

Epidemiological data of patients hospitalized with burns and other traumas in some cities in the southeast of Brazil from 1991 to 1997

D.A. De-Souza^{a,f}, A.R.X. Manço^b, W.G. Marchesan^{c,d}, L.J. Greene^{a,e,*}

^aCentro de Química de Proteínas, ^bDepartamento de Medicina Social, ^cUnidade de Queimados, ^dDepartamento de Cirurgia, ^eDepartamento de Biologia Celular, Molecular e Bioagentes Patogênicos, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Av. Bandeirantes 3900, Ribeirão Preto 14049-900, S.P., Brazil

^fDepartamento de Clínica Médica, Faculdade de Medicina, Universidade Federal de Uberlândia, Uberlândia 38400-902, M.G., Brazil

Accepted 6 September 2001

Abstract

This retrospective analysis of burn patients and victims of other forms of trauma from Ribeirão Preto and nearby cities admitted to hospitals in the city of Ribeirão Preto, São Paulo, Brazil, was carried out to determine the frequency of injuries of all types in order to identify the extent of the problem of burns relative to other forms of trauma. Data concerning 921 patients with burns and 60,344 patients with other traumatic injuries hospitalized during the period from 1991 to 1997 are described. Burns corresponded to 1.5% of the total number of traumatic injuries. When data are reported as absolute numbers or as incidence rate of hospitalized burn patients, burns were two times more frequent among men in most age groups. The case fatality ratio due to burns was 8.4% (77 deaths among 921 patients), with a rate of 6.4% for men and 12.2% for women. The case fatality ratio was higher among women than men regardless of the city of residence. The case fatality ratio was 3.2 and 4.4 times greater for men and women burn victims from other towns than for burn victims from Ribeirão Preto, indicating the need for additional equipment and training of medical and paramedical personnel in the initial measures to be taken with burn patients. © 2002 Elsevier Science Ltd and ISBI. All rights reserved.

Keywords: Epidemiological data; Burns and other traumatic injuries; Fatality ratio

1. Introduction

The present study concerns burn patients and victims of other forms of trauma admitted to hospitals in the city of Ribeirão Preto, São Paulo, Brazil. These hospitals provide services to a population of approximately one million in a region where large sugar cane plantations are dedicated to the manufacture of alcohol. A large number of accidental burns occur in the boilers of alcohol factories and in field burning operations for the pretreatment of sugar cane before harvesting. Accidental burns due to exploding and burning plastic alcohol bottles during the lighting of charcoal fires for barbecues and to other domestic accidents are probably the result of easy access to alcohol and other flammable liquids. Other common forms of traumas such as automobile, truck and motorcycle and occupational accidents as well as attempted homicides and suicides with firearms, knives and pointed instruments or by poisoning are also quite common. Despite the high frequency of factors predisposing to traumas,

few preventive measures have been taken, with a virtual absence of educational campaigns for the population.

The present retrospective survey was carried out to determine the frequency of injuries of all types during the period from 1991 to 1997 in order to identify the extent of the problem of burns relative to other forms of trauma. In the present study, we calculated the incidence rate of hospitalized burn patients, which corresponds to the risk a person has to be hospitalized for this type of injury in relation to the population of the same age range and of the same gender. We also calculated the case fatality ratio for burn patients from Ribeirão Preto and from other towns admitted to Ribeirão Preto hospitals. The determination of baseline values identified from these epidemiological data will permit the evaluation of the effects of preventive measures and a comparison of these results with those obtained in other services [1].

2. Patients and methods

Data referring to 921 patients with burns (413 residents of Ribeirão Preto and 508 residents of other cities) and to

* Corresponding author. Fax: +55-16-633-2119.
E-mail address: ljgreene@fmrp.usp.br (L.J. Greene).

60,344 patients with traumatic injuries (35,499 residents of Ribeirão Preto and 24,845 residents of other cities) caused by lesions and poisoning (all traumas) are described. Data were obtained by analysis of the records of the Center for Hospital Data Processing (CHDP) of the Department of Social Medicine, Faculty of Medicine of Ribeirão Preto, University of São Paulo (FMRP-USP). This Center records data concerning admissions to the University Hospital of FMRP and other hospitals in the city of Ribeirão Preto and surrounding region. The hospitals participating in the agreement with the CHDP complete hospital discharge forms and daily census forms for hospitalized patients. Once a month, a trained CHDP employee visits each hospital participating in the agreement in order to compare (and to correct, if necessary) the data recorded on these two forms. The data from the discharge form are then coded, entered into the computer and again checked by CHDP employees. Each hospital receives a monthly report containing the data from the hospital discharge form filed in the CHDP.

In the present study, we considered only the data concerning the first or the only admission to Ribeirão Preto hospitals due to burns or to other forms of trauma for each year during the period from 1991 to 1997. If a patient was admitted to a hospital for additional treatment of the first burn or for a new burn during subsequent years, the data was included in the study. For the rare cases in which the second (or subsequent) burn episode occurred during the same year as the first burn, the data were not included in the study.

A large number of patients with more severe burns and/or complications are transferred from towns in the region for specialized treatment at the Burn Unit of the University Hospital of FMRP, a tertiary care reference center for burn patients. This unit, which provides care to a population of one million people over an area of 47 km², has 16 beds and two operating rooms and is staffed by five plastic surgeons, six nurses, 16 nurse's aides, one physiotherapist, as well as one part time nutritionist and one part time psychologist.

In order to improve the quality of the data presented here and to permit their comparison with those obtained in other services, in the present study, we calculated the incidence rate of hospitalized burn patients and case fatality ratio. Data concerning the population residing in the municipality of Ribeirão Preto in 1991 and 1996 (Table 1) were obtained from DIPEC-IBGE/São Paulo, Brazil [2]. To determine the incidence rate of hospitalized burn patients for a given year during the period of study, we calculated the monthly growth rate for the population of the municipality of Ribeirão Preto. In the present study, this rate corresponded to the difference between the number of people residing in the municipality of Ribeirão Preto in September 1996 and in September 1991 (month when census data were published), divided by the number of months in this time interval (60 months). The population residing in the municipality of Ribeirão Preto, for example, in July 1993 was considered to be equal to the number of people recorded by the census in 1991 plus the difference of the number of months during this period (July 1993

Table 1
Population residing in the municipality of Ribeirão Preto in 1996^a

Age (years)	Gender		Total
	Male	Female	
0–9	36692	38348	75040
10–19	44563	45181	89744
20–29	39794	38425	78219
30–39	39279	35734	75013
40–49	30149	27317	57466
50–59	19646	17040	36686
60–69	13810	11437	25247
70 and above	10528	6910	17438
Total	234461	220392	454853

^a Data from [2].

to September 1991, that is for 22 months) multiplied by the monthly population growth rate. Similar calculations were carried out for the identification of number of persons per age range and gender for each year of the period under study.

The incidence rate of hospitalized burn patients corresponds to the ratio of the number of hospital admissions due to burns per age range, per gender, per year to the number of persons in the same age range and of the same gender residing in the same municipality during the respective year, multiplied by 10,000. The incidence rate of hospitalized burn patients represents only part of the burn incidence rate, because data about burn patients who did not require hospital admissions were not included. We only used data concerning burn patients residents of Ribeirão Preto to calculate the incidence rate of hospitalized burn patients. Data concerning hospitalized burn patients from the catchment areas and from other regions were not considered due to the impossibility to define this population. Furthermore, we have no way to determine whether all of the burns and other traumas in the city of Ribeirão Preto and in the towns of the catchment areas were treated in the hospitals included in the study. However, it is unlikely that many patients were lost.

The case fatality ratio (%) due to burns corresponds to the ratio of number of deaths due to burns per age range and per gender to the number of admissions of persons in the same age range and of the same gender, multiplied by 100. In the present study, the case fatality ratio for burn patients is reported separately for patients from Ribeirão Preto and for patients from other towns admitted to Ribeirão Preto hospitals.

3. Results

3.1. Frequency of burn patients hospital admissions per age range and gender

Although the number of women in the population is slightly higher than the number of men, when the frequency of hospitalized burn patients was expressed as absolute values we observed that males were victims of burns two

Table 2
Frequency of burns patients as hospital admissions to Ribeirão Preto hospitals during the period 1991–1997

Age range (years)	Year															
	1991		1992		1993		1994		1995		1996		1997		Total	
	Male	Female	Male	Female												
0–9	30	16	27	19	30	15	23	11	24	10	22	11	32	13	188	95
10–19	9	5	7	4	9	6	11	7	15	4	6	6	7	1	64	33
20–29	19	8	17	11	20	5	19	9	31	5	17	4	12	7	135	49
30–39	16	7	6	11	13	5	22	9	12	4	17	4	20	7	106	47
40–49	8	1	6	4	7	4	13	8	7	10	9	6	16	4	66	37
50–59	5	2	6	4	3	3	3	5	7	1	6	3	3	7	33	25
60–69	1	1	2	0	5	1	1	1	2	2	3	4	2	1	16	10
70–79	0	0	0	0	2	0	0	1	1	0	3	2	0	1	6	4
80–89	0	1	0	1	0	0	0	0	0	1	3	0	1	0	4	3
Total	88	41	71	54	89	39	92	51	99	37	86	40	93	41	618	303

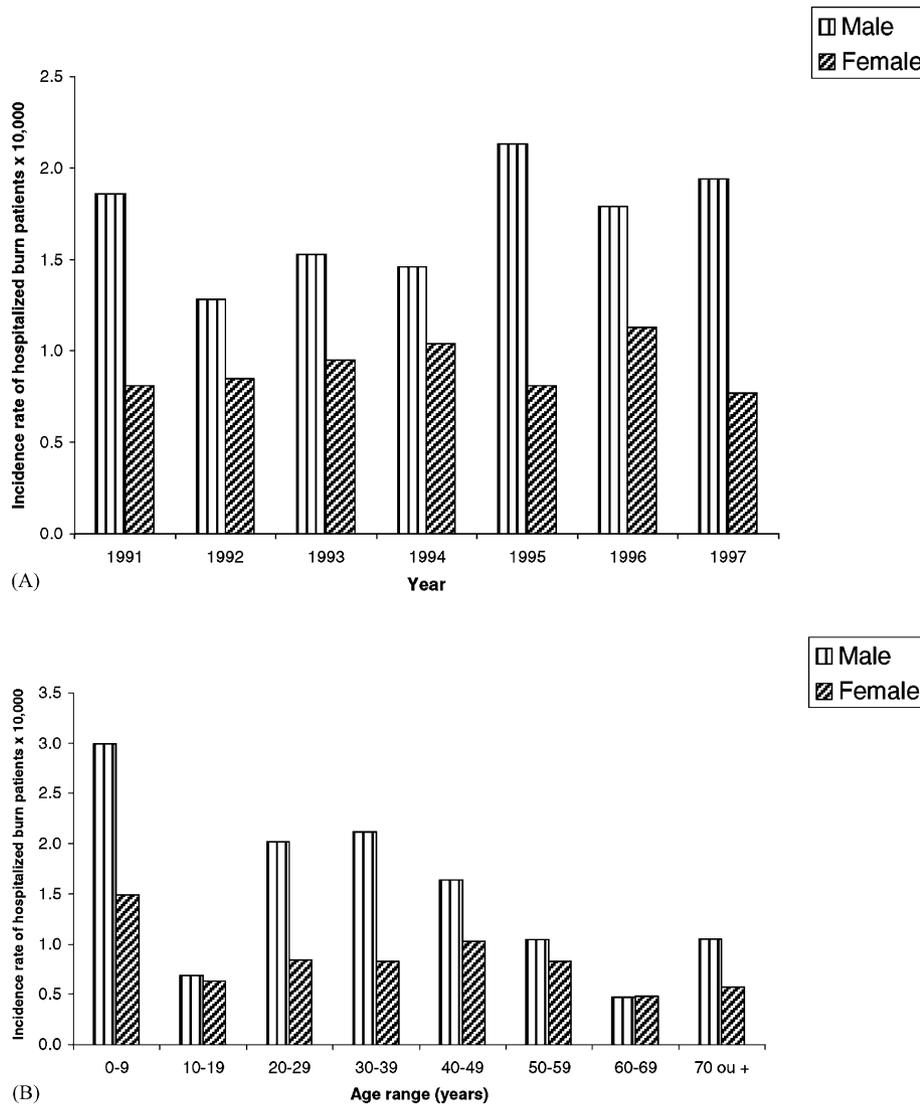


Fig. 1. Incidence rate of hospitalized burn patients per gender and per 10,000 persons in the population, for patients residing in Ribeirão Preto and admitted to Ribeirão Preto hospitals: (A) data presented per year; (B) data presented per age range for the period from 1991 to 1997. The incidence rate of hospitalized burn patients is the number of hospital admissions due to burns per age range, per gender, per year per number of persons in the same age range and of the same gender residing in the municipality under study during the same year $\times 10,000$.

times more frequently than females (618 male patients, 67.1% of all cases, versus 303 female patients, 32.9% of all cases) throughout the period studied. Burns were more frequent among patients of both genders up to 9 years of age (283 patients, 30.7% of all cases) and from 20 to 29 years (184 patients, 20.0% of all cases). The absolute number of admissions due to burns for both genders and the difference in the frequency of burn cases between men and women decreased progressively after 30 years of age (Table 2).

3.2. Incidence rate of hospitalized burn patients per year, per age group, and per gender

When the number of admissions due to burns was reported as incidence rate of hospitalized burn patients, the error of interpretation of the result inherent to the population effect was reduced. This is an important question for the analysis of the frequency of a form of injury among persons in a given age range. For example, for persons older than 50 years, the identification of a decrease in the absolute number of occurrences of a form of injury related to occupational activities does not necessarily mean that the risk for this form of injury is reduced. As long as there also is a decrease in the number of persons of the same age range in the population, the risk of occurrence of an injury may have any value, including a higher value than for other age ranges. The incidence rate of hospitalized burn patients indicate the overall risk for hospitalization for burns (Fig. 1).

When the incidence rate of hospitalized burn patients was reported per gender and per year, we observed that in all years from 1991 to 1997 men were the victims of burns more frequently than women (Fig. 1A). The difference in incidence rate of hospitalized burn patients between men and women were greatest in the years 1991, 1995 and 1997. These results confirm previous data obtained by analysis of the absolute numbers concerning the frequency of hospital admissions due to burns (Table 2).

When the incidence rate of hospitalized burn patients was reported per age range and gender, we again observed a higher risk for burns among men. The highest incidence rate of hospitalized burn patients was observed for patients of both genders in the 0–9 years age range. The incidence rate of hospitalized burn patients was two times greater for boys in the 0–9 years age range. Both the incidence rate of hospitalized burn patients and the difference in absolute values between men and women were markedly reduced for the 10–19 years age range and increased again after 20 years of age. However, starting from the 30–39 years age range, we again observed a trend to a progressive decrease in the risk of occurrences of burns and a reduced difference in the risk between men and women. The incidence rate of hospitalized burn patients and the difference in absolute values between men and women (with greater values among men) increased again among persons 70 years of age or older (Fig. 1B).

3.3. Case fatality ratio for burn patients per age group, per gender, per year, and per place of residence

We identified a case fatality ratio of 2.9% for men and of 4.3% for women among patients from Ribeirão Preto hospitalized in this city due to burns. The risk of death for this patient group was 1.5 times higher among women (Table 3).

Among patients from other towns who were transferred to Ribeirão Preto hospitals for burn treatment we obtained a case fatality ratio of 9.3% for men and 19.1% for women. The risk of death identified for this group of patients was 2.1 times higher for women. These values for patients from other towns were 3.2 and 4.4 times higher, respectively, than those obtained for men and women residing in Ribeirão Preto.

The higher risk of death for patients from other towns was also observed when the case fatality ratio was reported per age range. Among patients from other towns admitted to Ribeirão Preto hospitals for burn treatment, 15 deaths occurred in the age range up to 19 years, whereas among patients from Ribeirão Preto of the same age no death occurred. The case fatality ratio tended to increase progressively among patients in older age ranges.

3.4. Frequency of hospital admissions due to burns relative to hospital admissions due to all forms of trauma in Ribeirão Preto hospitals

When the absolute values of the frequencies of burns (Fig. 2A) and of all traumas (Fig. 2B) were analyzed year by year, a trend to stabilization of the number of burn events was observed, together with a slight increase in the frequency of all traumatic injuries. This divergence between the frequency of burns and of all forms of trauma resulted in

Table 3

Case fatality ratio^a (%) for burn patients admitted to Ribeirão Preto hospitals during during the period 1991–1997^b

Age range (years)	Patients from Ribeirão Preto		Patients from other towns	
	Male	Female	Male	Female
0–9	0	0	5.9 (6)	5.7 (3)
10–19	0	0	4.7 (2)	28.6 (4)
20–29	1.8 (1) ^b	4.3 (1)	8.8 (7)	19.2 (5)
30–39	3.6 (2)	14.3 (3)	13.7 (7)	19.2 (5)
40–49	6.5 (2)	10.5 (2)	17.1 (6)	22.2 (4)
50–59	15.4 (2)	0	0	46.7 (7)
60–69	0	0	33.3 (4)	33.3 (2)
70–79	2.5 (1)	0	0	0
80–89	0	0	0	50 (1)
Total	2.9 (8)	4.3 (6)	9.3 (32)	19.1 (31)

^a Case fatality ratio = number of deaths due to burns per age range, per gender and per place of origin per number of hospitalizations due to burns for the same age range, gender and place of origin $\times 100$.

^b The number of deaths is given within parentheses.

a discrete tendency to reduction of the burns/all traumas ratio, especially among women, from 1995 to 1997 (Fig. 2C). In all the years of the period studied, burns corresponded to approximately 1.5% of all traumas that led to hospital admissions (Fig. 2C).

As also observed for burns, the total number of traumas caused by lesions and poisoning was 2.0 times more frequent among men (40,387 male patients, 66.9% of all cases) than

among women (19,967 female patients, 33.1% of all cases) in all years of the study period (Table 4).

Analysis of the proportion of burns relative to all forms of traumatic injury by gender showed that the mean value for men (1.53%) was essentially the same as that for women (1.52%) (Table 4). The highest burns/all traumas ratios were obtained for individuals in the 0–9 and 20–49 years age ranges, regardless of gender.

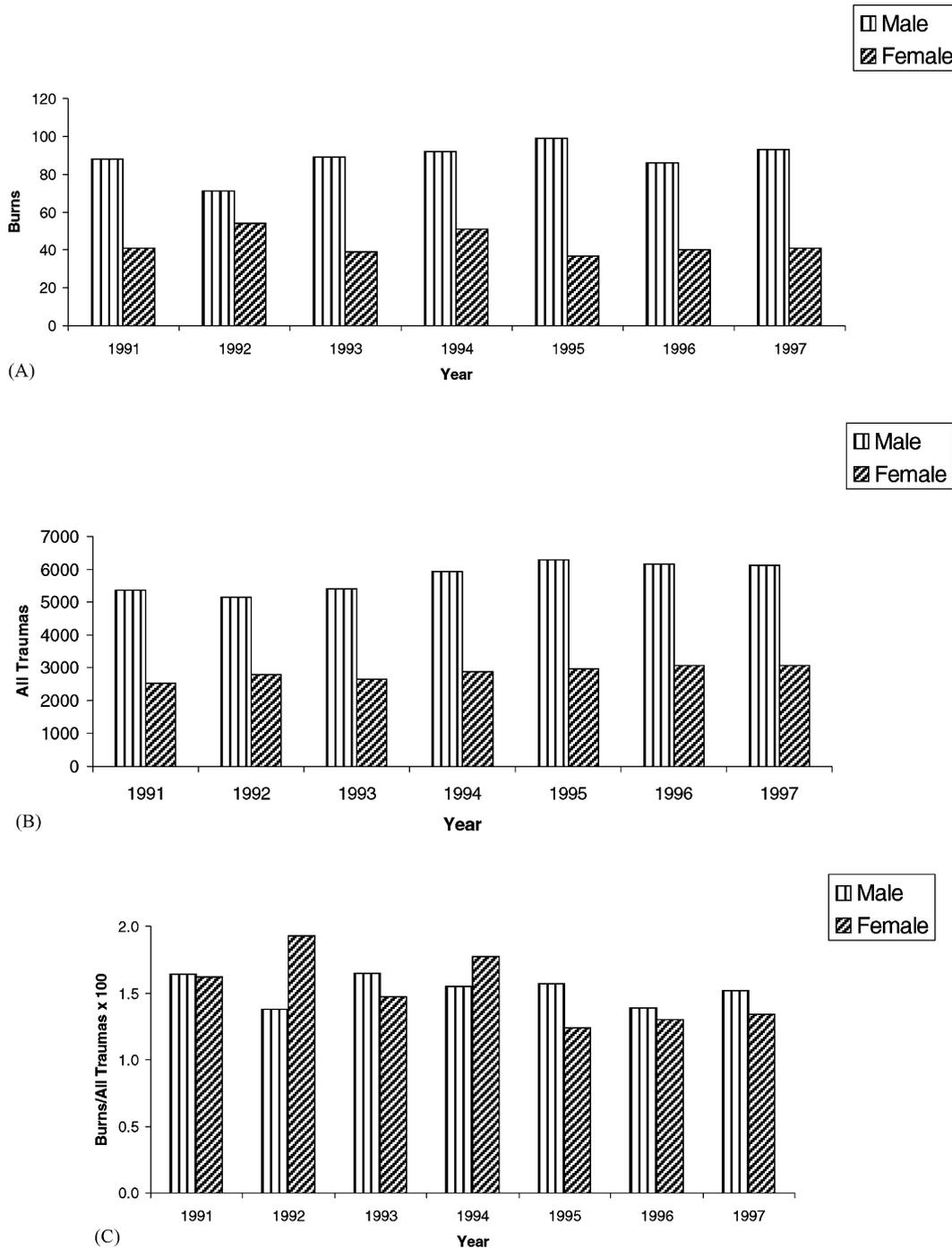


Fig. 2. Frequency of hospital admissions due to burns (A) all traumas (B) and burns/all traumas ratio $\times 100$ (C), for patients admitted to Ribeirão Preto hospitals.

Table 4

Frequency of hospital admissions due to burns relative to hospital admissions due to all forms of trauma in Ribeirão Preto hospitals during the period 1991–1997^a

Age range (years)	Male			Female		
	Burns	All Traumas	Burns/all traumas × 100	Burns	All traumas	Burns/all traumas × 100
0–9	188	5310	3.54	95	3190	2.98
10–19	64	7056	0.91	33	2512	1.31
20–29	135	9614	1.40	49	2737	1.80
30–39	106	6972	1.52	47	2506	1.88
40–49	66	4365	1.51	37	1987	1.86
50–59	33	2861	1.15	25	1712	1.46
60–69	16	2185	0.73	10	1919	0.52
70–79	6	1304	0.46	4	1843	0.22
80–89	4	605	0.66	3	1341	0.22
90–99	0	105	0	0	220	0
Total	618	40377	1.53	303	19967	1.52

^a Traumatic injuries provoked by lesions, poisoning and burns.

4. Discussion

The objective of the present study was to determine the importance of traumatic injuries due to burns for the population of the city of Ribeirão Preto and surrounding region in order to determine the extent of the burn injury as a public health problem relative to other forms of trauma.

Several factors should be considered when evaluating the importance of the burn problem for a population. Although these patients correspond to a small percentage of all trauma victims (1.53% for men and 1.52% for women) (Table 4), in terms of absolute values the number of persons admitted to Ribeirão Preto hospitals for burn treatment was considerable (921 patients over a period of 7 years) (Table 2). The literature demonstrates that burn patients frequently present complications due to infections and disabling and/or mutilating lesions which require multiple surgical interventions and additional hospital admissions. Taken together, these alterations cause the treatment of a burn patient to be highly specialized [3,4], prolonged [5,6] and of high cost [7], and to be associated with intense and frequent pain [8] and extensive social, aesthetic and economic losses, among others, for the patients [9,10].

As demonstrated in the literature [11–13] and in the present study, the importance of the burn problem is even more evident if we consider that this is a form of injury involving a high risk of death (77 deaths among 921 patients, i.e. 8.4% of cases; see Table 3), which occurs among persons of both genders and of all age ranges. The risk of death, as measured by the case fatality ratio, however, was always higher among women who were victims of burns than among men, regardless of whether the patients were from Ribeirão Preto or from other towns. These higher case fatality ratio among women contrasted with the data concerning the distribution of burn hospital admissions by gender (Table 2). In all years of the study period, burns were more frequent among men both in absolute terms

and after correction by calculation of the specific incidence rate of hospitalized burn patients per gender and per age range.

The risk of death of burn patients is the consequence of many factors associated with the severity of the injury which include percentage of surface burned, depth of burn, agent causing of burn (flame, chemical, scalding), smoke inhalation, as well as the prior condition of the patient (age, pre-existent diseases and nutritional status) and treatment variables [14]. Analysis of the causes of death is not possible on the basis of the data available to us in the present study. However, on the basis of data from a medical records in a study carried out at the same tertiary care unit [5], we identified the possibility that the high case fatality ratio identified for women was related at least in part to suicide. The risk of death for women aged 18 years or more who inflicted burns on themselves with suicidal intent was 3.2 times higher than the risk for women with accidental burns. In our region alcohol is the agent most frequently used in burns whose intention is suicide [15], thus compromising the prognosis of these patients. In Brazil, alcohol, a flammable liquid, is freely sold in supermarkets in packages of 1 litre as a product for domestic cleaning and in larger volumes in fuel stations for cars because Brazil has a large fleet of alcohol fueled cars. This situation facilitates the acquisition of large volumes of alcohol which can be poured over the body before lighting the fire. Indeed, we detected one of the highest frequencies of admission due to self-inflicted burns reported in the literature [16–18] among women older than 18 years admitted to the University Hospital of FMRP-USP (20 of 43 cases, i.e. 46.5% of the patients) [5].

The higher case fatality ratio for the patients from towns other than Ribeirão Preto (Table 3) were probably related to the higher frequency of transfer of patients in more serious condition to a tertiary care center and to the great importance of immediate care and of early therapeutic measures adopted [19] for the prognosis of burn patients. The data

demonstrate the need for basic equipment and better training of physicians and paramedical personnel involved in the primary treatment of burn patients, who then may be sent to tertiary care specialized burn units.

An interesting and promising observation identified by analysis of the frequency of hospital admissions due to burns and to all traumas during the period from 1991 to 1997 (Fig. 2) is that the frequency of burns seems to be stabilizing in this region. In 1994, the absolute number of burns increased by 10.9% compared to 1991 (143 patients in 1994 versus 129 patients in 1991), a value similar to the 11.8% increase detected for all traumas (8802 patients in 1994 versus 7875 in 1991). However, in 1997, the number of burns increased by only 3.9% compared to 1991 (134 patients in 1997 versus 129 patients in 1991), a value lower than 16.9% of the increase detected for all traumas (9179 patients in 1997 versus 7875 in 1991). Unfortunately, these data concerning hospital admissions due to burns and all traumas refer to the population of the city of Ribeirão Preto and of the surrounding region, and even of other regions, as a whole, i.e. it is impossible to define the number of inhabitants. However, if we consider that the population of the city of Ribeirão Preto increased by 2.2% from 1991 to 1994 (from 437,959 to 447,770 inhabitants) and by 4.5% from 1991 to 1997 (from 437,959 to 454,853 inhabitants), we can assume that the percent increase in all traumas during the study period (16.9%) was higher than the population increase. However, the pattern of increase of burn frequency observed up to 1994 was modified. From 1991 to 1997, the percentage increase in burn frequency (3.9%) was lower than the growth of the Ribeirão Preto population, suggesting a tendency to stabilization or even a decrease in the frequency of burns in our region. During this period, campaigns for the prevention of burns were transmitted on TV to the general public and to managers of plants that manufacture sugar and alcohol by the professionals of the Burn Unit of the HC-FMRP. However, the effectiveness of these prevention campaigns has not been properly evaluated. A reduction in the number of hospital admissions due to burns has been reported in Canada [20], the United States [21] and England [22].

The higher incidence rate of hospitalized burn patients and case fatality ratios detected in the present study for more advanced age ranges have also been reported by other investigators [12,13] and emphasize the need for campaigns of prevention of burn injuries directed at this population range. The reduction in cognitive function, motor ability and heat sensitivity, the presence of preexisting diseases that impair health in general, especially the cardiorespiratory and neurological systems, and the dermal thickening characteristic of more advanced ages cause the elderly to be particularly vulnerable to heat injuries and their complications, including death [23,24].

The higher frequency of burns observed among men is mainly due to accidental burns [5]. In the Brazilian culture, boys are educated in a more permissive way than girls and consequently they suffer a larger number of accidents.

Several professions involving high risks for burns are still exclusively male occupations. During the young productive phase, occupational accidents frequently occur due to the lack or to the non-observation of safety measures and to the unavailability of appropriate equipment. Also frequent among men are accidents provoked by the explosion and ignition of alcohol bottles used to light barbecue fires. In Brazil, alcohol is also the major factor responsible for domestic accidents involving children [5].

It would be inappropriate if a report of this type did not discuss preventive measures. Campaigns directed at specific age groups should be carried out to inform the public about the causes and risks of burns. In Brazil, the government should exercise more control over the distribution of alcohol, which should be sold in smaller containers, preferably of glass. Workers who are exposed to flammable liquids and fires should receive appropriate protective garments and orientation about preventing accidental burns. Programs involving medical–psychological care, professional orientation and the creation of jobs for women may result in better social, economic and emotional stability, with a reduction in the number of attempted suicides among women. Finally, an increase in the number of day care centers would reduce the number of 4–8-year-old children who remain at home alone with no adult supervision and who sometimes prepare their own food.

We conclude that although burns correspond to a small percentage of the total number of traumatic injuries (1.5%), they continue to represent a severe public health problem due to the large number of occurrences and to the severity of the complications inherent to this type of injury, including a high case fatality ratio. The markedly higher values of the case fatality ratio among patients from other towns indicate the need for additional training of medical and paramedical personal in the initial measures to be taken with burn patients. An analysis of the profile of our burn patients shows the need for specific preventive educational campaigns directed at specific age groups and at each of the two genders.

Acknowledgements

We thank Ms. Rosane Aparecida Monteiro, Departamento de Medicina Social, for her collaboration in obtaining the initial data concerning burns and others forms of trauma.

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