

ORIGINAL ARTICLE

A CROSS-SECTIONAL STUDY OF CHILDHOOD INJURIES IN KEDAH, MALAYSIA

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Abstract

A community-based study of childhood injuries in Kedah was undertaken in January-March 1996. The aims were to determine the types and frequencies of injuries reported; to assess the association between injury and selected variables (age, sex, place, number of children in the family, presence of care-givers and treatment); and to recommend further research and policy for childhood injury prevention. A total of 448 injuries were recorded from 1089 children in 451 randomly selected households. The incidence was 411.4/1000. There appeared to be a decrease in risk of injury as the number of children per household increased. The effect of lower age on injury was significant ($p > 0.05$). Male children were 1.5 times more likely to injure themselves than female children when data were controlled for number of children in the household. Falls accounted for 53.3% of all injuries sustained, and occurred more frequently when the child was with non-family members. Different injury categories were associated with different caregiver categories. It is concluded that child injury prevention programmes require more data on injury situations and collaborative efforts between clinical, health and behavioural professionals.

Key words : *Caregiver; childhood accidents; childhood injuries; risk behaviour*

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Introduction

Details of injury patterns among children in Malaysia are limited, and available data were essentially based on hospital admissions and cases seen at casualty departments.¹ A study in 1976–1977 at the University Hospital, Kuala Lumpur and other government hospitals in Malaysia revealed that the incidence of domestic injuries was high among children under 4 years of age, in male children, and in children from poor families and "rural" homes. This study concluded that domestic injuries in children are a common cause of morbidity and mortality in Malaysian children, particularly among the Malay populace, and that the most common injuries were falls.² In another report on a study at the Casualty Department, Kuala Lumpur General Hospital, the largest number of injury admissions among children occurred in the age group between 1–4 years (37.3%), followed by age group 5–9 years (31.6%). These data also reported that 61.8% of the children in the study were boys.³

In a study on home and recreational injuries among outpatients in Kedah, Selangor and Perak, it was noted that school-age children comprised 38.8% of cases. These findings also indicated that 81.1% of the injuries took place at home, 49.6% of which were falls and knocks, and that more males experienced injuries than females.⁴ A study on knowledge of child injury

and prevention by Malay mothers in Johore Bahru using health centre data, reported that falls were the most frequent domestic injuries (53.5%).⁵ A study of admission of children (n=1345) to Hospital Kuala Lumpur over a five-week period showed that 51.7% of these occurred at home and 24.8% on the roads.⁶

Concerning casualties due to motor vehicle accidents including pedestrians, it was reported that of the total hospital admissions in 1993, 11.6% occurred among children who were 15 years of age and below. Of these 51% had minor injuries, 36% suffered serious injuries and 13% died.⁷ The study above also reported that 46.7% of the road injuries in the study involved motorcyclists and pillion riders.⁶ In a recent study of 156 cases of road accidents involving motorcyclists and pillion riders, 14.6% involved cyclists under 16 years of age who had no license, and 24.5% of the pillion riders were in the group of 1-4 years.⁸

It was reported that among children aged 14 and under in the United States, injury is the second leading cause of hospitalisation and the leading cause of visits to hospital emergency departments. According to unpublished information, it was estimated that as many as 90% of unintentional injuries could be prevented.⁹ Overall, trends in childhood mortality and morbidity in Malaysia appear to be reflective of changing patterns in mortality and morbidity among children in developing countries in the late 20th century.^{10,11} As an example, it was reported that deaths in Hong Kong due to injuries and poisoning accounted for 23.5% of total deaths among children 1-4 years in 1988 compared to 5.9% in 1961.¹² Data on childhood home injuries are important in planning programmes for childhood injury prevention and management, yet most available data pertain to hospital admissions and cases treated in casualty departments.

In view of this, a three-month community-based study on childhood injuries was undertaken in

Kedah in January-March 1996. The objectives of the study were: (a) to determine the types and rates of injuries in children under 15 years of age in the community; (b) to assess injuries in households in relation to sex of child, number of children, ethnicity, place of injury and presence or absence of care-giver; and (c) to provide information and recommendations relevant to research and policy on childhood injury prevention.

Materials and methods

Kedah state was chosen as it has rural and semi-urban populations. It includes eleven *daerah* (districts) and 135 *mukim* (subdistricts). Three districts (Kota Star, Kuala Muda and Yan) were randomly selected, from these 13 subdistricts were randomly selected. Villages were randomly selected from these subdistricts, and 500 households were selected from these villages using random sampling, (approximating a 10% sample).

Trained research assistants interviewed 451 of these households, representing 419 Malay, 19 Indian and 13 Chinese families, for information on injuries of children less than 15 years of age. Respondents were either heads of households or spouses, or in their absence a guardian or caregiver (e.g. grandparents or close relatives). Domestic workers were not interviewed, as they were not considered to be the legal caregivers. The questionnaire used included two sections. The first was on personal particulars of the parents or guardians and on their knowledge and perception of injuries and injury prevention. The second was on personal particulars and injury/non-injury profiles of the children for a one-year period up to the date of interview. This time frame was reasonable as the parents were able to recall injuries, without much difficulty. The injury profiles included information on type of injury, cause, place, caregiver, method of treatment and outcome.

Analysis of data

Data from the households in the surveyed population were analysed using various statistical techniques including frequency analysis, and logistic regression. Analysis of injuries was done at the level of the individual child. Households with more than four children were categorised as one group. Households with one female child were the statistical referral group for possible effects of number and sex on injury.

General information of family households in the surveyed population was analysed by multiple logistic regression. Differences among ethnic groups on factors like children's sex and the average number of children per family were analysed by PROC FREQUENCY X² test (SASTM). A multiple logistic regression model with maximum likelihood loss of function estimation was used to determine the effect of the child's sex and the number of children in the household on injury. Four dummy variables were created for the number of children within households, with households with one child as the reference group. Adjusted odds ratios for each significant independent variable were calculated with their *p*-values.

For the analysis of injuries, the types of injuries in association with place of occurrence, caregiver present, type of treatment and outcome were analysed. A forward stepwise multiple logistic regression procedure was used (STATISTIX, SASTM). Each of the categories of injury was analysed separately as a dependent variable using a comparison group for each category. Inclusion of independent variables was set at *p*<0.05. If the effect of age was significant, an age variable was entered into the analysis. Potentially confounding variables in the logistic regression were age, place of injury, caregiver and type of treatment. The significant level was taken as <0.05.

Results

There were 1089 children under 15 years of age

in the 451 households studied, including 559 males (51.3%) and 530 females (48.7%) (Table I). The mean number of children per household was 2.41. A total of 448 episodes of injuries were reported for these children, with an incident rate of 411.4 per 1000. The rate for males was 452.6/1000 and 367.9/1000 was females. Children with multiple injuries (2.85% of total children) were assessed for serious injury ('serious' is defined here as requiring treatment by a general practitioner, polyclinic or hospital) in the respective category. The ratio of male to female children was 1.05:1 overall, and the proportion of male children in households with one child was lower than households with two or more children (*p*=0.01).

Table II lists logistic regression coefficients between predictor variables, *p*-values and odds ratios for risk of injury in relation to number and sex of children in the households. In comparison with households with one child, there appeared to be a trend towards a decrease in risk of injury with increasing number of children in a household. In relation to sex of child, male children were 1.5 times more likely to injure themselves than female children when the effect of number of children in the household was controlled.

Table III lists injuries according to sex and number of children in the household. "Falls" overall including general falls (53.3%), cycling (23.2%) and riding pillion (1.3%) accounted for 77.8% of cases. Injuries due to sharp or blunt objects accounted for 15.4% (9.8% and 5.6% respectively), burns 3.3% and others 3.3% (choking, drowning, suffocation, poisoning and others unspecified).

Table IV lists the association between place of injury and age, with type of injury and place as the independent variables. Using STATISTIX (SASTM) software, β -coefficients are shown as indicated at *p*<0.05 (see endnote 2). Injuries due to burns and sharp objects (e.g., knives, cutting blades, and items with sharp points) were more likely to occur in the kitchen areas. Injury from

Table I. Childhood injuries according to number and sex of children in various households

Sex	Injury ^a	No. of children in household					Total
		1	2	3	4	>4	
Male	+	31	52	89	48	44	253
	-	22	73	82	79	50	306
	Total	53	125	171	127	83	559
Female	+	51	56	43	34	11	195
	-	31	75	92	83	54	335
	Total	82	131	135	117	65	530
Total Injuries		82	108	132	82	44	448
Total Children		135	256	306	244	148	1089
% Male		39.3	48.8	55.9	52.0	56.1	51.3
% Female		60.7	51.2	54.1	48.0	43.9	48.7
Total Households		135	128	102	61	25	451

a (+ : injury; - : no injury)

Table II. Risk for injuries according to number and sex of children in various households

Independent variables ^a	Coefficient	Standard error (SE)	<i>p</i>	Odd ratio
Sex ^b	0.43163	0.12736	0.0002	1.54
Size ²	-0.80150	0.21880	0.0002	0.45
Size ³	-0.79285	0.21339	0.0002	0.45
Size ⁴	-1.18527	0.22469	0.0000	0.31
Size ^{>4}	-1.38373	0.25471	0.0000	0.25

^aSize^{2...>4} indicates number of children in household (reference group, households with one child)

^bReference group, households with one female child; 95% CI for sex, 1.20-1.98

Table III. Types and numbers of injuries according to number and sex of children in various households

Injury category	Sex	Number of children in household					Subtotal	Total (%)
		1	2	3	4	>4		
Falls	Male	19	27	50	23	18	137	239 (53.3)
	Female	31	28	23	13	7	102	
Cycling	Male	4	15	22	7	6	54	104 (23.2)
	Female	13	13	12	11	1	50	
Pillion	Male	0	2	1	2	1	6	6 (1.3)
	Female	0	0	0	0	0	0	
Sharp	Male	1	3	9	9	6	28	44 (9.8)
	Female	1	9	1	4	1	16	
Blunt	Male	4	3	1	4	1	13	25 (5.6)
	Female	2	2	2	5	1	12	
Burns	Male	2	1	3	3	0	9	15 (3.3)
	Female	0	3	1	1	1	6	
Others ^a	Male	1	1	3	0	1	6	15 (3.3)
	Female	4	1	4	0	0	9	
Total	—	82	108	132	82	44	(448)	448

^aCategories with number of cases less than 1% of total accidents were reclassified under Others. These include choking (4), drowning (2), suffocation (1), poisoning (1) and unspecified others (7).

blunt objects were more likely to take place in various rooms of the house, whereas falls could occur in a variety of environment. Compared to other injuries, it appeared that falls occurred more in younger children whereas injuries due to sharp objects and cycling increased with increasing age. The effect of age on injuries due to falls, sharp objects and cycling was significant ($p < 0.05$), with falls decreasing with increasing age. It is of interest that falls appeared to decrease when the child was alone, i.e. a caregiver was not in the child's immediate vicinity, and to increase when the children were with others (Table V), although this would be due to an

artifact of reporting. Falls also decreased with age, as shown in Table IV. Injuries from sharp and blunt objects seemed more likely to occur in the presence of the mother, burns with the father, and blunt objects with siblings. The likelihood of injuries due to cycling appeared to increase when the child was alone. Pillion injuries are included here despite their low frequency; the analysis indicated a significance at $p < 0.05$ ($\beta: 0.02$, 1.0202 OR) for this low but potentially serious accident category.

With respect to associations between treatment methods and types of injuries, some patterns appeared from the analysis. Injuries due to falls

Table IV. Significance of types of injuries according to place of occurrence

Variable ¹	Falls	Cycling	Sharp	Blunt	Burns	Others
Age	(-0.14)	(0.07)	(0.04)	-	-	-
Bathroom	0.47	-	-	-	-	-
Kitchen	-0.26	-	0.31	0.09	0.26	-
Stairs	0.48	-	-	-	-	-
Living room	-	-	-	0.15	-	0.09
Bedroom	-	-	-	0.31	-	-
House compound	-	0.32	-	-	-	-
Playground	0.18	0.27	-	-	-	-
School	0.37	-	-	-	-	0.08
River	-	-	-	-	-	0.49
Drain	0.54	-	-	-	-	-
Other places	-	-	-	-	0.21	-

¹ Only significant beta coefficients are shown ($p < 0.05$). Results were adjusted if the effect of age was significant ($p < 0.05$); for each category of injury, the referral group for broadest comparison was all events not in that category of injury.

Table V. Significance of types of injuries according to presence of care-givers

Variable ^a	Falls	Cycling	Sharp	Blunt	Burns	Others
Age	(-0.09)	-	(0.04)	-	-	(0.02)
Father	-	-	-	-	0.17	-
Mother	-	-	0.07	0.04	-	-
Sibling	-	-	-	0.09	-	-
Child alone	-0.11	0.27	-	-	-	-
With others	0.17	-	-	-	-	-

^a Only significant beta coefficients are shown ($p < 0.05$). Results were adjusted if the effect of age was significant ($p < 0.05$); for each category of injury, the referral group for broadest comparison was all events not in that category of injury.

(n=239) were for the most part "self-treated" and less likely to be brought to general practitioners or polyclinics, while injuries due to sharp objects (n=44) were more likely to be treated by general practitioners or at polyclinics. However, burns (n=15) were more likely to be referred to a hospital. Injuries that occurred during cycling (n=104) were mostly self-treated including treatment at home, although 2.5% of these were considered serious enough to be brought to the hospital. For all accidents, 21% were treated as serious including 4% who were admitted to hospitals. Of these admissions, two cases resulted in disability; these and similar accidents with this type of sequelae were likely to occur at playgrounds (β : 0.03, p : 0.02). Burns, sharps and others (i.e. choking, drowning, suffocation or poisoning) were more likely to be serious (all with $p < 0.005$). Of interest, the few pillion injuries appeared to be more likely to be treated with "traditional" methods than by general practitioners.

Discussion

Injuries are common phenomena among urban and rural children under 15 years of age. The likelihood for males to experience more injuries was not unexpected, since male children in Malay households are given more freedom than female children to do things by themselves. Ethnicity may also be a contributing factor. It is also possible that parents may consider female children as more prone to accidents than male children, and thus more protected. The interesting finding that the risk of injury appears to decrease with increasing number of children per household, probably could be partly explained by an overall tendency to pay more attention when there is more than one child to supervise, or that the presence of peers tends in some ways to protect against injury.

A general opinion held by the interviewed parents was that falls could occur at any time or place. Since most of these falls were self-treated, this may indicate they were less important or

severe. In the larger context, there were injuries which were not seen as important; in conjunction with this 5.7% of interviewees were unable to recall the specific care-taker at the time of injury (recall bias). On the other hand, burns appeared to be considered as more serious and received more attention. Injuries due to motor vehicles were termed *kemalangan* ("accident"), a term which suggests severity and possible death and thus classified under a different category of injury and seriousness.

The place of injury also highlights the association between a child's activity and parental or guardian supervision. It appears that injuries due to burns and sharp objects took place more in the kitchen where there is more exposure to fire and knives. As the child's age increases, relative relaxation of parental supervision might lead to other types of accidents outside the home such as cycling and pillion riding.

The data from this study support earlier findings that falls are the main category of childhood injury. In contrast to the findings that the majority of injuries occurred at home,⁴ this study indicates their occurrence in a wide variety of settings. There also appears to be a tendency for injuries from sharp objects and pillion riding to increase with age, as indicated by the analysis. Of the 448 accidents assessed here, only two resulted in disability. This low number seems misleading. Children in both urban and rural areas of Malaysia are more and more exposed to newer injury risks through better technology, more mobility, modernisation and societal change. Accordingly, more information and educational programmes are needed to make parents as well as children and the public become more aware of risks of accidents.^{20,21}

More research on childhood accidents, especially in relation to fatality/non-fatality, is needed for better comparative data. However, public information and education programmes are associated with priorities and limits in health resources. Strategies aimed at a better understanding of childhood accidents should be

promoted.^{22,23} This calls for assessment of both injuries and injury situations and for collaborative efforts between clinical, health and behavioural professionals to provide better information and informed recommendations in the vital area of childhood injury prevention.

Acknowledgements

The authors wish to thank UNICEF for its financial support of the study. Special gratitude goes to Dr. Junainah Sabirin and Dr. Fauziah Ehsan who facilitated the project. Sincere appreciation goes to Dr. Myint Myint Thein, National University of Singapore for professional assistance. Sincere thanks also go to Haniza M. Anuar, Public Health Institute for field supervision, and to M. Nizam Norali, Abd. Malik Yusuf, Rohana Shafie, Noraziah Jaafar, Rosnah Ramli and Yusmidar Ibrahim for assistance with interviews. Kind thanks go to Dr. Shahnaz Murad and Dr. Azizah Radzi, IMR, for professional support and to the Director, IMR, for permission to publish.

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