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Injury Prevention and Care : An Important Public Health Agenda for Health, Survival and Safety of Children

Gopalkrishna Gururaj

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Abstract Injuries affect the lives of thousands of young people and their families each year in India. With the gradual decline of communicable and nutritional diseases, injuries will be a leading cause of mortality, morbidity and disabilities and the success achieved so far in child health and survival is in jeopardy. Available data indicate that among children less than 18 y, 10–15 % of deaths, 20–30 % of hospital registrations and 20 % of disabilities are due to injuries. Based on available data, it is estimated that injuries result in death of nearly 1, 00,000 children every year in India and hospitalisations among 2 million children. Road Traffic Injuries (RTI's), drowning, falls, burns and poisoning are leading injury causes in India. Drowning and burns are major causes of mortality in less than 5 y, while RTIs, falls and poisoning are leading causes in 5–18 y. A shift in the occurrence of suicides to younger age groups of 15–20 y is a matter of serious concern in recent years. More number of males, those in rural areas, and majority of poor income households are affected due to injuries.

Child injuries are predictable and preventable. Children have limitations of size, development, vision, hearing and risk perceptions as compared to adults and hence are more susceptible and vulnerable to injuries. Thus, it is important to make products and home – road and school environments safer along with greater supervision by parents and care givers. The key approaches include vehicle and product safety, environmental modification, legislation and enforcement, education and skills development along with availability of quality trauma care. Child injury prevention and care requires good quality data, building human and financial resources, strengthening policies and programmes based on evidence and integrated implementation of countermeasures along with monitoring and evaluation. Child injury prevention and control is crucial and should be an integral part of child health and survival.

Keywords Children · Injury · Mortality · Morbidity · Disability · Road traffic injuries · Drowning · Falls · Burns · Poisoning · Intentional injuries · Policies and programs

Introduction

The United Nations Convention on the Rights of the Child, article 1, specifies that children include all those below the age of 18 y [1]. In India, they constitute 38 % of our population [2]. Child health policies and programmes by successive governments, expansion of child survival programmes and availability of preventive and therapeutic modalities has reduced mortality in the last 3 decades; however, it is still an unfinished agenda. The epidemiological and sociodemographic transition along with environmental and behavioral changes due to globalization, motorisation, urbanisation, migration and media impact has resulted in the emergence of injuries as a leading public health problem.

An injury is defined as "body damage due to sudden transfer of energy (physical, mechanical, chemical, thermal or radiant) resulting from an interaction of agent, host and environment and beyond the physical tolerance of an individual" [3]. Injuries are classified unintentional and intentional based on intent. Unintentional injuries include Road Traffic Injuries (RTIs), falls, burns, poisoning, drowning, occupational injuries, sports injuries, fall of objects and injuries in disaster situations, while intentional ones include suicide, assault, child maltreatment and homicides. Injuries

G. Gururaj (✉)
Department of Epidemiology, WHO Collaborating Centre for Injury Prevention and Safety Promotion,
National Institute of Mental Health and Neuro Sciences,
Bangalore 560029, India
e-mail: epiguru@yahoo.com

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among children are seen at home, on road, in school and even at some work places (with child labor being common in India). As children grow from infancy to adulthood, they are exposed to number of energy producing products and environments that result in injuries ; injuries can be major threats for safety and survival of children.

The purpose of the present report is to examine the burden, patterns, characteristics and impact of injuries among children and identify strategic approaches for prevention and care in India.

Injury Mortality and Morbidity

Global Scenario

The child injury surveys in Asia by The Alliance for Safe Children (TASC) and UNICEF revealed that injuries account for 20 % of deaths among children less than 18 y [4]. As per WHO, an estimated 950,000 children less than 18 y died of an injury in the world in 2004 [5]. The childhood injury mortality rate is nearly 4 times higher in Low and Middle Income Countries (LMICs). Unintentional injuries contribute for an estimated 90 % of these deaths and are a leading cause of mortality in the age group of 10–19 y. Nearly 60 % of all child injury deaths are accounted by 5 leading causes of RTIs, drowning, burns, falls and poisoning. RTIs and falls are one of the leading causes of DALYs lost for children in 0–14 y. It is noticed that among children less than 18 y, for every death, there were nearly 12 children hospitalized or permanently disabled and 34 children who required medical care or missed school [6].

Indian Scenario

Fatal Injuries

In India, data on injury deaths are collected by police as injuries are considered medico legal events. National Crime Records Bureau (NCRB) is the nodal agency for collection, analysis, interpretation and dissemination of all injury data [7]. Independent studies have reported underreporting of fatal injuries by 10–20 % , varying by location [8–12].

As per NCRB, total accidental deaths and suicides doubled during the 2 decades from 2, 48,312 in 1990 to 4, 84,172 by 2010 [7]. It is estimated that a million deaths occur due to injuries every year [8]. In 2010, children up to 14 y accounted for 7 % of total unintentional and 2.5 % of suicidal deaths (nearly 30,000 deaths) (Fig. 1); if age groups of 15–18 are included, this number is likely to be much higher. The Million Death Study (MDS) indicated that injuries were responsible for 3.2 % and 16 % of deaths in <4 and 5–14 y, respectively [13]. In 15–24 y, the top 3 leading causes of death were due to

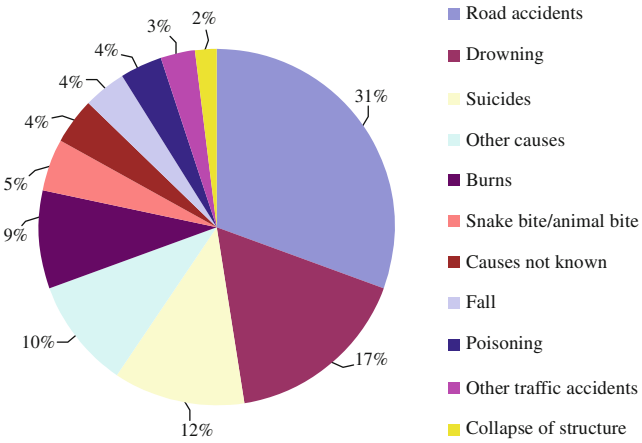

Fig. 1 Fatal injuries among children less than 14 y in India , 2010 (7)

intentional and unintentional injuries. Data from the Bangalore Road safety and Injury Prevention programme (BRSIPP) during 2008–2011 revealed that children up to 18 y accounted for 9 % and 8 % of total injury deaths in urban and rural Bangalore, respectively (Fig. 2) [14, 15]. Population based surveys though few in numbers indicate higher figures in different age groups. [12, 16–19]. Based on available data sources, it is estimated that nearly 1, 00,000 deaths every year, 10 % of total injury deaths, are among children below 18 y.

Nonfatal Injuries

Even though hospitals in both public and private sector provide care for the injured, injury data is limited due to absence of surveillance, formal reporting systems and limited research. BRSIPP data showed that injuries of all age groups constituted 20–30 % of ER registrations, 9–10 % of admissions and 40–50 % of deaths in hospitals. Children less than 18 y constituted nearly 10 % of deaths and 15 % of injuries as shown in Fig. 1 and the ratio of fatal to nonfatal injuries was 1: 24 [15]. Nearly 20 % of hospitalized children due to traumatic brain injuries were children below 15 y [20]. Mohan et al in a rural population based survey of childhood (<15 y) injuries observed that the ratio of severe, moderate to mild injuries (based on AIS coding) was 1: 18: 80 [17]. Findings from other studies indicate this ratio varies from 1: 10 to 1: 50 [21–24].

Age, Gender and Socioeconomic Status

Male children are affected more in a ratio of 2: 1, often linked to exposure variations and study settings. Injury is a minor cause of infant mortality, but a major cause for child mortality as it increases from the stages of infancy and reaches a peak by 15–19 y [4]. The MDS revealed that injuries were the 6th leading cause in <4 y olds (3.2 %)

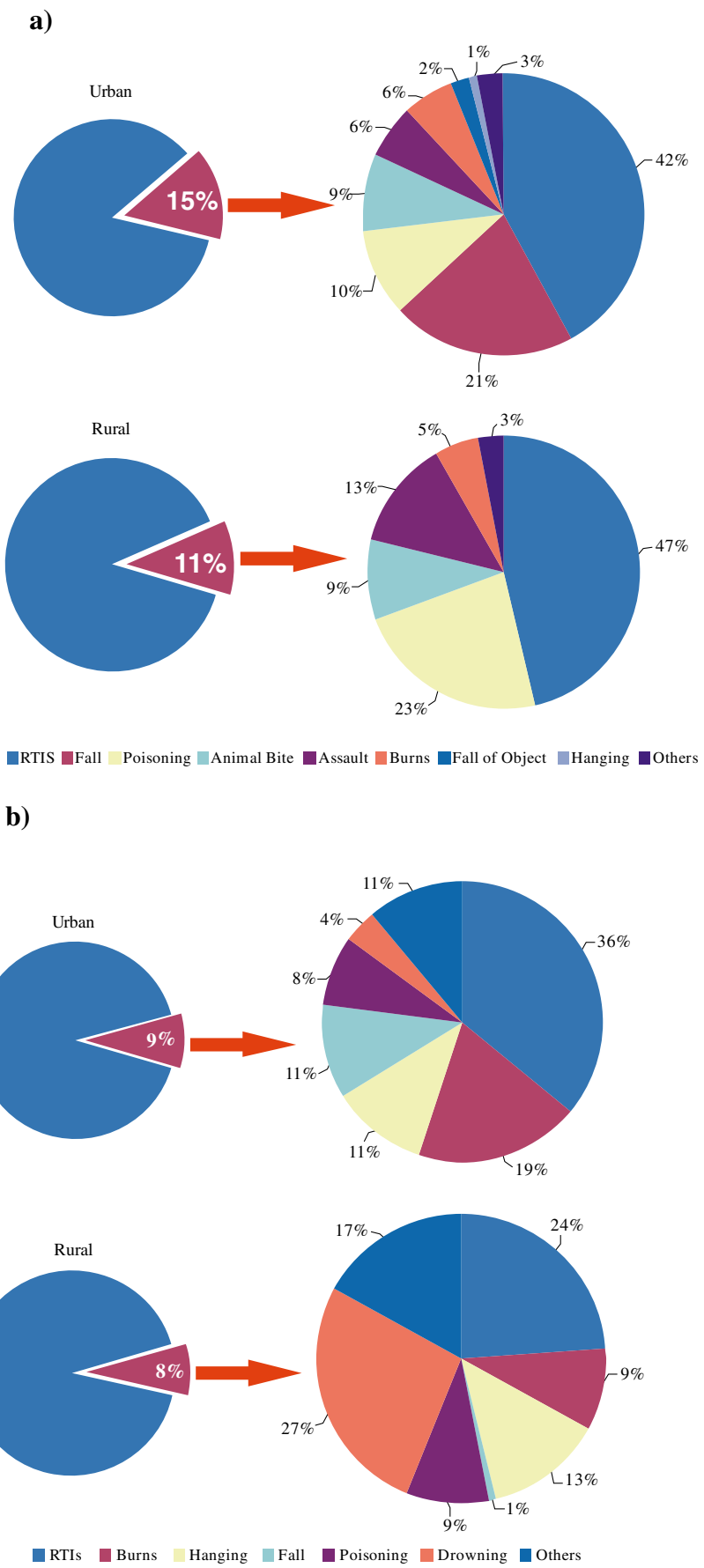

Fig. 2 Distribution of **a**) Non fatal injuries among children <18 y **b**) Fatal injuries among children <18 y

and the first major cause among 5–14 y (unintentional 16 %; RTIs 4 %) and 15–24 y (intentional self-harm −16 % and unintentional injuries −12 %) [13]. Analysis of 33,000 death records of Bangalore city during 2010 revealed that transport crashes and burns occupied 10th and 13th ranking in <4 y and the same causes moved to 3rd ranking by 5–14 y. Among 15–24 y, the top 3 leading causes of mortality were transport injuries, burns and poisoning [15].

Injuries are also high in poor households as they not only have high rates of exposure (high exposure to unsafe traffic environments, improper working conditions along with poor living and recreational situations) but also limited access to care (amidst spiraling costs and absence of health insurance), resulting in higher mortality and greater impact of injuries. Dandona et al reported a higher frequency of RTIs among children from lower socioeconomic households [18]. Higher incidence of brain injuries has been reported among poor households [20, 23]. People with low socioeconomic status had almost two-fold higher mortality rates across all age groups with low socioeconomic groups having 56 % excess cause-specific mortality [25]. The socioeconomic impact of RTIs study from Bangalore covering nearly 20,000 households showed that 71 % of urban households and 53 % of rural households had become poorer due to an injury [16].

Injury Patterns

Injury patterns vary with age, gender and place. In 2009, among children <14 y, major causes of fatal injuries were RTIs (31 %), drowning (17 %) and suicides (12 %) as shown in Fig. 1 [7]. The MDS observed that drowning and falls were higher in <5 y, while RTIs were the leading cause in 10–19 y [13]. Data collected by trained staff from police records during the 3 y of BRSIPP revealed that RTIs (36 %) and burns (19 %) were the leading injury causes in urban Bangalore, while RTIs (24 %) and hanging and poisoning (9 % each) were the leading causes in a rural district for deaths [15].

Among nonfatal injuries, data from independent studies reveal that falls, burns and RTIs are important causes for mortality and morbidity in 5–9 and 10–18 y age groups [17, 24, 26, 27]. RTIs were the leading cause of hospital contact in both urban (44 %) and rural (42 %) areas, followed closely by falls, burns and poisoning [14, 15]. Several hospital based studies have shown similar results and are in similarity with findings from other parts of world [28].

Road Traffic Injuries

Globally, RTIs account for 2 % of all child deaths (mortality rate of 10.7 per 100000 population). RTIs contributed for approximately 262000 deaths among children and youth aged 0–19 y, almost 1/3 of the total injury deaths in 2004 with >80 % occurring in LMICs [5]. RTIs are the leading cause of death globally among 15–19 y-olds, while for those in the 10–14 y it is the second leading cause [22]. Hyder et al, in a review of RTIs in South Asia noticed that children and adolescents constitute 13 % of all RTI deaths and represent 22 % of all those who seek care [29].

RTI's are a leading cause of death in India among 15–19 y old and second leading cause among 10–14 y and boys are affected more as compared to girls. In 2009, 6 % (based on NCRB) to 9 % (based on MORTH) of deaths were in <14 y (M : F :: 1:3), while 30 % were in 15–29 y (M : F :: 1 : 7) from both reports [7, 30]. More number of children from rural areas died as only 15 % of crashes happens in 32 large cities. In the Bangalore population based study, 5–8 % of those killed and 7–30 % of seriously injured were less than 16 y [16]. In a review of hospital studies on RTIs, Aarthi KK observed that that 20 % of hospital care seekers were children below 20 y [31]. Majority of children killed and injured in India are pedestrians and bicyclists as seen in other Low and Middle Income countries [4, 14, 19, 21, 29]. Collision of children with heavy and medium sized vehicles results in more deaths and serious injuries [32]. Some of the important risk factors and several proven interventions to reduce RTIs are given in Table 1.

Drowning

The child injury surveys by UNICEF and TASC indicated that drowning was a leading cause of death in all surveyed countries of Asia [6]. Nearly 175000 deaths were attributable to childhood drowning with 98 % of these occurring in LMICs in 2004. The rate of drowning deaths in South East Asia is estimated to be 6.2 while the rate in HICs is 1.2 per 100000 population with estimates for non fatal drowning ranging between 2 and 3 million [5].

In India, nearly 20 % of child (<14 y) injury deaths were due to drowning in 2009 with a male to female ratio of 2.5: 1 as per NCRB [7]. Data from BRSIPP showed that drowning was the leading cause of death in rural areas (27 %) for children <18 y [14, 15]. Jagnoor et al observed that drowning was 3 times higher in rural areas (110 /1,00,000 live births), more among boys, frequent in north eastern parts and during April–September [12] and accounted for nearly 25,000 deaths in <5 y olds in 2005. Apart from deaths during natural disasters, many children and adolescents die in recreational drowning acts in rivers, ponds, pools and lakes. The possible risk factors and prevention approaches are shown in Table 1.

Table 1 Risk factors and preventive strategies for selected injuries among children

External injury	Risk factors	Prevention strategies
Road Traffic Injuries	Age and development (limitations of size, vision, hearing, attention and judgement along with cognitive abilities), males, heterogeneous traffic environments, poor households, consumption of alcohol and drugs, failure to use safety equipments like helmets, seat belts, child restraints, over speeding, peer group influences, visibility issues and others.	Safer roads to school, traffic calming measures to reduce speed, safe design of highways, safer play areas, use of child restraints - bicycles and motorcycles helmets - seat belts, increasing visibility of vehicles, vehicle design features, graduated driver licensing systems, minimum drinking age and lower limits for blood alcohol along with adequate emergency and trauma care systems and rehabilitation services.
Drowning	Age and development, males, children living in lower income households, presence of unprotected open watery bodies, unsafe recreational activities, lack of safety equipment and knowledge, absence of supervision by parents and care givers and weather.	Limiting access of children to open watery bodies, greater supervision by parents and care givers, fencing pools and covering wells, teaching swimming for young children, making available flotation devices and timely trauma care.
Burns	Age and development of children, gender, poverty and living standards, presence of kerosene and unprotected gas cylinders in the vicinity, unsafe activities like use of fireworks, lack of knowledge on first aid and several others.	Environmental modification of houses, design of safer stoves, legislation and standards, parental supervision, banning of fireworks, safe placement of gas cylinders in houses, timely first aid, effective management of burns and timely rehabilitation of injured children.
Falls	Age, sex, living in poor income houses along with some of the contextual factors like height of fall, type of surface, mechanism of fall and others. The physical environment of home, school, play sites along with unsafe playgrounds and equipments and work places (for child labourers) are a major cause of falls.	Effective laws and regulations for safe design of buildings – homes and play sites, education of parents and care givers, screening of elderly people, eradication of child labour and others.
Poisoning	Age, gender, poverty, manufacture of lethal chemicals, easy availability of pesticides and drugs, lack of supervision.	Banning of dangerous products, making of less toxic products, limiting accessibility of children to drugs and pesticides , banning fireworks, safe storage at homes and parental supervision of children,
Suicides and violence	Violence and suicides are often due to a complex interaction of several social, cultural, economic and health related factors. Age, gender, poverty, alcohol and drugs, value systems, presence of mental health problems, domestic violence, crisis situations and others. Stigma, denial and significant underreporting compound the issues further.	Limiting accessibility to pesticides and drugs, early recognition and better management of mental health problems like depression and substance abuse, enhancing life skills education programmes, positive role of media, parental education programmes and support for suicide attempters and ideators.

Burns

Burns can be due to fire, scalds, and contact burns and is a debilitating condition that results in intense pain and disfigurement along with long term suffering. The global mortality rate of burns was 4/100000 population with infants having the highest death rates. It is estimated that nearly 96000 children below the age of 20 y died as a result of burn injuries globally [5].

Burns are disproportionately high among girls, globally, as well as in India. Nearly 10 % (2200) of deaths were due to burns (includes electrocution, explosion, electrical short circuits, fire crackers, *etc.*) among less than <14 y [7]. The BRSIPP study showed that 12 % and 9 % of injury deaths

and 5–10 % of hospitalisations among children (<18) were due to burns [14, 15]. Fire cracker related injuries during festival seasons in India are a common cause of injuries specially resulting in ocular traumatic injuries that can also lead to blindness [33, 34]. Proven interventions based on some recognized risk factors are given in Table 1.

Falls

Falls are an important cause of deaths and hospitalisation among children as they begin to walk and play. Non fatal falls were the 13th leading cause of DALYS lost in 2004 and account for about ¼ to ½ hospital emergency department contacts [5]. Hyder et al, in a review of fall injuries in Asia noticed that the median incidence was 170 per 100 000 children (<18) averaging 43 % of all injuries; in <5 y, the median incidence was 58.2 falls per 100 000 children - 35 % of all injuries [35].

Falls were the second leading cause of unintentional injury deaths in the MDS with an estimated 20,000 deaths in children <14 y [36]. As per NCRB, about a 1000 children <14 y died due to falls, indicating severe underreporting [7]. Nearly 7 % of fatal and 21 % of nonfatal injuries under the BRSIPP was due to falls in children less than 18 y [14, 15]. Falls are the second important cause of brain injuries among children and in rural areas [20, 37]. Fall from buildings (balconies, stair cases, high rise buildings), trees and in playgrounds are commonly seen among children. Risk factors are several and falls are preventable injuries (Table 1).

Poisoning

Unintentional and intentional poisoning resulted in nearly 45,000 childhood deaths globally with a mortality rate of 1.8 per 100000 population [5]. As per NCRB data, more than 2000 children (9.5 % of total childhood deaths in <14 y) died as a result of unintentional poisoning in India in 2009 [7]. The Bangalore study showed that poisoning was more frequent in rural areas contributing for 9 % of deaths and 22 % of hospitalisations [14, 15]. Studies highlight that pesticides, drugs and animal bites are major responsible causes and majority of the instances occur at home [38]. Some contributory factors and approaches for prevention are shown in Table 1.

Intentional Injuries

WHO defines violence against children as 'all forms of physical and/or emotional ill-treatment, sexual abuse, neglect, or negligent treatment or commercial or other exploitation, resulting in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power'[39]. It is estimated that nearly 25–50 % of children would have suffered physical abuse with 20 % of females and 5–10 % of males reporting sexual abuse in childhood [40]. Children experiencing violence are likely to develop a wide range of personality changes, host of antisocial and criminal behaviors, learning disabilities and poor academic performance, mental and behavioral problems, suicidal tendencies and several others. Studies show long-lasting effects on brain architecture, mental health, health risk behaviors, life expectancy, and health-care costs due to violence [41, 42].

Good quality data on violence, sexual and physical abuse, child maltreatment and others are not available from India. Generally, violence accounts for 10–15 % of deaths and hospitalisations as per hospital studies [43, 44]. In India, suicides are the leading cause of death in 15–29 y, more among females, in rural areas [7, 45–47] with a recent shift to younger age groups. This shift is confirmed by the fact that hanging and intentional poisoning were all leading causes of deaths and hospitalisations among children as per data of BRSIPP for the period 2008–2011 [14, 15]; 96 % of these deaths were in 16–18 y. Nearly 2.5 % (3000) of deaths among children less than 14 y were labeled as suicide as per NCRB [7]. Understanding patterns and risk factors for violence is crucial to develop multipronged and culture specific interventions even though some examples are available from HICs [41].

Nature and Type of Injuries

The four country childhood injury survey found that more than a quarter of injured children had injury to the head [28]. Polytrauma has been reported in approximately 10–20 % of the children involved in road traffic crashes. Several Indian studies have identified traumatic brain injury, fractures of upper and lower limbs as major injuries for hospitalisations [22, 43].

Disabilities and Injuries

The share of injuries for disabilities is likely to increase in the coming years. Injuries result in temporary or permanent disability affecting growth and development, education, play and other activities in children with majority requiring long term care. Disabled children are less likely to go to school and play and also become victims of physical and sexual violence [48].

The Asian studies have shown that the rate of permanent disability among children aged 1–17 y in RTIs

alone was 20/100000 children; for every death nearly 4 children were permanently disabled [4, 6]. The recent World Bank report estimates that 4–8 % of India's population (40–90 million) is disabled, and as per NSSO 2002 estimates, 8.4 % of rural households and 6.1 % of urban households has a member with a disability [49]. Injuries are found to be responsible for one fifth of all disabilities; 29 % of locomotor disabilities, 5 % of visual and speech disabilities and 4 % of mental disabilities [49]. The age of onset of significant number of these disabilities is less than 20 y and trauma is a major cause in this age group.

In the four country hospital surveillance study, 36 % were expected to suffer short-term disability (<6 wk); 11 % long-term disability (≥6 wk) and 2 % permanent disability [28]. The 3 y TBI registry at NIMHANS found that 26 % of children with injury to the brain had difficulties in activities of daily living at 4 months post discharge [20].

Impact of Injuries

The grief, pain, and suffering of losing a child due to an injury and the accompanying psychosocial – economic impacts are immeasurable, and impact the entire family and society ; much more, when it involves young children and adolescents. The Asian survey indicated that nearly 1/3 of injured children missed school and had sought treatment [6]. In Bangalore, 13 % could not attend school for more than a month with 3 % beyond 6 mo [20]. RTIs alone cost INR 55,000 crores at 2000 prices equivalent to 3 % of GDP every year in India [50].

Child Injuries are Predictable and Preventable

Child injuries are predictable and preventable and several interventions can yield positive results. The classical public health model focuses on primary prevention (preventing occurrence of new injuries), secondary prevention (reducing the severity of injuries through early management) and tertiary prevention (decreasing the frequency and severity of disability after an injury) [51]. It requires careful identification of factors that lie in children / families, products that are used and the environment in which they interact during pre crash / injury, crash and post crash periods, known as Haddon's matrix [52]. For child injury prevention to become a reality, it should move beyond human errors to making the products and environment safer through a system's approach [53, 54] and requires a judicious combination of education, engineering, enforcement and emergency care, integrated through policies and programmes.

The Way Forward

Several international declarations have called for protecting children and India is a signatory for all of them. In 2005, WHO and UNICEF issued call for an expanded global effort to prevent child injury; in 2006, WHO outlined a 10 y plan of action on child injury. The 2008 world report on child injury prevention highlights major initiatives that need to be undertaken for protecting children [5]. In addition, the Millennium Development Goals [55] and Rights of Children [1] have highlighted the importance of child safety.

Preventing child injury should receive greater attention in India as it has not received the same importance given to other childhood problems. Child injury is closely linked to children's health and should be a central part of all initiatives to reduce child mortality, morbidity, disability and improving overall growth and development of children [56]. Data from surveillance, registries and focused studies are crucial to identify the problem, understand risk factors, monitor interventions and to measure their impact. Research for product and environment safety and policy strengthening is critical. Well defined multicentre studies from representative populations with a focus on injuries among children are essential as current data has limitations of not including 15–18 y, serious underreporting along with misclassification of injuries.

Moving forward the agenda requires greater political will along with strong policies and programmes, legislation, environment modification, capacity strengthening and human resources, advocacy and public awareness, implementing solutions that are evidence based with modification to suit local context, along with monitoring and evaluation. Ministries at national and state levels, professional bodies, civil society and media should recognise the loss of young lives and work towards prevention and control of injuries among children.

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References

1. United Nations. Convention on the Rights of the Child, article 1, United Nations, 1989 http://www.unesco.org/education/pdf/CHILD_E.PDF, accessed on 31st September 2011.
2. UNICEF. The state of world's children 2011. Adolescence – An age of opportunity. United Nations Children's Fund, New York, USA. Feb 2011.
3. World Health Organization. Injury: A leading cause of Global burden of disease. In Krug E, ed. Geneva: Switzerland; 1999.

4. The Alliance for Safe Children and UNICEF. Towards a world safe for children. Conference on child injury; 2004 April; Bangkok
5. Peden M, Oyegbite K, Smith JO, et al. World report on child injury prevention. Geneva: World Health Organization; 2008.
6. Linnan M, Anh LV, Cuong PV, et al. Child mortality and injury in Asia: survey results and evidence. (Innocenti Working Paper 2007–06, Special Series on Child Injury No. 3, IWP-2007-06) Florence, UNICEF Innocenti Research Centre, 2007 (http://www.unicef-irc.org/publications/pdf/iwp_2007_06.pdf, accessed on 29th September 2011.
7. National Crime Records Bureau. Accidental deaths and suicides in India. New Delhi: Ministry of Home affairs, Government of India; 2010.
8. Gururaj G. Injuries in India: A National Perspective. In: Burden of disease in India: Equitable development—Healthy future. New Delhi: National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, Government of India; 2005. p. 325–47.
9. Dandona R, Kumar GA, Ameer MA, Reddy GB, Dandona L. Under-reporting of road traffic injuries to the police: results from two data sources in urban India. Inj Prev. 2008;14:360–5.
10. Gururaj G, Thomas AA, Reddi MN. Under reporting of road traffic injuries in Bangalore. Implications for road safety policies and programs. In Proceedings of the 5th World Conference of Injury Prevention and Control; 2000 Mar 5–8. New Delhi: Macmillan India, Ltd; 2000.
11. Varghese M, Mohan D. Transportation injuries in rural Haryana, North India. Proceedings of the international conference on traffic safety. New Delhi: Macmillan India Ltd; 2003. pp. 326–9.
12. 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;17:151–5.
13. Registrar General of India. Report on causes of death in India, 2001–2003. Office of the Registrar General, New Delhi, India; 2009.
14. Gururaj G, Bangaluru Injury surveillance collaborators group. Bangaluru Road safety and Injury Prevention program: Injury snapshots and Activity profile 2010. National Institute of Mental Health and Neuro Sciences, Publication No. 72, Bangalore, India; 2010.
15. Gururaj G, Bangalore Injury surveillance collaborators group. Bangalore road safety and injury prevention program: Results and learning, 2007–10. National Institute of Mental Health and Neuro Sciences, Publication No. 81, Bangalore, India; 2011.
16. Aeron Thomas A, Jacobs GD, Sexton B, Gururaj G, Rahman F. The involvement and impact of road crashes on the poor: Bangladesh and India case studies. PPR 010 published project report. TRL Ltd; 2004.
17. Mohan D, Kumar A, Varghese M. Childhood injuries in rural north India. Int J Inj Contr Saf Promot. 2010;17:45–52.
18. Dandona R, Kumar GA, Ameratunga S, Dandona L. Road use pattern and risk factors for non-fatal road traffic injuries among children in urban India. Injury. 2011;42:97–103.
19. Mahalakshmy T, Dongre AR, Kalaiselvan G. Epidemiology of childhood injuries in rural Puducherry, South India. Indian J Pediatr. 2011;78:821–5.
20. Gururaj G, Kolluri SVR, Chandramouli BA, Subbakrishna DK, Kraus JF. Traumatic brain injury. Bangalore: National Institute of Mental Health and Neurosciences; 2005.
21. Gururaj G. Road traffic deaths, injuries and disabilities in India: current scenario. Nat Med J India. 2008;21:14–20.
22. Toroyan T, Peden M. Youth and road safety. Geneva: World Health Organization; 2007.
23. Yattoo G, Tabish A. The profile of head injuries and traumatic brain injury deaths in Kashmir. J Trauma Manag Outcomes. 2008;2:5.
24. Verma S, Lal N, Lodha R, Murmu L. Childhood trauma profile at a tertiary care hospital in India. Indian Pediatr. 2009;46:168–71.
25. Mohan VR, Muliyil J. Mortality patterns and the effect of socio-economic factors on mortality in rural Tamil Nadu, south India: a community-based cohort study. Trans R Soc Trop Med Hyg. 2009;103:801–6.
26. Sharma M, Lahoti BK, Khandelwal G, Mathur RK, Sharma SS, Laddha A. Epidemiological trends of pediatric trauma: a single-center study of 791 patients. J Indian Assoc Pediatr Surg. 2011;16:88–92.
27. Kumar P, Chirayil PT, Chittoria R. Ten years epidemiological study of pediatric burns in Manipal, India. Burns. 2000;26:261–4.
28. Hyder AA, Sugerman DE, Puvanachandra P, et al. Global childhood unintentional injury surveillance in four cities in developing countries: a pilot study. Bull World Health Organ. 2009;87:345–52.
29. Hyder AA, Amach OH, Garg N, Labinjo MT. Estimating the burden of road traffic injuries among children and adolescents in urban South Asia. Health Policy. 2006;77:129–39.
30. Ministry of Road transport and Highways. Road accidents in India, 2008. Transport research Wing, Ministry of Road transport and Highways, Government of India, New Delhi, India; 2009.
31. Aarti KK. Epidemiology of road traffic accidents in India: a review of literature. Sir Ratan Tata Trust; 2011.
32. Gururaj G, Bengaluru Road Safety & Injury Prevention Programme collaborators group. Analysis of Fatal Bus Crashes in Bangalore, India. Paper presented at the 10th World Conference on Injury Prevention and Safety Promotion. London. 21–24 September 2010.
33. Puri V, Mahendru S, Rana R, Deshpande M. Firework injuries: a ten-year study. J Plast Reconstr Aesthet Surg. 2009;62:1103–11.
34. Kumar R, Puttanna M, Sriprakash KS, Sujatha Rathod BL. Prabhakaran VC. Firecracker eye injuries during Deepavali festival: a case series. Indian J Ophthalmol. 2010;58:157–9.
35. Hyder AA, Sugerman D, Ameratunga S, Callaghan JA. Falls among children in the developing world: a gap in child health burden estimations? Acta Paediatr. 2007;96:1394–8.
36. Jagnoor J, Suraweera W, Keay L, et al; Million Death Study Collaborators. Childhood and adult mortality from unintentional falls in India. Bull World Health. 2011;89:733–40.
37. Tabish A, Lone NA, Afzal WM, Salam A. The incidence and severity of injury in children hospitalised for traumatic brain injury in Kashmir. Injury. 2006;37:410–5.
38. Basu M, Kundu TK, Dasgupta MK, Das DK, Saha I. Poisoning, stings and bites in children – what is new? An experience from a tertiary care hospital in Kolkata. Indian J Public Health. 2009;53:229–31.
39. Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R. World report on violence and health. Geneva: World Health Organization; 2002.
40. WHO, ISPCAN. Preventing Child Maltreatment: A Guide to Taking Action and Generating Evidence. World Health Organization, Geneva; 2006.
41. Chandran A, Puvanachandra P, Hyder AA. Prevention of violence against children: a framework for progress in low- and middle-income countries. J Public Health Policy. 2011;32:121–34.
42. Anda RF, Felitti VJ, Bremner JD, et al. The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. Eur Arch Psychiatry Clin Neurosci. 2006;256:174–86.
43. Gururaj G. Epidemiology of traumatic brain injuries: Indian scenario. Neurol Res. 2002;24:24–8.
44. Kanchan T, Menezes RG. Mortalities among children and adolescents in manipal, southern India. J Trauma. 2008;64:1600–7.
45. Bose A, Konradsen F, John J, Suganthy P, Muliyil J, Abraham S. Mortality rate and years of life lost from unintentional injury and suicide in South India. Trop Med Int Health. 2006;11:1553–6.
46. Gajalakshmi V, Peto R. Suicide rates in rural Tamil Nadu, South India: verbal autopsy of 39000 deaths in 1997–98. Int J Epidemiol. 2007;36:203–7.

47. Gururaj G, Issac MK, Subbakrishna DK, Ranjani R. Risk factors for completed suicides: a case – control study from bangalore. Inj Control Saf Promot. 2004;11:183–91.
48. World Bank. People with disabilities in India. From communities to outcomes. 2007. http://siteresources.worldbank.org/INDIAEXTN/Resources/295583-1171456325808/DISABILITYREPORTFINALNOV2007.pdf, accessed on 29th September 2011.
49. National Sample Survey Organisation. Ministry of Statistics and Programme Implementation. Government of India. Disabled Persons in India. NSS 58th round. Report No. 485 (58/26/1) July – December 2002. December 2003.
50. Mohan D. The road ahead: traffic injuries and fatalities in India. New Delhi: Transportation Research and injury prevention Programme, Indian institute of Technology; 2004.
51. Mohan D, Tiwari G, Khayesi M, Nafukho FM. Road traffic injury prevention training manual. Geneva: World Health Organisation; 2006.
52. Haddon Jr W. The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively. Am J Public Health Nations Health. 1968;58:1431–8.
53. World Health Organization. World report on road traffic injury prevention: Summary. Geneva, Switzerland; 2004.
54. World Health Organization. Global Status Report on Road Safety: Time for action. Geneva, Switzerland; 2009.
55. Hyder AA, Lunnen J. Reduction of childhood mortality through Millennium Development Goal 4. BMJ. 2011;342:d357.
56. Meddings D. Child injury prevention and child survival. Inj Prev. 2011;17:145–6.