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A Survey on Injury Incidence in School Children in Shantou City, China

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Objectives To study incidence characteristics and causes of injury, and its medical consequences in school children of China. **Methods** A total of 2 553 school children aged 7-16 years were recruited from Shantou City in Gunagdong by cluster sampling method, and were investigated with questionnaires on cases of injuries occurred among them from October 1, 1996 to September 30, 1997. **Results** Injuries tended to increase with children's age, with an overall incidence rate of 37.96%, higher in boys than in girls ($P<0.05$); and 38.1% of children had more than two episodes of injury during this period. Falls took leading place of injury incidence both in boys and girls and in all age groups. Most injuries occurred when they were playing, sporting, riding and walking at home or in school. Self-inflicted injury ranked the first place of all injuries, followed by hurt caused by others (classmates, sibling or others). Moderate and serious injuries accounted for 8% of the total with a disability rate of 121.4/100 000. **Conclusions** Currently, injury has become one of the serious public health problems in China. For the improvement of children survival, it is crucial to reduce their injury to strengthen research on child safety and to implement safety-promotion programs.

Key words: Incidence; Falls; Disability; Injury; Child

INTRODUCTION

Injury is emerging as the most important preventable cause of death and disability in children beyond the first few months of life[1,2]. In China, injury has become a leading cause of death in children over one year[2]. In addition, injuries in children have heavy impacts on their parents, leading to economic loss and even poverty, as well as long term psychological distress in families. Therefore, injury during childhood is an important public health problem worldwide. Although epidemiological studies on childhood injury have been undertaken in many industrialized countries[3-5], little information is available to guide injury prevention in China. In this study, incidence, causes and medical consequences of injuries in children were investigated in terms of their functional characteristics. The objectives of the study were: (1) to understandmain problems, characteristics, risk factors and incidence of injury in children, including the age at high risk; and (2) to put forward recommendations for specific preventive measures relevant to injury in children, including creating evidence-based safe environment for them.

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SUBJECTS AND METHODS

Sampling Method

The study was conducted from October 1996 to September 1997 in two primary schools and one secondary school in urban districts of Shantou City in Guangdong Province, with around 900 000 inhabitants. A total of 2 559 pupils at the first to sixth grades in the primary school and the first to second grades in the secondary school were selected from 36 183 children by cluster sampling procedures. Of all these subjects, 0.2% was absent or refused to participate. Thus, complete data were obtained from 2 553 children aged 7-16 years.

Data Collection

Main characteristics of the sample are shown in Table 1. Sociodemographic characteristics and data of injury events in the children during the study period from October 1, 1996 to September 30, 1997, were collected with a structured questionnaire, including basic demographic information on the subjects and their family members, lifestyles, and other related information. All the subjects were interviewed with a questionnaire by specially trained teachers who were in charge of study subjects at the classes. All the teachers were trained before the study and then were requested to have the interviews on the spot in a standardized way. Each study subject was interviewed and a questionnaire was filled out. Survey procedure was designed to protect pupils' privacy by anonymous and voluntary participation with informed consent, as well as local permission from their parents before survey administration.

Variables

Indicators reflecting sociodemographic information included family status (two-parent family or single-parent family), parents' education (college, high school, middle school, primary school and illiteracy), occupation (government officials, staff and managers in enterprises, professional or technical personnel, industrial workers, service workers, commercial personnel, farmer, the unemployed, jobless and others), and lifestyles, focusing on unhealthy behaviors, such as smoking and drinking.

Injury was defined as a child injured within the past 12 months from the date of study. Information was also collected concerning the number of injury events, type, causes, and intention of injury, location of its occurrence and its medical consequences. Type of injury included falls, accidents in sports, cuts and pierce wound, something stuck in the throat, collision, burns and scalds, bite by animal, insect sting, hurt by hard object, electric shock, traffic accident, drowning, poisonings, suffocation, explosion, or others. Injury could occur in bicycle riding, playing, sports, walking, up and down stairs, stumble, learning, fighting, eating, washing, fire, flood, construction, using electronic equipment, swimming, taking medicine, and other activities. Injury can be classified as unintentional and intentional one. Intentional injury mainly involved those subjects injured by classmates, siblings, parents, teachers or others, which were also called as interpersonal injury. Injury can occur at home, schools, on road and other places. Medical consequences of injury in children were categorized into "minor", "moderate" and "severe" based on its severity. Minor injury was defined as injury that could be fully recovered, moderate injury as the one that could make children handicapped in activities, or cause them to feel unwell, and severe injury as the one

that could lead to disability.

TABLE 1

Distribution of School Children who Sustained Injuries by Demographic Characteristics and Types of Injuries, Shantou, China, 1996-1997

Variables	Injuries	
	No.	Incidence Rate(%)
Gender		
Male	545	41.16
Female	424	34.50
Age (years)		
7-	104	18.57
10-	466	36.61
13-16	399	55.42
Places of Injury Occurred		
Home	378	39.0
School	239	24.6
Other	352	36.4
Types of Injury		
Falls	519	20.33
Collision	110	4.31
Burn	63	2.47
Sports	119	4.66
Throat Stuck	34	1.33
Cut/Pierce	38	1.49
Traffic Accident	27	1.06
Episodes of Injuries		
1	969	37.96
2+	369	14.45
Father of the Study Subjects		
Have Spouse	2 343	38.24
Do not Have Spouse	77	44.16
Smoking	1 714	52.28
No Smoking	729	39.09
Alcoholic Drinking	754	47.75
No Alcoholic Drinking	1 483	36.08
Mother of the Study Subjects		
Have Spouse	2 313	38.78
Do Not Have Spouse	91	40.66
Smoking	44	50.00
No Smoking	2 191	40.44
Alcoholic Drinking	52	61.54
No Alcoholic Drinking	2 119	40.21
Level of Father's Eucation		
College	456	50.7
High School	955	52.9
Middle School	749	54.9
Primary school	303	56.8
Illiteracy	28	53.6
Level of Mother's Education		
College	240	49.2
High School	808	51.1
Middle School	805	51.7
Primary School	542	60.0
Illiteracy	96	58.3

Criteria for Injury Diagnosis

Injured victims were identified by the following conditions[6]: (1) Any injury occurred

in children that required health care by a nurse or a physician; (2) Injured children should be taken to emergency care by adults or teachers; and (3) that caused him/ her a half day off from school.

If a school child had one of the above conditions, he or she could be judged as an injury victim, including an injury event, which happened unexpectedly and resulted in any hurt in certain ways, even not serious enough for him or her to visit a doctor or an emergency department. For example, a child only with a small cut needed a patch of adhesive plaster, or a child cut his or her leg on a corner of a piece of furniture, all these could be recognized as injury victims.

Data Analysis

Information was coded after completion of questionnaires. Data were entered onto Foxprow database and validated by repeated entry, and any error was corrected by checking original recordings. Categorical data were analyzed with chi-square test and Cochran chi-square test for trend. All calculations were made using SPSS software.

RESULTS

Injury Prevalence for Children by Gender and Age Groups

Totally, 2 553 out of 2 559 pupils investigated answered questionnaires validly, with a response rate of 99.8 %, including 1 324 boys and 1 229 girls, with a gender ratio of 1.1. Five hundred and sixty pupils aged 7-9 years, 1 273 aged 10-12 years, and 720 aged 13-16 years. According to the sequence of occurrence of injury events, if more than one injury events occurred in the same victim within the study period, the first injury, the second injury, and so on were used to describe. Results showed that 969 children suffered from injury during the study period, with an incidence rate of 38.0% for children aged 7-16 years. Among those injured, 369 (38.1%) were injured two times or more in the same year, with an incidence rate of 14.5%. There was a significant difference in incidence rate of injury between boys and girls ($P<0.0001$), and between age groups ($P<0.0001$). Incidence rate of injury increased with age both in boys and girls with a significant trend (Cochran chi-square for trends=183.51, $P<0.001$) (Table 2).

TABLE 2

Incidence Rate of Injuries in School Children, Shantou, China, 1996-1997

Gender	Age Group							
	7-		10-		13-16		7-16	
	No.	Incidence Rate (%)	No.	Incidence Rate (%)	No.	Incidence Rate (%)	No.	Incidence Rate (%)
Males	61	21.48	264	39.58	220	58.98	545	41.16
Females	43	15.58	202	33.33	179	51.59	424	34.50
Total	104	18.57	466	36.61	399	55.42	969	37.96

Incidence rate of falls ranked the highest in all injuries occurred during the year. In terms of incidence rate, different types of injury could be listed in the following order: for boys falls, sport injury, collision and burns and for girls falls, collision, burns and sport injury

(Table 3). They accounted for 85.7% and 81.1% of all injuries in boys and girls, respectively.

TABLE 3

Proportion of the First Injury Occurred in School Children by Type of Activities and Gender During Study Period of 1996-1997, Shantou, China

Activities Children Were Engaged in When Injury Occurred	Males		Females	
	No.	%	No.	%
Playing	155	28.44	85	20.05
Sports	100	18.35	37	8.73
Cycling	91	16.70	88	20.76
Walking	34	6.24	40	9.43
Being Stumbled	29	5.32	28	6.60
Up and Down Stairs	27	4.95	22	5.19
Eating	13	2.39	21	4.95
Pouring Boiled Water	11	2.02	19	4.48
Housework	11	2.02	13	3.07
Animal Bite	10	1.84	9	2.12
Sports	100	18.35	37	8.73
Riding	91	16.70	88	20.76
Walking	34	6.24	40	9.43
Other	64	11.73	62	14.62
Total	545	100.00	424	100.00

Causes of Injury

During the whole study period, for boys, the first injury occurred when they were playing, doing sports, cycling, and walking, and the second injury occurred when they were doing sports, playing, being stumbled, and eating; and for girls, the first injury occurred when they were cycling, playing, walking and doing sports, and the second injury occurred when they were doing sports, doing housework, playing and eating (Tables 3 and 4).

Places of Injury Occurrence and Related Intention

Home was the most common location where injury occurred, accounting for 39.0% of all injuries, and was then followed by school campus, accounting for 24.6%.

Majority of injuries occurred in children were unintentional, accounting for 78.0%. Intentional injuries included hurt by classmates, siblings, parents, other persons and teachers according to their weight. So, unintentional injuries were much more common than intentional ones in children.

Severity of Injury and Absence Rate

Results showed that "minor" injury accounted for 92% of all injuries, "moderate" 4.7%, and "severe" 3.3%. There were 16 boys and 15 girls who suffered from "severe" injury. Rate of disability caused by injury was 121.4/100 000. Hospitalization rate associated with injury was 5.2% for the victims who suffered from the first injury event and 1.1% for those who suffered from the second one. Absent rate from school caused by injury was 7.8% for those who suffered from the first injury event and 0.3% for those who suffered from the second injury event. There was significant difference in hospitalization rate and absent rate from school between the victims who suffered from their first and second injury events ($P<0.05$).

TABLE 4

Proportion of the Second Injury Occurred in School Children by Type of Activities and Gender During Study Period of 1996-1997, Shantou, China

Activities Children Were Engaged in When Injury Occurred	Males		Females	
	No.	%	No.	%
Playing	32	14.75	12	7.89
Sports	61	28.11	23	15.13
Cycling	6	2.76	9	5.92
Walking	10	4.61	6	3.95
Being Stumbled	15	6.91	6	3.95
Up and Down Stairs	2	0.92	3	1.97
Eating	15	6.91	11	7.24
Pouring Boiled Water	8	3.69	6	3.95
Housework	7	3.23	21	13.82
Animal Bite	6	2.76	8	5.26
Other	55	25.35	47	30.92
Sports	61	28.11	23	15.13
Riding	6	2.76	9	5.92
Walking	10	4.61	6	3.95
Total	217	100.00	152	100.0

DISCUSSION

Results of this paper showed that incidence rate of injury was very high (37.96%) in 2 553 school children aged 7-16 years, and increased with children's age with a significant trend. The highest incidence rate of injury was found in children aged 13-16 years, which was less than that reported in the student (81.66%) at the second grade in a junior middle school by LI Xiang-Sheng, *et al.*[7]. LIN Liang-Ming, *et al.*[8] studied unintentional deaths in children aged 0-4 years in 81 cities and counties all over the country during 1991-1993, and their results showed that mortality of unintentional injury in remote areas was greater than that in inland areas, which was again greater than that in coastal areas. It was found that Shantou had a lower incidence of injury in school children, probably due to its location of coastal area, age difference of subjects between various studies and lacking of unified criteria for injury diagnosis.

It is noticeable that injury-related disability rate was higher (121.4/100 000) in children of Shantou, which is as 77.8 times high as that in rural children in Huailai County, Hebei Province, China[9] (15.6/100 000). The difference in disability rate between Shantou and Huailai may be caused by definition of disability, which was defined in this paper as any long-term limitation in daily activity resulting from a health condition or problem, and it is a functional concept and is also adopted and recommended by the World Health Organization (WHO) as an international standard for data collection for disability, but concept of disability in Huailai's study was limited to a physical disability. In addition, differences in "exposure to risk factors" may be an important contributor to differences in disability rate between urban and rural children. Of course, disability rate may be modified by child's behavior to varied extent, probably involving different mechanisms. Further research is needed to clarify these mechanisms. Rate of hospital admission for the injured children was 5.16%, much higher than that for children aged under 15 years in the United States[10]

(8.47/100 000). Therefore, injury seriously harms health status, normal development and learning of school children.

Owing to the common and frequent-occurrence of injury, some children probably would suffer from injury events once or more than once during the study period. Injury claimed 1 338 of 2 553 school children in this study, with an incidence rate of 66.9%, which was also less than that reported by LI Xiang-Sheng, *et al.*[7].

Incident rate of falls was the highest among all types of injury both in boys and girls and in varied age groups. Results of this study were consistent with those of LI Xiang-Shang, *et al.*[7], but the rank of types of injury in the former (injury occurred in doing sports, collision, burns) was not so consistent with that in the latter (cut, sting, fishbone stuck in the throat, traffic accident).

Results showed that injury occurred mostly in children when they were playing, doing sports, riding bicycling and walking. The results mentioned above were also consistent with other studies. It is noticeable that rank of occurrence of the second injury event was different with that of the first injury event for the same injury victims. We think that injury should be attributed to poor awareness of the injured children and their parents and teachers, who should pay more attention to injury prevention and take some relevant measures for causes of injury. If some causes of injury would be decreased, incidence of some injuries would be correspondingly reduced. Results of this paper showed that incidence of injury could be effectively controlled, so long as we know more about the main causes of injury and take effective measures. So, coordination between varied governmental sectors, health system, educational institutions, and general public in China is essential to recognize childhood injury as a major health problem for the well-being of its population and to implement necessary measures for prevention. Although we still have a long way to go in reducing morbidity and mortality caused by injuries in school children, we are moving on a right track in achieving this goal.

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