

# Bicycle-related injuries: a prospective study of 200 patients

Eid H O, Bashir M M, Muhammed O Q, Abu-Zidan F M

## ABSTRACT

**Introduction:** This study aims to evaluate the magnitude, mechanism, distribution and outcome of bicycle-related injuries managed at the Emergency Department, Al-Ain Hospital, United Arab Emirates.

**Methods:** 200 patients, who were treated at the emergency department of Al-Ain Hospital during the period of October 2001 to January 2003, were prospectively studied. A hard copy protocol was designed and data was collected on a daily basis.

**Results:** 175 patients (87.5 percent) were males. The average age was 16.1 +/- 13.7 years. Only two were wearing helmets (one percent). The majority of injuries occurred in the evening and was due to a fall from a bicycle in 163 patients (81.5 percent). 88 patients had lower limb injuries (44 percent), and 72 had head and neck injuries (36 percent). Only 31 patients (15.5 percent) needed hospitalisation. Of these, four (12.9 percent) were admitted to the intensive care unit. The mean (range) hospital stay was 6.3 (1-23) days. Patients who were admitted to the hospital were older males, involved in motor vehicle collisions, and had more head injuries. Three patients (1.5 percent) died.

**Conclusion:** Bicyclists' head injuries, caused by a motor vehicle collision, are a main cause of hospital admission. Helmet compliance in our community is alarmingly low, indicating the need for legislation and education on the use of helmets.

**Keywords:** bicycle-related injuries, injuries, helmet use, motor vehicular accidents, road safety

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## INTRODUCTION

Cycling is a healthy and cheap mode of transportation, and particularly popular among children. Young people,

especially low-income expatriate labourers, use bicycles for transportation in our community. The main roads in Al-Ain city are wide, well-designed, and have paved pathways on the side for bicyclists and pedestrians. However, cycling on these roads can be dangerous. We have observed significant morbidity and mortality caused by bicycle-related injuries in our hospital. Bicycle helmet usage has a protective effect regardless of age and types of accidents.<sup>(1)</sup> Wearing a helmet protects the brain from injury by 65% and severe brain from injury by 74%.<sup>(2)</sup> Bicycle-related mortality ranges between 1.7% and 9%.<sup>(3)</sup> Head injuries are the cause of most fatalities and long-term disabilities.<sup>(4)</sup> We aimed to prospectively evaluate the magnitude, mechanism, distribution and outcome of bicycle-related injuries managed at our hospital.

## METHODS

Data of all patients who presented at the emergency department of Al-Ain Hospital with bicycle-related injuries during the period of October 2001 to January 2003 were prospectively collected. Demography of patients, time of injury, details of injury, helmet usage, and duration of hospital stay were recorded in a designed protocol. Two of the authors (BM and MOQ) collected the data on a daily basis on a hard copy. Mechanism, distribution of injuries, and outcome were studied. Data were entered into the Microsoft Office Excel version 2003 (Microsoft Corporation, Washington, USA) and analysed using the Statistical Package for Social Sciences version 14.0 (SPSS Inc, Chicago, IL, USA). Statistical analysis using Fisher's exact test or Mann-Whitney U test was used to compare two independent groups. A p-value of less than 0.05 was considered to be significant.

## RESULTS

A total number of 200 patients were studied. 175 (87.5%) were males. The majority were children less than 16 years of age (Fig. 1). The mean age was 16.1 ± 13.7 years. Out of the 200 patients, only two (1%) were wearing helmets. The majority of injuries (75%) occurred in the evening from 1600 to 2300 hours (Fig. 2). There were 77 (38.5%) United Arab Emirates nationals and 133 (61.5%) expatriates (Table I). The main cause of injury was falling from a bicycle, followed by motor vehicle collision (Table II). Most injuries sustained involved the lower limbs (44%), followed by the head and the neck (36%),

Trauma Group,  
Faculty of Medicine  
and Health Sciences,  
United Arab  
Emirates University,  
PO Box 17666,  
Al-Ain,  
United Arab  
Emirates

Eid HO, MBBS  
Research Assistant

Abu-Zidan FM, MD,  
PhD, FRCS  
Associate Professor  
and Head

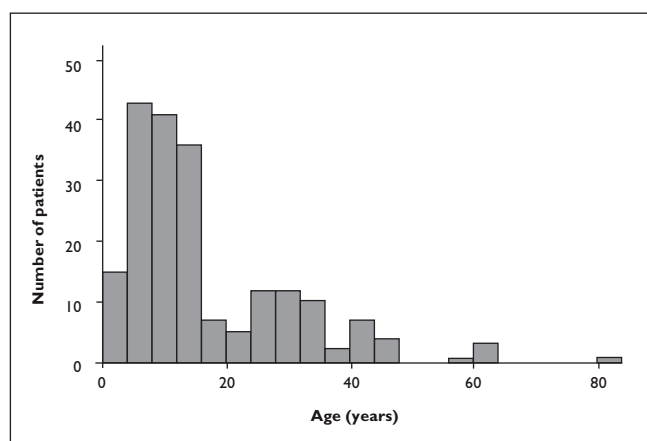
Department  
of Emergency  
Medicine,  
Al-Ain Hospital,  
PO Box 1006,  
Al-Ain,  
United Arab  
Emirates

Muhammed OQ,  
MRCSE  
Senior Registrar

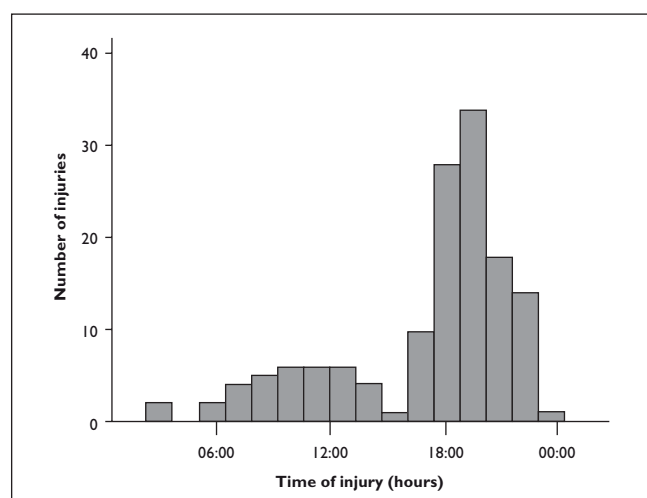
Department of  
Surgery,  
Al Rahba Hospital,  
PO Box 34555,  
Abu Dhabi,  
United Arab  
Emirates

Bashir MM, FRCS  
Senior Consultant

**Correspondence to:**  
Dr Fikri Abu-Zidan,  
Tel: (971) 3 713 7579  
Fax: (971) 3 767  
2067  
Email: fabuzidan@  
uaeu.ac.ae



**Fig. 1** Bar chart shows the age distribution of patients involved in bicycle-related injuries.



**Fig. 2** Bar chart shows the distribution of injuries by time of day.

and upper limbs (32%) (Table III). Injuries in the lower limb included fracture of the tibia/fibula in 18 (20.4%) patients, fracture of the ankle in four (4.5%) patients, fracture of the foot in five (5.7%) patients, and soft tissue injuries in 73 (85.2%) patients. 41 (20.5%) patients had injuries in more than one area of the body region; the most common being a combination of head and neck injury with lower limb injury. The two helmeted patients in our study sustained only mild soft tissue injuries to the scalp, forehead and lower limbs.

31 patients (15.5%) were admitted to the hospital, while 167 (83.5%) were discharged home. Four patients (2%) had serious injuries that required admission to the intensive care unit (ICU). Patients who were admitted to the hospital were significantly older males, involved in motor vehicle collisions, and had head injuries (Table IV). The median (range) Injury Severity Score (ISS) for patients discharged home and for those who were admitted was one (1–10) and two (1–17), respectively ( $p <$

**Table I. Nationality of patients.**

Nationality	Number	%
United Arab Emirates	77	38.5
Pakistani	23	11.5
Indian	17	8.5
Bangladeshi	17	8.5
Egypt	11	5.5
Others	55	27.5
Total	200	100

**Table II. Cause of injury.**

Cause	Number	%
Fall from a bicycle	163	81.5
Hit by a car	28	14
Hit a fixed object	5	2.5
Others	4	2
Total	200	100

**Table III. Distribution of injuries.**

Site of injury	Number	%
Lower limbs	88	44
Head, face and neck	72	36
Upper limbs	64	32
Pelvis	16	8
Chest	11	5.5
Abdomen	6	3
Spine	4	2

**Table IV. Univariate analysis comparing patients with bicycle-related injuries who were admitted to the hospital and those who were discharged.**

Patient demographics	Not admitted (n = 167)	Admitted (n = 31)	p-value
Age (years)	10 (1–84)	30 (1–60)	< 0.001
Head injury	43/167	25/31	< 0.001
Male	142/167	31/31	0.02
Car collision	6 / 167	20/31	< 0.001
Injury severity score	1(1–10)	2(1–17)	< 0.0001

0.001). The mean (range) of hospital stay was 6.3 (1–23) days. Three (1.5%) patients died; two in the emergency department and one in the ICU. They had suffered from severe injuries to the head, chest and lower limbs.

## DISCUSSION

Bicycle-related injuries have mainly involved children in our study. Besides spending more time cycling, compared to adults, children are generally inexperienced cyclists. This makes them more susceptible to bicycle-related injuries.<sup>(4-6)</sup> The male-to-female ratio in our study was 7:1. United Arab Emirates citizens constituted almost 40% of the injured in our study, although they only constitute about 20% of the general population. This can be explained by the high ratio of children in our study. Although expatriate workers constitute half of our community, the majority of them do not bring their families with them. This also accounts for the high male-to-female ratio (2:1) in our community.<sup>(7)</sup> Most of our patients were injured in the evening, similar to other studies.<sup>(6,8)</sup> Furthermore, most of these were children. This may be explained by their being at school in the mornings.

Falling from a bicycle was the main cause of injury. This was reflected in the distribution of injuries. The majority of our patients sustained injuries to their upper and lower limbs. The head was injured in 36% of patients, which is similar to other studies.<sup>(1,4)</sup> However, the majority of the injuries in our study was mild, and involved musculoskeletal and soft tissues.

Motor vehicle collisions were the second most common cause of injury in our study. All patients involved in these collisions were males; the majority had head injuries and only one of them used a helmet. Motor vehicle collisions are the cause of 30%–50% of bicycle-related injuries requiring hospitalisation. It has also been noted that the head injuries are the main cause of death in bicycle-related injuries.<sup>(3,6)</sup> All deaths that occurred in our study were a result of motor vehicle collisions, causing severe head injuries. Other studies also found that motor vehicle collisions are a major cause of head injuries and deaths of bicyclists.<sup>(6,9)</sup> In our study, the predominance of the male gender was observed. Cycling on the main road in Al-Ain is common among expatriate labourers of low income.<sup>(10)</sup> None of our patients were under the influence of alcohol, most likely due to the low income of the labourers, legislation, and their religious beliefs. Helmet usage rate in our patients was very low (1%). An observational study on the behaviour of bicyclists on the main roads of Al-Ain city have found a helmet usage of only 0.5%. In that study, 99.5% of cyclists were males, 97% adults, and 98% of them were non-locals.

Furthermore, 70% were cycling on the main roads in contact with high-speed vehicles and 46% were cycling against the flow of traffic.<sup>(10)</sup>

Helmet usage in our community is extremely low when compared with other series. The compliance rate reported in other series ranged between 8% and 80%.<sup>(1,11,12)</sup> This may be due to absence of legislation for helmet use in our country. Legislation has increased the level of helmet-wearing among children in Australia, Canada and New Zealand, and has contributed to the decrease in bicycle-related deaths.<sup>(2)</sup> As the rates of helmet-wearing by cyclists rose, a decline in hospital admission for head injuries were noted. 60% of serious head injuries can be prevented by helmet use.<sup>(13)</sup> Riding a bicycle without a helmet and collision with a motor vehicle are important risk factors of bicycle-related injuries.<sup>(4)</sup> In summary, our prospective study has shown that bicyclists' head injuries caused by a collision with a motor vehicle are the main cause of hospital admissions. Helmet compliance in our community is alarmingly low, indicating the need for legislation and education regarding the use of helmets.

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