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# CLINICAL ARTICLE

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## Road traffic accidents and orthopaedic injuries in children

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### Abstract

An audit on the epidemiology of road traffic accident-related fractures was performed in a state hospital in Gauteng, South Africa. The aim of the study was to evaluate the demographics and mechanism of injuries sustained in road traffic accidents. The study was a retrospective review of all admissions to the Chris Hani Baragwanath Hospital over a three-year period. Boys were injured twice as commonly as girls, the mean age at injury was 5 years and 86% of the injuries were sustained during pedestrian vehicle accidents. We conclude that road awareness and road safety programmes should be increased in an effort to reduce these preventable injuries.

### Introduction

The leading cause of death in children aged 1–14 years in the developed world is accidental trauma. Over 10 million children require emergency department care each year in the United States for the treatment of injuries. This represents nearly 1 out of 6 children. Motor vehicle accidents – whether the child is an occupant, pedestrian or cyclist – are the commonest cause of trauma-related deaths.<sup>1,4</sup> The epidemiology regarding RTA (road traffic accident) related injuries in South Africa is not clearly known. With regards to the epidemiology of fractures in children, very little has been published, especially relating to African children and fractures caused by road traffic accidents.<sup>3,5</sup> There is a perception that the incidence of RTA-related fractures is high, but very little local data is available to support or refute this perception. Our aim is to evaluate the epidemiology of paediatric orthopaedic injuries related to RTAs and to subsequently promote awareness in local communities in an attempt to reduce the incidence of RTA-related injuries.

### Materials and methods

This study is a retrospective review of documented admissions to the paediatric orthopaedic admission ward at Chris Hani Baragwanath Hospital from 31 March 2006 to 31 March 2009. The ward register was used to record all information available regarding RTA-related admissions. Data regarding date of admission, mechanism of injury, gender, age and details of injury were recorded on an Excel spread sheet. All children 14 years of age or younger who were admitted for any fracture or orthopaedic injury related to RTAs were included. Descriptive statistics were used to analyse the data.

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### Results

Over the three-year period a total of 2 299 patients were admitted to the paediatric orthopaedic ward. Of these 307 were related to RTAs (13.4%). Of the 307 patients involved in RTAs, 264 (86%) were due to pedestrian vehicle accidents (PVAs), 41 (13.3%) due to motor vehicle accidents (MVAs) and only 2 (0.7%) were due to bicycle vehicle accidents (BVAs). This is shown in *Figure 1*. In the 307 patients injured during an RTA, there were 130 (35.4%) femur fractures and 123 (33.5%) tibia/fibula fractures which made up the majority of the injuries. The remaining injuries included humerus fractures (5.5%), pelvic fractures (4.1%) and forearm fractures (3.5%) (*Figure 2*). Both sides were equally affected with 157 injuries on the right and 155 on the left.

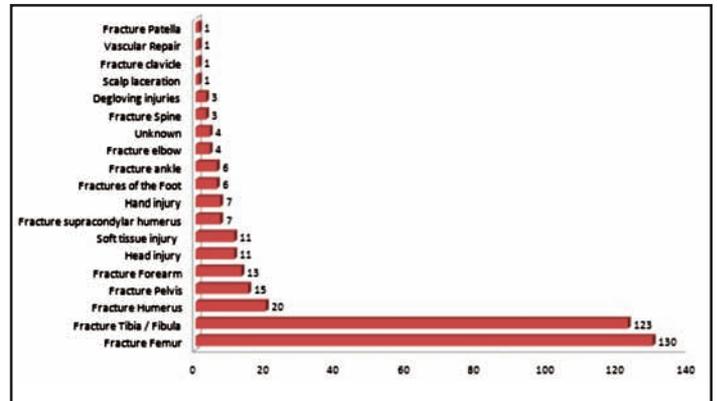
The mean age at time of injury was 5 years (range 1 to 14 years). *Figure 3* shows the distribution of age at the time of injury and shows that patients between the ages of 4 and 8 years had the highest frequency of injuries.

The male to female ratio was 2:1. There were 199 males and 100 females who sustained an orthopaedic injury related to RTA. The gender was unrecorded in eight cases.

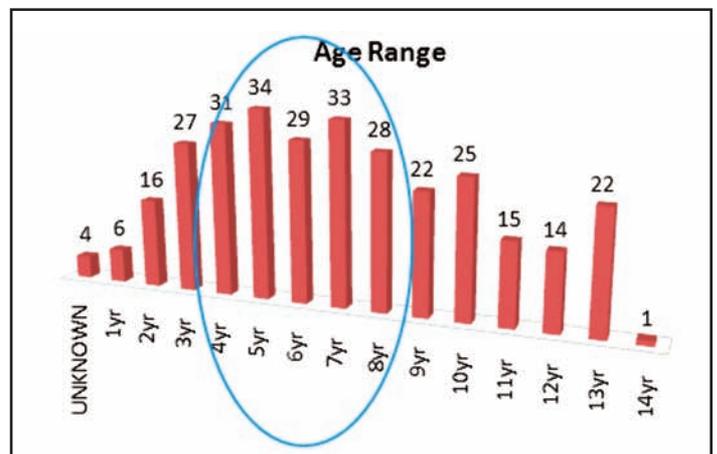
There was no seasonal variation in the number of admissions related to RTA. There was also no seasonal variation when assessing each type of RTA (PVA, MVA, BVA) (*Figure 4*).

### Discussion

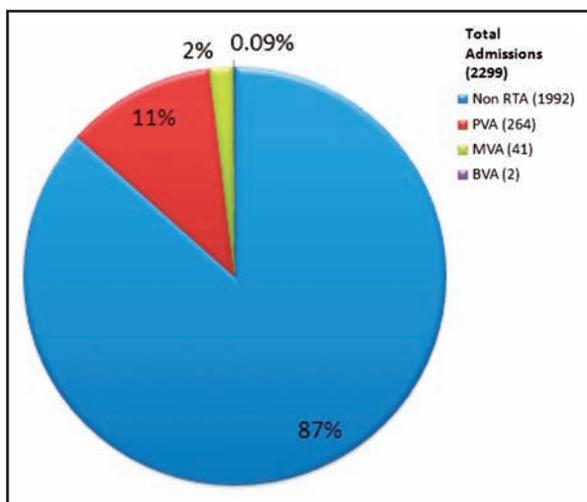
The aim of this study is to evaluate the epidemiology of paediatric orthopaedic injuries related to RTAs. By highlighting the burden this has on the community, we hope to raise awareness to promote local community road safety projects and reduce the incidence of RTA-related injuries.



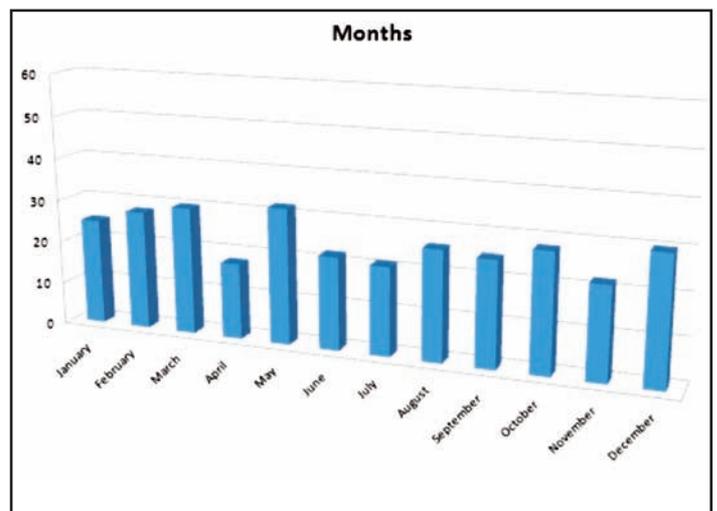
**Figure 2.** Distribution of fractures sustained in road traffic accidents



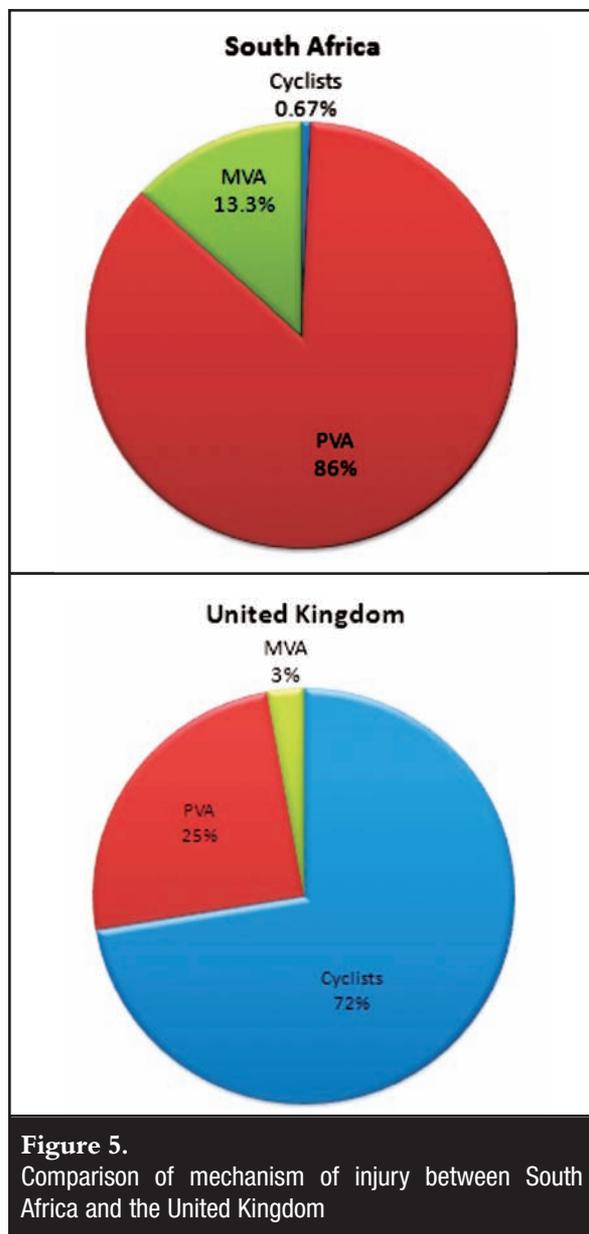
**Figure 3.** Age distribution at time of injury



**Figure 1.** Incidence of road traffic accidents as described by type of injury



**Figure 4.** Lack of seasonal variation in the distribution of RTA-related injuries



It is interesting to compare our local data with that recorded from the United Kingdom. Rennie *et al* demonstrated that in a United Kingdom population road traffic accidents accounted for 7% of paediatric fractures, which is half the incidence of our population (13.4%). 70% of their injuries occurred in cyclists, 24% in pedestrians and 2.7% were passengers in motor vehicles.<sup>6</sup> In contrast our data showed that the number of pedestrians in our cohort was almost four times their number (86%). Even more alarming is the statistic that our population was involved in motor vehicle accidents almost five times more often (13.3%). The small percentage of cycling accidents in our population may be explained by the fact that very few bicycles are used by children for transportation in our peri-urban environment (0.7%) (Figure 5).

As the majority of RTAs in the UK were associated with bicycle injuries their pattern of overall RTA fractures differed from ours. The five most common fractures included metacarpals (95%), distal radius (31%), tibia/fibula (11%), finger phalanges (7%) and femoral diaphysis (5%). In comparison our injuries were mainly due to PVAs and the majority of our injuries involved the lower limbs – femur fractures (35%) and tibia/fibula fractures (34%). Upper limb fractures made up a much smaller proportion of the total – humerus fractures (5%) and forearm fractures (4%). When the results are compared with fractures sustained by the United Kingdom PVA group only, the injuries are more similar with tibia/fibula (49%) and femoral diaphysis (11%) fractures making up the majority of injuries (Table I). These numbers are even more concerning, as one considers that this population of children with fractures is only a subset of all those involved in some sort of RTA. Results from a Nigerian-based study found that only 22% of their patients involved in an RTA sustained a fracture.<sup>3</sup>

Road traffic accidents have a bimodal distribution with regard to age. There is an early peak between 5 and 6 years and a later peak in adolescents.<sup>2,5,6</sup> Our findings show an age range of 4–8 years being most affected, with the peak age being 5 years. According to Venter, children of this age group have an obscured view of the road due to their short stature and their head and shoulders being at bumper height. They have slower reflexes, with limited peripheral vision and auditory perception, and are unable to react or move quickly enough as their perceptions of speed, distance and time are still developing.<sup>7</sup> Salvatore tested children's ability to perceive and classify car speed according to age. He found that age differences exist in the child's ability to correctly classify car speed as slow, medium or fast.<sup>8</sup> All of these factors culminate in the propensity of a young child to be at a very high risk of sustaining a fracture (or worse) related to RTA.

The male to female ratio for all paediatric fractures is 2.7 to 1.<sup>1</sup> A study of RTAs in Nigerian children showed equal gender proportions.<sup>3</sup> This is contrasted by a study of pedestrian vehicle accidents (PVAs) from South Africa which found that male children were more prone to RTAs than female children with a ratio of 1.3 to 1.<sup>5</sup> The current study was in line with the gender ratio quoted for all fractures being a 2:1 male to female predominance. This difference in gender has been postulated as being due to the fact that males are more adventurous and reckless by nature, and hence more likely to venture into the road alone, whereas females tend to stay close to their caregivers.<sup>7</sup>

Seasonal variation appears to be a dominant factor in climates closer to the Poles, which are affected more significantly by variation in daylight hours. In northern hemisphere countries, fractures are more common in the warmer summer months since the children are outside and exposed to more physical activities. The most consistent climatic factor appears to be the number of hours of sunshine.

**Table I. Comparison of fracture site distribution between South Africa (RTA) and the United Kingdom (RTA and PVA)**

	United Kingdom RTA	United Kingdom PVA	South Africa RTA
Femur	5%	11%	35%
Tibia & Fibula	11%	49%	34%
Pelvis		9%	4%
Humerus		9%	5%
Distal Radius	31%		1%
Hand Injuries	12%		2%

According to Rockwood and Wilkins<sup>2</sup> the average number of fractures in the summer is 2.5 times that of the winter. In our study there was no significant seasonal variation. This could be explained by the relatively warm winter climate in South Africa, where longer winter daylight hours, compared to northern hemisphere countries, allows children to be out and about and exposed to the dangers of the road throughout the year.

Unlike European studies, where bicycle injuries are common, the majority of RTAs admitted to our wards are due to pedestrian vehicle accidents, with the majority of the fractures involving the lower limbs. Studies have shown that road safety awareness programmes can positively influence the incidence of injuries related to RTAs.<sup>9</sup> It is imperative that road use awareness and road safety programmes be increased in our region to decrease the number of pedestrian vehicle accidents.

## Conclusion

The results of our study show that road traffic accidents make up 13.4% of our acute admissions, which is almost double the incidence of the European series. We plan to approach local authorities in an effort to highlight the concerns regarding the unnecessary injuries caused by motor vehicles, so that strategies to reduce these accidents may be implemented.

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*No benefits of any form have been received from a commercial party related directly or indirectly to the subject of this article. The content of this article is the sole work of the authors. The research has been approved by Wits Ethical Committee (M090645).*

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