

Epidemiology of children's cycling injuries in Ahwaz, Islamic Republic of Iran

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وبالبيات إصابات ركوب الدراجات بين أطفال الأهواز، في جمهورية إيران الإسلامية

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الخلاصة: أجريت هذه الدراسة التي استغرقت سنة واحدة في الأهواز، في جمهورية إيران الإسلامية، لتفحص وبالبيات الإصابات الناجمة عن ركوب الدراجات بين أطفال الأهواز، وقد تمت دراسة الأطفال الذين تبلغ أعمارهم 15 سنة أو أقل ممن راجعوا أقسام الحوادث والطوارئ في جميع المستشفيات الحضرية بسبب تعرضهم لإصابات ناجمة عن ركوب الدراجات، كما أجريت مقابلات مع والديهم من خلال استبيانات. واتضح أنه خلال فترة الدراسة راجع 1079 طفلاً أقسام الحوادث والطوارئ من جراء تعرضهم لإصابات ناجمة عن ركوب الدراجات (78.8% منهم من الفتيان و21.2% من الفتيات)، ويمثّل مجموعهم 4.9% من مجمل الأطفال المتعرضين للإصابات. وكان أكثر مواقع الإصابات حدوثاً هي الشوارع (51.9%) والمنزل (42.3%)، فيما كان الرأس أكثر أجزاء الجسم تعرضاً للإصابات (55.0%). ولم يكن أي من الأطفال يضع على رأسه خوذة واقية للرأس من الإصابات. تقترح هذه الدراسة فرض استخدام الخوذات، وسن تشريعات السلامة، والبدء ببرامج تثقيفية لإلزام راكب الدراجة باتباعها في المجتمع.

ABSTRACT A one-year study was carried out in Ahwaz, Islamic Republic of Iran to investigate the epidemiology of children's cycling injuries. Children 15 years old or younger taken to the accident and emergency (A&E) departments of all urban hospitals due to cycling injury were investigated, and their parents interviewed by questionnaire. During the study, 1079 children presented to A&E departments with cycling injuries (78.8% boys and 21.2% girls), representing 4.9% of all children presenting with injuries. The most frequent injury sites were the street (51.9%) and the home (42.3%), and the head was the part of the body most frequently injured (55.0%). None of the injured children was using a cycling helmet at the time of injury. This study suggests mandatory helmet use, safety regulations and educational programmes for bicycle riders should be established in our community.

Epidémiologie des accidents de bicyclette chez les enfants à Ahwaz (République Islamique d'Iran)

RESUME Une étude a été réalisée à Ahwaz (République islamique d'Iran) sur un an pour étudier les accidents de bicyclette chez les enfants. On a examiné des enfants de 15 ans ou moins qui avaient été amenés au service des urgences de tous les hôpitaux urbains en raison d'un accident de bicyclette, et leurs parents ont été interviewés à l'aide d'un questionnaire. Pendant l'étude, 1079 enfants ont été conduits au service des urgences pour accident de bicyclette (78,8 % de garçons et 21,2 % de filles), représentant 4,9 % de tous les enfants se présentant avec des traumatismes. Les lieux d'accident les plus fréquents étaient la rue (51,9 %) et la maison (42,3 %), et la tête était la partie du corps la plus fréquemment touchée (55,0 %). Aucun enfant blessé ne portait de casque au moment de l'accident. Cette étude suggère de rendre obligatoire le port du casque ; des règles de sécurité et des programmes d'éducation pour les cyclistes devraient également être établis dans notre communauté.

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Introduction

Bicycles are the only road vehicles which children are allowed to use. Each year many children are killed following cycling accidents, or are admitted to hospitals. It is evident that the causes and patterns of injury and preventive measures required are different in various communities [1]. Some studies have shown that, among children, many cycling accidents occur on roads in built-up areas, at a junction and in daylight [2]. By far the greatest number of bicycle accidents takes place on streets considered to be quite safe [3]. The vast majority occurs within half a mile of the child's home [1]. The peak time for cycling accidents is different for the various ages [2]. The head and neck are the most common anatomical site of bicycle-related injuries in children [4], and research has demonstrated that helmets reduce the occurrence and severity of head injury in bicyclists [5–8].

Casualty rates of cycling injuries for children are higher than for adults. Child and adult cycling accidents should be considered separately, since cycling behaviour, experience and injuries are different in the two groups. While children injured in accidents are mainly cycling for pleasure, many adult cyclists are injured travelling to and fro [9]. This study was undertaken to identify the patterns of children's cycling injuries in Ahwaz, Islamic Republic of Iran and to suggest the possible causes and preventive measures.

Methods

All children taken to all accident and emergency (A&E) departments in Ahwaz, Islamic Republic of Iran as a result of bicycle injury, from 21 March 1999 to 20 March 2000 (21 March is the first day of the year

in the Persian calendar) were included in the study. The total child population in the city was 405 640. Parents of injured children were interviewed and a questionnaire including demographic and cycling injury information was filled by trained hospital general practitioners. It took about 10 minutes per person to complete. In this study an accidental injury was defined as a sudden external occurrence leading to a cycling injury that presented to an A&E department in the city for medical treatment. Cases that presented to the A&E departments within 1 day of injury were included in the study. Data were collected on each patient's age, sex, ethnicity, the date, time and place of injury, the body part injured, type of injury, and eventual outcomes. The analyses were performed using SPSS (version 10.0).

Results

During the study period, 22 020 children aged 15 years or younger were taken to A&E departments of all hospitals in Ahwaz because of an accidental injury. Of these, 1079 were children's cycling injuries (4.9% of all children's injury presentations). The children's cycling injury incidence rate was 2.66 per 1000 (95% CI = 2.5–2.8 per 1000). Table 1 shows the characteristics of the children involved in a bicycle accident compared to children injured in other ways. Children injured while cycling ranged in age from under 1 to 15 years with a mean of 7.9 years (standard deviation = 4.2), and were distributed equally between Iranians and Arabs, as well as between preschool (under 7 years) and school-age (7–15 years) groups (48.6% versus 51.4%). Boys, compared to girls, were more likely to be injured (78.8% versus 21.2%). Most children were living with

Table 1 Characteristics of children injured while cycling ($n = 1079$) compared to children injured in other ways ($n = 20\,941$)

Characteristic	Children injured while cycling ^a		Children injured in other ways ^a	
	No.	%	No.	%
<i>Age group (years)</i>				
<1	30	3.1	1115	5.5
1-4	336	34.5	6935	34.2
5-9	257	26.4	6774	33.4
10-15	350	36.0	5470	26.9
<i>Sex</i>				
Male	850	78.8	14246	68.0
Female	229	21.2	6693	32.0
<i>Ethnicity</i>				
Arab	531	50.7	10940	55.0
Iranian	517	49.3	8938	45.0
<i>Child is living with</i>				
Both parents	898	85.7	19596	93.8
Others	150	14.3	1304	6.2
<i>Mother's education</i>				
Educated	806	78.4	13198	73.4
Uneducated	106	11.6	4771	26.6
<i>Mother's occupation</i>				
Housewife	807	94.7	15577	95.2
Other	45	5.3	793	4.8

^aTotal number reported is less than the total number of patients treated due to incomplete reporting.

both parents (85.7%), and their mothers were educated (78.4%) and were housewives (94.7%).

Table 2 shows the distribution of injured children by age group and sex according to sites, the body part injured, type of injury, severity of injury and helmet use. Among both preschool and school-age children, boys were more likely to be injured on streets than girls ($P < 0.001$). No injuries occurred among girls in the school-age group. The most frequent injury sites were on the street (51.9%) and home (42.3%). Cuts/lacerations and fractures were the most frequently reported injuries suffered

by children following a bicycle accident, at 38.4% and 23.2% respectively. The head was the most common anatomical site of bicycle-related injuries in children (55.0%). No deaths occurred among the children after one-week follow-up. However, the majority of injured children needed medical treatment, and more than one-third were admitted to A&E departments or to hospital wards. None of the injured children was using a cycle helmet at the time of injury.

The peak months for children's bicycle injuries were October (17.1%) and November (14.4%), with the lowest occurrence found in September (1.4%). The

Table 2 Details of children's bicycle injuries by age group and sex

Injury data	Preschool group (<7 years)		School-age group (7-15 years) ^a	Total ^b
	Boys (%)	Girls (%)	Boys (%)	No. (%)
<i>Place where injury occurred</i>				
Street	66.8	0.0	63.2	544 (51.9)
Home (yard/garden)	33.2	82.1	30.6	443 (42.3)
School	0.0	0.0	17.9	30 (2.9)
Public place	0.0	17.9	6.2	31 (3.0)
<i>Body part injured</i>				
Head	74.9	22.3	53.8	394 (55.0)
Hand	16.4	0.0	33.8	153 (21.4)
Leg	8.7	66.9	8.3	139 (19.4)
Other	0.0	10.8	4.1	30 (4.2)
<i>Type of injury</i>				
Cut/laceration	64.5	15.1	24.9	380 (38.4)
Fracture	14.0	30.7	28.5	229 (23.2)
Bruise/contusion	7.5	15.1	12.4	106 (10.7)
Dislocation	0.0	16.1	0.0	32 (3.2)
Abrasion/graze	0.0	0.0	3.1	15 (1.5)
Other	14.0	23.1	31.1	30 (3.0)
<i>Severity scale</i>				
No treatment needed	56.2	72.6	3.0	15 (1.4)
First aid needed	0.0	0.0	57.6	670 (63.9)
Admitted to A&E department	10.9	8.9	24.4	167 (15.9)
Admitted to hospital	32.8	18.5	15.0	196 (18.7)

^aThere were no bicycle injuries among school-age girls.

^bTotal number reported is less than total patient number (n = 1079) due to incomplete reporting.

None of the children who had sustained a bicycle injury had been wearing a helmet at the time of the accident.

A&E = accident and emergency.

peak day covering all age groups was Friday (the weekend day in the Islamic Republic of Iran) and the lowest number of accidents occurred on Saturday (Figure 1). School-age children, compared to preschool children, were more likely to be injured on weekdays (48.0% versus 29.0%, $P < 0.001$) than the weekends. All bicycle injuries in children occurred between the hours of 7:00 and 21:00. The peak time was between 18:00 and 19:00, at 31.6% for all age groups and 27.8% versus 35.2% for

preschool and school-age groups respectively.

Discussion

Each year many children are injured following cycling accidents in Ahwaz. The incidence rate during the period of this study for those who needed medical treatment and were taken to A&E departments was 2.66 per 1000. However, the scope of the

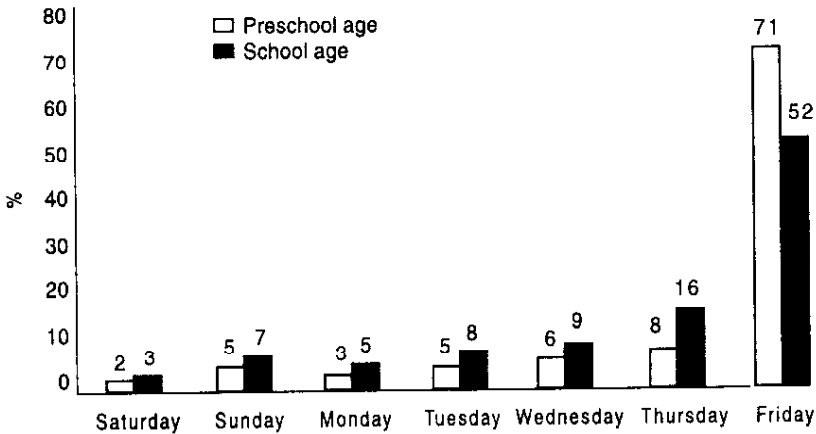


Figure 1 Distribution (%) of children injured while cycling by day of the week and age group

problem of children's cycling injuries could be more serious because only about 6 out of 10 bicycling injuries are treated in A&E departments [10].

Boys were more likely to have cycling injuries than girls, as reported by many other studies [11–13]. For example in England, over five times as many boys as girls are killed or seriously injured as a result of bicycle accidents [14]. The increased injury rate in boys could largely be due to their riding more often [5]. Among girls in school-age groups, cycling is not popular in our community, and their parents are less likely to allow them take part in outdoor activities [15].

In this study the type of injury was also different between boys and girls. This variation might be due to the mechanism of injury, behavioural differences or environmental factors. For instance, girls have a greater tendency to behave in ways that may be considered safe [16], and ride more slowly than boys [17]. In contrast, boys are more likely to play and cycle in the

street or on busy roads [16]. More needs to be learned about this variation.

Although the effect of cycling helmets in reducing head injuries and the severity of injuries has been well demonstrated [6,8,17–20], none of the injured children in this study reported wearing a helmet at the time of the accident and more than half of the injuries sustained were head injuries. This is similar to other studies that have shown that the head and neck are the most common anatomical sites of bicycle-related injuries in children [4]. Wearing of helmets by cyclists has been recommended and cycling without a helmet has been considered a risky behaviour [6–8]. Greensher [20] suggested mandatory helmets for bicycle riders, and there is good evidence of a substantial reduction in head injuries following high rates of voluntary helmet usage and subsequently very high rates after mandated usage [18].

This study is the first epidemiological investigation of children's cycling injuries in this community. However, we have not

presented the risk expressed in terms of time and length of exposure (when and how long the injured children had been cycling in hazardous situations each day), the circumstances that contribute to risky bicycling behaviours, and the role of road hazards, bicycle design or poor bicycle maintenance and cyclist error or inexperience regarding children's bicycling injuries. Many cycling accidents occur on streets considered to be quite safe near the child's home [13]. There is a direct correlation between accident rates and risk expressed in terms of time and length of exposure, holidays, low socioeconomic status, and density of the population. Among children, about 97% of cycling accidents occur on roads in built-up areas, 65% at a junction, 95% in daylight and only 4% on journeys to or from school [2].

Other studies showed that the circumstances that contribute to bicycling accidents include performing stunts or speeding, riding double, road hazards, loss of control on downhill slopes, poor bicycle maintenance and cyclist error or inexperience [1,3,13]. Bicycle design, riding double and use of the wrong-sized bicycle have contributed to injuries.

This study suggests mandatory helmets and safety regulations for bicycle riders in the community of Ahwaz. Although it is well known that the use of helmets can help

prevent bicycle injuries, some studies have shown that children are unlikely to use bicycle helmets [21-23]. It has been described that reasons for refusal to use helmets, other than cost, might include lack of awareness of benefits and possible negative peer pressure [23]. Safety considerations and parental pressures have been shown to influence helmet usage [24].

The reasons for children's cycling injuries and lack of use of helmets in our community should be investigated. In addition, bicycle training for children also seems sensible [1,3,13]. A comprehensive educational programme, especially for children and their parents, may be a way to address safety-related riding habits. Such programmes typically may include information on the use of helmets, safe riding habits, changing the cycling environment, improving cycle equipment (e.g. chain covers, spoke covers), increasing the visibility of riders in darkness, and changing children's risky activities.

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