

The importance of seat restraints: a short annotated bibliography

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Abstract: This annotated bibliography paper will address road traffic injuries and how the improper use of seat restraints contribute to road traffic injuries in children and adults. (PHD 2004 Vol 11 No 1 Pages 132 - 135)

Introduction

Road traffic injuries are now seen to be a major and leading cause of morbidity and mortality globally and more so in the low and middle income countries. The World Health Organization (WHO) has estimated that at least 3000 people are killed daily in road traffic crashes globally with 30,000 others injured or disabled¹. In low and middle income countries this accounts for 85% of deaths and 90% of DALYS (disability adjusted life years) lost globally. Globally, the costs of road injuries are estimated to be about \$US158 billion annually.

Motor vehicle crashes can result from a variety of factors ranging from inadequate roadway design, hazardous conditions, improper and/or failure to use safety devices such as helmets and seat belts, lack of appropriate vehicles and vehicle maintenance, unskilled or inexperienced drivers, inattention to pedestrians and cyclists, problems related to road sharing, impairment due to alcohol use or fatigue and other factors. These factors however can be amenable to change or prevented as seen by trends in high income countries¹.

In the Pacific region there is still lack of proper data and local research to estimate these occurrences and much work is definitely needed in this area. A recent study in Fiji conducted by WHO showed that road accidents were the second cause of death for people between the ages of 5-29

and the third cause of death for people between the ages of 30-44, representing the group of people who most actively contributed to national economies². This annotated bibliography paper will address road traffic injuries and how the improper use of seat restraints contribute to road traffic injuries in children and adults.

Muszynski CA, Yoganandan N, Pintar FA, Gennarelli TA, (2005). Risk of paediatric head injury after motor vehicle accidents. *Journal of Neurosurgery*, 102(4), 374-379.

The authors here analyzed the correlation between

the relative risk of paediatric brain injury and the use of child safety seats (CSSs). Data was obtained from the national motor vehicle accidents (MVA) database looking at four categories of children – infant, toddler, young child and adolescent and four restraint categories – unrestrained, properly restrained, improperly restrained, and other. Evaluation was done on children with no injuries and children with moderate to severe head injuries using the Abbreviated Injury Scale (AIS). The authors found that their data confirmed that proper use of CSS substantially increased the likelihood of not sustaining head injury in an MVA and the findings were most dramatically seen in infants where the likelihood of sustaining no injuries for unrestrained infants was 15.2% as compared to 92.8% for properly restrained infants. So they concluded that a CSS is most protective for infants and toddler categories and improvements in CSSs can reduce the risk of moderate to severe head injuries in children of all age categories.

Petridou E, Skalkidou A, Lescohier I, Trichopoulos D, (1998). Car Restraints and Seating Position for Prevention of Motor Vehicle Injuries in Greece. *Arch Dis Child*, 78, 335-339.

The authors, researchers from Athens University Medical School and the Harvard Injury Control Center in Boston, Massachusetts used a population based case control study on 129 children ages 0-11 years to evaluate the protective effect of child restraint and relative safety of front and rear seating in a population where children often travel unrestrained. Their results suggested that in Greece about two thirds of all childhood injuries from car crashes could have been avoided through the regular use of a car restraint. Their data also indicated that in the absence of a child restraint system, a rear seating position conveyed substantial protection and could explain the low mortality of children as car passengers in Greece. Their findings confirmed the universal and proper use of child restraint systems as the ultimate

objective and that in the absence of this, children should only be transported in the rear seats.

Von Kuenssberg D, Wagner DG, Mayrose J, Hashmi U, (2005). Seat Belt Use by Police: Should They Click It? *Journal of Trauma*, 58(1), 119-120

The authors conducted a retrospective study using data from the Fatality Analysis Reporting System involving police vehicle crashes in the USA from the years 1997-2001. They hypothesized that there would be a significant reduction in police officer deaths if officers increased their use of seat belts. Their results showed that the risk of death was 2.6 times higher for unbelted occupants of police vehicles than for belted occupants in their study population. This risk was not statistically related to police response to emergency versus non emergency calls. It was suggested that interventions and legislation that improve the rate of seat belt use among police officers should be investigated to reduce the number of police officer fatalities.

Halman SI, Chipman M, Parkin PC, Wright JG, (2002). Are Seat Belt Restraints as Effective in School Age Children as in Adults? A Prospective Crash Study. *British Medical Journal*, 324, 1123-1126.

The researchers here studied the effectiveness of seat belts in protecting school age children in road vehicle crashes with the purpose to determine whether seat belts are as effective for school age children (4-14 years) as they are for adults. The data was collected from ten Canadian university crash investigation centers by trained investigators from the years 1984-1992. Their results consistently showed that school age children involved in motor vehicle crashes were less severely injured if they were wearing seat belts irrespective of the type of restraint or position in car.

Children who were unbelted and sat in the front passenger seat were nine times more likely to sustain fatal or moderately severe injury as compared to children who were unrestrained and sat in the rear left seat of the car. The latter group was twice as likely to sustain such injuries. They concluded that although 40% of children were unbelted in the study, seat belts helped to protect school age children from injury in road vehicle crashes. The researchers also critiqued their study and made notes of their study limitations in sampling methods, reporting and selection bias.

Berg MD, Cook L, Corneli H, Vernon D, Dean MJ, (2000). Effect of Seating Position and Restraint Use on Injuries to Children in Motor Vehicle Crashes. *Pediatrics*, 105(4), 831-835.

The objective of this study was to determine the effect of restraint use and seating position on injuries to children less than 15 years of age in motor vehicle crashes in Utah from 1992 through to 1996. Data was collected from statewide motor vehicle crash records during this period. 5751 children were studied and results showed that more than 53% of children were rear seat passengers and more than 40% were unrestrained. Rear seat passengers were significantly less likely to be seriously injured or killed in frontal impact crashes as compared to front seat passengers and also better protected against serious injury or death in nonfrontal impact crashes. Limitations of this study were also noted on inaccuracy in crash reporting and data entry.

It was concluded that sitting in the rear seat and using an age appropriate restraint device significantly and independently decreased the risk of serious injury or death to children involved in serious automobile crashes. Non use or suboptimal restraint use of seat belts placed children at unnecessarily high risk for serious injury or death.

Nantulya V, Reich M, (2002). The Neglected Epidemic: Road Traffic Injuries in Developing Countries. *British Medical Journal*, 324, 1130-1141.

The authors here discussed how the injury profile for road traffic injuries in developing countries differed in important ways from developed countries. It was seen that road traffic injuries in developing countries mostly affected pedestrians, passengers and cyclists as opposed to drivers. The reasons for high burden in developing countries were the growth in motor vehicle numbers, the people killed or injured per crash, poor enforcement of traffic safety rules, inadequate public health infrastructure, and poor access to health services by the vulnerable group. They concluded that multiple policy initiatives were needed to address the vulnerable groups of passengers, cyclists and pedestrians. Its effectiveness will need to be based on local research and evidence taking into account the social, political and economic situations of developing countries.

Vaca F, Anderson C, Agran P, Winn D, Cheng G, (2002). Child Safety Seat Knowledge Among Parents Utilizing Emergency Services in a Level 1 Trauma Center in Southern California. *Pediatrics*, 110(5), 61-65.

The authors conducted a prospective cross sectional study at a level 1 trauma center in Orange County, California. Their objective was to determine the level of child safety seat (CSS) and airbag safety knowledge in parents who utilize emergency care services for their children and determine factors that may influence

knowledge associated with safe transportation of children. Their results showed that 81% of parents were aware that infants in rear facing CSS should never be placed in front of an airbag and many parents showed lack of knowledge of CSS and airbag safety. Moreover many parents were not familiar with the state law regarding child restraints. It was concluded that parents who utilized emergency services would benefit from passenger safety education.

Wegner M, Girasek D, (2003). How Readable are Child Safety Seat Installation Instructions? *Pediatrics*, 111(3), 588-591

The objective of this study was to measure the required reading level of a sample of child safety seat (CSS) installation instructions and to compare and determine whether this was accessible to low income parents in a language that they understood. Data was collected from the National Highway Traffic Safety Administration and pricing from an internet based company with available CSS models. Results showed that the readability instructions sets ranged from 7th-12th grade and there were no significant associations between readability and seat prices. The authors concluded that CSS instruction manuals were written at a level that exceeded the reading skills of most American consumers and that these instructions needed to be set at a level appropriate to the understanding of these consumers to encourage the proper installation of CSS.

Cummings P, Rivara F, (2004). Car Occupant Death According to the Restraint Use of Other Occupants. *Journal of the American Medical Association*, 291(3), 343-349.

The authors used a matched pair cohort study to estimate the association between the death of a car occupant and the restraint use of another occupant in the same car, comparing the outcomes of two target occupants in the same passenger car that crashed. Data was obtained from the Fatality Analysis Reporting US system from the years 1988-2000. Results showed that the risk of death was greater for a restrained front target occupant in front of an unrestrained occupant as compared to a restrained front occupant in front of a restrained occupant so that a person's risk of death in a crash is associated with the restrained use of other occupants. This risk was lowest when all occupants were restrained. They concluded that persons who wish to reduce their risk of death should wear a restraint and ask all others in the same vehicle to do the same.

Research has also shown that restraining of all passengers in the same vehicle is just as important in decreasing the extent of injuries and lowering the risk of death.

Cummings P, Koepsell T, Rivara F, McKnight B, Mack C, (2002). Air Bags and Passenger fatality According to Passenger Age and Restraint Use. *Epidemiology*, 13(5), 525-532.

The authors conducted a case control study to estimate the association of passenger air bag presence with death according to passenger age and seat belt use. Data was used from crashes on US public roads from 1992-1998. Results showed that among unrestrained passengers, the risk of death was higher in children 12 years or younger as compared to adults 20 years and older with the passenger air bag.

It was concluded that passenger air bags may be hazardous to unrestrained children and of little benefit to unrestrained adults. The results also supported the fact that children 13 years and younger should not sit in front of an active air bag. Limitations of the study were also taken note of.

Forjuoh S (2003). Traffic Related Injury Prevention Interventions for Low Income Countries. *Injury Control and Safety Promotion*, 10(1-2), pp. 109-118.

The author reviewed selected interventions and strategies that had been developed to counter traffic related injuries in high income countries in terms of their effectiveness and applicability to low income countries. He used a classification model adopted by the US National Committee on Injury Prevention and Control in 1989 to classify the effectiveness of these interventions and strategies. He concluded that what is practiced in high income countries will not necessarily be adopted and successful in low income countries and that other

factors need to be considered. These were issues such as the economic situation of the country, the type of local transport used and the cultural implications and beliefs, the political situation, the literacy rate and the competing health problems of the country

putting something such as traffic injuries as a low priority. He noted that there needed to be careful analysis and planning specific to the particular country and more information sharing between high income and low income countries especially with scarcity of resources. Moreover road safety and injury prevention need to be seen as a high priority for these low income countries with support from high income countries and based on sound scientific evidence.

Discussion

The annotated bibliography above shows the importance of proper seat restraints, its usage and the position of

passengers in vehicles. Evidence has shown that rear seating for younger children who are restrained have resulted in less injuries and lower risk of deaths as compared to unrestrained children. Research has also shown that restraining of all passengers in the same vehicle is just as important in decreasing the extent of injuries and lowering the risk of death.

Studies in low income countries have shown the relationship of traffic injuries to the country's economic, political, social and cultural status. Attention has been drawn to the relevance of literacy, understanding instructions and in a language compatible to these low income families. Barriers have been taken note of and the need to address these barriers and prioritize the country's response to traffic injuries is just as important.

Research has indicated the importance of rear seat position in a vehicle and the importance of positioning of children and the relevance of air bags. Injury prevention and lower risk of death have been seen in situations where all passengers have been restrained. It has been observed that multiple policy initiatives will be needed to address the safety of passengers, cyclists

and pedestrians in low income countries and decrease traffic injuries. Certain studies have shown how injuries can add to the burden of the country with enormous costs of hospitalizations and rehabilitations.

There is a lack of published research and local data in Pacific countries with regards to traffic injuries, seat belt usage, and seat restraints. This is an important observation. The Pacific urgently need research information to design appropriate intervention for its small isolated jurisdictions. Interventions and strategies used in high income countries may not be as relevant and applicable to the Pacific and its varied political, social, economic and cultural situations.

References

1. Nantulya V, Sleet DA, Reich M, et al. The global challenge of road traffic injuries: can we achieve equity in safety? *Injury Control and Safety Promotion*, 2003; 10 (1-2): 3-7.
2. WHO, Press Release GA/10236, 58th General Assembly Plenary 84th Meeting, 2004

The most evident and apparent sign of true wisdom is a constant
and unconstrained rejoicing
(Michel de Montague 1533 - 1592)