—	1	—
Total	46	9	134	70	320	253	500	332

TABLE 4

Mode of burn cases

Mode of burn	Adult males		Adult females		Children		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Death
Accidental	90 (18.0)	40 (12.0)	277 (55.4)	221 (66.6)	46 (9.2)	9 (2.7)	413 (82.6)	270 (81.3)
Suicidal	34 (6.8)	29 (8.8)	28 (5.6)	22 (6.6)	—	—	62 (12.4)	51 (15.4)
Homicidal	10 (2.0)	1 (0.3)	15 (3.0)	10 (3.0)	—	—	25 (5.0)	11 (3.3)
Total	134 (26.8)	70 (21.1)	320 (64)	253 (76.2)	46 (9.2)	9 (2.7)	500 (100)	332 (100)

(Figures in parentheses show percentage of total cases or deaths)

Discussion

The proportional admission rate for burns of 1.8 per cent in our study may appear lower than some studies [3] but was responsible for over 15 per cent deaths in the hospital. Besides, it represents only the tip of the iceberg as many patients of burns are treated either as outpatients or in private hospitals.

Involvement of children and elderly patients was not as common as reported by studies abroad [4-6]. A rather high incidence of burn injuries among women of reproductive age group has also been reported by other Indian studies [7,8]. We found higher mortality among female subjects ($p < 0.001$). Whether this is due to their dressing pattern or social factors needs further study. Inverse relationship of the socioeconomic status and the incidence of serious burns is now universally known. In our study the housewife tops the list of occupations affected.

Higher incidence of patients from overcrowded kutch houses with floor level cooking practice may be merely a reflection of low level of education and income of our patients or it may well be the intermediate factor relating socioeconomic status to the incidence of burn injuries.

In our study departure from health was not a significant finding. The proportion of suicidal and homicidal burns observed by us was higher than that reported in earlier studies [4,9]. Flame burns are recognized as the most common and serious burns. Cooking appliances were the commonest source causing flame burns. The conventional kerosene pressure stove was found to be responsible for half of all the burn cases. These findings in the light of the fact that in Indian homes the kitchen is the domain of the female sex explains the higher morbidity and mortality of burn injuries in women. Long, loose, flowing garments like sarees, chunnis, lehngas easily reach out to the unsafe cooking appliances burning on the floor in an overcrowded kitchen. Synthetic fabrics are cheap and easy to maintain as compared to cotton but burn faster and inflict more extensive burns. This explains higher mortality among the victims who wore synthetic fabric.

Tissue injury due to accumulated heat can con-

tinue for some time even after the flame is put off. This is the reason why first aid of burns is important and it has been indirectly substantiated by our finding that mortality was higher in those cases where the rescuers response was inappropriate.

Thus the female sex, low level of education and income, overcrowding, floor level cooking, unsafe cooking appliances, wearing of long loose garments made of highly flammable fabric and inappropriate response of the rescuer to the burning process stand out as prominent risk factors for burns morbidity and mortality. Even though many aspects of the epidemiology of burn injuries remain obscure, preventive programs should be formulated based on the knowledge gathered by studies conducted so far. These preventive programmes should be multipronged using education, research, and legislation. People need to be educated to adopt safer appliances and practices and on the first aid of burns. Manufacturers of cooking and other heating appliances need to be educated and motivated to make their products safe for the users.

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