

What do We Need to Know to Prevent Unintentional Injuries do Children?

Luiz Antonio Del Ciampo¹, Ieda Regina Lopes Del Ciampo²

¹Department of Puericulture and Pediatrics, Faculty of Medicine of Ribeirão Preto, University of São Paulo, Brazil, ²Department of Medicine, Federal University of São Carlos, Brazil

ABSTRACT

Unintentional injuries represent a major global public health problem that affects all age groups. Especially during childhood, high rates of morbidity, mortality, and permanent disability bring problems for the whole society. Knowledge of all the elements involved in the occurrence of an injury is essential for taking preventive measures. The purpose of this article is to present some characteristics of the injuries, the child victim of this event, and preventive measures that can be adopted, to keep the whole community alert to minimize this great health problem.

Key words: injuries, injury prevention, primary health care, unintentional injuries

INTRODUCTION

The declaration of the rights of the child was proclaimed by general assembly resolution 1386 of 20 November 1959 and adopted by the United Nations General Assembly 30 years later, presents in its principle 2 that “the child shall enjoy special protection and shall be given opportunities and facilities, by law and by other means, to enable him to develop physically, mentally, morally, spiritually, and socially in a healthy and normal manner and in conditions of freedom and dignity. In the enactment of laws for this purpose, the best interests of the child shall be the paramount consideration.^[1]” In view of this, it is the obligation of the whole society to promote actions to avoid that negative factors can influence the well-being of the children. Moreover, particularly in medicine, pediatrics must take the lead in protecting the physical and emotional integrity of individuals during their first decade of life.

While medicine evolves with improvement in the processes of prevention, treatment, and rehabilitation of infectious and degenerative diseases, unintentional injuries remain as an important and still little-studied problem that causes physical,

emotional, and social impacts on children, unbalancing their health, and may result in illnesses, disabilities, and even deaths.^[2,3] As a result of urbanization, demographic and nutritional transitions, economic growth and technological change, and the epidemiological profile of populations have been moving to non-communicable diseases and injuries.^[4] Since the 1960s, injuries were conceptualized as a public health problem worldwide, being by far the leading cause of death in children and adolescents of developed countries,^[5] and with the decline of infant mortality and the aging of the population, the number of people at risk of injuries is increasing.^[6]

WHAT IS INJURY?

An injury is defined as physical damage results when the body is subjected to sudden or brief intolerable levels of energy that exceeds physiologic tolerance or as the damage that results when the body is deprived of a vital element (e.g., oxygen).^[7]

All injuries are acute events, and this suddenness and unexpectedness have led to the popular myth that is random events, and until a few years ago, these events were called

Address for correspondence:

Luiz Antonio Del Ciampo, Avenida Bandeirantes, 3900, CEP. 14049-900, Ribeirão Preto, São Paulo, Brazil.
E-mail: delciamp@fmrp.usp.br

© 2018 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

“accident.” More recently, researches have avoided the use of the term “accident” because it implies the notion of fate, change, or God’s will rather than the events that can be studied scientifically and whose distribution can be understood just as other disease processes can be understood.^[8] Therefore, the most correct nomenclature adopted for this type of health problem is unintentional injury, because in reality, many injuries may have been anticipated and therefore are potentially avoidable.^[9]

EPIDEMIOLOGY

Globally, about 110 children die every hour from an unintentional injury, more than 2600 every day, nearly 1 million each year, with 87% that results of an unintentional and potentially preventable cause.^[10] Estimates indicate that more than 95% of injury-related deaths among children occur in low- and middle-income countries, but unfortunately, this is only estimated because there is a great lack of correct information from these countries.^[11] In the USA, almost 16 million of injured children are admitted to emergency units each year, with 40,000 ward admissions, 7000 deaths, and 30,000 of which suffer permanent defects.^[12] Children injuries represent a major burden to health-care resources. The medical costs exceed \$87 billion dollar each year. In England, more than 420,000 emergency department attendances in children aged under 5 years, with 90% of severe injuries in this age group are potentially preventable.^[13] In 2011, over 800 children died from trauma-related injuries in Canada.

Among all possible places of occurrence, over 90% of all unintentional injuries in children age 5 and under occur at home.^[14,15] This environment is a potential source of hazard because children spend a large part of their time at home.^[10] The most common household non-intentional injuries are falls, drownings, burns, and suffocation. As a consequence, children suffer pain associated with the original injury and possible treatment and have the risk of physical damage that may limit their long-term development and potential psychological trauma.^[16]

WHY DO CHILDREN SUFFER INJURIES?

Children are considered to be more vulnerable and susceptible to unintentional injuries due to many characteristics of the age group: ^[3,10,15,17-20]

- a. Physical and mental immaturity to predict and avoid danger
- b. Poor motor coordination
- c. Curiosity to explore and experiment their surroundings
- d. Tendency to challenge other children to play
- e. Ability to imitate and repeat some kinds of behaviors
- f. Increased interest in danger
- g. Small stature, small mass, and head circumference larger than the chest

- h. Center of gravity at the height of the chest
 - i. Small airway size
 - j. Tendency to explore by mouth
 - k. Limited natural protection (thin skin, brittle bones and ligaments, and slow withdrawal reflexes)
 - l. Lack of body sense and spatial memory.

WHAT FACTORS CONTRIBUTE TO THE OCCURRENCE OF INJURIES?

Children are exposed to hazards as part of their everyday lives. Besides their characteristics, several factors can contribute to the occurrence of unintentional injuries: ^[2,10,14,21]

- a. Young age, mainly between 1 and 5 years
- b. Young parents
- c. Single parenthood
- d. Family size
- e. Lack of maternal education
- f. Mother with anxiety and depression
- g. Parental drug or alcohol abuse
- h. Low socioeconomic status/unemployment/poor housing
- i. Limiting access to health care
- j. Parent’s resistance to changing their existing safety behaviors.

Childhood encompasses different stages of emotional, physical, and brain development, ranging from newborn babies to adolescents. Injury prevention requires different responses at each stage.^[22] In view of all the above information, it is possible to identify the profile of a child more predisposed to the occurrence of non-intentional injuries. After 1 year of age, children become more mobile and manage to escape adult supervision; boys engage in specific behaviors because they have competitive nature and high interest in physical activities;^[23] situations such as fatigue, illness, stress, and hunger can compromise alertness; children with disability or physical/learning impairment and those living in multiple-occupied housing are also more predisposed to injuries.^[10,18]

WHAT CAN WE DO TO REDUCE THE IMPACT OF NON-INTENTIONAL INJURIES?

The injury occurs when the body is exposed to an energy greater than its ability to absorb it. Therefore, the severity of the lesions depends on the amount of energy that comes in contact with the child, the distribution of that energy in time/space, and the part of the body affected, considering that the child has less tolerance in absorbing this energy, and therefore, the damages are greater when compared with adults. Some strategies have been adopted to minimize the impact of unintentional injuries on the children.^[24,25]

- a. Reduce the amount of energy produced (e.g., decrease bath water temperature)

- b. Prevent the release of energy (e.g., use of safety latches)
- c. Modify the spatial energy distribution rate (e.g., use of helmets for cyclists)
- d. To separate the child from energy in time and space (e.g., tracks exclusively for cyclists)
- e. Modify the contact surface (e.g., soft floor in the playground)
- f. Reinforce the surface that can receive energy (e.g., fitness for sports activities).

WHAT ELSE DO WE NEED TO DO?

Among all the measures that can be adopted in relation to the occurrence of unintentional injuries, the prevention is the one that deserves greater prominence. Studies have shown that preventive measures are capable of drastically reducing the occurrence of injuries, provided that some aspects are known and principles can be adopted efficiently.

It is necessary to anticipate injury risk and develop strategies to minimize the risk,^[13] and for this, one of the models adopted for such a strategy defines into three levels: (a) Primary prevention (aims to prevent the transfer of energy including warning parents of new hazards as their child develops greater abilities); (b) secondary prevention (reduces the severity of the injury and involves providing the carers of injured children with information to prevent recurrence), and (c) tertiary prevention (minimizes the consequence of the injuries by reducing the frequency and severity of disability and optimizing the care of the injured children to prevent disabilities and death).^[9,19]

Another widely used strategy can be categorized using the “3 Es:” Education - Enforcement - Engineering and concerns the whole of society.^[9,16]

Education: Educational approaches to reduce injuries are well established with child-focused and aimed at parents, caregivers, and health professionals on targeted at high-risk groups.^[16] Parents and family education should allow for the perceived need for constant supervision and proximity to the children and ability to identify hazards. They should be trained about the inherent risks of injuries to expand learning and risk identification regarding injury prevention. Health education is an essential tool for suitable health-care device and the teaching-learning process must be constant through programs and actions.^[18] It is very important the supervision and the use of verbal commands, modeling safe behavior, and physical restraint with repeatedly teaching safety rules.^[21,26] Children need to learn about dangerous situations and safety rules.

Enforcement: Strategies are aimed at identified opportunities for injury prevention. The use of legislation, regulations, or standards is used to promote safer behaviors, environments, and products.^[16]

Engineering: Environments are usually designed for the needs of adults and may predispose to injury risks for children. Engineered solutions and technologies can be used effectively to reduce injuries through the modification of products and adaptation in the physical and social environments.^[16,19]

THE ROLE OF EACH SOCIAL ACTOR

Injury prevention is low cost and high impact, easy to deliver and quite understandable and accepted by people. All society must know about severity in unintentional injuries to enhance the prevention awareness, emphasizing the predictability and preventability.^[27] The interaction of parents, caregivers, and community in health care is considered a major factor on the risk prevention.^[18]

- a. **Primary care:** Regular contact with children and their families in the community is important to identify vulnerable children and offer direct advice and education.^[9] Parenting interventions and supportive home visits to identify hazards in the home, school, and public places, correct use of safety equipment, changes in child behavior, and improvements are other important actions developed by health workers.^[19] Broaden the knowledge on the subject, collecting and sharing information on the causes, incidence, and severity of injuries and providing high-quality treatment and rehabilitation are also the responsibility of the health services.^[16]
- b. **Health-care providers:** Have a role in preventing unintentional injuries to improve general child well-being by being injury aware, by identifying high-risk groups, and providing individual and group education and advice.^[9,16]
- c. **Pediatricians:** Have unique opportunities for one-to-one personal contact with parents and children. With their knowledge and insight into child development and behavior enables them to interpret the evidence of effectiveness of interventions with respect to the developmental abilities of an individual child.^[19]
- d. **Health sector:** Can play a central role by documenting the burden, distilling the evidence of what works, prioritizing actions, and engaging others sectors in partnerships to develop prevention plans.^[28]
- e. **Community:** Improving the safety of children is one of the most important health issues for community, and injury prevention needs to be considered in the context of the wider public agenda. Legislation and regulations have proved power tools in the prevention of injuries. Lack of knowledge of threats to children’s health and unrealistic assessments of major safety risks are limitations in the development of public policy about prevention and reduction of unintentional injuries.^[8]

Box 1 presents some basic principles that can be used to implement preventive measures and which can be adopted by anyone and at any time.

- a) Passive strategies will be more effective than requiring repeated actions: (e.g., reduction in water heater temperature versus instructing parents to test the water temperature)
- b) Specific advice is more effective than generalized information (e.g., use of child seat restraints versus “supervise your child”)
- c) Injury control must also include post-injury care and rehabilitation
- d) Attention should be focused on common problems for which effective intervention is available

Box 1: Principle to implement preventive measures (adapted from Hazinski *et al.*, 1983).

CONCLUSION

Although unintentional injury-related deaths have decreased over the past century, the magnitude of this reduction has not seen as steady of a decline as other preventable illnesses.^[14] All children are vulnerable to injury because they live in a world in which they have little control. Houses and all their equipment are built for the comfort of adults, and we still have a lot to learn about injury prevention to effectively direct advice as to possible means prevention.^[29] Unintentional injuries are predictable and preventable when appropriate precautions are taken. Therefore, it is necessary to follow the children prospectively to better identify probable situations of injuries and adopt the measures for prevention.^[14,29]

Pediatric health-care providers play an important role in preventing injuries due they are the most credible and influential force, in changing parents/caregivers knowledge, and behavior.^[30] They can also use their professional credibility and knowledge to mobilize legislators, participating in multi-agency alliances and providing high-quality treatment and rehabilitation.^[16]

Pediatricians, as advocate for the health of children, have a duty to help reduce incidence of injuries as a part of the holistic care for individual children and by their ability to influence politicians, policy-makers, and the media.^[9] Systematic counseling regarding specific behaviors should be an integral part of preventive health practice and should be performed at each well-child visit.^[30] Children injury is a great drain on a family’s material and emotional resources. Direct and indirect costs (missing school and loss of earnings for parents) of caring for an injured or disabled child may place a heavier burden.^[31] Children have a right to safe environments and we must make efforts to promote safety, respect, and quality of life at this vulnerable group.

REFERENCES

1. Convention on the Rights of the Child. New York, United Nations; 1989. Available from: <http://www.un.org/millennium/law/iv-10.htm>. [Last accessed on 2018 Jun 06].
2. Del Ciampo LA, Ricco RG, Almeida CA, Muccillo G. Incidence of childhood accidents determined in a study based on home surveys. *An Trop Pediatr* 2001;21:239-43.
3. Dolgun E, Kalkum A, Eregun S. The determination of home accidents risks and measures to prevent accident of children: Quase-experimental research. *Turk J Fam Med Prim Care* 2017;11:100-5.
4. Vecino-Ortiz AI, Jafri A, Hyder AA. Effective interventions for unintentional injuries: A systematic review and mortality impact assessment among the poorest billion. *Lancet* 2018;6:e523-34.
5. Parkkari J, Sievänen H, Niemi S. Injury deaths in the adolescent population of Finland: A 43-year secular trend analysis between 1971 and 2013. *Inj Prev* 2016;22:239-46.
6. Abdalla S, Ahmed S, Swareldahab Z, Bhalla K; Sudan Burden of Injury Team. Estimating the burden of injury in urban and rural Sudan in 2008. *Inj Prev* 2017;23:171-8.
7. Sethi D, Aldridge E, Rakovac I, Makhija A. Worsening inequalities in child injury daths in the WHO european region. *Int J Env Res Pub Health* 2017;14:1128-36.
8. Kronenfeld JJ, Glik DC. Unintentional injury: A major health problem for young children and youth. *J Fam Econ Issues* 1985;16:365-74.
9. Patel D, Sandell JM. Prevention of unintentional injury in children. *Paed Child Health* 2013;23:402-8.
10. Stewart J, Ablewhite J, Hawkins A, McDaid LA. Home safe home: Evaluation of childhood home safety program. *J Trauma Acute Care Surg* 2016;81:533-41.
11. Mickalide A, Carr K. Preventing unintentional childhood injuries across the globe. *Pediatr Clin N Am* 2012;59:1367-80.
12. Younesian S, Mahfoozpour S, Ghaffari Shad E, Kariman H, Hatamabadi HR. Unintentional home injury prevention in preschool children: A study of contributing factors. *Emergency* 2016;4:72-7.
13. Ablewhite J, Peel I, McDaid L, Hawkins A, Goodenough T, Deave T, *et al.* Parental perceptions of barriers and facilitators to preventing child unintentional injuries within the home: A qualitative study. *BMC Public Health* 2015;15:280-9.
14. Jaques ML, Weaver TL, Weaver NL, Willoughby L. The association between pediatric injury risks and parenting behaviors. *Child Care Health Dev* 2018;44:297-303.
15. Chaudhary S, Figueroa J, Shaikh S, Mays EW, Bayakly R, Javed M, *et al.* Pediatric falls age 0-4: Understanding demographics, mechanisms, and injury severities. *Inj Epidemiol* 2018;5 Suppl 1:7-13.
16. Watson MG, Errington G. Preventing unintentional injuries in children: Successful approaches. *Paediatr Child Care* 2016;26:194-200.
17. Mathur A, Mehta L, Diwan V, Pathak A. Unintentional childhood injuries in urban and rural Ujjain, India: A Community-based survey. *Children* 2018;5:23-31.
18. Pereira DA, Costa NM, Sousa AL, Jardim PC, Zanini CR. The effect of educational intervention regarding in the knowlwdge

- of mothers on prevention of accidents in childhood. *Open Nur J* 2016;10:113-21.
19. Towner E, Mytton J. Prevention of unintentional injuries in children. *Paed Child Care* 2009;19:517-25.
 20. Li Q, Alonge O, Hyder AA. Children and road traffic injuries: Can't the world do better? *Arch Dis Child* 2016;101:1063-70.
 21. Damashek A, Corlis MB. The role of proximal maternal supervision in children's risk for injury in low-income sample. *J Pediatr Psychol* 2017;42:727-37.
 22. Aynsley-Green A, Barker M, Morgan J, Viner R. Who is speaking for children and adolescents and for their health at policy level. *BMJ* 2000;321:229-32.
 23. Morrongiello BA, McArthur BA, Spence JR. Understanding gender differences in childhood injuries: Examining longitudinal relations between parental reactions and boys' versus girls' injury-risk behaviors. *Health Psychol* 2016;5:523-30.
 24. Haddon W. Energy damage and the countermeasure strategies. *J Trauma* 1973;13:321-8.
 25. Cushman R. Injury prevention: The time has come. *Can Med Assoc J* 1995;152:219-3.
 26. Dietrich HF. Accidents, childhood's greatest physical threat, are preventable. *JAMA* 1950;144:1175-9.
 27. Campbell MM, Cowley N. Prevención de accidentes y daños infantiles en la sociedad del riesgo: Un análisis crítico. *Int Mult J Soc Sci* 2015;4:245-70.
 28. WHO. European Report on Child Injury Prevention. Copenhagen; 2008. p. 98.
 29. Zonfrillo MR, Linakis JG, Yang ES, Mello MJ. A systematic review of longitudinal cohort studies examining unintentional injury in young children. *Glob Ped Health* 2018;5:1-9.
 30. Hazinski MF, Francescutti LH, Lapidus GD. Pediatric injury prevention. *Ann Emerg Med* 1983;22:456-63.
 31. Bartlett S. Children's experience of the physical environment in poor urban settlements and the implications for policy, planning and practice. *Env Urb* 1999;11:63-73.

How to cite this article: Ciampo LAD, Ciampo LRLD. What do We Need to Know to Prevent Unintentional Injuries do Children?. *Clin Res Pediatr* 2018;1(1):1-5.