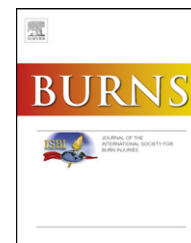


available at www.sciencedirect.comjournal homepage: www.elsevier.com/locate/burns

Epidemiology of childhood burn: Yield of largest community based injury survey in Bangladesh

S.R. Mashreky^{a,b,*}, A. Rahman^a, S.M. Chowdhury^a, S. Giashuddin^a,
L. Svanström^b, M. Linnan^c, S. Shafinaz^d, I.J. Uhaa^d, F. Rahman^{a,b}

^a Centre for Injury Prevention and Research, Bangladesh

^b Department of Public Health Science, Karolinska Institutet, Sweden

^c The Alliance for Safe Children, Thailand

^d UNICEF, Bangladesh

ARTICLE INFO

Article history:

Accepted 27 September 2007

Keywords:

Burn
Epidemiology
Children
Prevention
Bangladesh

ABSTRACT

In terms of mortality, morbidity and disability, burns are emerging as a major child health problem in Bangladesh. This trend is similar to many other developing countries. To develop effective burn prevention programmes, information on its magnitude and determinants is necessary. The purpose of this study was to document the magnitude and determinant of childhood burns in Bangladesh, based on a population-based survey which was conducted between January and December 2003. Nationally representative data was collected from 171,366 rural and urban households, comprising of a total population of 819,429. To facilitate data collection, face-to-face interviews were conducted.

The rate of non-fatal burn among children under 18 years of age was calculated as 288.1 per 100,000 children-year. The highest incidence (782.1/100,000 children-year) was found among the 1–4 years age group. About 46% of non-fatal burn injuries occurred between 9 a.m. and 3 p.m. The incidence of childhood burn was found to be more than four times higher in rural children than urban children. Ninety percent (90%) of the childhood burns occurred at homes and the kitchen was the most common place. The rate of disability due to burn was 5.7 per 100,000 children per year. The rate of fatal burn was 0.6 per 100,000 per year among all children. The study findings confirmed that childhood burn was a major childhood illness in Bangladesh. An urgent and appropriate prevention programme is required to prevent these unwanted morbidities, disabilities and deaths due to burn.

© 2007 Elsevier Ltd and ISBI. All rights reserved.

1. Introduction

In terms of functional, social and psychological impairment burns have been identified as one of the most devastating causes of child injury [1–4]. Burns have aroused widespread public health concern and constitute a global public health problem [5]. In 1998, fire related burns ranked ninth among the leading causes of global burden of diseases (based on death and disability) among children aged 5–14 years [6]. The

number of global deaths due to fire was recorded as 238,000 in 2000, the majority (95%) of which occurred in low- and middle-income countries [7]. Even in developed countries, injuries from burns represent the leading cause of unintentional injury death and morbidity [8–11].

In developing countries, burns have been found as a major cause of injury morbidities, disabilities and deaths. In Africa and many of the South-Asian countries, including India, Pakistan, Nepal, Sri Lanka and Afghanistan, childhood burns

* Corresponding author. Fax: +880 28861499.

have emerged as a major public health issue [12–19]. In Bangladesh, although there are few studies where causes of deaths are directly comparable, most public health experts noted a gradual shift in the cause of child death from largely infectious disease to largely non-communicable disease and injury [20]. However, the magnitudes of burns have not been studied and documented in Bangladesh. This population-based survey, provided evidence on the magnitude and risk factors for burn among children under 18 years of age in Bangladesh, and provides a basis for burn prevention programmes in the country.

2. Methods

2.1. Study design

Cross-sectional study.

2.2. Study population

The study was carried out during 2003 (January to December) in 12 randomly selected districts of Bangladesh and in Dhaka Metropolitan City. This encompassed a population of 819,429.

A multistage cluster sampling was used to choose a total sample size of 171,366 households; 88,380 from rural areas, 45,183 from district towns (urban areas) and 37,803 households from Dhaka Metropolitan City.

In Bangladesh there are 64 districts. A total of 12 districts were chosen by simple random sampling. Each district is comprised of several upazilas (sub-district). One upazila was randomly selected from each selected district. Each upazila is comprised of a number of unions. A union is the lowest administrative unit comprising of ~20,000 persons. From each upazila two unions were selected randomly and each union were considered as clusters. All households in the union were included in the survey. On the other hand the district headquarters of the 12 selected districts and Dhaka Metropolitan City constituted the urban areas. In the urban areas, *mohallas* (a *mohalla* is the lowest unit in an urban area) served as clusters and systematic sampling was done to achieve the required number of households. However, Dhaka Metropolitan City was selected purposely.

2.3. Case ascertainment

Anyone under 18 years of age was considered to be a child. Children were identified as burned if s/he took any treatment or could not perform normal activities at least for 3 days due to the burn.

2.4. Data collection and interview

Forty-eight data collectors collected data from respondents using face-to-face interviews. Along with the researchers, six fulltime supervisors were employed for the supervision and monitoring of the data collection process. Mothers were primarily preferred as respondents. However, if the mother was not available the most knowledgeable members of the household were considered as respondents. Where possible, it

was the head of household and as many members of the household were present as possible to corroborate or add detail to the respondents' interview answers. Screening forms were used to identify any mortality or morbidity in the household. A household member was defined as a member living in the same house including domestic helpers, long-term guest, etc., sharing meals and information.

The respondents were first asked whether any deaths had taken place in the household in the last 2 and 3 years in National and Dhaka metropolitan survey, respectively or illness in the last 6 months. If any deaths or illnesses were identified, the interviewer proceeded with further clarification regarding the death or illness. Structure questionnaires were employed if burns caused the death or illness. Repeat visits were made to the household where respondents were unavailable in first visit. In spite of repeated attempts, 2.7% household could not be interviewed. A total of 166,766 households participated in the study.

The detailed methodology of the survey has been published elsewhere [31].

3. Statistical analysis

Standard descriptive statistics were used to analyse the characteristics of burn patients and their injuries. Mean, standard deviation (S.D.) and proportion were used where appropriate. Burns were presented by gender, age categories and residence. Age was categorised in five groups. Yearly incidence rate of burn were calculated from the number of occurrences of childhood burn in 6 months multiplied by two, as data were collected considering a 6 month recall period. Rates were calculated with 95% confidence intervals (CI). Relative risk (RR) were calculated to compare the burn risk in different age groups, place of residence, and sex by using two by two table in EPI info software. All of the descriptive analyses were carried out by using SPSS 11.5 software.

4. Result

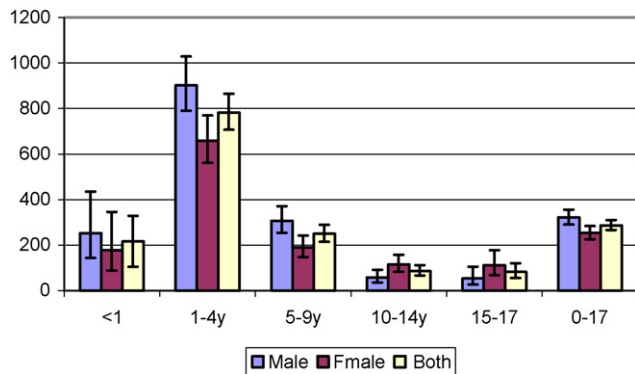
In the sampled households 351,651 children of 0–17 years of age were identified; among them 178,285 were male and 173,366 were female. Among the total children 155,934 were from urban and 195,717 from rural areas.

A total of 1013 children were found to have suffered burn injury/illness. Two children had died due to burns. The rates of fatal and non-fatal burn injuries in children less than 18 years of age were 0.6 per 100,000 children-year and 288.1 per 100,000 children-year, respectively. Among the total children with non-fatal burn 56.7% were male and 43.3% were female. The median age of having non-fatal burn was 3 years and mean age was 4.75 (S.D. \pm 3.94) years, ranging from 0 to 17 years. The highest proportion of non-fatal burn (57%) was found among children 1–4 years old.

Study findings show that burn was the fifth leading cause of child health illness among the children of 1–17 years of age in Bangladesh. In the age group of 1–4 years of age, burn was found as the 3rd leading cause of childhood illness (Table 1).

Table 1 – Burden of burn morbidity among children (>18 years) in comparison to other childhood illness

Rank	<1 year	1–4 years	5–9 years	10–14 years	15–17 years	1–17 years
1	ARI/Pneumonia (848)	ARI/Pneumonia (1686)	Fall (582)	Fever (505)	Fever (238)	ARI/Pneumonia (2668)
2	Diarrhoeal diseases (381)	Diarrhoeal diseases (1287)	Fever (555)	Fall (447)	Fall (169)	Diarrhoeal diseases (1937)
3	Malnutrition (97)	Burn (580)	ARI/Pneumonia (508)	ARI/Pneumonia (334)	ARI/Pneumonia (140)	Fever (1857)
4	Fever (94)	Fever (559)	Diarrhoeal diseases (352)	Cut injury (216)	Transport injury (128)	Fall (1600)
5	Fall (53)	Fall (402)	Burn (267)	Diarrhoeal diseases (210)	Cut injury (94)	Burn (979)
6	Skin disease (49)	Malnutrition (301)	Measles (264)	Measles (200)	Diarrhoeal Diseases (88)	Measles (828)
7	Measles (37)	Near drowning (297)	Cut injury (261)	Transport injury (188)	Measles (80)	Cut injury (714)
8	ARI and Diarrhoea (36)	Measles (284)	Transport injury (228)	Skin disease (151)	Jaundice (75)	Transport injury (651)
9	Burn (35)	Skin disease (216)	Asthma (132)	Animal bite (125)	Malaria (57)	Malnutrition (531)
10	Meningitis (25)	ARI and Diarrhoea (157)	Malnutrition (125)	Jaundice (117)	Burn (42)	Skin disease (500)

**Fig. 1 – Incidence rate (per 100,000 children-year) of childhood non-fatal burn by age and sex.**

The incidence of burn was 288.1 per 100,000 child-years in all children. The highest incidence (782.1 per 100,000 children per year) was found among children 1–4 years old. The rate in children aged 1–4 years was more than nine times higher than

the 15–17 years adolescents. The incidence rate in children 5–9 years (249.7 per 100,000 children per year) was more than three times higher than the rate in 15–17 years old. No significant difference of non-fatal burn incidence was found between 15–17 years and 10–14 years olds. However, the incidence rate in children 5–9 years (249.7 per 100,000 children per year) was more than three times higher than the 15–17 years adolescents (Fig. 1).

The incidence of non-fatal burn was found to be significantly higher among boys than girls (322 vs. 251.5 per 100,000 children per year) among all children. Higher rates of non-fatal burn were among male children 9 years and below. On the contrary, higher rates of burn were found among girls 10 years and above. The rate of burn was about two times higher among girls than boys in the age groups of 10–14 and 15–17 years (Fig. 2).

A significantly higher incidence rate of non-fatal burns were found in rural areas (435 per 100,000 children-year) compared to urban areas (102 per 100,000 children-year). In the age group 10–14 years the incidence was found to be more than five times higher in the rural areas than the urban. Similar rural predominance of burn was found in children 1–4 years old; it was also approximately five times higher than the urban areas (Table 2).

Table 2 – Determinants of childhood burn injury

	Variable	n = 1013	Rate (per 100,000 per year)	RR	95% CI
Age group	15–17 years	42	82.1	1	
	10–14 years	89	86.2	1.05	0.73–1.52
	5–9 years	267	249.7	3.04	2.20–4.21
	1–4 years	580	782.1	9.53	6.97–13.03
	Infant	35	261.1	2.64	1.68–4.13
	All children	1013	288.1	3.51	2.58–4.78
Sex	Male	574	322	1.27	1.12–1.44
	Female	439	253.2	1	
Residence	Urban	159	102	1	
	Rural	854	436.3	4.28	3.61–5.07

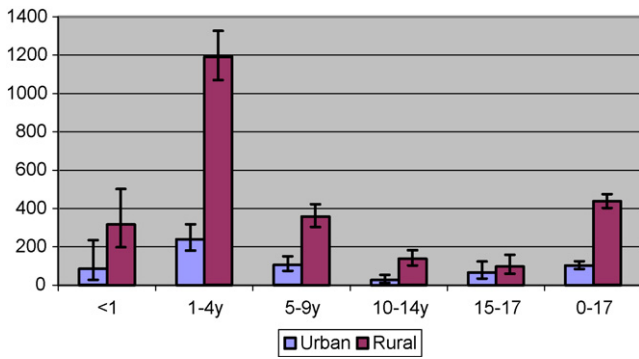


Fig. 2 – Incidence rate (per 100,000) of childhood non-fatal burn by age and place of residence.

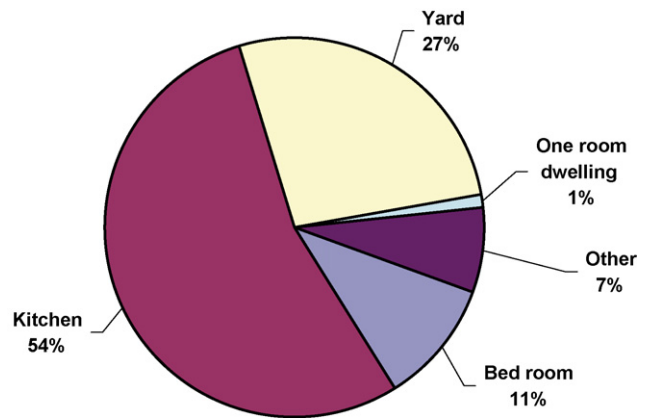


Fig. 4 – Distribution of non-fatal burn cases at home.

The home environment was found to be the most frequent place for childhood burns. More than 90% of burns occurred within the home environment. Highways/street, agricultural areas, commercial places and other areas were found to be other common areas where various proportions of burns occurred among children. It was found that proportion of burn occurrence outside home increased with the increase of age of children. Among infants all burns occurred at home. On the other hand 6.9% of the burns in the 1-4 years age group occurred outside home. The proportions have been found higher in children 5-9 years and 10-15 years, 15.2% and 16.6%, respectively.

At home, the kitchen was found as the most frequent (54%) place for childhood burn. The next common places were yard (27%) and bedroom (11%) (Figs. 3 and 4).

4.1. Time of occurrence of burn

Most of the burns (86%) occurred between 6 a.m. to 6 p.m. Forty-six percent of childhood burn occurred while the mothers were busy with household chores (9 a.m. to 3 p.m.). Very few (1%) of burns occurred after 9 p.m. Only 2% of the burns happened during mid-night to 6 a.m.

4.2. Cause of burn

The study documents that flame was the leading cause of childhood burn; it constituted about 40% of the total burns. It

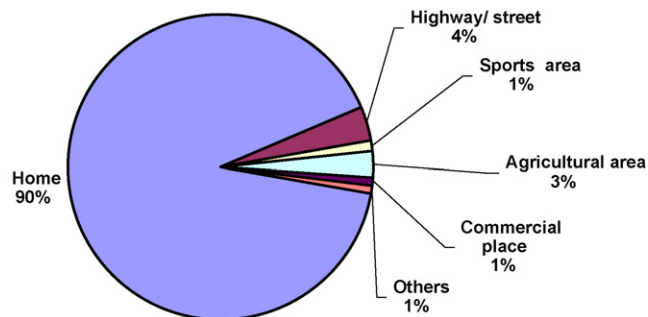


Fig. 3 – Distribution of non-fatal burn cases by place of occurrence.

was also found that cooking fires were the major source (58%) of flame, which caused burns to children. Burn injuries caused by flame among girls of 10-14 years and 15-17 years were mostly caused by cooking fire, being 77% and 70%, respectively. Kerosene lamp flame was the other cause of burn especially among infants (23%) and children of 1-4 years (11%) (Fig. 5).

Hot liquid was found as the second leading cause of childhood burn in Bangladesh, it was observed that a total of 317 children suffered scalds; constituted approximately one third of the total non-fatal burn cases. Hot liquid food, hot rice water (water drained from cooked rice), hot water for cooking, hot cooking oil, hot water for bathing were the major causes of scalding. It was found that about 70% of scalding cases were due to cooking related liquids.

Out of a total of 1,036,306 children were burnt from hot objects, which constitutes 30% of the total cases of non-fatal burn. The majority of the hot objects were found in the kitchen (50%). More than 33% of burns due to contact with a hot object were caused by charcoal and 16.4% by cooking utensils.

4.3. Other causes

The study findings reveal that out of 1013 childhood burns, 12 cases (1.2%) were due to acid. Rate of acid burn

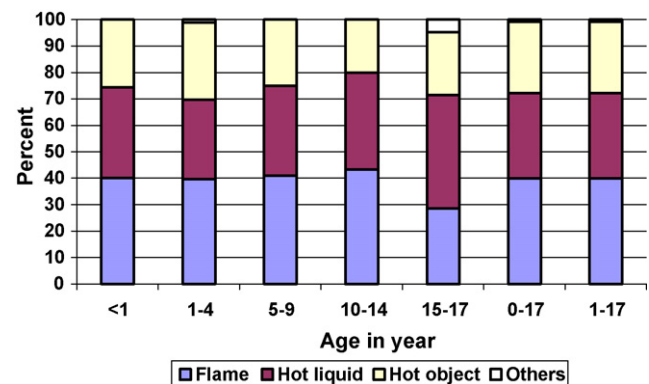


Fig. 5 – Distribution of cause of burn by age.

was 3.4 per 100,000 children-year. One burn was as a result of contact with lime. Like other causes, children 1–4 years were the major victims of acid burn. This made up half the total for acid burn. All of the burns in this study were unintentional.

4.4. Activities by children prior to injury

More than 60% of children of this study were less than 4 years old. It was difficult to ascertain the activities of the children prior to injury. Findings revealed that about 16% of the children were playing with fire or the hot object prior to injury. About 9% of the children were cooking and more than 8% children heating or warming their body prior to injury.

4.5. Permanent disability

It was found in this study that 20 children had become permanently disabled which was about 2% of the total burnt children. The rate of disability was 5.7 per 100,000 children per year.

4.6. Mortality

Only two fatal burn cases were found in this study and the calculated rate was 0.6 per 100,000 children-year for children 0–17 years. All of the fatal burn cases were male, one was an infant and other was a toddler. This number is too small to use for meaningful fatal burn pattern across the child age groups. It was estimated that about 340 children get fatally burned each year in Bangladesh.

5. Discussion

This is a first population-based survey focusing on burn and burn related injuries in Bangladesh. Multistage cluster sampling was used to select 171,366 households both from rural, urban and metropolitan areas. A total population of 819,429 was surveyed between January and December 2003.

Burn was found to be the fifth leading cause of childhood illness among children 1–17 years of age in Bangladesh. It was estimated that every year about 173,000 children suffered from moderate to severe illness due to burn. Epidemiological study findings reveal that age, gender, place of residence (urban and rural) and the place at home are the major issues to discuss in considering childhood burn and its prevention. In this study, children of 1–4 years were the major victims of childhood burn which is consistent to many other studies [10,22,26,28,38–40] of other countries.

The incidence of childhood burn in Bangladesh is higher than South Africa [38] but lower than other African countries like Ghana and Ethiopia [18,37]. Rural children were found to be more vulnerable to burn injuries than the urban. Similar findings were made in Ghana and France [10,37]. Many other studies show predominance of burn in urban areas [22,25,27]. Male children of Bangladesh in younger age groups were more vulnerable to burn injuries which are consistent to other studies [19,36–37].

Female predominance was found in older children which is similar to pattern of burns in Zimbabwe, Ethiopia, other African countries [18,9,41]. When the girls in Bangladesh grow older (10 years and over) they start helping their mothers in household chores including cooking which could be one of the main reasons for higher incidence of burn among older female children. Similar behavioural pattern can be found in African countries, as traditionally females are involved in the cooking for the family and therefore have higher incidence of domestic burn [18,19,41].

A major proportion of childhood burns occurred at home, which is consistent with other studies [27–30,32–36,38–40]. The most risky place for childhood burn identified at home was the kitchen, which corroborates with the findings from many developed and developing countries like United States, India and Ghana [4,30,36,42]. Bangladesh rural communities usually use an open space for cooking instead of kitchen. Because of having cooking space at ground level children might have easy access to the stove (choola) and utensils. Cooking practice in rural areas are risky, because usually stoves have a hole at ground level and wood, dry leaf and cow dung are used as main fuel which produced immense uncontrolled flames. Higher incidence of burn in Bangladeshi kitchens could also be due to special utensil types (hari/patil). These utensils have dome-shaped bottoms which can get easily upset and spill or fall causing scalding burn. In Bangladesh flame was found to be the major cause of childhood burn which is somewhat different to many other countries but similar to Japan, Korea and Sri Lanka [21,22,39]. In contrast, scalds were found as the predominant cause of childhood burn in other countries [18,23,24,26,28–30,32–36,40]. High incidence of flame burn in Bangladesh may be due to use of traditional earthen stove (choola), kerosene lamp without any shade (kupi bati) and very traditional use of earthen pots filled with burning charcoals or open fires as heat source for warming body or room in winter. In bedrooms kupi bati was found to be the major source (59%) of flame burn among children, specially infants and 1–4 year olds. There are some stigmas in rural Bangladesh that fire should be kept near little children at night to protect them from any evil soul. This type of belief leads the adults to keep burning lamps beside the infants and toddlers which is a very risky behaviour unknowingly putting them in danger. In Sri Lanka similar type of kerosene lamp found as a major cause of childhood burn [15,39]. In any Bangladeshi burn prevention program kupi bati should be considered.

Burns from scalds were found to be the second leading cause of childhood burn in Bangladesh and hot liquid food was the major cause of scalding which constitute about 50% of the scald burn. Cooking oil and tea/coffee also contributed to a significant proportion of scalding. The traditional round bottom shape of utensils could be responsible for causing high incidence of scald from spilling of hot liquid food. Specialised arrangement for keeping or securing these types of utensils could reduce the scalding burn.

Very low rate of burn death was found in this study. It was only 0.6 per 100,000 (95% CI 0.1–2.3) children per year. Burn death is a rare event. The sample size of this study was very large; it might not be large enough to capture the significant number of burn deaths.

5.1. Limitation and strength

This is the largest community based injury survey in a developing country. Study findings represent the national statistics. In developing countries a large number of injured people do not attend the hospital for treatment. In addition the hospital recording system is not good enough to record and collate the information, so often hospital statistics are very much under reported. This study captured higher number of cases as it was conducted at household and community level. As recall bias was considered 6 months for illness, some moderate injuries may not have been captured.

5.2. Conclusion

The study revealed that rural young children are the most vulnerable group to childhood burns. Younger male children and older female children are at most risk in the population. The home environment, especially the kitchen, is the most risky place. Considering the magnitude of this problem it is urgent to consider it as a public health problem. It is imperative to launch a burn prevention program to address huge morbidity, disability and mortality of children due to burn. Special attention should be given to high-risk age groups and gender in implementation of prevention programme. The home should be the major focus in the prevention programme with the kitchen environment of most importance. Modification of household environment should be in consideration specially environment of the kitchen. Place and type of cooker, fuel used for cooking should also be considered in burn prevention programme. Preventing burn injuries requires educating the public, in particular the mother and other household occupants especially in rural Bangladesh.

REFERENCES

- [1] Crawley-Coha T. Childhood injury: a status report, part 2. *J Pediatr Nurs* 2002;17:133-6.
- [2] Taal LA, Faberb AW. Posttraumatic stress and maladjustment among adult burn survivors 1-2 years postburn. *Burns* 1998;24:285-92.
- [3] Macarthur C. Evaluation of Safe Kids Week 2001: prevention of scald and burn injuries in young children. *Inj Prev* 2003;9:112-6.
- [4] Drago DA. Kitchen scalds and thermal burns in children five years and younger. *Pediatrics* 2005;115:10-6.
- [5] Zaidi MM, Abusetta A, Brogowski K, Agrawal PL, Franka MR. Analysis of burned children treated in the Burns and Plastic Surgery Center, Tripoly Libya, in the Year 1992. *Ann Medit Burns Club* 1993;V1(4).
- [6] Krug E, editor. *Injury: a leading cause of the global burden of disease*. Geneva: World Health Organisation; 1999.
- [7] Peden M, McGee K, Sharma G. *The injury chart book: a graphical overview of the global burden of injuries*. Geneva: World Health Organization; 2002.
- [8] Krug E. Injury surveillance is key to preventing injuries. *Lancet* 2004;364:1563-6.
- [9] Rivara FP. Burns: the importance of prevention. *Inj Prev* 2000;6:243-4.
- [10] Mercier C, Blond MH. Epidemiological survey of childhood burn injuries in France. *Burns* 1996;22:29-34.
- [11] Cronin KJ, Butler PEM, McHugh M, Edwards G. A 1-year prospective study of burns in an Irish paediatric burns unit. *Burns* 1996;22:221-4.
- [12] Marsh D, Sheikh A, Khalilz A, Kamil S, Zaman JU, Qureshi I, et al. Epidemiology of adults hospitalized with burns in Karachi, Pakistan. *Burns* 1996;22:225-9.
- [13] Liua EH, Khatrib B, Shakyab YM, Richardb BM. A 3-year prospective audit of burns patients treated at the Western Regional Hospital of Nepal. *Burns* 1998;24:129-33.
- [14] Ahuja RB, Bhattacharya S. Burns in the developing world and burn disasters. *BMJ* 2004;329:447-9.
- [15] Laloë V. Epidemiology and mortality of burns in a general hospital of Eastern Sri Lanka. *Burns* 2002;28:778-81.
- [16] Razzak JA, Luby SP, Laflamme L, Chotani H. Injuries among children in Karachi, Pakistan—what, where and how. *Public Health* 2004;118:114-20.
- [17] Calder F. Four years of burn injuries in a Red Cross hospital in Afghanistan. *Burns* 2002;28:563-8.
- [18] Nega KE, Lindtjörn B. Epidemiology of burn injuries in Mekele Town. Northern Ethiopia: a community based study. *Ethiop J Health Dev* 2002;16:1-7.
- [19] Mzezewa S, Jonsson K, Aberg M, Salemar L. A prospective study on the epidemiology of burns in patients admitted to the Harare burn units. *Burns* 1999;25:499-504.
- [20] Baqi AH, Black RE, Arefeen SE, Hill K, Mitra SN, Sabbir A. Causes of childhood deaths in Bangladesh: results of a verbal autopsy study. *Bull World Health Organ* 1998;76:161-71.
- [21] Kobayashi K, Ikeda H, Higuchi R, Nozaki M, Yamamoto Y, Urabe M, et al. Epidemiological and outcome characteristics of major burns in Tokyo. *Burns* 2005;31S:S3-11.
- [22] Han TH, Kim JH, Yang MS, Han KW, Han SH, Jung JA, et al. A retrospective analysis of 19,157 burns patients: 18-year experience from Hallym Burn Center in Seoul, Korea. *Burns* 2005;31:465-70.
- [23] Song C, Chua A. Epidemiology of burn injuries in Singapore from 1997 to 2003. *Burns* 2005;31S:S18-26.
- [24] Sharma PN, Bang RL, Al-Fadhli AN, Sharma P, Bang S, Ghoneim IE. Paediatric burns in Kuwait: incidence, causes and mortality. *Burns* 2006;32:104-11.
- [25] Treacan GV, Lessenot ST, Grossin C, Devau S, Pages M, Laguerre J, et al. Differences between burns in rural and in urban areas: implications for prevention. *Burns* 2006;26:351-8.
- [26] Tung KY, Lin CM, Wang HJ, Chen GS, Peck M, Yang J, et al. A seven-year epidemiology study of 12,381 admitted burn patients in Taiwan—using the Internet registration system of the Childhood Burn Foundation. *Burns* 2005;31S:S12-7.
- [27] Anlatıcı R, Özerdem ÖR, Dalay C, Kesikta E, Acartürk S, Seydao'glu G. A retrospective analysis of 1083 Turkish patients with serious burns. *Burns* 2002;28:231-7.
- [28] Tarim A, Nursal TZ, Yildirim S, Noyan T, Moray G, Haberal M. Epidemiology of pediatric burn injuries in southern Turkey. *J Burn Care Rehabil* 2005;26:327-30.
- [29] Mungdi IA. Childhood burn injuries in North Western Nigeria. *Niger J Med* 2002;11:30-2.
- [30] Kumar P, Chirayil PT, Chittoria R. Ten years epidemiological study of paediatric burns in Manipal, India. *Burns* 2000;26:261-4.
- [31] Bangladesh Health and Injury Survey, Report on Children, Dhaka Bangladesh, 2005.
- [32] Ansari-Lari M, Askarian M. Epidemiology of burns presenting to an emergency department in Shiraz, South Iran. *Burns* 2003;29:579-81.
- [33] Lin TM, Wang KH, Lai CS, Lin SD. Epidemiology of pediatric burn in southern Taiwan. *Burns* 2005;31:182-7.
- [34] Tse T, Poon CHY, Tse KH, Tsui TK, Ayyappan T, Burd A. Paediatric burn prevention: an epidemiological approach. *Burns* 2006;32:229-34.

- [35] Badawy AE, Mabrouk AR. Epidemiology of childhood burns in the burn unit of Ain Shams University in Cairo, Egypt. *Burns* 1998;24:728-32.
- [36] Mukerji G, Chamanian S, Patidar GP, Gupta S. Epidemiology of paediatric burns in Indore, India. *Burns* 2001;27:33-8.
- [37] Forjuoh SN, Keyl PM, Diener-West M, Smith GS, Guyer B. Prevalence and age-specific incidence of burns in Ghanaian children. *J Trop Pediatr* 1995;4:273-7.
- [38] Niekerk AV, Rode H, Laflamme L. Incidence and patterns of childhood burn injuries in the Western Cape, South Africa. *Burns* 2004;30:341-7.
- [39] Lau YS. An insight into burns in a developing country: a Sri Lankan experience. *Public Health* 2006;120:958-65.
- [40] Adamo C, Esposito G, Lissia M, Vonella M, Zagaria N, Scuderi N. Epidemiological data on burn injuries in—Angola a retrospective study of 7230 patients. *Burns* 1995;21:536-8.
- [41] Albertyn R, Bickler SW, Rode H. Paediatric burn injuries in Sub Saharan Africa—an overview. *Burns* 2006;32:605-12.
- [42] Forjuoh SN, Guyer B, Smith GS. Childhood burns in Ghana: epidemiological characteristics and home-based treatment. *Burns* 1995;21:24-8.