

The pattern of paediatric burn injuries in Southwestern, Saudi Arabia

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Summary

Background: Burn injuries constitute a major concern in the paediatric age group with respect to morbidity and mortality particularly among children in developing countries. Burn injuries represent an extremely stressful experience for both the burn victims as well as their families.

Objectives: To identify the pattern and demographic aspects of paediatric burn injuries (BI) at the Aseer Central Hospital, Abha, Kingdom of Saudi Arabia and to analyze morbidity and mortality as such information has not been reported from our locality.

Patients and methods: All the 380 patients children aged <1 to 12 with BI admitted to the Burns Unit over six year period (January 1997 – December 2002) of the Aseer Central Hospital Saudi Arabia. A special proforma was designed and the information entered included age, sex, residence, level of education, place and time of BI, brief description of the event, agent, and site(s) affected, total surface area burnt (TSAB), degree, depth, severity, date of admission and discharge.

Results: Out of 380 patients in this study, 191 (50.3%) were boys and 189 (49.7%) were girls (M:F = 1.01:1). There was no statistical difference in the gender distribution ($p=0.4$). Saudi and non-Saudi patients constituted 362 (95.3%) and 18 (4.7%). Ninety (24%) were aged one year or below, 204 (54%) included children older than one year but not older five years of age and 86 (22%) were above five years of age but not older than 12 years. Whereas 64% of BI are due to scald, 27.6% were due to flame, 5% were due to electrical while 1.8% were due to chemical injury.

Conclusion: The majority of BI occur in children aged five years and below and most of these injuries occurred at home. Scald injuries predominated and length of hospital stay correlated well to the extent of burned body surface area.

Key words: Pattern, Burn, Children, Saudi Arabia.

Résumé

Introduction: Blessures à travers des brûlures constituent un intérêt majeur chez la tranche d'âge pédiatrique en ce qui concerne morbidité et mortalité en particulier parmi des enfants dans les pays en voie de développement. Blessures à travers des brûlures constituent une

expérience extrêmement stressante pour les victimes de brûlure de même que leur famille, les deux.

Objectif: Identifier la tendance et aspects démographiques des blessures à travers la brûlure pédiatrique (BI) dans l'Hôpital Central d'Aseer, Abha, royaume d'Arabie saoudite et d'analyser la morbidité et mortalité parce qu'une telle information n'a jamais été rapporté dans notre région.

Patients et méthodes: Tous les 380 patients, enfants, âgés < 1 à 12 atteints de BI admis au service des Brûlures au cours d'une durée de six ans (janvier 1997 - décembre 2002) à l'Hôpital Central d'Aseer Arabie saoudite. On a préparé un proforma spécial et les informations inscrites sont les suivantes, âge, sexe, séjour, niveau d'éducation, lieu et temps de BI, description en bref d'événement, agent et siège atteint l'ensemble de la surface des brûlures (TSAB), degré, profondeur, gravité, date d'admission et renvoie.

Résultats: Parmi les 380 patients de cette étude, 191 soit 50,3% étaient garçons et 189 soit 49,7% étaient filles (M:F = 1,01:1). Il n'y avait aucun écart statistique dans la répartition du genre ($P=0,4$). Patients saoudites et non saoudites constituaient 362 soit 95,3% et 18 soit 4,7%. Quatre-vingt dix soit 24% étaient âgés d'un an et ou au-dessous d'un an, 204 soit 54% y compris des enfants âgés de plus d'un an mais pas plus de cinq ans et 86 soit 22% étaient âgés de plus de cinq ans mais pas plus de 12 ans. Tandis que 64% de BI sont attribuables à la brûlure, 27,6% provoqués par la flamme, 5% était causé par défaut dans le système électrique tandis que 1,8% était provoqué par la blessure chimique.

Introduction

Burn injuries (BI) are a unique form of trauma which is often times avoidable¹. They are categorized among the most severe injuries an individual can experience^{2,3}. BI represent a major health problem worldwide, due to the attending morbidity and mortality^{4,7} and economic loss, regardless of the extent of the BI^{1,8}. Causes, types and incidence of burns vary from one community to the other and are influenced by age, sex, economic status, local customs, social and environmental circumstances⁹⁻¹¹.

Burn injuries, especially in childhood, present with complex problems, which not only leave scars on the skin of the child, but more importantly, result in the scarring of the child's personality. These complications can occur even if the BI is small but leaves a mark that disfigures the

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face or a finger which may lead to contracture and dysfunction of the hand. In terms of manpower loss, the younger the age at the time of the disabling BI, the greater the loss in productive years⁸. BI also places a major burden on the family during the period from injury to recovery, through reconstruction, rehabilitation and reintegration into the society. Since the etiological factors in burn injuries vary considerably in different communities, careful analysis of the epidemiological features in each community is needed before a sound preventive program can be planned and implemented.

The aim of this retrospective study is to identify the pattern and demographic aspects of paediatric burn injuries at the Aseer Central Hospital, Abha (Southwestern region of Kingdom of Saudi Arabia) and to analyze morbidity and mortality as such information has not been reported from our locality.

Patients and methods

This retrospective study included all children aged <1 to 12 with BI admitted to the Burns Unit of the Aseer Central Hospital which is the only referral hospital in the region of Saudi Arabia (population: 1.3 million). It lies about 8500 feet above sea level. As an urban population, people enjoy many modern families but retain the basic dietary and social habits of rural communities.

The admission policy to the burn unit is to admit all BI cases referred to the unit unless the burn is obviously small, can be managed by the patient or when the patient lives in close proximity to the Unit in which case follow-up would be easy. The latter group of patients are seen and treated on an outpatient basis. It is considered that the study sample is representative of the pattern of BI in the Aseer region, Southwestern Saudi Arabia since all casualty departments of the peripheral hospital refer the majority of patients with BI to the Unit.

All the 380 patients children with BI who were admitted to the burn unit over six year period (January 1997 – December 2002) constituted the study group. A special proforma was designed and the information entered included age, sex, residence, level of education, place and time of BI, brief description of the event, agent, and site(s) affected, total surface area burnt (TSAB), degree, depth,

severity, date of admission and discharge. The data obtained were then coded and entered into an IBM compatible computer. Statistical analyses were carried out using Statistical Package for Social Science software (SPSS-Version 10). For each item, the frequency and percentage were calculated. Chi-square test and Student's t-test were used as tests of significance when applicable. The limit of statistical significance was set at $p < 0.05$.

Results

There were 380 patients in this study, of whom 191 (50.3%) were boys and 189 (49.7%) were girls (M:F=1.01:1). There was no statistical difference in the gender distribution ($p=0.4$). Saudi and non-Saudi patients constituted 362 (95.3%) and 18 (4.7%).

The children were stratified into three groups on the basis of age. The first group of patients, 90 (24%) were aged one year or below, second group of patients, 204 (54%) included children older than one year but not older five years of age. The third group of patients, 86 (22%) were above five years of age but not older than 12 years. The distribution of patients with BI according to age, sex and nationality are shown in Table 1.

Most cases of BI were either mixed second and third degree or isolated second degree 178 (47%) and 162 (42.7%) respectively. In this study (78%) of these burn injuries took place at home. Seasonal variation did not significantly affect the incidence of BI ($p=0.2$).

The scald burn injuries constituted 64%, flame burn injuries 28%, electrical burn injuries 5% and the chemical burn injuries 1.8% of paediatric burn injury in our survey. There was a statistically significant difference ($p < 0.001$) between the incidences of these types of BI (Table 2). Scald BI were more common in children one year old or below (100%), followed by children aged over one year but below five years (64%) ($p < 0.01$). Flame, electrical, and chemical injuries involved mainly children over one year of age (Table 2).

Scald burn injuries were caused by hot water in 33%, hot tea in 25%, hot coffee in 19%, hot oil in 14% and hot milk in 9% of the patients ($p < 0.05$) (Table 3)

Table 4 shows the sources of BI in this study. The

Table 1 Analysis of patients according to age, sex, and nationality

Age group (year)	Males			Females			Total Saudi	Total Non-Saudi	Total Patients
	Saudi	Non-Saudi	Total males	Saudi	Non-Saudi	Total females			
<1	41	5	46	41	3	44	82	8	90
1-5	102	3	105	96	3	99	198	6	204
5-12	37	3	40	45	1	46	82	4	86
Total	180	11	191	182	7	189	362	18	380
%	94	6	50.3	96	4	49.7	95	5	100

Table 2 Types of burn injuries according to age and sex

Age (yr)	Scald			Flame			Electrical			Chemical			Grand total
	M	F	Total	M	F	Total	M	F	Total	M	F	Total	
=1	46	44	90			-			-			-	90
>1-5	70	60	130	29	31	60	5	6	11	1	2	3	204
>5-12	10	14	24	23	22	45	6	2	8	1	3	4	86
Total	126	118	244	52	53	105	11	8	19	2	5	7	380
%	33	31	64	13.6	13.9	27.6	2.8	2	5	0.5	1.3	1.8	100

most common source of flame BI was charcoal fire. There was a statistically significant difference between the sources of flame BI ($p < 0.05$).

The estimated body surface area (EBSA) involved in the BI was 30% or least in 345 patients (90%), more than 30% in 35 patients (9%). EBSA was between 51 and 60% in 5 (1.3%) patients and 61-70% in 2 patients. The overall mortality was 1.05 % (Table 5).

The distribution of BI according the parts of the body affected shown in Table 6. The majority of patients 73.6% sustained BI to the upper parts of the body, with the highest frequency (40%) being on the upper extremities, followed by the chest in 21%.

The mean duration of hospital stay was 8.5 ± 2.4 days. Majority of patients, 189 stayed in hospital 6 to 10 days, 108 of patients, spent less than six days in hospital as shown in table 7. Patients with EBSA of 20% or less stayed in the hospital less than ten days as compared to patients with EBSA of more than 20% and this was statistically significant ($p=0.01$).

Discussion

Burn injuries (BI) and their related morbidity, disability and mortality represent a public health problem of increasing importance in developing countries. The considerable decrease in the infectious diseases rate has increased the importance of injuries as a leading cause of premature death and disability in such countries.¹²⁻¹³

Epidemiological studies of morbidity area pre-requisite for effective burn prevention programmes because each population group seems to have its own epidemio-

logical characteristics¹⁷. Knowledge of the epidemiology of burns is needed to select target groups for preventive actions.

Our study showed that the domestic environment was the main place where the majority of BI occurred (78%). This is comparable to other reports from developing countries such as, India¹⁴, Nigeria¹⁵ and Ghana¹⁶ where the incidence of BI in the home ranges from 71-92%. In industrialized countries the incidence of BI in the home is 30-76% which is lower than those from developing countries¹⁷. This may be due to the relatively better home safety, with safer cooking and heating devices in the industrialized countries.

Age and sex are important epidemiological determinants for BI.² Our results showed that children less than five years of age were more commonly sustained BI compared to older children. This finding reflects the particular developmental or behavioral pattern associated with age. In children five years of age and below, the lack of coordination and unawareness of dangerous substances play important roles in the occurrence of BI. In addition, young children in our community lack adequate supervision because of the large families units and the lack of domestic safety measures²¹. The high incidence among this age group on the other hand may be explained by their longer stay at home, high activity, and inability to protect themselves²¹.

With respect to sex distribution of children with BI, there was no significant difference between male and females ($p=0.4$). This is comparable to reports by other authors.^{9,18,19} The low members of non-Saudi children in

Table 3 Analysis of the liquids causing scald injuries and sex distribution

Type of liquid	Males		Females		Total	
	No.	(%)	No.	(%)	No.	(%)
Hot water	43	(34.1)	37	(31.3)	80	(33)
Hot tea	29	(23.1)	31	(26.2)	60	(25)
Hot coffee	20	(15.8)	26	(22.1)	46	(19)
Hot oil	22	(17.5)	13	(11.1)	35	(14)
Hot milk	12	(9.5)	11	(9.3)	23	(9)
Total	126	(100)	118	(100)	244	(100)

Table 4 Sources of flame injuries and sex distribution

Source of flame	Males		Females		Total	
	No.	%	No.	%	No.	%
Charcoal	26	(50)	36	(67.9)	62	(59)
Gas cylinder	15	(28.8)	10	(18.8)	25	(24)
Firewood	11	(21.2)	7	(13.3)	18	(17)
Total No.	52	(100)	53	(100)	105	(100)

Table 5 Patient distribution according to age and the percentage of body surface area burned.

%EBSA	Age (yr)			Total	Mortality (%)
	<1	1-5	6-12		
0-10	19	30	51	100	0 (0)
11-20	40	110	20	170	0 (0)
21-30	20	50	5	75	0 (0)
31-40	5	8	6	15	0 (0)
41-50	4	3	2	10	0 (0)
51-60	2	1	2	3	2 (67)
61-70	-	2	-	2	2 (100)
Total	90	204	86	380	4 (1.05)

this study could be explained by the equally low number of non-Saudi families living in this part of Saudi Arabia.

With regards to the agent of the BI, scald was the predominant type of injuries 64%, a pattern which is similar to the findings in previous reports.²⁰⁻²¹ Contrasting findings however, have been reported from Nigeria²² where flame burns predominated over scalds. This was explained by the common use of firewood as the main fuel for domestic needs. A report from Egypt²³ also showed that flame burns predominated over scalds. This type of BI resulted from the common use of portable pressure kerosene stoves for domestic cooking needs.

With respect to age distribution and the sources of

burn injury, scald injury was most common source of burn in children in all age groups and this was statistically significant ($p < 0.01$). However, it is important to mention that as the child's age increases, their sources of burn injuries such as flames, electrical and chemical injury incidence appear to rise. This could be due to the fact that older children have increased motor activity and the ability to reach other sources of BI easily.

The most common cause of scald burn was hot water, followed by hot tea, hot coffee, hot oil then hot milk, some other studies showed different orders of causes of scald burn^{2,15,24}. This variation could be explained by the fact that some communities have their own environmental factors and social habits..

In this study, the clinical assessment of burn wound showed that the largest percentage of surface area burned was found in children below one year of age, followed by children below five years of age. Most cases were either mixed second or third degree or isolated second degree burns and this was similar to other previous reports.^{9,19} With respect to the thermally injured parts of body, the upper extremities were the most affected followed by head, neck and chest.

Less than one-quarter of patients were able to go home within five days. The length of hospital stay is correlated to the extent of burned body surface area. The mortality of burn injuries varies widely, from 15 to 52% depending on several factors such as the nature of the

Table 6 Distribution of thermally injured parts of body according to age.

Age group	No. of cases by location of injury				HN,UL,T	T,LL	HN,UL,T,LL
	HN	UL	T	LL			
≤1	18	32	30	2	3	2	3
>1-5	19	90	20	30	10	20	15
>5-12	10	30	31	2	6	4	3
Total	47	152	81	4	19	26	21
%	12.3	40	21.3	9.0	5.0	6.8	5.5

Key: HN = Head & Neck; UL = Upper Limb; LL = Lower Limb
 H,N, UL,T = Head, Neck, Upper Limb & Trunk
 T,LL = Trunk, Lower Limb;
 NN, UI, T, LL = Head, Neck, Upper Limb, Trunk, Lower Limb

Table 7 The duration of hospital stay according to age

Duration of hospitalization (days)	Age groups (yr)			Total
	<1	1-5	>5-12	
1-5	25	63	20	108
6-10	45	102	42	189
11-20	15	36	20	71
21-30	3	2	2	7
31-40	1	-	2	3
41-60	1	-	-	1
>60	-	1	-	1

study population, the burn facility concerned, and the policy of admission.²⁴⁻²⁶. Our mortality rate was quite low compared to reports from other studies²⁷. The low mortality in this study could be due to the dominance of young patients and minor and moderate burns which carry very low mortality as compared to older patients who tend to have severe BI. The actual mortality may be worse as the figure does not include cases which may have died before they reached hospital.

In conclusion, the majority of BI occurred in children aged five years and below and most of these injuries occurred at home. Scald injuries predominated and length of hospital stay correlated well to the extent of burned body surface area.

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