Burn injury in Bangladesh: electrical injury a major contributor

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Abstract: Electrical injury is a major cause of burn injury and significant cause of mortality, morbidity and disability. To explore the proportional incidence of thermal and electrical burn injuries in Bangladesh, a population-based cross sectional survey 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. The study was designed to describe the proportional incidence of thermal, electrical and chemical cause of burn in Bangladesh. Electrical injury constituted about one third of the total burn injuries. Among the total 1,999 injuries about 31% were due to electrical injuries, about 26% were due to flame, about 25% were due to hot liquid, over 16% by hot object, about 2% by chemical and less than 1% were due to explosives. The incidence of death rate was 3.97 per 100,000 populations per year. Thermal burn was found as the major cause of death due to burn injuries and constituted 58% of the total deaths due to burn. Electrical injuries caused 42% of the deaths. It was estimated that more than 5,600 people die due to burn and electrical injuries every year in Bangladesh considering the incidence rate of 3.97 per 100,000 populations per year in the 150 million population. Electrical injury including lightning constitute about one third of the burn related mortality, morbidity and disabilities. Rural people and children are the more vulnerable group. Electrical injury needs to be included as a special component in a burn prevention strategy, particularly in rural Bangladesh.

Keywords: Burn, electrical Injury, Bangladesh

Introduction

Burn is a devastating type of injury with long-term physical and psychosocial effects. Along with its traumatic nature, painful treatment can sometimes induce psychopathological responses [1]. Interdisciplinary rehabilitation due to physical and psychological complication is not uncommon in burn injury [2]. Along with the advancement of medical care, survival rate has been increased, however long term morbidity following burn injury remains a huge burden [3].

Electrical injury is a major contributor to burn related morbidity and mortality. The management of electrical burn sometimes becomes critical because of difficulty in assessment of injury on initial presentation [4]. Despite significant improvements in product safety, electrical injury is still the cause of many fatalities and of considerable morbidity in developed countries [5]. Due to rapid expansion and use of electricity, and less awareness of safety issues in low income countries electrical injuries are becoming an emerging health problem. To describe the magnitude and nature of burn and electrocution, a number of papers have been published in Bangladesh [6-7], however information regarding proportional incidence of electrical and thermal burn was not sufficiently documented. This study was designed to describe the proportional incidence of thermal and electrical burn injuries in Bangladesh.

Materials and methods

Study population

A nationwide survey was conducted during 2003 (January to December) in 12 randomly selected districts of Bangladesh and in Dhaka Metropolitan City.

Multi-stage 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. This encompassed a total population of 819,429.

Bangladesh has a total of 64 districts. Among them 12 districts were chosen by simple random sampling. Each district comprises of several upazilas (sub-districts). One upazila was randomly selected from each selected district. An upazila comprises of a number of unions. A union is the lowest administrative unit comprising of ~20,000 population. From each upazila two unions were selected randomly and each union was considered a cluster. All households in the union were included in the survey. The district headquarters of the 12 selected districts and Dhaka Metropolitan City constituted the urban areas. In the urban areas, mohallas served as clusters. Mohallas are the lowest unit of the city corporation. About 400-500 households constitute a mohalla. Systematic sampling was done to achieve the required number of households.

Case ascertainment

Anyone who was burned and received treatment or could not perform normal activities for at least 3 days was included as a case of burn injury.

Data collection and interviews

Forty-eight data collectors collected data from respondents through face to face interviews. Along with the researchers, 6 full-time supervisors were employed for the supervision and monitoring of the data collection process. Both the supervisors and data collectors were trained on the data collection process. Mothers were 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 the 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 someone living in the same house including domestic helpers or long-term guests who shared meals and participated in the daily activities within the household.

The respondents were first asked whether there had been any illness or injury at home in the last 6 months. If any illnesses/injuries were identified, the interviewer proceeded with further clarification regarding the injuries. Structured questionnaires were employed if burn injuries caused the illness. Repeat visits were made to the households where respondents were unavailable during the first visit. In spite of repeated attempts, 2.7% of households could not be interviewed. A total of 166,766 households participated in the study.

Adjustment of data

The stratified multi-stage sampling scheme generated a national sample that required weighting to allow for proper representation. Weighting factors were calculated for Dhaka Metropolitan City (DMC) and for districts other than DMC. Weighting factors for DMC were calculated for slum, non slum and peri-urban populations. For other districts, weighting factors were calculated for the rural and urban populations in each district. For the national estimation the proportional size of the population of DMC and other districts was taken into consideration in calculating the final weighting factor.

Recall bias in national survey

To ensure a sufficient number of deaths in the survey, the recall period considered was two years in areas other than Dhaka Metropolitan City and three years in Dhaka Metropolitan City. An analysis of deaths by year of recall showed that most fatal events were recalled in the first year of the recall period with a rapid fall off in each year after. Due to this, a final analysis was conducted using deaths from the most recent year to obtain the most accurate fatality rates.

In the case of morbidity, the recall period was six months in both Dhaka city and areas other than Dhaka. As the recall period was long, no minor electrical injury was included in this study and only moderate to severe electrical injuries were included in this study. A structured definition of moderate, serious and severe burn was made for this study.

Statistical analysis

Standard descriptive statistics were used to analyse the characteristics of burn patients and their injuries. Mean, standard deviation (SD)
and proportion were used where appropriate. Injuries were presented by gender, age and place of residence. Age was categorised in seven groups. The yearly incidence was calculated from the occurrence of morbidity in 6 months multiplied by 2, as data were collected with a 6 month recall period. Rates were calculated with 95% confidence intervals (CI).

Ethical issues

Ethical clearance was obtained from the Ethical Committee of Institute of Child and Mother Health Dhaka. Participants were informed about the benefits and objectives of the study. Verbal consent was obtained from each head of the household before proceeding with the interviews.

Result

Overall

Due to thermal, electrical and other causes a total of 1,999 fatal and non-fatal burn injuries were identified in the Bangladesh Health and Injury Survey (BHIS). It was found that 52% of the total burn incidences were male and 48% were female. The incidence rate was 243.8 per 100,000 population per year. It was estimated that more than 365,000 people were injured fatally and non-fatally by burn and electrical injuries every year in Bangladesh considering the incidence rate 243.8 per 100,000 population per year in the 150 million population.

Thermal cause was found as the major cause of burn in Bangladesh which constituted about two thirds of the total burn, with flame the major contributor. Electrical injury constituted about one third of the total burn injuries. Among the total 1,999 injuries about 31% were due to electrical injuries, about 26% were due to flame, about 25% were due to hot liquid, over 16% by hot object, about 2% by chemical and less than 1% were due to explosives (Figure 1).

Non fatal injuries

A total of 1,968 people were non-fatally injured due to thermal, electrical and other causes of burn injuries. Among them 52% were male and 47% were female.

Children less than 10 years were found to be at a high risk and children less than five were the most vulnerable group. The rate of non-fatal injuries was found to be 687.3 and 286.6 per 100,000 children per year amongst the 0-4 year and 5-9 year age groups respectively (Figure 2).

The overall rate of injury due to burn and electricity was found to be 240 per 100,000 per year. It was significantly higher in the rural areas. Incidence was found to be four times higher in the rural areas compare to urban. The rates were 367.5 and 96.6 per 100,000 population per year in urban and rural areas respectively (Figure 3).

Place of injuries

More than 78% of the injuries took place at home. About 11% of injuries occurred at highways and streets. 4% of injuries occurred in industrial settings, factory workshops or in commercial areas and in agricultural fields and farms about 3% of injuries occurred. More than 1% of injuries took place in school and sports areas.

At home more than 45% of injuries took place in the kitchen or cooking areas, about 28% of injuries occurred in the yard and about 15% of injuries happened in the bedroom.

Treatment received

About 36% of patients received treatment from a hospital/clinic or from a registered physician.
About 30% of patients received treatment from the medicine shopkeeper and more than 18% received herbal or homeopathic treatment. About 6% of patients received treatment from a traditional healer or religious leader and about 9% received from friends and relatives.

Among the total non-fatal injuries, 6.6% of patients needed to be admitted to a hospital. The rate of hospital admission was calculated at 16
per 100,000 population per year.

The average duration of hospital stay was found to be 14.34 days, ranging from 1 day to 75 days.

Fatal injuries

The total deaths due to burn and electrocution were 31. Among them 48% were male and 52% were female. The incidence of death rate was 3.97 per 100,000 population per year.

Thermal burn was found as the major cause of death due to burn injuries and constituted 58% of the total deaths due to burn. Electrical injuries caused 42% of the deaths.

It was estimated that more than 5,600 people die due to burn and electrical injuries every year in Bangladesh considering the incidence rate of 3.97 per 100,000 population per year in the 150 million population.

Place of death

43% percent of deaths occurred at home, 8% on the way to home, 20% of deaths occurred at the site of injury and 19% at hospital.

Treatment

Among the 31 people who died due to thermal and electrical burn (19), 61% of them received treatment from hospital. Six people died at the site of injury and another 7 (20%) received treatment from other sources like homeopath, herbal and medicine shopkeepers. The rate of hospitalization for severe burn was 2.3 per 100,000 population per year.

Considering both fatal and non-fatal hospital admissions, the rate was calculated at 18.3 per 100,000 population per year. It was estimated that about 27,000 people needed hospital admission due to thermal, electrical and other causes of burn injuries every year in Bangladesh (considering the incidence rate, 18.3 per 100,000 population per year in the 150 million population).

Discussion

Every year in Bangladesh more than 365,000 people are injured by electrical, thermal and other causes of burn injuries. Among the total burn related injuries, 27,000 needed hospital admission and over 5,600 died. Thermal burn was the major cause of burn injuries which constituted about two thirds of the total burn. Only about 3% were caused by chemicals and explosives, and about one third of the total burn injury in Bangladesh was due to electrical injuries.

Children of less than five years were the most vulnerable group for burn and electrical injury. Findings were found to be consistent with many of the other studies [8]. A significantly higher rate of thermal and electrical burn incidence was found in rural areas. The incidence of electrical injuries was found to be six times higher in rural areas when compared to urban areas. Low literacy of the population and a lack of safety measures when in contact with electricity might be the reason behind it.

Electrical injury is increasingly becoming a significant health problem in Bangladesh, especially in rural areas due to the increasing uptake of electricity for agricultural development purposes [6]. As such, in a burn prevention strategy electrical causes should be considered with special importance and special emphasis needs to be given to the rural population.

Conclusion

Burn is a major public health problem in Bangladesh. Electrical injury including lightning constitute about one third of the burn related mortality, morbidity and disabilities. Rural people and children are the more vulnerable group.

Electrical injury needs to be included as a special component in a burn prevention strategy, particularly in rural Bangladesh.

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