

Safer Roads to School

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Abstract

Any and all advances made by medical science cannot solve the problem of road traffic injuries (RTIs) in school-going children, especially if the only concerned people are those of the medical fraternity. Children are a vulnerable part of the traveling population and thus have been persistent due to the callous nature of the citizens and policy makers toward road safety and injury prevention. In our multicultural and multilingual country, there is a need for multistakeholder initiative with a countrywide presence if we are to stem the rise of mortality and morbidity due to these accidents. The first question we need to ask is how to prevent road traffic accidents and improve the condition of our roads. Pediatric RTIs are eternal problem of industrial revolution with complications and effects that may affect individual and society with increase in the number of motorized communications. Dedicated capacity building is urgently need who should be able to provide the necessary care to the injured children at the road crash spot as well as should be informed where to take the injured child and whom to contact in the dedicated injury care center while transporting the victims of situations.

Keywords: Pediatric, pediatric trauma, road safety, road traffic accidents, school-aged children, traumatic brain injury

INTRODUCTION

The United Nations Children's Fund defined children as "Every human being who is below 18 years of age."^[1] Children can be a part of the road users as pedestrians, vehicle occupants, bicyclists, and motorcyclists or as young drivers or pillion riders.^[2-6] The World Health Organization (WHO 2004) recognized childhood injuries as a major public health problem, resulting in about 10 lakhs deaths each year under the age of 18 years.^[7] Road crashes are recognized as one of the leading causes of road traffic injuries (RTIs) in the pediatric and adolescent age groups with significant load of morbidity, disability, and mortality in the whole world.^[4,6,8,9] These injuries not only pose a great burden on financial resources but also result in loss of potential workforce expected of bulk of the future citizens of the world.^[6,7] Many studies from India have reported injury patterns and related issues in road traffic crashes from India.^[10-14] In addition, a number of strategies have been planned and implemented in developed and developing countries to reduce the number of road traffic-related injuries in children.^[6,15,16] The aim of this study was to identify the epidemiology including innumerable risk factors and risk

correlates of childhood injuries on road to find out holistic multistakeholder solutions for this totally preventable health issue.

MECHANISM OF INJURY

Globally, road crashes are also foremost causes to seek dedicated care in emergency departments of health-care delivery systems for school-aged children.^[17] Almost all the studies have reported that male children were more prone to get involved in RTIs than female counterparts.^[18,19] These injuries can be sustained when they use roads as motor vehicle occupants, drivers, pedestrians, cyclists, or motorcyclists, even playing on roads.^[19-22] Traumatic brain injury is the most

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leading cause of morbidity and mortality among the victims of road crashes;^[19,23,24] however, high-velocity impacts can also lead to multisystem injuries including associated injuries leading to fatal and nonfatal outcomes including facial with mandibular injuries; chest and abdominal injuries including soft tissues (lung and spleen); and injuries to spine, pelvis, and extremities which are designated as polytrauma that may have further sequel for the growing anatomy and physiology of childhood and adolescence.^[22] The whole lot of injury spectrum depends on the impact and other correlates that make the situation graver including untrained primary health-care delivery system to manage the injury continuum.

CHILD-RELATED FACTORS

“Children are not small adults;” they differ significant from adults. These differences include height, relative weight of the head, head-to-body ratio, center of gravity, strength of neck and spinal muscles, and the developmental pattern of bony structures (including skull and vertebrae), fusion pattern of ossification centers, and structure of bony pelvis.^[25-28] As the myelination of the nerve fibers remains incomplete in this period of life,^[29] damage to major neural fiber pathways may have long-term health issues.^[30] Further, damage to vascular structures also has long-lasting effects as they are still under development till puberty is over.^[31] Because of these anatomical and functional differences, restraint devices^[32] and kinetic forces exerted during accident will result in injuries that will be grossly different in children and adolescents than those in adults.^[28,33] In addition, children may not be able to adapt to the safety issues regarding road environment and vehicle behavior which is not designed for them in many situations;^[34] they may not be attentive as they may be unable to protect themselves when casually roaming, walking, running, jogging, and playing on the road^[35] and, further, their inability to visualize and imagine safer and smarter decisions at the crisis moments,^[36] unintentional risk-taking behavior corresponding to their ages,^[37,38] poor ability to perform multitasking when engrossed in their own world,^[39] less developed sensory facilities (particularly visual and auditory) leading to their inability to anticipate clues to danger,^[40] and sensitized to respond optimally to get out of these dangers safely viz., when and where to stop 1.^[36,41] Further, awareness levels of these young individuals of the school-age groups vary depending on their ages from preschool to high school levels. Thus, we need to consider a very critical issue of safety of this heterogeneous spectrum of the school children because they are the future citizens who will carry the message of road safety in this new millennium.

INJURY SPECTRUM AND EMERGENCY RESPONSE

Children are injury prone traveling population with a high risk of sustaining a spectrum of injuries during their journey from home to school, participating in different academic and cocurricular activities and return back home. The injuries experienced by them vary from minor injuries viz., lacerations

and bruises (in any parts of the body), sprains and strains, fractures and dislocations, burns and scalds, blunt soft tissue injuries to chest and abdomen, traumatic brain injury, spinal cord injuries, and in severe cases injury to the multiple organ systems. In case of emergency, transport vehicle drivers shall provide transport vehicle attendants and bystanders might include passerby, teachers and support staff, parents, as well as fellow children and other first responders whenever they are available trained for prehospital care. These responders need to spot the emergency and the level of urgency that is highly needed on the case-to-case basis. The vehicles carrying school children should have dedicated section for keeping necessary gadgets necessary for prehospital care. This is expected to include a well-planned prearranged updated first aid box (discussed latter), stethoscope and sphygmomanometer, spine and cervical stabilization equipment, oxygen and intravenous fluid administration facility, etc., with a back-up generator set if possible along with the arrangement of lights for managing emergencies during nights. There is a need to provide detailed information regarding available prehospital and emergency care services in their area viz., whom to contact or where to take the injured child or should they wait at the scene doing triage and resuscitation till the suitable vehicles for transportation arrive and which health-care center will be best equipped to take care of pediatric cases. Simultaneously, they should be able to make sure the safety of other children as well as they should be able to assure the fellow children.

Steps to be followed for emergency mitigation

Schools and appropriate authorities should design an appropriate crisis and emergency response protocol for the capacity building of all levels of staffs working with the schoolchildren supported by regular drill of the well-oiled first responder machinery. Accordingly, they need to be trained adequately to provide the whole range of prehospital care that includes conventional first aid in cases of minor injuries and basic life support in cases of life-threatening injuries.

Steps to be followed during an emergency

Involved personnel's should be able to recognize from their competency on emergency medical services that there is a need for emergency response (i.e., maybe a road traffic accident or fall). Once an emergency is suspected the person can follow these steps:

- Make a “help” call to the co-coordinating center and/or nearby dedicated injury care center
- Assess the area of incidence and the injured persons by ABCDE protocol of basic life support
- Triage and color coding of the children and adolescent at the site of the event
- Determine the safety of himself/herself, place, and safety of others
- Identify the mechanism and type of injuries as well as associated medical care issues
- Explore the possibility of whether there are nearby people

- to support him or her or them
- Identify and examine how many persons are injured and died on spot
- Identify the extent of minor injuries who can be disposed of from the site
- Identify the life-threatening injuries and fractures who need to be carried to referral centres
- Liaison with dedicated referral injury care center regarding arrangements before transfer
- Co-coordinate at the site of emergency till all the victims are optimally managed
- Stay back at the site of emergency till all the dead bodies are disposed with due care.

Life-threatening conditions

These can be strongly suspected in case the following clinical signs are seen:

- Loss of consciousness
- Shock
- No motor or verbal response or breathing movements
- Chest pain or discomfort in breathing
- Absence of pulse
- Hypo or hyperthermia
- Exsanguination and bleeding
- Seizures
- Extensive burns and scalds involving the head, neck, feet, hands, and genital area
- Injuries due to explosives, chemicals, electricity, or high-velocity accidents.

Features suggestive of traumatic brain injury

These should be suspected in case the following signs are present:

- Loss of consciousness, disorientation, or confusion
- Headache
- Vomiting, especially if repeated and uncontrollable
- Seizures.

Other injuries

- Bruises or swelling over chest or abdomen with or without signs of blunt injury
- Swelling of arms, legs with pain
- Inability to walk
- Spinal cord injury.

FIRST AID NEEDS ASSESSMENT AND ACTIONS

School authorities should identify children-specific first aid needs and make a policy document to address the needs of the students during transportation or their stay at school. This should contain the information of people who shall be trained to provide first aid, coordinators, communication in-charges-to contact parents or guardians, list of nearby hospitals, and information booklet elaborating the contents of the first aid

kit and their use in local language and English so that it is understandable to all the team members. It should be clearly understood that first aid is purely to buy time in case of severe injuries and not the definitive care, which needs to be provided at a well-equipped center.

FIRST AID AND FIRST AID KIT

The transportation vehicle must carry first aid material in a dust-proof removable metal box, which needs to be placed in a location that is easily noticeable and accessible. The contents of the first aid box should be checked, well-planned, and updated at regular intervals with the use-by dates inspected regularly for top-up of exhausted materials.^[42] It must contain leaflet elaborating the contents in first aid box and how to use the contents and emergency contact numbers including contact number of ambulance service and family members as well as nearby hospitals where the injured can be transported in an emergency.

At the minimum, it should include:

- Large and sterile gauze pads for dressings
- Adhesive tape of different sizes
- Roller and triangular bandages to hold dressings in place or to make an arm sling
- Adhesive bandages in assorted sizes
- Scissors
- Tweezers
- Safety pins
- Disposable gloves
- Torchlight with spare batteries
- Antiseptic wipes or soap
- Pencil and pad
- Emergency blanket
- Eye patches
- Thermometer
- Face mask or face shield.

MANAGEMENT CHALLENGES

Treating a child suspected of having head injuries is a challenge in itself as often these children will not give details regarding the mechanism of injury and may not even be cooperative for physical examination for injuries and clinical tests.^[43-45] As for adults, the primary management starts at the site of accident and primary care and passerby and sympathizers may provide rescue. The primary objective at this level should be to identify the children with significant and or life-threatening injuries to ensure their safety at the scene followed by optimally quick and effective stabilization to prevent secondary injuries.^[6,46] Until proven otherwise, an often overlooked critical aspect is immobilization for spinal and associated injuries as any missed injuries and unnecessary movement can lead to irreversible and permanent disability.^[47] One can follow a clinical decision rule (NEXUS criteria) “no midline cervical tenderness, no focal neurological deficit, normal alertness, no intoxication and no painful, distracting injury” with a further evaluation with

appropriate radiographs to suspect or rule out spinal injuries.^[48] Children poses a difficult challenge as they may not be able to communicate well with the first responders and also there may have been impaired level of consciousness; a higher degree of suspicion is required to rule out any other life-threatening injuries.^[49] During the management of these groups of children and adolescents, certain social factors need to be remembered, such as age-specific patient and parent anxiety, difficulty in communication, and the relative paucity of personnel who are experienced in the management of pediatric trauma patients. All these can delay the diagnosis and management and lead to critical consequences.^[50] Children poses a difficult challenge as they may not be able to communicate and also there may be impaired level of consciousness; hence, a high degree of suspicion is required to rule any injuries.^[49] This is more important when dealing particularly with the cases of differently abled children with special needs of training to care them with more empathy.

PREVENTION

We can say that injuries in children are not inevitable; however, at the same time, they are potentially preventable and thus prevention of road traffic-related injuries should be given a special priority in our national-level planning.^[51,52] There are proven and effective measures that can be put into place to reduce their risks to the minimum levels.^[6] Comprehensive and multifaceted approaches to injury prevention include “Education, Enforcement/legislation and Engineering (vehicle design to prevent a vehicle rollover, improved protection for vehicle occupants).”^[53,54] A number of preventive measures have been recommended, including reduced speed (30 km/h) particularly around schools, separation of two-wheelers (i.e., dedicated lane for child cyclists and exclusive motorcycle lanes), vehicle modifications, child restraint systems (i.e., booster cushions or booster seats), seat-belts (children >10 years of age), and bicycle and two-wheeler helmets.^[4,6,55-57] Additional measures include the promotion of road safety education to children, to drivers, and to the general public, which can be further reinforced with strong legislation and government policies.^[51,52,55-58]

CONCLUSIONS

Because of their unique physical and cognitive characteristics, road can be considered as a dangerous place for school-aged children. Based on the available literature, it can be supposed that a large number of school-aged children experience injury in road traffic accidents and sustain injuries with significant morbidity, disability, and mortality. We need to change the mindset from the stakeholders and policy makers to the last citizen on the urban and rural roads that this altogether preventable health issues as the outcomes of the road crashes need to handle by the active participation of all. School-aged children (or school-going children) can be a part of the road crashes as a passenger, pedestrians, bicyclist, drivers, vehicle occupants, or users of motorized or nonmotorized three- and

two-wheelers. There is an urgent need to carry out research studies to better understand the need of this precious group to make them safe when traveling to and fro from home to school.

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Conflicts of interest

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