Restraint use and seating position among children in motor vehicles in Bloemfontein

Background. Most child deaths from motor vehicle accidents (MVAs) occur in low- and middle-income countries. Effective measures to protect children involved in MVAs include wearing age-appropriate child restraints and being seated in the rear of the vehicle.

Methods. A descriptive study was used to assess use of child restraints, seating positions of children, driver restraint and vehicle overloading in Bloemfontein in 2007. Two pairs of observers stood at selected sites recording these findings. The study was done over a period of 1 month.

Results. A total of 512 children in 374 vehicles were assessed. Just over a third of the children were seated on the front seat of the vehicle, and 14.1% were seated on other people’s laps (73.6% of these were on the front seat). Restraints were used by 8.8% of children and 17.4% of drivers; 10 times more children used restraints if the driver was restrained versus not restrained. Between 9.3% and 20.4% of vehicles were assessed as being overloaded with passengers.

Conclusion. The safety of child passengers in Bloemfontein in the event of an MVA is threatened by poor adherence to basic safety measures. Enforcement of correct seating position and use of child restraints will prevent unnecessary deaths, disabilities and suffering of child passengers injured in the event of an MVA. Driver motivation and responsibility is important in achieving safer seating of children in motor vehicles.
years (10 - 18 kg) should be restrained in a safety seat in the rear of the car. The safety seat should be secured by a lap belt and a diagonal belt. Children aged 6 - 11 years (22 - 36 kg) can use booster cushions with safety belts, although child seats with a back rest are preferred. Children should ride with a seatbelt positioned as for an adult only when they can sit with their backs straight against the vehicle’s seat with their knees bent over the edge of the seat, without slouching. The shoulder and lap belt should fit comfortably across the shoulder, lower abdomen and pelvic area. A child in a safety seat placed on the front passenger seat of a vehicle equipped with front or side airbags has an increased risk of injury and death in the event of a crash through impact with the airbags.6

Correctly installed and used, child safety seats can reduce the risk of death in the case of an accident by 71% in infants and 54% for children aged 1 - 4 years ('Seat-belts and child restraints: increasing use and optimising performance', European Transport Safety Council, 1996, quoted in World Report on Road Traffic Injury Prevention,1 and Will and Geller7). Unrestrained children seated in the rear are 35% less likely to sustain fatal injuries than those seated in the front, and 44% less likely to sustain fatal injuries if they also use seatbelts.8,9 The need for hospitalisation after an MVA among restrained children aged 4 years and younger is reduced by 69%.9 Use of seatbelts by children seated on the rear seat will reduce injuries not only to the child but also to the driver and front passenger. Children seated on the back of a ‘bakkie’ (a light motor vehicle with a rear load area) cannot be appropriately restrained, and the practice of transporting children in this manner should not be condoned.

Many countries have legislated the mandatory use of child restraints. Yet, in an international study assessing seatbelt use in different countries, only 42% of respondents felt that the current level of seatbelt enforcement was ‘very good’.12 A study from the USA showed that 51% of 3 - 8-year-olds are inappropriately restrained in adult safety belts.13 The need for hospitalisation after an MVA among restrained children aged 4 years and younger is reduced by 69%.9 Use of seatbelts by children seated on the rear seat will reduce injuries not only to the child but also to the driver and front passenger. Children seated on the back of a ‘bakkie’ (a light motor vehicle with a rear load area) cannot be appropriately restrained, and the practice of transporting children in this manner should not be condoned.

A study done by the Medical Research Council of South Africa (MRC) reports that only 14.3% of learners always wear a seatbelt, and there is no significant variation by gender, ‘race’, age or grade.5 In (MRC) reports that only 14.3% of learners always wear a seatbelt, MVAs, we investigated the seating position and use of child restraints

it was estimated that the appropriate use of child restraints would be less than 10%. A sample size of 500 children would result in a confidence interval of 7 - 13%. Therefore 16 sites were chosen, to assess about 32 children per site.

A pilot study to test and refine the methodology was performed at two stopping points, observing 60 children. Approval for the study was obtained from the Ethics Committee of the Faculty of Health Sciences of the University of the Free State as well as from the Chief of Traffic of the Mangaung Municipality.

Results

A total of 512 children in 374 vehicles were assessed. Most vehicles carried only one (70.3% of vehicles) or two child passengers (25.1% of vehicles).

Sixty per cent of the children were seated in the rear of the vehicle, 39.6% were seated in the front, and 0.4% were seated in the back of an open bakkie. Of the 14.1% of children seated on other people’s laps, 73.6% were on the front seat and 26.4% on the back seat.

Child restraint use in Bloemfontein was found to be 8.8% (95% confidence interval (CI) 6.6 - 11.6%) and appropriate restraint use to be 2.9% (95% CI 1.8 - 4.8%). None of the children sitting on laps were restrained. Of children seated in the front, 10.3% were restrained (only 2% appropriately), while in the rear only 7.8% were restrained (only 3.6% appropriately). There was an association between the affluence level of an area and child restraint use, with children in less affluent areas being less likely to be restrained than their counterparts in more affluent areas (1.0% v. 13.4%, p<0.0001) (Table I). A similar association was seen between area affluence and appropriate use of child restraints (p=0.0023). Driver restraint use was 17.4% (95% CI 13.9 - 21.3%). Twenty-four per cent of drivers in affluent areas were restrained, versus only 5.8% of drivers in less affluent areas.

<table>
<thead>
<tr>
<th>TABLE I. CHILD RESTRAINT USE ACCORDING TO AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affluent (N (%))</td>
</tr>
<tr>
<td>Not restrained</td>
</tr>
<tr>
<td>Restrained, but not appropriately</td>
</tr>
<tr>
<td>Restrained appropriately</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

There was a strong association between driver restraint and child restraint (p<0.0001). (Table II). If a driver was restrained, the chance that all the children in the vehicle would be restrained was 10 times higher than when the driver was not restrained (95% CI 4.9 - 20.2).
prohibits a person from occupying a seat that is not fitted with a seatbelt. Regulation 213(5) also provides that the seating and restraint use.

**Discussion**

The limitations of the study are accuracy in estimation of the age and weight of the children (to assess appropriateness of child restraint) and affluence of the area. A similar study in Nigeria in 2005, which included 456 vehicles, showed that despite 95% of vehicles having

<table>
<thead>
<tr>
<th>Total</th>
<th>339</th>
<th>31</th>
<th>5</th>
<th>374</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver not restrained</td>
<td>294 (95.1)</td>
<td>10 (3.2)</td>
<td>5 (1.6)</td>
<td>309 (100)</td>
</tr>
<tr>
<td>Driver restrained</td>
<td>38 (58.5)</td>
<td>21 (32.3)</td>
<td>6 (9.2)</td>
<td>65 (100)</td>
</tr>
</tbody>
</table>

The percentage of overloaded vehicles was 13.4% (95% CI 10.3 - 17.2%). There was an association between area affluence and vehicle overloading (p<0.05); in affluent areas 9.3% vehicles were overloaded, while in non-affluent areas 20.4% were overloaded. In all of the 50 overloaded vehicles no child was restrained, while in non-overloaded vehicles 13% of children were restrained (p=0.0227).

**TABLE II. ASSOCIATION BETWEEN DRIVER RESTRAINT USE AND CHILD RESTRAINT USE**

- An American study has also shown that children are 3 - 4 times less likely to be restrained if the driver is also unrestrained. Drivers need to be buckled up and be held responsible for their passengers’ safety. Driver restraint is consistently associated with higher use of restraints in children.

In our study there was an association between child restraint use (and appropriateness thereof) and driver restraint use, vehicle overloading and ‘affluence’ of the area where these were observed. There is therefore a need to consider subsidising installation of safety belts in vehicles that do not have seatbelts. Child seats and booster cushions also need to be available at affordable prices. In the long term, the costs will probably be recovered from savings due to fewer injuries to child passengers.

Most developed countries have legislation to protect children travelling in motor vehicles. In South Africa, the wearing of seatbelts for passengers and drivers is compulsory in terms of regulation 213(4) of the National Road Traffic Regulation, under the National Road Traffic Act, 1996 (Act No. 93 of 1996). Regulation 213(5) also prohibits a person from occupying a seat that is not fitted with a seatbelt while a seat with a belt is unoccupied. Since 1995, all new cars in South Africa must have lap and shoulder belts on the front seats and at least lap belts on the rear seats. For children aged between 3 and 14 years, the law states that “The driver of a motor vehicle operated on a public road shall ensure that a child seated on a seat of the motor vehicle uses an appropriate child restraint where it is available in the motor vehicle or, if no child restraint is available, wears the seatbelt of an unoccupied seat which is fitted with a seatbelt, if available.” However, there is no legal requirement for a child aged less than 3 years to wear a seatbelt unless there is a child seat or restraint, in which case the child must be seated and restrained in it. The general apathy of South Africans towards the use of child restraints begins with inadequate seatbelt laws for children. Despite high injury figures, there is an ambiguity about enforcement of safety measures, as well as an indifference of drivers to ensure the safety of their passengers. The driver is liable for a fine should a passenger or child not be wearing a seatbelt. Enforcement of seatbelt use in South Africa was given a score of 2/10 by the WHO. Despite the availability of information, there is no culture of appropriate child seating and restraint use.

The process of reducing road traffic injuries and deaths by enforcing appropriate behaviour is not difficult. In Finland the wearing of seatbelts increased drastically after law enforcement. Information and education campaigns were used only to emphasise the importance of the laws. In a study from Cape Town on the reporting of paediatric trauma and safety, there was a plea for greater coverage by the media on the prevention of unintentional injuries. The media can assist with education and advocacy for child passenger and driver restraint in motor vehicles.

The severity of child passenger injuries can be attenuated and deaths can be prevented by using childhood restraints correctly. The ‘four Es’ of injury prevention need to be applied (Table III).

**TABLE III. PREVENTION OF INJURIES TO CHILD PASSENGERS IN CARS**

| Education | • Awareness of legislation that drivers and passengers must wear restraints and children to be seated on rear seats • Teach older children • Use of media, pamphlets, road safety programmes in schools |
| Environment modification | • Infant seats available for sale or hire at lower cost • Availability and affordability of correct and age-appropriate child restraints |
| Engineering | • All cars to be fitted with seatbelts, front and rear |
| Enforcement | • Enforcement of legislation • Adding legislation for child restraints for children <4 years • High visibility of law enforcement |

**TABLE II. ASSOCIATION BETWEEN DRIVER RESTRAINT USE AND CHILD RESTRAINT USE**

<table>
<thead>
<tr>
<th>No children restrained (N (%))</th>
<th>All children restrained (N (%))</th>
<th>Some children restrained (N (%))</th>
<th>Total (N (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver not restrained</td>
<td>294</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Driver restrained</td>
<td>38</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>332</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>
Partnership) and explains the planning and management of a seatbelt programme and how to develop, implement and evaluate such a programme. It is aimed specifically at policy makers and road safety practitioners and uses experience from countries that have succeeded in implementing high levels of restraint use. The manual is adaptable to the specific needs of a country.

South Africa should urgently tackle this problem to prevent unnecessary injuries, permanent disabilities and deaths as well as decrease financial losses. If the use of restraints is enforced, there would be a direct financial gain from less medical costs for the acute care and rehabilitation of victims. Safety as a human rights issue needs to receive priority attention. Drivers, traffic authorities and politicians need to be convinced of the importance of wearing seatbelts. Law enforcement of correct child restraint use will prevent much unnecessary suffering, and large financial savings will ensue. The New South Wales Centre for Road Safety (Australia) puts the message bluntly on an outside billboard: ‘No Belt. No Brains.’

References