

REVIEW

HOW SAFE ARE OUR CHILDREN IN VEHICLES ON THE ROAD? A MALAYSIAN PERSPECTIVE

S. Sivasankar¹, K. Karmegam¹, M. T. Shamsul Bahri¹, H.Sadeghi N.², S. Kulanthayan¹, Z.A. Emilia¹, A.P. Puvanasvaran³, MengYa Su⁴

¹ Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Malaysia

² Iran University of Science and Technology (IUST), Iran

³ Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Malaysia

⁴ Centre for Project Management, University of Limerick, Ireland

*Corresponding Author: Email: megam@upm.edu.my

ABSTRACT

As Malaysia races towards a developed nation status, children are increasingly being ferried daily in vehicles almost exclusively as the majority of the population are able to afford private transportations. This paper reviews the current safety concerns for children whilst going in vehicles on Malaysian roads and the steps undertaken to address the need to enhance children's safety whilst going in these vehicles and suggest possible remedial action to counter the possible lack of awareness for children's safety whilst in these vehicles. This paper focuses on children on motorcycles and private vehicles (cars, vans and multi-purpose vehicle (MPV)) and excludes other form of transport (buses, lorries) as this paper tries to put forth measures that can be undertaken by the children's parents and guardian to better enhance the safety of their children. A search was undertaken of all the major database of articles. Articles related to children's safety systems, children related injuries, children related accident data, available laws and legislation were reviewed to present the need for greater awareness of children's safety while going in vehicles in Malaysia. There are currently already safety legislations, measures, steps and equipments in place in ensuring the safety of children whilst going in vehicles on Malaysian roads. However, enforcement of laws in developing countries are not easy and we have to start at the root of the problem which is the parents and adults who ferry these children in vehicles. There is a pressing need to educate parents and adults alike on the urgent undertaking of child safety whilst in vehicles. Engineering countermeasures and intervention are probably needed to protect these vulnerable users. For vehicles, a device capable of providing some sort of protection to the child whilst riding pillion should be designed and developed. A legislation mandating the use of child seats whilst ensuring the child seats are affordable to the masses.

Keywords: Children, safety, vehicles, Malaysia, awareness, protection

INTRODUCTION

There are many lives lost on the roads and streets worldwide every single day (M. M. Peden et al., 2004; Roehler et al., 2013). Accidents are fast becoming a serious societal problem in the developing and developed world. Accidents causes serious problems in terms medical, economic, property and most importantly human cost (Theofilatos & Yannis, 2014). The leading cause for the increase in childhood and adolescent morbidity and mortality is increasingly being blamed on accidents (Laloo, Sheiham, & Nazroo, 2003).

Experts worldwide have said that child injuries is becoming a major public health issue that requires immediate attention. One interesting point to note is that the threat of injury to children goes down significantly in developed nations as compared to developing nations (Thalayasingam, Veerakumarasivam, Kulanthayan, Khairuddin, & Cheah, 2012). According to the World Health Organisation (WHO), in the developing and developed countries, traffic accidents involving children has become a serious epidemic problem (Joly, Foggin, & Pless, 1991). Every year, unintentional (accidental) injuries are blamed for 3.5 million

deaths worldwide and in South East Asia, it is estimated that 25% of the global accidental fatalities occur every year. The 'last major plague of the young', a term coined by the experts to describe accidental injuries in childhood is a major health issue which needs to be given higher priority (Kanchan, Menezes, & Monteiro, 2009).

Road traffic accidents are now becoming more common with the advent of more vehicles on the roads. In fact, injuries from road traffic accidents are now outranking infectious diseases as the cause of morbidity and mortality in major middle income nations in Asia and Latin America (Adesunkanmi, Oginni, Oyelami, & Badru, 2000). Traffic related accidents are causing unacceptable costs on the community in terms of both human injury and economic terms (Ju & Sohn, 2011). According to the World Health Organisation (WHO) around 830,000 children are fatally injured from accidental or unintentional injuries every year. Most of these injuries happen in middle to low income nations (M. Peden, M, et al., 2008). Young children under the age of twelve will need constant adult care and guidance as they are extremely vulnerable due to them being exposed to possible fatal conditions which could be unnatural (accidents homicides) and natural (medical conditions). Fatalities caused by medical

conditions is could be preventable if detected early enough. However, fatalities caused by unintentional injuries are more vastly preventable (Kanchan et al., 2009). Like many other developing nations, Malaysia which has a fast growing economy which makes private vehicles affordable for the majority of its people. As a result of these vehicles being on the road, Malaysia has a high rate of accidents for motor vehicles where these accidents are a common cause of disability and deaths (Hauswald, 1997).

Worldwide, the major cause of fatalities among 10 to 19 years old is road traffic injuries. A majority of these child road traffic injury fatalities (two thirds) happens in the Western Pacific and South East Asian regions. However Eastern Mediterranean and Africa regions have the highest rates of fatalities among all users. Even in nations of the European Unions, 1 in 5 childhood injury fatalities are caused by road traffic injury. Worryingly, 93% of child road traffic fatalities are accounted in middle to low income nations (M. Peden, M, et al., 2008). In high income nations, children in vehicles make up to 50% of all child road traffic fatalities. In an event of an accident, unrestrained children are more likely to be fatally injured compared to children who are correctly using appropriate child restraints. In certain Asian nations, children on motorcycles account for all child road traffic fatalities where motorcycle accidents are the main cause of fatality among teenagers (M. Peden, M, et al., 2008; M. M. Peden et al., 2004).

Society has a responsibility in ensuring that children are protected especially from road traffic accidents and injuries as children are a vulnerable group of people in traffic. Road traffic injuries are a main cause of disability, morbidity, and mortality. By the year 2020, globally, it is predicted that road traffic injuries could be one third of all main causes mortality and morbidity (Olofsson, Bunketorp, & Andersson, 2012; M. Peden, M, et al., 2008).

There are currently effective injury prevention strategies and interventions in many countries. However, these interventions and strategies are not effectively implemented and are underutilised especially in middle to low income nations. The global burden of road traffic injuries and deaths will not go down without organised and collective efforts. Unfortunately, middle to low income nations suffer disproportionately from road traffic injuries as more that 90% of all road traffic injuries and death happen in developing nations which could cause a decline and stagnation in the long term economic and health development (M. M. Peden et al., 2004; Roehler et al., 2013).

OBJECTIVE

As Malaysia races towards a developed nation status, children are increasingly being ferried daily in vehicles almost exclusively. There have not been much studies being carried out to address the safety awareness of child vehicle occupants in the Malaysia context. There are adverts and articles in the newspapers and other print media, television and radio adverts and internet that advocates vehicle user safety by remaindering them to use their safety belts, helmets and wear bright reflective coloured clothing. However, a general observation is that not everyone adheres to this law (Sivasankar, Karmegam, Shamsul Bahri, Naeini, & Kulanthayan, 2014). This paper reviews the reasons behind the lack of awareness for the safety of Malaysian child vehicle users and possible remedial action in getting children better protected whilst in vehicles on Malaysian roads.

METHODS

Specific terminologies were searched in various Universities databases and other databases such as Taylor and Francis, Science Direct, Elsevier, Springer Online, World Health Organisation, PubMed, BioMed Central and MIROS were searched. The keywords searched were children, vehicle, Malaysia, accidents, fatalities, injury and protection. The research screened covered a time span of between the years 1988 to 2015. This large span of time was taken in order to ensure that all possible research carried out in this field was covered (Sivasankar, Karmegam, Shamsul Bahri, Naeini, et al., 2014; Uibel, Müller, Klingelhofer, & Groneberg, 2012).

RESULTS

Until the year 2014, the number of vehicles registered in Malaysia since the year 2000 has more than doubled with motorcycles accounting for nearly half the number of vehicles on the road. Similarly, the volume of traffic on the road has more than doubled where there was a massive 10% increase of traffic for the year 2013 alone (OECD & Forum, 2015). In general, motorcycles constitute the highest number of road fatalities in Malaysia. For the year 2012, motorcyclists made up an alarming 61% of all road fatalities followed by occupants of car with 21% of all road deaths (OECD & Forum, 2014).

For the Malaysian society in general, traffic accidents account for a significant cost. An estimated puts the traffic accidents costs Malaysia around 1.6% of the Malaysian gross domestic product (GDP). Hence, the statistical value of life in Malaysia is RM 1.3 million (OECD & Forum, 2015). Accidents are in fact the manifestation of choices made by the parents, surrounding family, adults in charge and society at large which in turn

determines the risk of injuries exposure of the children (Currie & Hotz, 2004). Between 1999 to 2002, road traffic accidents is the main reason for more than half of the accidental injury instances admitted to Government hospitals in Malaysia. Male children and teenagers (ages 12 to 19) form the highest proportion of fatalities (Tee, 2009a).

According to the United Nations Children's Fund (UNICEF), accidental injuries have become a major problem where it is among the major causes of deaths among children aged 5 to 19 years. Accidental injuries are largely preventable. One of the major findings in World Report on Child Injury Prevention', a report released by UNICEF and World Health Organisation (WHO) at the end of 2008 have noted unintentional childhood injuries have become a major public health concern. The report noted that outside of Malaysia, worldwide, road traffic accidents are the main cause of child fatalities from injuries, where more than 260,000 children are killed on the roads every year (Tee, 2009b).

Road traffic injuries are the main cause of disability for children. Every year, the estimated number of children who are disabled or injured due to road traffic accidents is around 10 million children. In the South East Asian region, 254 children need hospitalisation for every child that dies in road traffic accidents, four of whom will be most probably permanently disabled. Fractured limbs and head injuries constitutes the most common types of non-fatal injuries where up to 20% children sustaining multiple injuries in road traffic accidents. Worldwide, teenagers exhibit the lowest rate of using seat belts in vehicles. Motorcyclists without helmets are at a greater risk of severe head injuries or even death. In many nations, the proper usage of helmets is still low among motorcyclist and their pillion riders especially children (M. Peden, M, et al., 2008).

Children do not show the same signs or patterns of injuries to an adult due to the developing anatomical and physiological feature. Children with developing bodies have elastic type bodies where quick deceleration and acceleration of energy will be transferred causing internal energies without exhibition significant external signs (Kawato, Hitosugi, Mizuno, Matsui, & Tokudome, 2013). When a child is involved or injured in a road traffic accident, the child could end up mentally impaired with post traumatic disorder. A child could also end up with profound psychological effects if the child ends up orphaned due to the accident (M. Peden, M, et al., 2008).

In developed countries, due to the increase in child traffic related accidents, there was increasing pressure to change the safety policy in order to immediately lessen the number of motorcycle accidents and deaths. As a result, a

large number of laws and legislations were passed such as mandatory motorcycle helmets (1973) and better design standards (1977 and 1980); stringent competence tests, and a lowering the time an interim licence could be held (1982); and limitation on the engine capacity for learners (1983) (Chesam, Rutter, & Quine, 1993). Due to increase of vehicles on Malaysian roads, there has to be a detailed evaluation of interventions in order to greater enhance the safety of child occupants (Kulanthayan, Razak, & Schenk, 2010)n

DISCUSSION

Worldwide, previous studies have identified the child, vehicle and environment as the risk factors for accidental injuries in children and the risk elements have been shown to vary from one setting to another setting. Unintentional injuries are most preventable causes of morbidity and mortality among children. The majority of childhood injury fatalities happens in low income and middle income nations where the rate of injury fatality rate among children aged less than 15 years is five times higher than the children in high-income countries (Dandona, Kumar, Ameratunga, & Dandona, 2011).

According to the World Health Organisation (WHO), child injuries and fatalities in road traffic accidents is becoming a major problem in the world. Malaysian accident data have shown a consistent pattern of motorcycle fatalities in children from the ages of 1 to 18 years. For the age group of 1 to 6 and 7 to 12 years, 88% fatality that occurred were the pillion riders (Wong S.V., 2009). Previous studies have shown that during road traffic accidents, compared to female children, there are twice the number of male children fatalities. Majority of these fatalities in childhood traffic injuries are attributable to trauma to the head and hence head injuries are important areas of research to look for ways to further protect the vulnerable heads of these children (Kanchan et al., 2009).

Motorcycles are a less safe mode of transport compared to other types of vehicles. Compared to every vehicle mile travelled, motorcycle riders and their pillions have a higher chance of 34 times of dying in an accident compared to people in other different categories of vehicles. Motorcyclists are also eight times more likely to get injured. These high risks were associated with lack of protection afforded by motorcycles, the younger age of riders and poor visibility afforded by motorcycles and vehicles of the other road users (Lin & Kraus, 2009). Studies and latest data have indicated that injuries and deaths in relation to motorcycle accidents are steadily increasing year on year and is fast becoming a serious problem for the public health system (Baldi, Baer, & Cook, 2005).

There are a lot of risk factors connected to childhood accidents. The risks are ecological factors, biological and psycho-social. These factors are often work together which increases the risk of the accidents happening. Also, accidents happens more frequently in boys and older children (Laloo et al., 2003).

Head related injuries are a major cause of injury and fatalities to children both off and on the road (McNally & Rosenberg, 2013). In motorcycle accidents (in head-on collisions and single motorcycle crashes), head injury in the most common form of injury experienced by motorcyclists and their pillion who are usually children. This was followed by limb fractures and injuries (Adesunikanmi et al., 2000). In non-fatal motorcycle crashes, 30 to 70% of the injured riders reported lower extremity injuries where fractures are the most common and most severe type of the outcomes. These lower extremity injuries will have a knock on effect on permanent disability and the resulting economic costs (Lin & Kraus, 2009). Regardless of the child's age or type of impact in an accident, head injuries are the common causes of permanent medical disability and also fatalities among child occupants in vehicular collisions (Skjerven-Martinsen et al., 2014).

Childhood mortality and morbidity due to head trauma is on the rise caused by the high rates of road traffic accidents. The most common cause of fatalities of children in road traffic injuries are traumatic brain injury. In developed countries, even with the availability of proper treatments, disability among children is not uncommon due to the injuries sustained during these accidents. Children who survive these accidents are prone to irreversible neurological damage which could result in future socioeconomic issues (Bahloul et al., 2009).

Social and economic consequences are hidden factors of road accidents where the social, occupational and financial impacts on the victims and their families can be a burden that has to be carried by them for a long tie after the accidents have occurred (Tournier et al., 2014). Other than the obvious reason for saving children from injury related disabilities and fatalities, preventing or reducing child injury will also result in monetary savings towards the society. Child injury prevention plan of action such as child occupant protection legislation and child friendly engineering interventions are not only potentially successful, but can also be potentially cost saving as well. Sufficient monetary savings are connected with the use of safety products, such as child passenger restraints which will indirectly translate to extending the life of the child ((CDC), 2012).

When a child is involved in nonfatal or non-fatal accidents, the consequences goes beyond the child. It usually carries an emotional and physical cost to the society and individual alike. A child who is injured also affects other people who are involved in the child's life. When a child dies, the family, acquaintances, fellow workers, employers, and other members of the child's circle also significantly feel the loss. The state and nation also bears the cost burden of the child injuries. Families' lives are torn apart when they lose a child. The extended families including grandparents, uncles and aunts are also affected with grief. When a nonfatal injury occurs, the child is most often cared for by immediate family members. This usually causes lost time from work, stress and possible loss of income. The community also feels for the children that survive accidents, these children are left with lifelong disabilities with significant physical, psychosocial and financial consequences. Child injuries will cause a significant strain on overstretched health care systems. A very cost effective public health strategy is injury prevention ((CDC), 2012; M. Peden, M, et al., 2008; Tee, 2009a, 2009b). The prevention of injuries has been recognised as an important constituent in the approach of trauma in developed countries. The injuries preventable mechanisms in place are almost similar between the developing and developed countries (Adesunikanmi et al., 2000).

For motorcyclists, helmets are most important form of protection currently available as correct helmet usage reduces the incidence and severity of head injuries among motorcycle riders and pillion compared to non-helmeted riders. The helmet legislation and laws were formalised in order to prevent head injuries and the resultant death of motorcyclists. The resulting increased usage of helmets has managed to lessen the possibility of death, head injuries and the resulting medical cost (Lin & Kraus, 2009; Mock, Maier, Boyle, Pilcher, & Rivara, 1995).

According to the World Health Organisation (WHO), during an accident, motorcycle users usually sustain the most severe injuries which would possibly lead to disability around neck and head. When a motorcyclists utilises a good quality, standard motorcycle helmet, the risk of injury is reduced by 70% and the risk of death is reduced by 40%. The formalisation and enforcement of helmet usage is successful in increasing helmet usage rates (Peltzer & Pengpid, 2014).

Other than head injuries, non-usage of helmet could also result in facial injuries and high-severity facial fractures. Other than the usage of helmets, protective clothing, protective boots, crash bars could also provide additional protection to motorcycle riders. On higher end and more expensive motorcycles, motorcycle

airbags, back and leg protectors are also available. Protective clothing can reduce the risk of soft tissue injuries. Boots can provide protection against foot and ankle injuries. Crash bars protect the lower legs from side impacts (Lin & Kraus, 2009).

While riding pillion on motorcycles, children can be susceptible to exhaust system contact burns injuries. This is another area where there is a lack of data in Malaysia. Even though these burns only could be small, they were usually severe and possibly require surgery. Children with exhaust systems contact burns could be associated with considerable morbidity. Young children are in the high risk group for exhaust burns due to their thinner skin which will burn more deeply at lower temperatures. Children are disproportionately affected by exhaust burns due to their small size, exposed limbs and thin dermis predispose them to these sort of injuries (Nelson & Beierle, 2005; Rajan, Abeyasundara, Harvey, & Holland, 2011). In a study carried out by Nelson et al in 2005, 90% of the children in their study had to undergo some form of surgical intervention to treat their exhaust burn (Nelson & Beierle, 2005). Matzavakis et al noted that children are risk of exhaust burns two times more compared to an adult. This could be due to the fact that neither the parents nor children realise the danger of being so close to a hot motorcycles exhaust pipe (Matzavakis, Frangakis, Charalampopoulou, & Petridou, 2005). Clothing does not offer proper protection against exhaust burns. In a study carried out by Roberts et al in 2002, he noted that even though one child had shoes while riding motorcycle, the child experienced exhaust burns, leaving a full thickness injury on the dorsum of the right foot (Roberts, Kelson, Goodall-Wilson, & Kimble, 2002). Exhaust burns usually takes an average time of 20 days to heal. These injuries are inconveniencing due to the multiple hospital visits, causes indirect costs to the comminution of nurses, medical and care-givers time taken as well (Rajan et al., 2011).

In order to reduce or prevent childhood morbidity and mortality road traffic accidents, child restraint systems were designed with the sole purpose of protecting and preventing and reducing childhood morbidity and mortality in traffic accidents. and implemented in many countries. Different nations have different legislation mandating the usage of child restraint systems. There are many child restraint systems in the market currently. Among them are baby restraints (baby capsules) for new babies, car seat restraints for slightly older babies and kindergarten children, booster seat for preschool and early school going children and child safety harnesses. In other countries, legislations are in place mandating the use of child restraint systems. For instance, 90% of children below 5

years old in New Zealand currently use child restraint systems (Schluter & Paterson, 2010).

It has been proven time and again that the children below 10 years old, will have to be restrained in an approved child restraints as the adult seatbelt will not be able to provide adequate protection and these adult seat belts could even inflict injuries on to the child if it is not properly aligned. Previous studies have shown the effectiveness of child restraints being quite impressive. A study conducted in the USA for children restrained in a child seat compared to children using adult seat belts found when that there was a 60% reduction of risk of injury and 70% reduction in risk of head injury. The overall finding was that when the children were correctly restrained in the back/rear seat, the injuries sustained by the children were minor in nature (Fildes, Charlton, Fitzharris, Langwieder, & Hummel, 2003).

Currently in Malaysia, there are no laws mandating the use of child safety seat. Child safety seat have been proven time and again as an effective tool in lowering the morbidity and mortality of child motor vehicle users. When used correctly, child safety seats have been shown to reduce the risk of death of children aged between 2 to 6 years by 28% (Kulanthayan et al., 2010). In order to prevent road traffic deaths among cars drivers and motorcyclists, seats belts and helmets had a profound effect in reducing the fatalities (Shibata & Fukuda, 1994). The seat belt laws in Malaysia has been in place since the 1970s. The current seat belt rules requires the seat belt to be used by all the occupants of the vehicle (Hauswald, 1997; Sivasankar, Karmegam, Shamsul Bahri, Kulanthayan, & Naeini, 2014).

Enforcement of the law and legislation is very important as various countries have shown that correct implementation of the law not only reduces the number of fatalities and injuries from head trauma but it also increases the usage of motorcycle helmets (Lunnen et al., 2015).

There have been a number of other measures undertaken to enhance the safety of children on the road. Public education on the need to ensure the safety of children in vehicles can be helpful in the short term as it is a relatively cheap measure to reach a large number of people in a short space of time (Preusser & Blomberg, 1984). Among the measures that can be undertaken are advertisements in the newspaper, television and radio and on social websites that a frequented by people. However, it be difficult the gauge the effectiveness of the adverts as there will be little opportunity for follow up to see the effectiveness.

Another solution could be the legislation of new laws. Legislation can help in ensuring that responsibilities are assigned for the safety of

children on the road. Parents, supervising adults, vehicle manufacturers, vehicle owners and even the government can be liable for the safety of children in vehicles where the well-being of children should be the utmost importance to ensure they are always safe on the roads (Centner, 2005). Another possible solution is to ensure that all motorcycle riders are properly licensed to ride the correct levels of motorcycle. Studies have shown that correctly and properly licensed motorcyclists tend to be less likely involved in accidents compared to unlicensed motorcyclists. Similarly, previous studies have shown that effective rider education for reducing crashes and accidents have helped trained riders in having fewer and less severe crashes (Baldi et al., 2005).

It is not the sole responsibility of teachers or parents to ensure the prevention of injuries in children. Interventions have to be started from the highest level of the policy makers and has to be translated all the way to the private and civil sector (Tee, 2009a). The joint UNICEF-WHO 'World Report on Child Injury Prevention' report recommends a wide range approach in tackling child injury prevention. The report among other things recommends that governments are responsible for enacting and implementing multipronged strategies for child injury prevention. Most importantly though, the joint report also recommends product modification to better enable child safety and injury prevention (Tee, 2009a, 2009b).

The United Nations declared the 2011-2020 decade as the 'Decade of Action for Road Safety' where the goal of the decade is to stabilise and then reduce global road fatalities by increasing national, regional and global activities (Roehler et al., 2013). The steps being undertaken by various government agencies together with the new interventions and interventions for child road vehicle users in Malaysia can help achieve this United Nations vision.

SUMMARY

Accidental injuries are the number one cause of disability and death among children (Visser, Pijl, Stolk, Neeleman, & Rosmalen, 2007). Motorcycle riders and vehicle drivers are influential in ensuring the safety of children in vehicles. In the Malaysian context, mandatory laws and educational programmes addressing the proper and correct usage of child safety restraints could strongly influence its utilisation by the drivers in Malaysia. Any legislation efforts or awareness should be thoroughly evaluated to make sure that they most effective in achieving the desired outcomes. The usage of child safety systems can be potential tool for mitigating the ever increasing number of child road traffic accidents with the appropriate support utilising

educational, research and legislative efforts (Kulanthayan et al., 2010). There is an urgent need to better protect our children while they are travelling in vehicles (motorcycles and cars included) on roads in Malaysia. The creation and introduction of the correct type of protection systems, regulations and standards will go a long way towards realising the vision for a safer travelling environment for the children in Malaysia (Wong S.V., 2009)

CONCLUSION

There is a pressing need to educate parents and adults on the urgent undertaking of child safety whilst going in vehicles on Malaysian roads. Therefore, this paper highlights current safety concerns for children whilst going in vehicles on Malaysian roads and the steps undertaken to address the need to enhance children's safety whilst going in these vehicles and suggest possible remedial action to counter the possible lack of awareness for children's safety whilst in these vehicles. Children should be taught continuously from a young age on safety and the perils going in cars and whilst riding motorcycles as pillion. There is a pressing need to educate parents and adults alike on the urgent undertaking of child safety whilst in vehicles. A possible review of the Malaysian law pertaining suitability of children riding pillion with a set age limit of should be carried out for the benefit of this vulnerable group. Another review should be undertaken with a view of mandating the use of child seats whilst ensuring the child seats are affordable to the masses. Engineering countermeasures should be implemented to create a safer and more 'crashworthy' travel environment for child pillion riders. For motorcycles, a device capable of providing some sort of protection to the child whilst riding pillion should be designed and developed. For vehicles, a possible enhancement to the existing car child restraint seat could be made to ensure that it is affordable for the masses while still providing the same sort of protection as a regular child restraint seat.

ABBREVIATIONS

GDP - Gross Domestic Product
MIROS - Malaysian Institute of Road Safety Research
UNICEF - United Nations Children's Fund
WHO - World Health Organization

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COMPETING INTERESTS

There is no conflict of interest.

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