Original article

Trends in trauma-related mortality among adolescents: A 6 year snapshot from a teaching hospital's post mortem data

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ARTICLE INFO

Article history:

Received 24 June 2016

Received in revised form 11 October 2016

Accepted 23 February 2017

Available online 18 March 2017

Keywords:

Trauma

Adolescents

Mortality

Age

Teaching hospital

India

ABSTRACT

Introduction: The aim is to explore the trends in trauma mortality in children aged 0–18 years can help to co-ordinate resources toward research and programs to reduce the burden.

Methods: This is a retrospective study carried out on adolescents ≤18 years of age autopsied according to the attorney request at Forensic Medicine & Toxicology department of King George's Medical University, Lucknow, India in the period from January 1st, 2009 to December 31st, 2014.

Results: There were 9160 deaths from all causes in children ≤18 years old, 7747 of which were due to trauma related causes, with a female predominance of 1.3:1. The age distribution revealed that 65.8% of deaths occurred in the 10–18 age group. Road traffic accidents (RTA) was the most prevalent cause (3635 deaths – 46.92%), followed by asphyxia (1128 deaths – 14.56%) and sexual assault (649 deaths – 8.37%). Asphyxia/suffocation was the major cause of injury with 31.96% of deaths within group <1 year; asphyxia (28.66%) and transport-related injuries (32.27%) were more predominant in the 1–4 age group; transport-related deaths were frequent in the 5–9 age group (45.14%), 10–14 age group (55.68%) and in the group 15–18 age group (51.69%). Regarding times of death, 61% occurred at the scene, 5.6% during pre-hospital care, 26.2% occurred at the hospital within the first 24 h after admission, and the remaining 7.6% of deaths occurred after 24 h after admission to the hospital. When we analyzed the deaths according to the intent, homicides occurred in 16% of cases. Unintentional injuries occurred in 69% of deaths and self-inflicted injuries were identified in 15% cases.

Conclusions: Findings show that there was a predominance of deaths in children and adolescents males, between 15 and 18 years old, mainly from road traffic accidents. This study highlights the burden of trauma caused mortalities in children, which requires instant action.

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1. Introduction

Trauma remains the most under-recognized public health problems (leading cause of morbidity and mortality, disability and socioeconomic burden) among children and adolescents worldwide and every year, approximately 875,000 children are murdered and nonfatal injuries affect the lives of between 10 million and 30 million more globally.¹ More than 5 million people died accounting of 1 out of every 10 deaths from injuries in 2000 alone. More than 90% people came from developing and under developed country. In Asia, trauma is responsible for 30% of all deaths in the 1–3-years age group, 40% in the 4-year-olds and between 50% and 60% of the 5–17-years age group (36). In addition

to these 1 million deaths, tens of millions of children require prolonged hospital care for their injuries each year, and many of the children are left with a degree of disability, often lifelong (37). Unfortunately, the burden of childhood injuries predominantly affects low- and middle-income countries, where resources to deal with them are scarce; it is estimated that more than 95% of all deaths in children due to injury occur in these countries. It is further estimated that from all children suffering an injury, 12% will develop a long-term temporary disability and 2% will be permanently disabled (1). Considering the high incidence and diversity of injury, solving this problem is one of the greatest challenges in the field of public health.^{1–4}

India is also experiencing an increasing trend in injuries, particularly due to road traffic injuries (RTI) at an annual rate of 3%.⁴ India is projected to be the world's most populous country by 2025, surpassing China. India has more than 50% of its population below the age of 25 and more than 65% below the age of 35. A trauma-related death occurs in India every 1.9 min.

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Unintentional injuries are the prime cause of morbidity and mortality among children and adolescents. Previous reports show that among unintentional injuries, fatalities from road traffic accidents (RTA) are quite prevalent.^{5,6} The majority of fatal road-traffic accident victims are pedestrians, two wheeler riders and bicyclists. A vehicular accident is reported every 2 min and a death every 8 min on Indian roads.

A world report on Road Traffic Injuries indicates that it will be major killer accounts for 1.5 million death and 15 million DALY'S lost by 2020.⁷ Improperly equipped trauma center are major drawback in reduction of mortality and morbidity among victim.⁸ In Indian scenario trauma care facilities are at its nascent phase and confined only to urban and semi-urban premises, because of this victim with ISS > 9 are six time more prone for the risk of death compared to their counterpart in developed country.¹⁰

All Traumas is not Road Traffic Injuries. Other causes of injuries leading to death among adolescents cited in the literature are fall (pediatric age group), agricultural related trauma, firearms, intentional self harm, assault, terrorist, fall of objects, burns, drowning and natural disasters. The paucity of injury related mortality data and in fact data on causes of death in adolescents can be traced in part to the limited registration of deaths in several developing countries like India.

There is a need to develop an understanding of traumatic fatalities in children and adolescents to improve injury prevention strategies. In theory, almost all serious injuries could be prevented by adequate care giving and supervision. Developing an appropriate approach toward injury prevention in children depends on the knowledge of the epidemiology of traumatic deaths. To have an understanding of injury related mortality among young people in Lucknow, and in the absence of authentic death registration data, the study objective is to examine the prevalence and distribution of deaths due to injury among adolescent's ≤ 18 years using available postmortem data from Department of Forensic Medicine, King George's Medical University, Lucknow, India.

"Keeping our children safe and helping them live to their full potential"

2. Materials and methods

This is a retrospective study carried out on adolescents ≤ 18 years of age autopsied according to the attorney request at Forensic Medicine & Toxicology department of King George's Medical University, Lucknow, India in the period from January 1st, 2009 to December 31st, 2014. A figure of 7747 that died from trauma related causes formed the material of this study. This represents approx 33 deaths from trauma-related causes per 100,000 inhabitants per year. Regarding the population ≤ 18 years of age, there were 9160 deaths independent of trauma-related causes.

In India, by law, medico-legal autopsies are performed in all cases of sudden, suspicious or external cause related deaths. This

study included only examinations confirmed as trauma related and exclusively from the District of Lucknow. The data for the causes of death were confirmed by the death certificate registry. Other documents relating to the deaths were also examined, such as the inquest report, First Information Report (FIR) and the complete autopsy report. Data were collected in a database using MS Excel spreadsheets and analysis was carried out.

The ages of children were categorized into five groups: less than 1 year, 1–4 years, 5–9 years, 10–14 years and 15–18 years, in order to correlate with causes of death. The deaths were grouped by cause: transport-related (car passengers, pedestrians hit by an automobile or train, bicycles, or motorcycles), asphyxia/suffocation, hanging/strangulation, poisoning, burning, stab wound, firearm, fall, assault/blunt trauma, and others. The deaths were also grouped by intent: homicide, self-inflicted (suicide), and unintentional. Locations of death were described as: at the scene, pre-hospital care, and at the hospital. The times of death were classified as: immediate (at the scene), less than 24 h, or more than 24 h after the injury.

Ethical approval was declared from the King George's Medical university ethics committee wide letter no-865/R-Cell-12. Ref. code: 55 E.C.M.II A/P20.

3. Setting

The study was carried out in Lucknow, the capital of Uttar Pradesh, a major metropolitan city of India. The Lucknow district has a population of 4,588,455¹¹ according to the 2011 census which roughly equals the nation of Georgia or the US state of Louisiana. It is placed at 31st position in descending order out of a total of the 640 populated cities of India. Over 33.8 percent of the total population resides in rural areas leaving barely around 66.2 percent composed of urbanites.

4. Results

Overall, 9160 deaths were reported in children ≤ 18 years old during the period of 2009–2014. Of these deaths, 7747 were due to trauma, accounting for 84.6% of the total deaths. There was a continuous increasing trend in proportion of mortality by trauma related cause from 2009 to 2012 compared to the period 2013–2014 (Table 1).

There were 3309 males (42.71%) and 4438 females (57.29%). The proportion of males to females was 1:1.3. Females had higher death rates compared to males in all age groups. 34.19% death was in children between 0 and 9 yrs of age while 65.81% of deaths were in children between 10 and 18 years old. When examining by sex and age group, most victims were males between 15 and 18 years (Fig. 1).

Death rates differed by cause, with the highest rates related to injuries due to transportation (46.92%) and the lowest rates related to assault/blunt trauma (1.6%) (Table 2).

Table 1

Year-wise distribution of total autopsy, total deaths below 18 years of age and trauma deaths ≤ 18 years of age/100,000 populations.

Year	Total autopsy	Autopsy rate/100,000 population	Total number of deaths ≤ 18 years of age	Total number of trauma deaths ≤ 18 years of age	Trauma deaths ≤ 18 years of age rate/100,000 population
2009	4274	93.1	1360	1119	24.3
2010	4180	91.1	1355	1125	24.5
2011	4205	91.6	1401	1232	26.8
2012	4608	100.4	1502	1307	28.4
2013	5615	122.3	1915	1573	34.2
2014	4700	102.4	1627	1391	30.3
Total	27,582	–	9160	7747	–

Fig. 1. Distribution of trauma deaths by age and gender group.

Table 2

Deaths according to mechanism of injury and age groups.

Mechanism	<1 year	1–4 years	5–9 years	10–14 years	15–18 years	Total
RTA	65	295	563	1068	1644	3635
Asphyxia	156	262	276	152	282	1128
Fall from height	38	46	47	79	150	360
Burns	79	69	76	66	194	484
Stab wound	7	12	19	48	103	189
Intoxication	69	98	117	104	186	574
Blunt Trauma	10	12	18	31	56	127
Sexual Assault	26	64	63	201	295	649
Gun shot	0	5	16	55	79	155
Others	38	51	52	114	191	446
Total	488	914	1247	1918	3180	7747

Asphyxia/suffocation was the major cause of injury in 31.96% of deaths in group <1 year; asphyxia (28.6%) and transport-related injuries (32.27%) were more predominant in the 1–4 age group; transport-related deaths were frequent in the 5–9 age group (45.1%), 10–14 age group (55.68%) and in the group 15–18 age group (51.70%). Sexual assault was also reported in 5.77% victim within 0–9 year of age group and within 9.72% victim of 10–18 years age group while maximum cases were reported in 15–18 year of age group (Table 2).

Pedestrian strike was the major cause of injury in 30.06% of transport-related deaths. 8.9% children were hit by a train. Motorcycle crashes are a public health problem in India and 15.30% adolescents died this way (Fig. 2).

Fig. 2. Classification of deaths according to the intent.

Regarding times of death, 61% occurred at the scene, 5.6% during pre-hospital care, 26.2% occurred at the hospital within the first 24 h after admission, and the remaining 7.6% of deaths occurred after 24 h after admission to the hospital (Fig. 3).

When we analyzed the deaths according to the intent, homicides occurred in 16% of cases. Unintentional injuries occurred in 69% of deaths and traffic-related injuries were the most common. Self-inflicted injuries were identified in 15% cases (Fig. 4).

5. Discussion

Trauma has tagged along with mankind since time immemorial, the worst of it often carried by children: the weakest and most vulnerable part of this world. This study describes the causes of injury related mortality among adolescents using post-mortem data from a teaching hospital in India. Studies related to mortality are useful in order to develop preventive strategies. In the present study, death rate for males was almost two times the rate for

females, and males had a higher injury death rate compared to females in all childhood age groups. Studies from other countries like USA, Qatar, South Africa, Brazil, Sweden, China and India showed the same pattern of results.^{9,12–17} The reasons for this supremacy, according to some authors, are greater exposures of males to behavioral risk factors, increased interest in and easier access to firearm and other vehicles like cars, motorcycle etc. They are also main earner of society. Child labor is a curse in our society so they have greater integration into labor market via legal or illegal activities. Besides it there violent and aggressive and inquisitive nature are additive in it.^{5,18,19} Socioeconomic status and

Fig. 3. Transport-related deaths by age group.

Fig. 4. Distribution of cases regarding times of death.

social belief together plays an important role. The causes of injury differ depending on the socioeconomic level of each country or region.^{16,18,20} In developing countries like India, male babies are preferred in lower socio-economic section because they provide manual labor and success the female lineage. The selective killing of female child is most common in these areas where cultural norms value the male child over female child for a variety of bad practices in society. People of lower socioeconomic status generally have greater under-5 mortality rate because of inadequate care and malnutrition.¹⁷

In our series, the most prevalent causes of injury were traffic-related events and Asphyxia. Currently, violence is a major public concern across all societies, especially in underdeveloped or developing countries. Asphyxia/Suffocation was the major cause of injury in 31.9% death in <1 year. Manner of death may be homicide and accidental here. In accidental cases Sudden Infant Death Syndrome is an important cause.²¹ Traffic related injury and asphyxia both are major player among 1 to 4 years of age group while from 5 years to 18 years transport related injuries are most predominant, which differ from the study carried out by Fraga et al.²² Road traffic accident are major problems of a populous country like India.²³ Children between 5 and 18 years of age start getting expose to road traffic but they are usually unaware of traffic rule. In many cases violent sexual assault are also associated with RTA and later lead to death of victim. Violent Sexual assault like rape with children is itself a curse in our world so it is described as a separate traumatic event. In our society very little attention is given to child abuse due to other major problem like malnutrition and infection while children are most easily targeted victim.²⁴ There is sharp increase in trend of sexual abuse from <1 year to 18 years of age. Like other study victims were mostly girl child and rarely male child.²⁵ Similar to other study from India many other traumatic situation like asphyxial death, fall from height, burn, gunshot, blunt trauma all are generally associated with violent sexual assault.²⁶

Traffic related injuries are major public health problem and major cause of mortality and morbidity in developing countries. Traffic accidents related death have overall increasing trend because of lack of preventive measures and lack of awareness among public.²⁷ In 2004, approx 1.3 million people have died from road traffic crashes worldwide, which show destructive power of road traffic accident.¹ Literature data show that in most studies the main cause of deaths from trauma-related injuries in children ≤18 years is related to traffic accidents.^{5,13,15–17}

Several studies have attempted to elucidate the risk factors related to deaths from traffic accidents.²⁷ Besides inexperience young driver of 15–18 age group other human factors like drunk

and drive, poor road condition such as poor surface maintenance and lack of proper kerbs, unawareness toward rules of the road are major factors associated with the RTA related death. In middle- and high-income countries the number of pedestrian child deaths is approximately 33%, while in low-income countries this may be substantially higher, where it is usual for children to walk along roads (1). The present study shows that the frequency of death in both pedestrian and vehicle occupant were increasing with age. Transport related death was higher in pedestrians among all age group except age <1 year. Children less than 1 year of age are least often in contact of road. Studies show that in countries like Mexico and Colombia, accidents involving pedestrian are also more frequent.^{27,28} High influx of migrant and their settlement along the road, lack of safety measures and unawareness toward rules of the Road are major factors for this trend. These Homeless migrant settlers are mostly belongs to rural background and not accustomed to chaotic traffic of the cities.²⁶ The present study revealed that 13.7% of deaths related to transport accident were associated with motorcycles. This type of problem was observed in parts of Asia and India.⁹ Despite the obvious advantages of cost, various authors noted that the risk of fatality and injury is much higher in motorcycle accidents than in other categories of motor vehicles. The vulnerability of motorcyclists is higher and fatality in an accident is 14 times more likely compared to car occupants.^{29,30} Despite the laws regulating the use of helmets, safety equipment and the practice of traffic safety most of these rules are blatantly ignored in India by drivers.

In this study approximately 61% of deaths occurred at accident scenes. These data are somewhat consistent with a study conducted in the state of São Paulo and in several American cities such as Los Angeles, San Francisco and Vermont.^{31,32} In another American series, in Colorado, we found that most deaths occurring in less than 24 h were due to traffic accidents.³³

Regarding intention, this study noted that the primary cause of death was accident (69%), followed by homicide (16%) and suicide (15%). In our study homicidal death was usually present in cases of younger children less than 10 years and in cases of females, while Suicidal tendency was commonly seen in children of 10 year to 18 year of age group. These older children are more susceptible to mental trauma and these mental or physical injuries usually provoked suicide. These data are truly alarming when considering the growing violence in our society and the social and economic repercussions that this may cause. The same pattern of intent was observed in other studies carried out in Canada, Nepal, South Africa and China.^{15,34–36} It is interesting to note that a study in India, relating to the period of 1994–2005, showed that there were no cases of homicide in adolescents less than 19 years of age.⁹

In relation to suicide, this is an emerging problem in developing countries. In developed countries like USA, it is the second most common cause of death in children (10–14 year age group) and in a study conducted in Sweden in 2002; it was the first cause of death among 5–25 year olds.^{5,12} Other factors also related to homicide in younger children were described by Fujiwara et al. in a study of 2009, which used data from the National Violent Injury Statistics System in the U.S.A. The study indicated that the main victims of homicide aged less than 2 years were boys, whose parents had depression and financial problems.³⁵ This study again support our fact that main victims of homicide are younger children.

The first measure in reducing deaths from trauma related causes is prevention and proper education. Law makers of different countries should take some measures that are specific to the host, the cause of death and the environmental and social factors surrounding the problem. Whatever success has already been achieved in relation to prevention should be linked to active prevention with a mix of laws, educational programs. Some programs are design collectively by different stakeholder to focus

on multidisciplinary and well-distributed teams, as well as the strengthening and organization of the state body to counter these trauma related death. Several studies focused on the prevention of accidents have shown a decrease in the number of deaths.^{37–40}

6. Conclusions

We come to an end that among children and adolescents, there is a predominance of deaths arising from trauma-related injuries amongst males aged 15–18 years, mainly from traffic related fatalities. These observations are useful in guiding further development and execution of intervention measures and prevention strategies in this district in order to minimize deaths from trauma-related injuries.

7. Limitation of study

Since the study relies only on data from the Forensic Medicine and Toxicology reports which performs postmortem of either unnatural deaths or medico-legal cases it under estimates the total toll and also screws toward causes of unnatural deaths.

Conflict of interest

The authors have none to declare.

Source of funding

University Grants Commission (U.G.C.) wide letter No. 17/7-2011 (SA-1).

References

1. Paden M, Oyegbite K, Ozanne-Smith J, et al. *World Report on Child Injury Prevention*. Geneva: World Health Organization; 2008.
2. Nagaraja J, Menkedick J, Phelan KJ, Ashley P, Zhang X, Lanphear BP. Deaths from residential injuries in US children and adolescents, 1985–1997. *Pediatrics*. 2005;116:454–461.
3. Committee on Child Abuse and Neglect. Committee on Injury, Violence, and Poison Prevention; Council on Community Pediatrics, American Academy of Pediatrics: Policy statement – child fatality review. *Pediatrics*. 2010;126(3):592–596.
4. Peden M, McGee K, Sharma G. *The Injury Chart Book: A Graphical Overview of the Global Burden of Injuries*. Geneva: World Health Organization; 2002. Available from: <http://www.who.int/publications/924156220x.pdf> Accessed 26.05.11.
5. Kanchan T, Menezes RG. Mortalities among children and adolescents in Manipal, Southern India. *J Trauma*. 2008;64(6):1600–1607.
6. Celis A, Villaseñor M. Injury mortality among children and teenagers in Mexico, 1997. *Inj Prev*. 2001;7:74–75.
7. Joshipura MK, Shah HS, Patel PR, Divatia PA. Trauma care systems in India—an overview. *Indian J Crit Care Med*. 2004;8:93–97.
8. Radjou AN, Balliga DK, Pal R, Mahajan P. Injury-related mortality audit in a regional trauma center at Puducherry, India. *J Emerg Trauma Shock*. 2012;5(1):42.
9. West JG, Cales RH, Gazzaniga AB. Impact of regionalization. The orange county experience. *Arch Surg*. 1983;118:740–744.
10. Mock CN, Jurkovich GJ, Amon-Kotei D, Arreola-Risa C, Maier RV. Trauma mortality patterns in three nations at different economic levels: implications for global trauma system development. *J Trauma*. 1998;44:804–814.
11. Kumar S, Verma AK, Ali W, Singh US, Krishna A. Intentional and non-intentional burns related deaths: a comparative study of socio-demographic profile. *Burns*. 2015;10.1016/j.burns.2014.06.006.
12. Barros MD, Ximenes R, de Lima ML. Child and adolescent mortality due to external causes: trends from 1979 to 1995. *Rev Saude Publica*. 2001;35:142–149.
13. Hjern A, Bremberg S. Social aetiology of violent deaths in Swedish children and youth. *J Epidemiol Community Health*. 2002;56(9):688–692.
14. Fraga AM, Fraga GP, Stanley C, Costantini TW, Coimbra R. Children at danger: injury fatalities among children in San Diego County. *Eur J Epidemiol*. 2010;25(3):211–217.
15. Jiang G, Choi BC, Wang D, et al. Leading causes of death from injury and poisoning by age, sex and urban/rural areas in Tianjin, China 1999–2006. *Injury*. 2011;42(5):501–506.
16. Bener A, Hussain SJ, Ghaffar A, Abou-Taleb H, El-Sayed HF. Trends in childhood trauma mortality in the fast economically developing State of Qatar. *World J Pediatr*. 2011;7(1):41–44.
17. Ruiz-Casares M. Unintentional childhood injuries in sub-Saharan Africa: an overview of risk and protective factors. *J Health Care Poor Underserved*. 2009;20(4 suppl):51–67.
18. Brehaut JC, Miller A, Raina P. Childhood behavior disorders and injuries among children and youth: a population based study. *Pediatrics*. 2003;111:262–269.
19. Jagnoor J, Bassani DG, Keay L, et al. Million death study collaborators: unintentional injury deaths among children younger than 5 years of age in India: a nationally representative study. *Inj Prev*. 2011;17(3):151–155.
20. Agran PF, Winn D, Anderson C, Trent R, Walton-Haynes L. Rates of pediatric and adolescent injuries by year of age. *Pediatrics*. 2001;108(3):E45.
21. Fleming PJ, Blair PS, Pease A. Sudden unexpected death in infancy: aetiology, pathophysiology, epidemiology and prevention in 2015. *Arch Dis Child*. 2015; pii: archdischild-2014-306424.
22. Fraga AMA, Bustorff-Silva JM, Fernandez TM, et al. Children and adolescents deaths from trauma-related causes in a Brazilian City. *World J Emerg Surg*. 2013;8:52 Page 2 of 7.
23. Thomas V. Epidemiologic Profile of Road Traffic Accident (RTA) Cases Admitted in a Tertiary Care Hospital – a retrospective study in Hyderabad, Andhra Pradesh. *IJMPs*. 2013;3(6):30–36.
24. Chen JQ, Han P, Dunne MP. Child sexual abuse: a study among 892 female students of a medical school. *Zhonghua Er Ke Za Zhi*. 2004;42(Jan (1)):39–43.
25. Chinawa JM, Aronu AE, Chukwu BF, Obu HA. Prevalence and pattern of child abuse and associated factors in four secondary institutions in Enugu, Southeast Nigeria. *Eur J Pediatr*. 2014;173(Apr (4)):451–456. doi:10.1007/s00431-013-2191-4.
26. Singh R, Singh M, Rupani R, Verma AK, Singh H, Kumar S, et al. A comparative study on the death of unclaimed homeless males and females based on autopsy and circumstantial findings in a large North Indian population. *J Public Health*. 2015;10.1007/s10389-015-0686-3.
27. Hajar M, Chu LD, Kraus JF. Cross-national comparison of injury mortality: Los Angeles County, California and Mexico City, Mexico. *Int J Epidemiol*. 2000;29(4):715–721.
28. Posada J, Ben-Michael E, Herman A, Kahan E, Richter E. Death and injury from motor vehicle crashes in Colombia. *Rev Panam Salud Publica*. 2000;7(2):88–91.
29. Carrasco CE, Godinho M, De Azevedo Barros MB, Rizoli S, Fraga GP. Fatal motorcycle crashes: a serious public health problem in Brazil. *World J Emerg Surg*. 2012;7(suppl 1):S5.
30. Lin MR, Chang SH, Huang W, Hwang HF, Pai L. Factors associated with severity of motorcycle injuries among young adult riders. *Ann Emerg Med*. 2003;41(6):783–791.
31. Masella CA, Pinho VF, Costa Passos AD, Spencer Netto FA, Rizoli S, Scarpelini S. Temporal distribution of trauma deaths: quality of trauma care in a developing country. *J Trauma*. 2008;65(3):653–658.
32. Demetriades D, Murray J, Charalambides K, et al. Trauma fatalities: time and location of hospital deaths. *J Am Coll Surg*. 2004;198(1):20–26.
33. Cothren CC, Moore EE, Hedegaard HB, Meng K. Epidemiology of urban trauma deaths: a comprehensive reassessment 10 years later. *World J Surg*. 2007;31(7):1507–1511.
34. Roaten JB, Partrick DA, Nydam TL, et al. Nonaccidental trauma is a major cause of morbidity and mortality among patients at a regional level 1 pediatric trauma center. *J Pediatr Surg*. 2006;41(12):2013–2015.
35. Sharma G, Shrestha PK, Wasti H, Kadel T, Ghimire P, Dhungana S. A review of violent and traumatic deaths in Kathmandu, Nepal. *Int J Inj Contr Saf Promot*. 2006;13(3):197–199.
36. Meel BL. Mortality of children in the Transkei region of South Africa. *Am J Forensic Med Pathol*. 2003;24(2):141–147.
37. Scholer SJ, Hickson GB, Ray WA. Sociodemographic factors identify US infants at high risk of injury mortality. *Pediatrics*. 1999;103(6 Pt 1):1183–1188.
38. Hoppe-Roberts JM, Lloyd LM, Chyka PA. Poisoning mortality in the United States: comparison of national mortality statistics and poison control center reports. *Ann Emerg Med*. 2000;35(5):440–448.
39. Rimsza ME, Schackner RA, Bowen KA, Marshall W. Can child deaths be prevented? The Arizona child fatality review program experience. *Pediatrics*. 2002;110(1 Pt 1):e11.
40. Gielen AC, McDonald EM, Wilson ME, et al. Effects of improved access to safety counseling, products, and home visits on parents' safety practices: results of a randomized trial. *Arch Pediatr Adolesc Med*. 2002;156(1):33–40.