Original Article

Epidemiological Survey of the Prevalence of Non-fatal Injury among Children Aged 5-14 Years in China*

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Abstract

Objective To determine the prevalence of non-fatal injuries among children aged 5-14 years in China.

Methods Data of 21 973 children aged 5-14 years were extracted from the Fourth National Health Service Survey of China carried out between June 15 and July 10, 2008. Injury-related indicators included: history of ever having had an injury, and injury frequency, cause, location and severity.

Results The overall prevalence of non-fatal injuries among the children in the previous 12 months was 17.0 per 1000 subjects. The leading causes of non-fatal injuries were falls, animal bites, traffic accidents, falling objects and burns. The majority of children sustained only one injury. The main place of injury was at home in 40% and 54% of urban boys and girls, respectively, at school in 48% of rural boys, and at home and at school each in 33% of rural girls. Medical treatment for one day was the main option for 80% of urban boys and girls, 84% of rural boys, and 72% of rural girls.

Conclusion Nonfatal injuries among children aged 5-14 years are a serious public health concern in China.

Key words: Injury; Non-fatal; Child; Prevalence; Geographical location

Biomed Environ Sci, 2012; 25(4):407-412 *doi: 10.3967/0895-3988.2012.04.005* *ISSN:0895-3988*

www.besjournal.com(full text) *CN: 11-2816/Q*

INTRODUCTION

Injury in children is becoming a global public health and social concern. A report on the prevention of child injuries published by the World Health Organization in 2008 demonstrated that approximately 950 000 adolescents under 18 years old died of injury every year in the world[1]. Injury was the leading cause of death of children aged 1-14 years in China from 2003 to 2009[2]. In addition, of the non-fatal injuries in children and adolescents, 92% were minor injuries, 4.7% were moderate causing limitation of motion, and 3.3% were serious causing disability. The disability rate was 1214.25/100 000[3], and 1.4 times higher than the injury mortality rate[4]. National elementary and middle school students had 13.6 million instances of medical treatment in Outpatient and Emergency Departments, and 3.35 million instances of hospitalization each year. Additionally, 1.2 million children suffered impairment of function, and 0.4 million were disabled. Altogether, it was estimated that the economic loss was 3 billion yuan, and absenteeism was 21.6 billion days[5].

Epidemiologic studies of injury indicated that there were enormous differences in the

*This work was supported by the Research Fund from National Education Science "Eleventh Five-Year Plan" of the National Youth Fund projects (ELA080320).

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Received: April 16, 2012; Accepted: June 4, 2012

prevalence, economic burden, prevention and consequences of injuries between high income and middle-low income countries[6]. In the United States, the current situation and the possible outcomes of child and adolescent accidental injuries could be determined from injury monitoring data. In contrast, in middle-low income countries, it is difficult to obtain adequate information about injuries because of the lack of comprehensive injury monitoring systems. Thus, a precise evaluation of the economic and social burden of injuries is not possible. Up to now, epidemiological research into injuries in Chinese children either investigated fatal injuries based on national or hospital death monitoring data[7], or carried out specific surveys of children's injuries in localized areas[8-10]. Therefore, the current situation of injuries nationwide in China has not been completely and systematically investigated.

The National Health Services Survey is the main source of information of urban and rural residents' health, health service use and associated factors. It is organized by the Ministry of Health and approved by the National Bureau of Statistics, and is conducted every 5 years. In the Fourth National Health Services Survey in 2008, non-fatal injuries were included in the survey for the first time. To obtain nationally representative data, our studies utilized data from the 2008 National Survey to systematically analyze the epidemiological characteristics of non-fatal injuries in 5-14-year-old children in China.

SUBJECTS AND METHODS

Research Subjects

A multi-stage stratified cluster sampling method was adopted in the Fourth National Health Services Survey. The sampling districts corresponded to those in the previous three surveys, and residents were selected by random sampling. The census data of 2000 were used to test the representativeness of the samples in this study. The results indicated that the previous sampling districts well represented the overall status of the national population, economy, education and health[11]. The survey included 56 400 families randomized drawn from 940 administrative villages (or city communities), 470 townships (or streets), 94 counties (or cities), 31 provinces. The subjects for the current study were 21 973 children aged 5-14 years in the Fourth National Health Services Survey in 2008.

Survey Methods

In the Fourth National Health Services Survey, verbal informed consent was given by the parent or guardian for collection of data from children in the household. Parents or guardians of 5-6-year-old children answered questions for the children, while 7-14-year-old children answered questions themselves, with parental help. Interviews were completed by trained and qualified medical investigators. The survey was carried out between June 15, 2008 and July 10, 2008.

Survey

There were five items related to demographic and socioeconomic variables: gender, race, age group, *per capita* household income, and district of residence. As the Han race accounts for 90% of the whole population, the other ethnicities were combined. Age was divided into two groups: 5-9 years and 10-14 years. The families were divided into four groups according to *per capita* income: very low (<25th percentile); low (25th-49th percentile); high (50th-75th percentile); and very high (>75th percentile). Districts were divided into urban and rural areas.

The questionnaire on injury defined injury as receiving medical treatment or having limitation of motion for at least one day. The questionnaire included five questions about injury: Have you ever been injured in the past 12 months; If you were injured in the past 12 months, how many times; If you were injured in the past 12 months, what was the cause of the last injury (traffic accident, fall, falling object, cut/piercing, explosion, animal bite, drowning, suffocation, electric current, fires/burns, poisoning, assault, self-harm); If you were injured in the past 12 months, where did the last injury happen (street, working environment, home, school, public building, other places); If you were injured in the past 12 months, how serious was the last injury (disability, no disability, hospitalization for at least 10 days, hospitalization for 1 to 9 days, medical treatment or rest for 1 day).

Statistical Analysis

Data entry, verification, and management were carried out by the Statistics Information Center of the Ministry of Health. The prevalence of non-fatal injuries and 95% confidence interval (95% CI) was determined. In the two-sided test (Chi-square test), significance was set at a level of $P \leqslant 0.05$.

RESULTS

Demographics

Data were available for 21 973 children, 11 547 male and 10 413 female: 80% were of Han ethnicity, 45% were in the 5-9-year-old group, and 82% lived in a rural area. The proportion of children in the very low, low, high and very high income groups were 16%, 23%, 25%, and 36%, respectively.

Proportion and Prevalence of Non-fatal Injuries

In the previous 12 months in children aged 5-14 years, 53% of injuries were in boys, and 47% in girls. The prevalence of non-fatal injuries was 17 per 1000 subjects (95% CI, 15.3-18.7). The prevalence of non-fatal injuries in boys (24.5 per 1000 subjects) was significantly higher than that in girls (12.1 per 1000 subjects; $P<0.05$).

The prevalence of non-fatal injuries in 5-9-year-old children was significantly higher (19.3 per 1000 subjects) than in 10-14-year-old children (15.1 per 1000 subjects; $P<0.05$). There were no significant differences in prevalence among different ethnicities, different family income groups, or different areas of residence. The results are shown in Table 1.

Table 1. Prevalence of Non-fatal Injuries among Chinese Children Aged 5-14 Years in the 12 Months

Demographic Variables	*n*	Proportion(%)	Prevalence	95% CI	PRR	95% CI
Total	21 973	100	17.0	(15.3,18.7)		
Gender						
Male	11 547	53	24.5	(18.8, 24.1)	1.77	(1.44,2.18)[a]
Female	10 413	47	12.1	(10.0, 14.2)	1.00	
Race						
Han people	17 405	80	17.8	(15.8, 19.8)	1.00	
Other minorities	4 472	20	14.3	(10.8, 17.8)	0.83	(0.59,1.26)
Age group (years)						
5-9	9 944	45	19.3	(16.6, 22.0)	1.00	
10-14	12 029	55	15.1	(12.9, 17.3)	0.79	(0.65,0.97)[a]
Per capita household income						
Very high (>Percentile$_{75}$)	7 869	36	15.5	(12.8, 18.2)	1.00	
High (Percentile$_{50}$-Percentile$_{75}$]	5 478	25	17.5	(14.0, 21.0)	1.24	(0.88,1.73)
Low (Percentile$_{25}$-Percentile$_{49}$]	5 081	23	19.5	(15.7, 23.3)	1.08	(0.77,1.53)
Very low (<Percentile$_{25}$)	3 514	16	16.2	(12.0, 20.3)	1.01	(0.72,1.43)
Districts[b]						
Large cities	1 065	5	16.0	(8.4, 23.4)	1.00	
Middle cities	1 114	5	11.7	(5.4, 18.0))	0.63	(0.28, 1.42)
Small cities	1 765	8	10.8	(5.9, 15.6)	0.57	(0.27, 1.20)
First-class rural areas	3 165	14	15.2	(10.9, 19.4)	0.91	(0.49, 1.69)
Second-class rural areas	5 226	24	17.6	(14.0, 21.1)	0.99	(0.56, 1.76)
Third-class rural areas	6 117	28	24.2	(20.4, 28.1)	1.41	(0.80, 2.47)
Fourth-class rural areas	3 461	16	20.1	(6.8, 13.4)	0.59	(0.30, 1.16)

Note. PRR: unadjusted prevalence rate ratio. [a]$P<0.05$. [b]According to cluster analysis, the survey divided the country into seven types of regions.

Causes of Non-fatal Injuries

In urban areas, the three leading causes of non-fatal injuries in boys were falls, animal bites, and traffic accidents, and the prevalence was 9.4‰, 7.9‰ and 1.3‰ respectively. For girls, the three leading causes were animal bites, falls, and traffic accident and the prevalence was 4.8‰, 3.3‰, and 1.5‰, respectively.

In rural areas, the three leading causes of non-fatal injuries in boys were falling objects, falls and animal bites, with prevalence of 7.9‰, 4.2‰ and 2.0‰, respectively. For girls, the leading causes were falls, animal bites, traffic accidents and burn, with prevalence of 7.8‰, 1.6‰, 1.0‰, and 1.0‰, respectively, as shown in Table 2.

Characteristics of Non-fatal Injuries

The majority of children (94%) suffered only one

injury, and the proportion was the same in urban andrural areas, and in both sexes. The leading place where injuries occurred was at home in 40% and 54%, respectively, of urban boys and girls, and at school in 48% of rural boys. For rural girls, injuries occurred mainly at home (33%) or at school (33%). For treatment of the injuries, 80% of urban boys and girls, 84% of rural boys, and 72% of rural girls received medical treatment for one day only. The results are shown in Table 3.

Table 2. Cause-specific Prevalence of Non-fatal Injuries among Chinese Children Aged 5-14 in the Previous 12 Months (/1000 Persons)

Intent/Cause	Urban		Rural	
	Male Prevalence (95% CI)	Female Prevalence (95% CI)	Male Prevalence (95% CI)	Female Prevalence (95% CI)
Unintentional				
Traffic Accident	1.3 (0.5, 2.0)	1.5 (0.7, 11.3)	0.5 (-0.5, 1.5)	1.0 (-0.4, 2.5)
Fall	9.4 (7.4, 11.3)	3.3 (2.1, 4.5)	4.2(1.3, 7.1)	7.8 (4.0, 11.7)
Falling object	0.7 (-0.5, 1.6)	0.5 (0.0, 0.9)	7.9 (4.0, 11.7)	0.5 (-0.1, 1.6)
Cut/piercing	0.5 (0.1, 1.0)	0.5 (0.0, 0.9)	1.5 (-0.2, 3.1)	—
Exploding	0.2 (-0.2, 0.5)	0.1 (-0.1, 0.3)	—	—
Animal bite	7.9 (6.1, 9.7)	4.8 (3.3, 6.3)	2.0 (0.0, 3.9,)	1.6 (-0.2, 3.3)
Drowning	—	0.1 (-0.1, 0.3)	—	—
Suffocation	—	—	—	—
Electric current	—	—	—	—
Fire/burn	0.8 (0.3, 1.4)	1.3 (0.5, 2.1)	0.5 (-0.5, 1.5)	1.0 (-0.4, 2.5)
Poisoning	0.8 (0.3, 1.4)	0.5 (0.0, 0.9)	—	0.5 (-0.5, 1.6)
Violence				
Assault	1.1 (0.5, 1.8)	0.1 (-0.1, 0.3)	1.0 (-0.4, 2.3)	—
Self-harm	—	—	—	—
Others	0.2 (-0.1, 0.5)	—	0.5 (-0.5, 1.6))	1.0 (-0.4, 2.3)

Table 3. Characteristics of Non-fatal Injuries among Chinese Aged 5-14 in the Previous 12 Months (/1000 Persons)

Characteristics of Injury	Urban		Rural	
	Male *N* Proportion	Female *N* Proportion	Male *N* Proportion	Female *N* Proportion
No. of times of injuries				
1	204 (94%)	102 (96%)	29 (94%)	17 (94%)
2	13 (6%)	5 (5%)	1 (3%)	1 (6%)
⩾3	0 (0%)	1 (1%)	1 (3%)	0 (0%)
Place of last injury				
Street	63 (29%)	23 (22%)	3(10%)	4 (22%)
Working environment	4 (2%)	2 (2%)	1 (3%)	0 (0%)
Home	86 (40%)	58 (54%)	5 (16%)	6 (33%)
School	51 (24%)	20 (19%)	15 (48%)	6 (33%)
Public building	7(3%)	1 (1%)	6 (19%)	0 (0%)
Others	5(2%)	3 (3%)	1 (3%)	2 (11%)
Severity of last injury				
Disability	1 (0.5%)	1 (1%)	0 (0%)	1 (6%)
Without disability	—	—	—	—
Hospitalization for ⩾10 days	16 (8%)	9 (9%)	4 (13%)	2 (11%)
Hospitalization for 1-9 days	24 (11.5%)	11 (10%)	1 (3%)	2 (11%)
Medical treatment for 1 day	168 (80%)	85 (80%)	26 (84%)	13 (72%)

Note. There are missing values in the table: 1.Place of last injury: urban males 1 case missing (0.5%); urban females 1 case missing (0.9%). 2.Severity of last injury: urban males 8 cases missing (3.7%); urban females 2 cases missing (1.8%).

DISCUSSION

This study revealed that the prevalence of non-fatal injuries in 5-14-year-old Chinese children was 17‰, which was similar to the study of MA et al.[12], who performed a school-based, cross-sectional questionnaire survey in 42 750 children in two urban cities in Guangdong province. However, the prevalence of injuries in our study was lower than that reported in most other studies in China. In 2005, a survey was carried out in 18 provinces and municipalities all over the country, including Beijing, Tianjing, Hebei, Liaoning, and Heilongjiang. The sample included students from Grade 1 in junior middle school to Grade 3 in senior middle school. The result revealed a prevalence of injuries in 11-15-year-old children of 23%[13]. In 2006, SHEN et al. investigated patterns of non-fatal unintentional injuries among "abandoned children" in Macheng, China[14]. The annual injury rate per 1000 among these children was more than twice that of children living with both parents: 252.9‰ (95% CI, 233.0-273.0) and 119.8‰ (95% CI, 105-134), respectively[14]. In addition, the injury rates in the study of Postel et al.[15] (15.6% among the 1187 Chinese middle school adolescents) and LI et al.[16] (37.96% among 2553 school children aged 7-16 years) were both higher than that in our study.

The differences in the results could result from differences in the samples, as studies in localized areas do not represent the nationwide situation. However, some differences arose from the definition of injury. For example, some studies defined injury as “harm resulting in medical treatment or absenteeism for at least one day” (or, in unemployed or pre-school subjects, harm causing inconvenience in daily life such as eating, putting on clothes, bathing, or going to the bathroom for at least one day)[17]. This definition included detailed descriptions, and was more comprehensive than in our study.

Our results indicated that the prevalence of non-fatal injuries in 5-14-year-old boys was higher than in girls, which was similar to previous results[11-12,16,18-20]. Compared with girls, boys may have a greater chance of being exposed to outside dangers (injury inducement). Thus more attention should be paid to boys in injury prevention.

Our study found that there were no differences in the prevalence of non-fatal injuries in 5-14-year-old children according to urban or rural areas, family income, or ethnicity. This was similar to previous studies[2,11,21-22]. Therefore, injury prevention in children in urban areas or rural areas is equally important.

In this study, the leading causes of non-fatal injury were animal bites, falls, traffic accidents, falling objects, and burns, which was in accord with previous studies[11]. The result suggests that children’s activities and fondness for experiencing new situations should be taken into consideration in injury prevention, with reference to aspects of environmental safety, supervision of children, and safety education.

We found that injuries occurred most frequently in the family home followed by schools. Family homes are traditionally thought to be the safest place for children, and consequently the importance of the family environment in preventing children’s injuries is ignored. Our results suggest a series of measures, such as safety precautions and safety education for older children, should take place in the home and in school.

There are limitations in this study. First, the recall time of 12 months probably led to an underestimate of the prevalence of injuries, as previous studies found that some slight injuries can be forgotten during this length of time[23]. Second, the survey was performed in the home, which may have resulted in a lack of truth in answering questions about violent injuries in some cases.

In conclusion, this survey found a prevalence of non-fatal injuries of 17.0 per 1000 population in Chinese children aged 5-14 years. This represents a serious public health issue in China, and safety measures and education targeting this age group and their parents are necessary.

REFERENCES

1. Peden M, Oyegbite K, Ozanne-Smith J, et al. World report on child injury prevention. Geneva: World Health Organization, 2008.
2. Ministry of Health of China. China’s Health Statistics Yearbook of 2004-2010. Beijing: Peking Union Medical University Press, 2004-2010. (In Chinese)
3. Wang SY, Chi GB. Research of Injury Prevention and Control in China. Chin J Epidemiol, 2000; 21(5), 375-7. (In Chinese)
4. Wang SY. Connotation and Extension of Injury Definition. Chin J Epidemiol, 2010; 31(10), 1081-2. (In Chinese)
5. Li ZY, Guo ZP, Huang HE, et al. Status of Injury Prevention and control in China. Chin J Prev Contr Chron Non-commun Dis, 2007; 15(2), 181-3. (In Chinese)
6. Bartlett SN. The problem of children's injuries in low-income countries: a review. Health Policy Plan, 2002; 17(1), 1-13.
7. Wang LJ, Hu N, Wan X, et al. Status and trend of injury deaths among Chinese population, 1991-2005. Chin Prev Med, 2010; 44(4), 309-13. (In Chinese)

8. Lin NH, Duan J, Chen X, et al. Child injury surveillance that guides interventions: the Beijing primary healthcare experience. Inj Prev, 2011; 17(2), 74-8.
9. Postel MW, Jaung MS, Chen G, et al. Farm work-related injury among middle school students in rural China. J Agric Saf Health, 2009; 15(2), 129-42.
10. Zhu XX, Chen K, Liu QM, et al. Study on the risk factors of injuries among children at school age, from thefamilies of migrant workers in Hangzhou city. Chin J Epidemiol, 2009; 30(9), 911- 4. (In Chinese)
11. Ministry of Health of China. The program of Fourth National Health Services Survey and survey guide. Beijing: Ministry of Health of China, 2008. (In Chinese)
12. Ma W, Nie S, Xu H, et al. Nonfatal child pedestrian injury in two urban cities of Guangdong Province, China: results from a cross-sectional survey. Biomed Environ Sci, 2011; 24(4), 335-42.
13. Chen TJ, Ji CY, Xing Y, et al. Study on incidences and effect factors of injuries among middle school students in 18 provinces, China. Chin J Epidemiol, 2007; 28(2), 154-6. (In Chinese)
14. Shen M, Yang S, Han J, et al. Non-fatal injury rates among the "left-behind children" of rural China. Inj Prev, 2009; 15(4), 244-7.
15. Postel MW, Jaung MS, Chen G, et al. Farm work-related injury among middle school students in rural China. J Agric Saf Health, 2009; 15(2), 129-42.
16. Li LP, Wang S, Huang G, et al. A survey on injury incidence in school children in Shantou City, China. Biomed Environ Sci, 2003; 16(2), 180-6.
17. Investigation Team of Children Injury in Jiangxi Province. Epidemiological survey of child injury in Jiangxi province. Chin Prev Med, 2007; 8(5), 521-6. (In Chinese)
18. Liu L, Liu XX, Wen QS, et al. Research on unintentional injuries and its affecting factors in preschool children at urban area of Guiyang city. Chin J Child Health Care, 2001; 9(2), 91-3. (In Chinese)
19. Yao YS, Jin YL, Ye DQ. A cross-sectional investigation on unintentional injuries in preschool children from the southern parts of Anhui province. Chin J Epidemiol, 2007; 28(12), 1240-1. (In Chinese)
20. Liu W, Wang WH, Wang K, et al. Epidemiological investigation on hospitalized children injuries. Modern Prev Med, 2007; 34 (19), 3715-6.
21. Faelker T, Pickett W, Brison RJ. Socioeconomic differences in childhood injury: a population based epidemiologic study in Ontario, Canada. Injury Prev, 2000; 3(6), 203-8.
22. Engström K, Diderichsen F, Laflamme L. Socioeconomic differences in injury risks in childhood and adolescence: a nation-wide study of intentional and unintentional injuries in Sweden. Injury Prev, 2002; 2(8), 137-42.
23. Warner M, Schenker N, Heinen MA, et al. The effects of recall on reporting injury and poisoning episodes in the National Health Interview Survey. Injury Prev, 2005; 11(5), 282-7.