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A child an hour: burden of injury deaths among children under 5 in Pakistan

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Abstract

Background—Globally, more than 875 000 children under the age of 18 die due to injury every year. The rate of child injury death is 3.4 times higher in low-income and middle-income countries than in high-income countries.

Objectives—To study injury mortality burden among children under the age of 5 in Pakistan.

Methods—Demographic and Health Survey in Pakistan was conducted from September 2006 until February 2007. It included 95 000 households, out of which 3232 households had death of a child under the age of 5 from January 2005 onwards. The Child Verbal Autopsy Questionnaire (CVAQ) was administered to these households with a response rate of 96%.

Results—For age group 0–5 years, injury was the sixth leading cause of death and was responsible for 2.5% of all deaths (n=73). For age group 1–5 years, injury was found to be the third leading cause of death (11%) after diarrhoea (18%) and pneumonia (17%). The overall under fives mortality rate due to injury was estimated at 39.5 per 100 000 per year in Pakistan. Drowning (22%), road traffic injuries (12%), burns (11%) and falls (10%) were the most common types of injury. The mortality rate was twice as high in rural areas (32 per 100 000; 95% CI 18 to 45), compared to the urban areas (15 per 100 000; 95% CI 0.3 to 29).

Conclusions—Injury is the third leading cause of deaths among children 1–5 in Pakistan. The burden is twice as high in rural areas.

INTRODUCTION

Children living in lower middle-income countries (LMICs) are three times more likely to die due to injuries than those living in high-income countries.^{1–3} Restricted mobility, limited environmental exposure, anatomical and physiological differences make the nature, causes

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and preventive strategies different among this group compared to older children. Countries such as Iran and Bangladesh have found a significant burden of injuries in this age group.⁴⁵

Of the 10 million under 5 deaths, over half a million deaths occur in Pakistan, ranking it fourth in the total under 5 deaths after India, Nigeria and China.⁶⁷ Mortality due to injuries in this group is not well defined. Earlier work has focused on national figures on morbidity due to injury in Pakistan.⁸⁻¹¹ The purpose of this study was to determine the burden of injury deaths among children less than 5 years of age compared to other causes of deaths and define the distribution of injuries by age, sex, province and urban versus rural residence using Pakistan Demographic and Health Survey (PDHS) data.

METHODS

Pakistan is the sixth most populous country in the world with an estimated population of 179 million with children less than 5 years accounting for 14.8% (26 million) of the total population.¹²⁻¹⁴ The under-five mortality rate for Pakistan is 90 per 1000 live births.¹⁵

The Pakistan Demographic and Health Survey is carried out every few years, the last one being in 2007. The survey is the largest household-based survey conducted in Pakistan. The survey adopted a two-stage, stratified, random sample design. The first stage involved selecting 1000 sample points (clusters) with probability proportional to size of urban (390) and rural areas (610). In urban areas, the sample points consisted 26 800 enumeration blocks, each including about 200–250 households. The frame for rural areas consists of the list of 50 588 villages enumerated in the 1998 population census. However, because of political instability, 28 sample points could not be surveyed and a total of 972 sample points were covered out of initial 1000. The sample for the 2006–2007 PDHS represents the population of Pakistan excluding the Federally Administered Northern Areas and restricted military and protected areas. Although the Federally Administered Tribal Areas (FATA) were initially included in the sample, due to security and political reasons, it was not possible to cover any of the sample points in the FATA. Aside from 20 sample points in FATA, the job of listing of households could not be done in four areas of Baluchistan due to inability of the Federal Bureau of Statistics (FBS) to provide household listings because of unrest in those areas. Another four clusters in North West Frontier Province (NWFP); now Khyber Pakhtunkhwa could not be covered because of resistance and refusal of the community.

The second stage of sampling involved selecting households. In each sample point, 105 households were selected by applying a systematic random sampling technique. This way, a total of 102 060 households were selected and 95 441 households (98%) were successfully interviewed and were asked to report information about deaths to children under the age of 5 that had occurred since January 2005, including the sex, month, year of death and age at death. A total of 3232 deaths of children under 5 were identified as occurring since January 2005 and 3101 verbal autopsies were completed (for a response rate of 96%). Response rate varied only slightly by sex, residence, province or age of the child at death. Information on causes of child deaths was obtained using a verbal autopsy (VA) questionnaire. The standard infant and child VA questionnaire, which had been applied in various settings, was

used.¹⁶⁻¹⁸ The modified instrument was also validated in prospective studies in Pakistan and India.^{19,20} These questionnaires were then translated into local languages. Trained interviewers used these questionnaire that elicited details about the illness and cause of death from the parents and/or others who were present at the time of death of the child. Separate teams of physicians reviewed these VA questionnaires to assign causes of death.

The 2006–2007 PDHS data show that the average household size observed in the survey is 7.2 persons. The population for children under 5 years of age by PDHS was 113 620. Figure 1 gives the PDHS sampling methodology.

Statistical analysis

Analysis was done using SPSS V.16. Weighted analysis was performed. The injury mortality rate for children was calculated per 100 000 populations. Simple frequencies and percentages were reported for variables, for example, type of injuries, age groups and provinces.

RESULTS

Injury ranked sixth among the leading causes of death for children under the age of 5 in Pakistan after birth asphyxia, sepsis, pneumonia, prematurity and meningitis. The mortality rate of injuries for children under the age of 5 was estimated at 39.5 per 100 000 (95% CI 27 to 52) per year in Pakistan. Extrapolated to the estimated current under-five populations of 25 million, the total injury deaths are expected to be around 9800 per year for children under the age of 5 in Pakistan or 27 deaths per day. Injury is the third leading cause of death (11%) after diarrhoea (17.7%) and pneumonia (16.9%) in age group 1–5 years (table 1). The estimated injury death rate was 37 per 100 000 per year for ages between 1 and 5 years. Under-five injury mortality rates were same among boys, 40 per 100 000 (95% CI 22 to 58), and girls, 40 per 100 000 (95% CI 21 to 58). Rural areas were found to have twice the injury mortality rates compared to urban areas (47 per 100 000; 95% CI 31 to 64 versus 22 per 100 000; 95% CI 4 to 40 per year). The injury mortality rate was highest in Baluchistan, 99 per 100 000 (95% CI 7.5 to 190), followed by NWFP, 47 per 100 000 (95% CI 11 to 83), Sindh, 35 per 100 000 (95% CI 11 to 59) and Punjab, 34 per 100 000 (95% CI 18 to 50).

Table 2 shows the causes of injury mortality in children under 5 in Pakistan. The most common cause of mortality is drowning (21.9%), followed by road traffic injuries (RTIs; 12.3%), burns (11%) and falls (9.6%). Between the ages 1 and 4 years, drowning (24.1%), burns (14.8%) and falls (9.3%) were frequent causes of death. There were 18 injury deaths in children less than 1 year of age (0.7% of total <1 year deaths), with almost equal distribution among RTI (n=3), injury due to falling objects (n=3), drowning (n=3), falls (n=2), natural disasters (n=2) and others (n=5).

DISCUSSION

We found that injury is the third leading cause of <5 childhood mortality among those who survive the first year of their life. Rural areas have twice the mortality rates compared to the urban areas and drowning, and RTIs and falls are the major causes of injury deaths.

This study represents first national estimates of injury rates. Previously, smaller subnational studies from rural communities showed rates consistent with our findings from rural populations. A community survey on a sample of 1441 under-five population in the rural northern areas of Pakistan reported annual mortality rate of 48 per 100 000 persons per year compared to 47 per 100 000 in our study.²¹ Similarly, a study from another rural population used VA algorithms and reported injury as a cause of death among 4% of under-five deaths.²² Globally, there are large variations in child injury mortality rates (table 3). The rates in Pakistan were found to be similar to the global injury death rate of 45.87 per 100 000 but five times higher than 8.5 per 100 000 from high-income countries.¹ There is also significant regional variation. In Bangladesh, 30% of deaths between 1 and 5 years of age are caused by injury, compared to 9% in India and 11% in this study.^{23,24} Similarly, the unintentional injury rate in Bangladesh is 96 per 100 000 children, two and a half times that of Pakistan.²³ Bangladesh's high mortality rates are primarily due to drowning which is the cause of injury-related mortality in 90% of cases.²⁵ Iran, a neighbouring country with substantially higher income level, reported an injury mortality rate of 33.4 per 100 000.²⁶ Table 3 gives a comparison of rates of different parts of the world.¹²³

There are several limitations of our study. First, injury as the cause of death was determined through a simple question 'Did he/she die from an injury or accident?' This question is likely to identify the immediate deaths due to injuries and will miss injury deaths occurring up to 30 days post event, which is the current definition of an injury mortality.²⁷ Second, injuries are a relatively uncommon event and require a larger sample size.²⁸ This is true for this large population-based survey done in Pakistan, where only 73 out of 3101 deaths were found to be due to injury. Larger surveys will provide further information but may not be feasible. Other methodologies need to be used to answer questions requiring larger number of injury victims. The sample size required for a more accurate estimate as well as analysis of types and regional variations will be much larger. Third, 6% of deaths could not be classified into a single cause raising another potential for misclassification. Fourth, our study suffers from the limitation of any study using VA methodology such as recall, misclassification of cause of death.²⁹ This may be especially true for deaths due to violence or abuse and the lower rate for deaths due to homicide/assault could be due to reporting bias. Despite these limitations, VA remains one of the most reliable methods in the absence of a functioning vital registration system and validation studies. Standard VA tools by WHO and others have shown reasonable sensitivity and specificity for childhood deaths.^{30,31} Finally, this study only focuses on mortality only. For every child who dies, several others suffer permanent disability.

There are several policy implications of our findings. It is important that child health community in Pakistan and in other developing countries enhances its focus on injury as a child health issue and integrate injury prevention efforts in child health policies and programmes. Injury is preventable disease and there are several well-known interventions for injury prevention. Good evidence exists for interventions such as pool fencing; child-resistant containers for poisonous household substances speed control and smoke alarms to prevent deaths in children. Some of these may not be relevant or practical and may not address majority of child injury burden in countries such as Pakistan. Major gains could result through advocacy efforts that help formulate effective legislation and enforcement of

home safety standards. Specifically, within homes, interventions to reduce access to water storage systems within and around households, safe design of the staircases and roofs to that minimise the risk of falls, and low cost design changes in cooking areas to prevent burns/scalds could save many lives and prevent disability. For RTIs, enforcing lower speed limits around residential and school areas and enactment/enforcement of child motorcycle and bicycle helmet laws and safe school transport could significantly reduce the deaths and disabilities due to RTIs. Healthcare providers can also play a critical role in education parents of young children about safety issues. Improving access to life-saving trauma care to the injured children at the community level during transportation and at facility level would enhance chances of survival. Finally, surveillance data to drive and evaluate action as well as research focusing on interventions for injury prevention and treatment need to be undertaken to move from identification of problem to implementable and cost-effective solutions.

CONCLUSION

Injuries are the third most common cause of deaths in Pakistani children between ages 1 and <5 years.

Preventing drowning, RTIs, burns and falls using the well-known interventions are likely to reduce deaths and disability.⁸

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What is already known on this topic

- ▶ Data on the epidemiology of unintentional injury in low-income countries are still scarce.
- ▶ Drowning was the most common cause of death.
- ▶ Injury deaths are higher in rural areas.

What this study adds

- ▶ This is the first study to provide injury mortality rates of children under 5 in Pakistan.
- ▶ The study results indicate the need to include injury prevention to achieve Millennium development goal of reducing child mortality by two-thirds.

Figure 1.
Pakistan Demographic and Health Survey Sampling Methodology.

Table 1

Causes of under-five mortality in Pakistan—Pakistan Demographic and Health Survey 2006–2007

Children <1 year (n=2439)	Children between 1 and 4 years (n=503)	Children less than 5 years (n=2942)
Birth asphyxia (39.5%)	Diarrhoea (17.7%)	Birth asphyxia (22.1%)
Pneumonia (32%)	Pneumonia (16.9%)	Sepsis (14.2%)
Sepsis (28%)	Injury (11%)	Pneumonia (13.3%)
Diarrhoea (27.9%)	Measles (7.7%)	Prematurity (9.2%)
Prematurity (16.3%)	Meningitis (6.6%)	Meningitis (4%)
Meningitis (9.9%)	Sepsis (4.7%)	Injury (2.5%)

Table 2

Injury deaths under 5 years of age according to demographic characteristics

Variables	RTIs n (%)	Falls n (%)	Something fell on the child n (%)	Burns n (%)	Drowning n (%)	Poisoning n (%)	Bite/ sting n (%)	Natural disaster n (%)	Homicide/ assault n (%)	Others n (%)	Total
Total	9 (12)	7 (10)	4 (5)	8 (11)	16 (22)	2 (3)	3 (4)	6 (8)	2 (3)	16 (22)	73 (100)
AGE											
0–12 months	3 (33)	2 (29)	3 (75)	–	3 (19)	–	–	2 (33)	–	5 (31)	18 (25)
12–59 months	6 (67)	5 (71)	1 (25)	8 (100)	13 (81)	2 (100)	2 (67)	4 (67)	2 (100)	11 (69)	54 (74)
GENDER											
Male	7 (78)	4 (57)	2 (50)	2 (25)	5 (31)	–	2 (67)	2 (33)	2 (100)	11 (69)	37 (51)
Female	2 (22)	3 (43)	2 (50)	6 (75)	11 (69)	2 (100)	1 (33)	4 (67)	–	5 (31)	36 (49)
AREA											
Large city	–	2 (29)	–	1 (13)	1 (6)	–	–	1 (17)	–	3 (19)	8 (11)
Other city	–	1 (14)	–	–	–	–	–	–	–	1 (6)	2 (3)
Rural	9 (100)	4 (57)	4 (100)	6 (75)	15 (94)	2 (100)	2 (67)	5 (83)	2 (100)	12 (75)	61 (83)

RTIs, road traffic injuries.

Table 3

Injury mortality rates of children between 1 and 4 years of age—rates from the other parts of the world

Countries	Injury mortality rate (1–4 years per 100 000 population per year)*
Pakistan*	37
Iran	33.4
Bangladesh	92
Thailand	30.4
Philippines	74.7
Vietnam	52.8
Eastern Mediterranean Region	
All	49.4
HICs	30.2
LMICs	50.5
World	
All	45.87
HICs	8.5
LMICs	49.7

HICs, high-income countries; LMICs, lower middle-income countries.

* Includes unintentional and intentional injuries while rest of the data from other regions are only unintentional injuries.