

Injuries in Children and Adolescents

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ABSTRACT Morbidity and mortality caused by injuries in children increasing from year to year. The objective of this study was to investigate the incidence of injuries among children and adolescents who required inpatient or outpatient care in the Emergency Unit Sanglah Hospital. This study was carried out by using retrospective method, by taking the data from the medical records of children under 18-yr-old who required inpatient or outpatient care caused by injuries, at the Emergency Unit Sanglah Hospital, during the period of January 1 - December 31, 1996. The data were presented descriptively in the form of table, classified based on age, sex, and type of injuries. Statistically analysed by using chi-square test, it was considered significance if $p < 0.05$. During the 1996 period, it was found 4,801 injuries on children, averagely 400 injuries per month. The highest number of incidence found in children aged 13-18 years (45%), boys were 3 times higher than girls, mostly (75.8%) due to the traffic injuries and 24.2% domestic injuries. The highest number of domestic injuries was found in children aged 1-5 years (57.5%) and the most frequent cause of domestic injuries was due to falling down, foreign bodies, animal bites, and burn. It was really needed an injury control in a wider scope. [Paediatr Indones 1999; 39:315-324]

Introduction

In recent years, advances in the treatment and prevention of a wide variety of acute and chronic diseases have highlighted the importance of injuries as the cause of mortality, morbidity, and disability.¹ WHO's future collaboration and support will be mainly focused on the promotion of epidemiological studies of injuries. WHO had targeted that by 1995 at least 60% of countries would access the magnitude and determinants of domestic and traffic injuries in their population on the basis of epidemiological studies and 50% of the countries would develop national policies and

programs for injury control.²

In Indonesia, from the National data injuries placed the sixth rank of the annual 10 leading causes of death by age.³ The incidence of injuries in children aged 0-18 years increasing from year to year. In 1986, there was 3,197 traffic injuries and 1,078 domestic injuries. In 1987, increased becoming 17,741 traffic injuries and 6,219 domestic injuries. In 1989 noted that there was an increasing numbers nearly twice bigger, 41,778 traffic injuries and 13,618 domestic injuries caused by falling down, poisoning, foreign bodies, and drowning.⁴ According to WHO (1980), in developed countries such as USA, England and Wales, Netherland, Italy, Japan and Singapore, injuries depicted the third cause of death after the cardiovascular diseases and cancer. It was said that 78 millions of handicaps caused by injuries or 15.2% from all total numbers of handicaps in the world. The most frequent cause of those injuries, was that traffic injuries, industrial injuries, and domestic injuries.⁵ The aim of this study was to investigate the incidence of injuries in children and adolescents found in the Emergency Unit of Sanglah General Hospital, Denpasar.

Methods

This study had been retrospectively done by collecting data from the medical records of the Emergency Unit of Sanglah General Hospital, for one year period starting from January 1, 1996 until December 31 1996. The inclusion criteria of the subjects was children aged 0-18 years who required inpatient or outpatient care in the Emergency Unit which mainly caused by injuries, and this study differentiated between traffic and domestic injuries. Operational definition of the variable would be presented as follows : Traffic injury: injury incurred when the victim happened on the road, including occupant injury, pedestrian injury, bicycle injury, and motorcycle injury; whereas domestic injury was injury that happening at home and house surrounding. he data were descriptively analyzed, and classified based on the types of injuries (domestic or traffic injuries), sex (girl or boy), and age of children was classified based on developmental stages : 0-1 yr, 1-5 yr, 6-12 yr, dan 13-18 yr-old. Statistically analysed by using chi-square test, it was considered significance if $p < 0.05$.

Results

During the one year period starting from January 1, 1996 to December 31, 1996 in Emergency Unit of Sanglah Hospital, there was 14,881 cases of injuries where 4,801 cases (32.3%) was found in children under 18 years old. From those 4,801 cases, only 725 (15.1%) of children required to be inpatients. Nine children (0.2%) died because of the head injuries, in which all of them as a result of traffic injuries.

Table 1, indicated that the number of injuries which was averagely 400 cases per month. Based on the age group classification, the highest number of injuries (45%) was found during adolescence period aged 13-18 years, but there was significant difference ($p < 0.05$). Whereas in table 2 indicating that the number of injuries happened was three time higher in boys (75.6%) than that of girls (24.4%).

Table 1. Frequency, distribution of injuries by age

Month	Age (year)				Total
	0-1	1-5	6-13	13-18	
January	7	94	95	206	402
February	5	107	103	150	365
March	4	78	101	175	340
April	11	80	87	180	358
May	18	114	128	175	435
June	6	107	151	177	441
July	4	114	153	219	490
August	13	105	114	221	453
September	1	311	194	160	378
October	1	19	197	151	350
November	5	96	106	178	385
December	9	128	78	171	404
Total	106	1,225	1,307	2,163	4,801
	2.2	25.5	27.2	45.0	100

$\chi^2 = 93,1$ $df = 33$ $p < 0.05$

Based upon the types of injuries, it was found that the injury mostly caused by traffic injuries (75.8%) and domestic injuries found only 24.2%. The result indicated that there was significant difference ($p < 0.05$) (Table 3). There were 29 cases traffic injuries found in children under one year old, because by the time that the traffic injuries happened the children only as the vehicle occupants.

From 1161 cases of domestic injuries (Table 4), most of them caused by falling down (38.4%), followed by foreign bodies (16.9%), animal bites (12.8%), and burn (12%). The cause of falling down in children below 1-yr-old was mainly caused by

falling from crib or bed and baby walker. The number of falling down happening

Table 2. Frequency distribution of injuries by sex

Month	Sex		Total
	Boy	Girl	
January	316	86	402
February	287	78	365
March	271	69	340
April	258	100	358
May	318	117	435
June	361	80	441
July	378	112	490
August	331	122	453
September	269	109	378
October	264	86	350
November	287	98	385
December	290	144	398
Total	3,630	1,171	4,801
%	75.6	24.4	100

$\chi^2 = 52,36$ $df = 11$ $p < 0.05$

mostly found in group of ages 1-5 years (345 cases), and its cause was more varied such as falling down while walking, running, jumping, climbing, riding tricycles, etc. The injuries as a result of the foreign bodies, mostly found in the the ages of 1-5 years (136 cases). The most frequent cause was that the children putting in the seeds into their nostrills or ears, only in 2 children found injuries as a result of coin ingestion. Injuries as a result of animal's bite, the most frequently found was that insect's bite or pet's bite such as dog's bite, cat's, monkey's. Whereas burning injuries mostly found as a result of hot water dropping.

Discussion

Because definitions of injury or accident have not been standardized, every study has had to develop its own ways to describe, analyze, and report its results.^{6,7} As a result, research and surveillance data are too often difficult to be interpreted and compared. Definition according to WHO (quoted from 6), an accident is an event, independent of the will of man, caused by a quickly acting extraneous force, and manifesting itself by an injury to body or mind. Consequently this definition

Table 3. Types of injuries by age

	Age (year)				Total	%
	0-1	1-5	6-12	13-18		
Traffic injuries	29	557	1,104	1,950	3,640	75.8
Domestic injuries	77	668	203	213	1,161	24.2
Total	106	1,225	1,307	2,163	4,801	100
%	2.2	25.5	27.2	45.0	100	

$\chi^2 = 926,98$ $df = 3$ $p < 0.005$

Table 4. Pattern of domestic injuries by age

Pattern of domestic Injuries	Age (yr)				Total	%
	0-1	1-5	6-12	13-18		
Fall	42	34	62	434	445	38.4
Foreign bodies	12	13	63	118	197	16.9
Animal bites	4	48	59	38	149	12.8
Burn	8	52	31	49	140	12
Poisoning	9	56	11	29	105	9
Sharp materials	2	22	42	33	99	8.6
Electrical injuries	0	0	1	3	4	0.4
Drowning	0	2	0	0	2	0.2
Unspecified	0	7	4	9	20	1.7
Total	77	668	203	213	1,161	100
%	6.6	57.5	17.5	18.4	100	

excludes deliberate acts of violence: suicide, homicide and maltreatment. It should be noted that it is not always easy to differentiate between an accident and an intentional injury, especially in the case of cruelty to children. The idea of chance, misfortune, embodied in the word accident leads to accepting accident as unavoidable and therefore the negative attitude towards prevention, for these reasons the term accident is often replaced by injury. In fact, most injuries occur under fairly predictable circumstances to high risk children and families. To overcome this impediment to gain its needed knowledge about childhood injuries, a conference was held in 1989 by the National Institute of Child Health and Human Development (NICHD) to develop a set of standard definition.⁷ In Indonesia, the injury reporting system refers to the International Classification of Disease (ICD) IX, but medical practitioners have difficulty in using this classification because of the complexity of giving a code to multiple injuries. The Nomesco (Nordic Medico Statistic Committee) tries to fulfill the shortage of information in the ICD IX.²

Viewed from the epidemiology angle, the injury resulted from the interaction among 3 components, those are agent, host and environment. Meanwhile the injury classification or group according to International Classification of Disease based on time, place of injuries and its victims, was that : Domestic injuries, Traffic injuries, Industrial injuries dan Public places injuries.⁶

Morbidity and mortality caused by injuries, increasing from year to year, and so in Indonesia.⁴ In United States,⁸ approximately 20-25% of children and adolescents receive medical care for an injury each year in hospital emergency departments, and at least an equal number are treated in physician offices. Of these, 2.5% require inpatient care and 55% have at least short-term temporary disability from their injuries. The leading causes of death were homicide, suffocation, under vehicle crashes, and choking (20) While from this study which was carried out in Sanglah Hospital 1996, a number of 4801 the occurrence of accident (32.3%) which was happening to children under 18 years old, where 15.1% required inpatient care and 0.2% died because of the head injuries. The highest incidence of injuries was found in adolescents ages between 13-18 years (45%). Injuries found in boys three times bigger than that of girls, this is may be caused by the fact that the boys more active than girls. But Rivara⁸ stated that at the beginning of approximately 1-2 yr of age and continuing the 7th decade of life, males have higher rates of injuries than do females. During childhood this does not appear to be due to developmental differences between the sexes, differences in coordination, or differences in muscle strength. Variation in exposure to risk may account for the male predominance in some types of injuries. Boys in all age groups have higher rates of bicycle related injuries, because they use bicycles more frequently or for more hours or more interested in riding bicycle with high speed.

In Indonesia seen from the National data 1990, the incidence of traffic injuries was 43.6%.³ In this study, it was found that most of the injuries resulted from traffic injuries (75.8%), and the incidence of traffic injuries mostly found in children ages

between 13-18 years. Unfortunately, due to the fact that the limited availability of data in medical records, so that it was difficult to classify the cause of traffic injury, whether it was due to the bicycle injuries, motor vehicle injuries, or pedestrian injuries. In this research there was 29 children under the age of one year who included in traffic injuries, as child occupants. While in United States^{8,11} each year approximately 400 children and adolescents died because of the injuries incurred while riding bicycles; bicycle-related injuries is one of the most common reasons for children with trauma to visit emergency room. The majority of severe and fatal bicycle injuries involve head trauma. A logical step in the prevention of these head injuries is the use of helmet.^{12,13} In fact by administering bicycle helmet campaign, bicycle-related head injuries decreases to 66,6% in 5 to 9 years old and 67,6% in 10 to 14 years old.¹³ Most of the fatal motor vehicle crashes involving drivers under the age of 20 years.^{8,10} This matter might be caused by the fact that at adolescence period, the emotional development is still unstable, so that very often he cannot control his emotion.

Besides that the risk of injury can also be the result of sleepy while driving, the careless habit of the driver and still not capable of driving vehicle (10). Whereas the risk of serious injury and mortality is directly related to the speed at the time of the crash. Alcoholic drink consumption is a major cause of motor vehicle trauma in adolescents. Injuries to occupants are the predominant cause of motor vehicle death among children and adolescents. Use of restraint devices, such as car seat, seat belt, airbag and motorcycle helmet can be expected to reduce fatality and the risk of serious injuries. Pedestrian injuries are the most important causes of traumatic death for 5 to 9 years old children in United States and most industrialized countries. The risk of pedestrian injury is greater neighborhoods with high traffic volumes, speeds greater than 25 kph, absence of play space adjacent to the home, household crowding, and low socioeconomic status.⁸ One of the important risk factors for childhood pedestrian injuries is in the developmental level of the child. Young children have poor ability to judge the distance and speed of traffic, and are easily distracted by playmates or other factors in the environment. A major focus of the prevention should be to change the environment to make it safer for pedestrians of all ages, including children.

In this study, domestic injuries found in 1,161 children, where it is found (57.6%) most of them in children ages 1-5 years old. This is because most of the underfives children spend their time at home and the significant temperament of underfives children such as a tendency to higher activity level, exploratory behaviour and negative reactions to new situations as a predisposing factors for injuries.⁹ In this study the cause of domestic injuries mostly found in children under one year old due to the falling from crib or bed or from baby walker. To prevent from falling, among other things is to keep crib sides up, prepare to transfer child out of crib to low bed, or avoid using baby walkers.¹⁴

While injuries caused by foreign bodies, mostly due to put in the seeds to the nostrils or earhole, only 2 cases as a result of the coin ingestion. Most of the ingested

coins or solid objects pass through the digestive tract without incident, but the few that lodge in the oesophagus can cause serious complications. In few cases, coin are aspirated into the respiratory tract, entering the airway upon ingestion or after the child swallows and then vomits the coin. Aspirated coin or solid object caused cough, stridor, retractions, and cyanosis. They must be removed by emergency bronchoscopic extraction.¹⁵ In this study injuries caused by animal bites, the most frequently happen is that the bite of pets or insects. So that don't leave a child alone with pets. While burned injury, often happens because of hot water dropping. The majority of scalds burns still involve food and beverages, and occur in the kitchen or other places where food is prepared and served.¹⁶ To prevent from it never eat, drink, or carry anything hot near or while holding a baby or child.

For many years, prevention of injuries centered around attempts to pinpoint the innate characteristics of a child that result in greater frequency of injury (accident-prone child). But, it is more productive to examine the physical and social environment of children with frequent rates of injuries than to try to identify particular personality traits or temperaments. Actually, in the primary prevention of the injuries, a great attention must include interaction between host-agent-environment. At-risk children are likely to be relatively poor supervised, has disorganized or stressed families, and live in hazardous environment.

Efforts to control injuries include education or persuasion, changes in products, and modification of the environment, whether it be the social or physical environment, e.g. the trampoline should not be used at home, or in outdoor playgrounds, and prohibited for children younger than 6 years of age.¹⁹ Maternal education, age and parity are strongly and independently associated with injury mortality.¹⁷ Reduction in morbidity and mortality from injuries can be accomplished not only through primary prevention of the event, but also through secondary and tertiary prevention, that is, appropriate emergency medical services for injured children; regionalized trauma care for the multiply injured, severely burned, or head injured child; and specialized pediatric rehabilitation services that attempt to return children to their prior level of functioning. This wide scope of prevention is more properly described by term injury control.^{1,8,18}

In the retrospective study which was carried out in the Emergency Unit Sanglah Hospital, in the period of January 1 - December 31, 1996, it was found that the number of injuries in children and adolescents still high, especially in the group of ages 13 - 18 years old, boys three times greater than girls, mostly due to the traffic injuries, 15.1% needed to be inpatient and 0.2% died. While in domestic injuries, very often found the ages 1-5 years old, the most frequent cause was that fall down, foreign bodies, animal bites, and burn.

Due to the fact that morbidity and mortality caused by injuries was still high, so it is needed injury control with a wider scope, including primary prevention in the aspects host-agent-environment, along with secondary and tertiary prevention.

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References

1. Rivara FP. Pediatric injury control in 1999: Where do we go from here?. *Pediatrics* 1999; 103:883-888.
2. Emil Agustiono, Abdul Radjak. Classification of injuries and its problem. *MKI* 1993; 43:409-414.
3. Ranuh Gde IGN. Accident & injury prevention in Indonesia. Presented at Pre Congress-Workshop 9th Asian Congress of Paediatrics, Hong Kong, 22-23 March 1997.
4. Moersintowarti BN. Approach on problems of child abuse and neglect. Proceedings of the 6th Asean Pediatric Federation conference, October 21-24, 1992, Denpasar Bali.
5. Report on a WHO Working Group: Early detection of handicap in children, Copenhagen, 1980.
6. Hardi Soeselo. *Epidemiologi Kecelakaan*. *MKI* 1988; 38:427-429.
7. Christoffel KK, Scheidt PC, Agran PF, et al. Standard definitions for childhood injury research: Exerpts of a conference report. *Pediatrics* 1992;89:1027-1034.
8. Rivara FP, Brownstein DR. Injury control. In: Berhman BE, Kliegman RM, Nelson WE, Vaughan VC, Eds. *Nelson Textbook of Pediatrics*; 15th Ed. Philadelphia: Saunders, 1996, 226-232.
9. Nyman Gote. Infant temperament, childhood accidents, and hospitalization. *Clin Pediatr* 1987;26:389-404.
10. Budiharto, Bambang Sutrisna, Hadi Pratomo. Faktor-faktor yang mempengaruhi kecelakaan lalu lintas yang mengakibatkan korban luka berat atau mati, di wilayah Polda Metro Jaya. *MKI* 1987; 2:122-128.
11. Sosin DM, Sacks JJ, Webb KW. Pediatric head injuries and deaths from bicycling in the United States. *Pediatrics* 1996;98: 868-870.
12. Karp Stanley. A 10-point program for bicycle safety. *Contemp Pediatr* 1987;4:16-27.
13. Rivara FP, Thompson DC, Thompson RS, et al. The Seattle children's bicycle helmet campaign: Changes in helmet use and head injury admissions. *Pediatrics* 1994; 93:567-569.
14. Wilson M. Injury prevention: Protecting the under-6 set. *Contemporary Pediatrics* 1988; 5:19-34.
15. Bonadio WA. Coin ingestion: Small change, big problem. *Contemp Pediatr* 1992;February: 71-88.
16. McLoughlin E, Brigham PA. Stop Carelessness? No, Reduce burn risk. *Pediatric Annals* 1992; 21:423-428.
17. Scholer SJ, Mitchel EF, Ray WA. Predictors of injury mortality in early childhood. *Pediatrics* 1997;100:342-347.

18. Jaffe KM, McDonald CM. Rehabilitation following childhood injury. *Pediatric Annals* 1992; 21:438-447.
19. Committee on injury and poison prevention and committee on sports medicine and fitness, American Academy of Pediatrics. Trampolines at home, school, and recreational centers. *Pediatrics* 1999; 103:1053-1055.
20. Brenner RA, Overpeck MD, Trumble AC, et al. Deaths attributable to injuries in infants, United States, 1983-1991. *Pediatrics* 1999; 103:968-974.