KERTAS SAINTIFIK

EPIDEMIOLOGY OF SCHOOL INJURIES IN MALAYSIA

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ABSTRACT

The objective is to study the characteristics of school injuries in terms of age, sex, ethnicity., specific location, time of injury, body parts involved, mechanisms of injury, circumstances and outcome and to identify the physical and mechanical factors involved in injury. This is a descriptive study conducted over a period of three months from 1 June 1996 to 31 August 1996 with the exception of Sarawak, which collected data from 1 August to 31 October 1996. Morbidity and mortality data involving injuries occurring at schools were collected from all patients who sought treatment at government hospitals and clinics in Malaysia with the exception of Perlis. Data were collected using questionnaire and analyzed using Epid Info Programme. There were 1,846 school injuries and of which six were fatal. Majority that is 69.5% of school injuries occurred outdoors. Males had higher incidence of both indoor and outdoor injuries in all age groups. Both outdoor and indoor school injuries peaked during morning break (around 10 a. m). Falls were the main event leading to injury both indoors (63.1%) and outdoors (43.2%) and in all age groups. Sharp objects or cutting instruments, floor and flooring surfaces were the products commonly identified that could contribute to both indoor and outdoor injuries. Playground surface were identified in 26.3% of outdoor school injuries. Head was the main body parts injured followed by extremities. Majority of injuries were accidental but three out of six deaths were due to homicide. Prevention strategies should be targeted towards prevention of falls.

ABSTRAK

Satu kajian untuk mengenalpasti cirri-ciri kecederaan yang berlaku di sekolah dari aspek umur, jantina, kaum, lokasi, masa, bahagian tubuh yang terlibat, mekanisma berlaku kecederaan, situasi serta akibat dan mengenalpasti faktor fisikal dan mekanikal yang terlibat dalam kecederaan yang berlaku di sekolah. Ini merupakan kajian deskriptif yang dijalankan dalam masa 3 bulan mulai 1 Jun 1996 hingga 31 Ogos 1996 kecuali Sarawak yang mengumpul data dari 1 Ogos 1996 hingga 31 Oktober 1996. Data morbiditi dan mortaliti yang berkaitan kecederaan yang berlaku di sekolah telah direkodkan dari pesakit yang mendapatkan rawatan di hospital dan klinik kerajaan kecuali di Perlis. Data dikumpulkan melalui soal selidik dan dianalisa menggunakan Program Epid Info. Terdapat 1,846 kecederaan di sekolah dan 6 melibatkan kematian. Kebanyakan 69.5% kecederaan berlaku diluar bangunan. Lelaki mempunyai insiden kecederaan yang tinggi berbanding perempuan di semua peringkat kumpulan umur. Kecederaan di dalam dan di luar bangunan berlaku terutama pada waktu rehat (10 pagi). Terjatuh merupakan sebab utama berlaku kecederaan di dalam bangunan (63.1)dan luar bangunan(43.2%) dan mengikut semua kumpulan umur. Benda tajam, lantai merupakan produk yang sering dikenalpasti mengakibatkan kecederaan di dalam dan di luar bangunan. Permukaan taman permainan telah dikenalpasti di dalam 26.3% kecederaan yang berlaku di luar bangunan. Kepala merupakan anggota yang utama terlibat diikuti oleh kaki dan tangan. Kebanyakan kecederaan adalah tidak disengajakan tetapi tiga daripada enam kematian adalah kerana homisid. Program pencegahan perlu ditekankan untuk pencegahan terjatuh.

INTRODUCTION

Injuries are one of the leading causes of death in the world. In Malaysia, injuries form one of the three main causes of death and hospitalization. They are also an important cause of permanent and temporary disability. The total annual economic loss due to all types of injuries is estimated to be 2 billion Malaysian Ringgit (John T Arokiasamy & R Krishnan 1994). Frederick P. Rivara et al 1989 in his study showed that the location of injury occurrence varied with the age of the child. Highest proportion of injuries in young children occurred at home (0-4 years of age) and in contrast the majority of injuries in the oldest age group occurred in school or the schoolyard (10-19 years of age). Injuries are a significant cause of absences from school among the school age population and so impinge upon the learning opportunities of a large number of students. However, in Malaysia there is a dearth of data at present on injuries at school, only occasional reports are seen in the dailies (John T Arokiasamy & R

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Krishnan 1994). The objective is to study the characteristics of school injuries in terms of age, sex, ethnicity, specific location, time of injury, body parts involved, mechanisms of injury, circumstances and outcome and to identify the physical and mechanical factors involved in school injury.

METHODOLOGY

This is a descriptive study conducted over a period of three months from 1 June to 31 August 1996 with the exception of Sarawak, which collected data from 1 August 1996 to 31 October 1996. Morbidity and mortality data involving injuries occurring at the schools were collected from all patients who sought treatment at government hospitals and clinics in Malaysia with the exception of Perlis. For logistic reasons private hospitals and clinics were not included in the study. Data were collected by using questionnaire. This questionnaire was drafted with the State Epidemiologists. The final draft of the questionnaire was pre tested in Selangor and then circulated to all government hospitals and clinics in all the states. The completed questionnaires were complied by State Epidemiologist and returned to the Injury Prevention and Control Unit for analysis.

Data collected were analyzed using Epid Info Programme. School injuries are defined as injuries occurring at schools, nurseries and kindergartens. It includes injuries occurring during school hours and outside school hours. Analysis had been divided into several categories. These are indoor and outdoor school injuries as well as according to age group that is preschool (< 7 years of age), primary School (7-12 years of age) and secondary school (13-19 years of age). Indoor school injuries differ in nature to out door school injuries due to the different types of activities involved. As well, older children tend to engage in different types of activities both in and out of the classroom compared to younger children. Therefore the above categories have been chosen so that a suitable basis for the most appropriate countermeasures can be identified.

FINDINGS

During the study period there were 1,846 school injury cases reported.

Distribution by state

Johore reported the highest number of cases accounting for 347 cases (18.8%) followed by Perak 294 cases (15.9%) and Sabah 219 cases (11.9%). Negeri Sembilan reported 50.0% of fatal injury cases followed by Johore (33.3%) and Perak (16.7%).

Distribution by age (indoor versus outdoor)

Majority (69.5%) of school injury cases were outdoor injury cases while 30.5% were indoor injury cases. Outdoor injury cases represented 73.4% of all injury cases among the preschool age group, 70.8% among primary school age group and 68.4% among secondary school age group. The latter group had a higher incidence of indoor injury cases compared to the primary and preschool age group (Figure 1). This is similar to findings by Stephen Goss 1992 whereby outdoor injury cases represent 90% of all injury cases among primary age group and 70% among junior secondary students. In contrast Peter Cunning et al 1996 found that injuries among children < 5 years old in child day care occurs more frequently indoors.

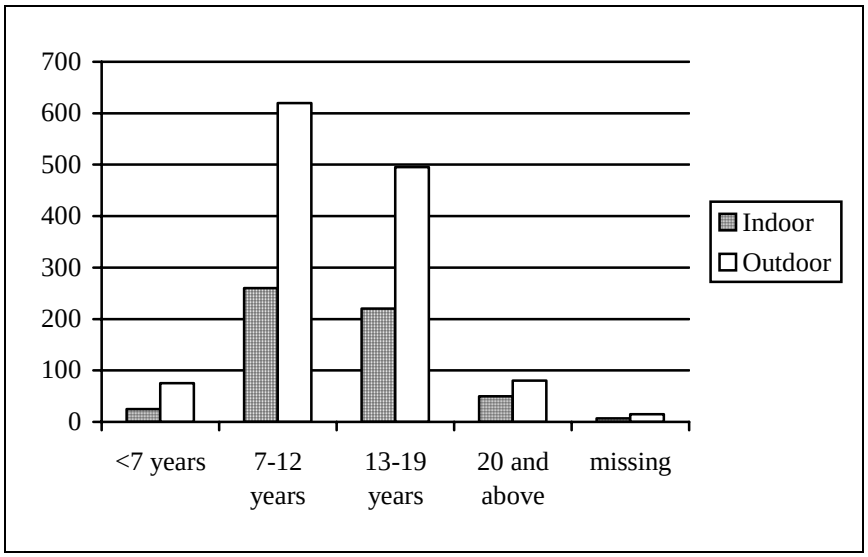

Figure 1: School injury cases by location and age group

Distribution by gender (indoor versus outdoor)

Similar to findings by Stephen Goss 1992, Peter Cunnings et al 1996 and Hamidah Karim & R Krishnan 1993, showed that males had a higher incidence of both indoor and outdoor injuries. Males were also noted to have a higher incidence of injury at all age groups particularly the secondary school age group as can be seen in Figure 2 and Figure 3.

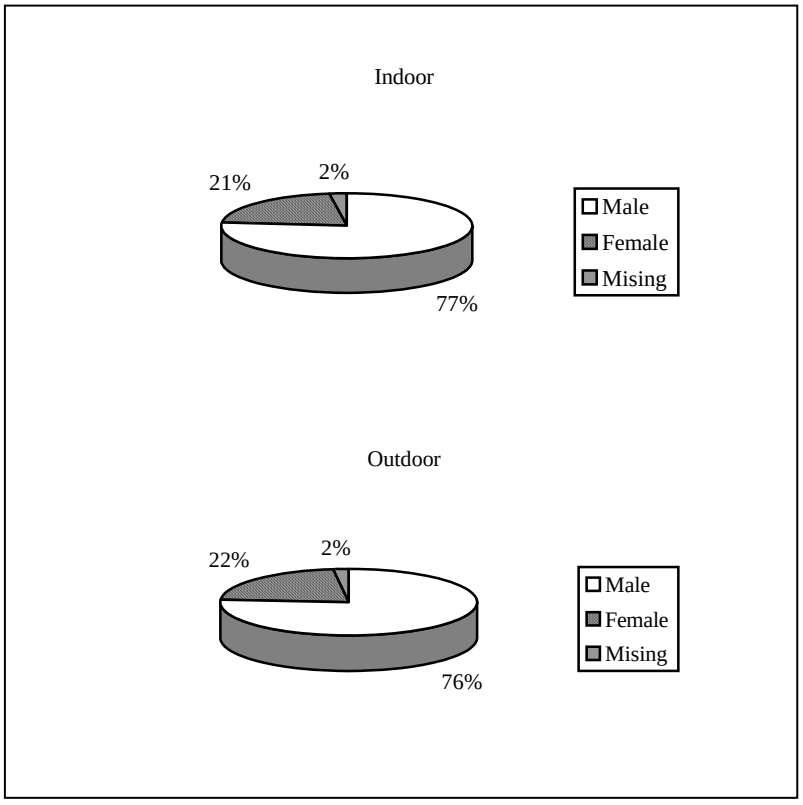

Figure 2: School injury cases by location and gander

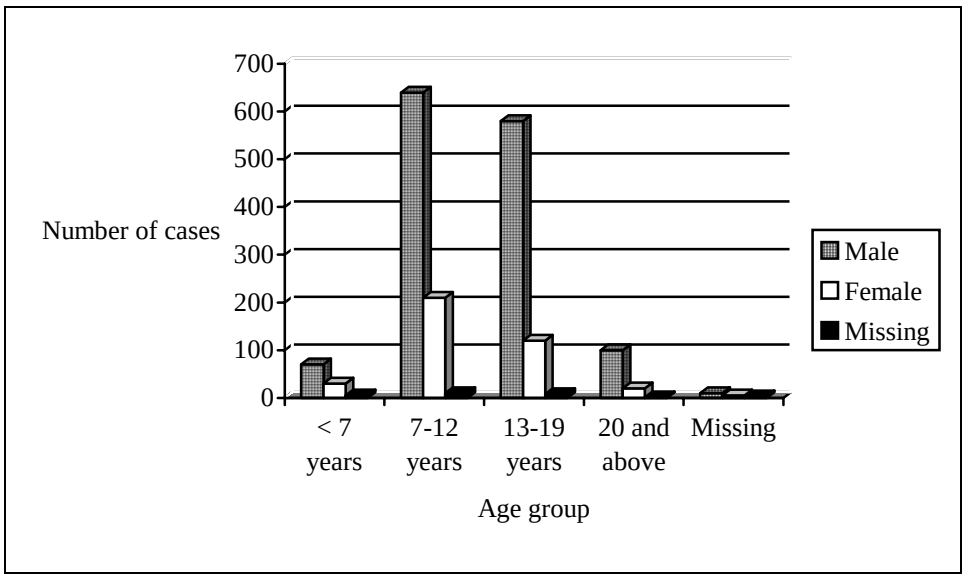

Figure 3: School injury cases by age anf gender

Distribution by ethnicity (indoor versus outdoor)

Majority of both outdoor and indoor injury cases involved Malays (58.6%) and (52.5%) respectively. Indians were involved in 15.8% of both indoor and outdoor injury cases. Five of the fatal cases (83.3%) were Malays and one case (16.7%) was Indian.

Distribution by time of occurrence (indoor versus outdoor)

As can be seen in Figure 4, both outdoor and indoor injury cases peaked during the morning break (around 10 a.m.). Outdoor injury cases tend to increase again between 4 to 6 p.m. while indoor injury cases showed a declining trend after 10 a.m.

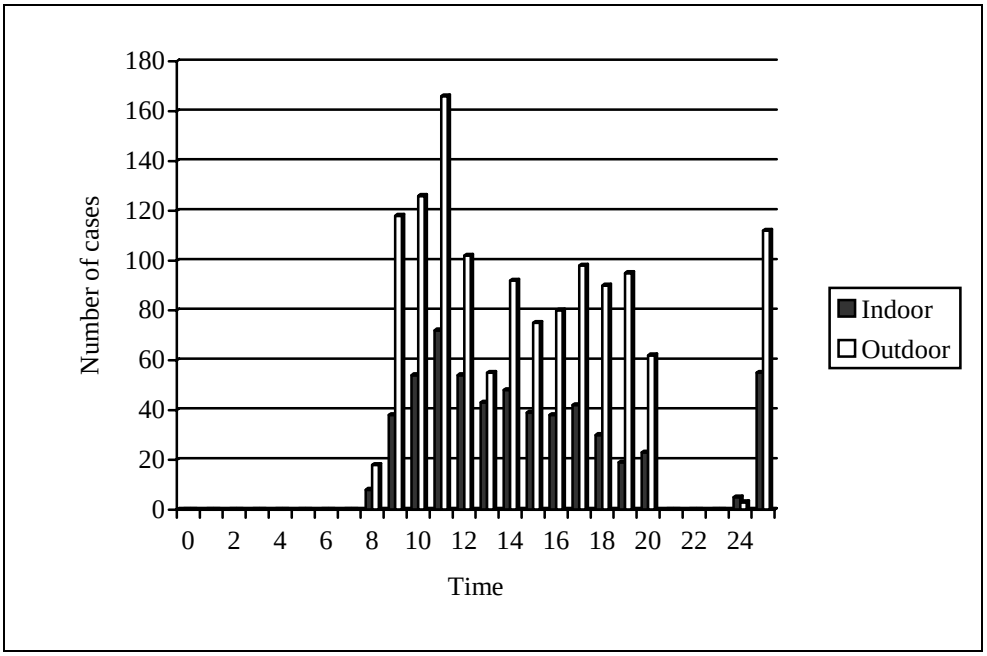

Figure 4: School injury cases by location and time of occurrence

Distribution by types/mechanism of injury (indoor versus outdoor)

Majority of falls occurring indoors were as a result of falls on the same level due to slipping, tripping or stumbling (61.7%). This is followed by falls on the same level due to collision, pushing or shoving by or with other person (18.5%), falls on / from stairs (9.1%), falls from greater heights (6.6%) and into hole / open surface (4.1%). Majority of falls occurring outdoors were as a result of falls on the same level due to slipping, tripping or stumbling (60.9%). This is followed by falls on the same level due to collision, pushing or shoving by or with other person (22.6%), falls into hole / open surface (7.2%), on or from stairs 5.9% and falls from greater heights (3.5%).

Out of 12 indoor poisoning cases, four (33.3%) were as a result of drugs and medication while seven cases (58.3%) were due to others such as glue etc. One case (8.3%) had missing data. There were 12 outdoor poisoning cases. Two cases (16.7%) were as a result of drugs and medication, one case (8.3%) was due to kerosene, one case (8.3%) was due to pesticides, five cases (41.7%) were due to others and 3 (25.0%) had missing data.

Majority of burns occurring indoors [six cases (54.5%)] were due to fire and flames followed by due to hot liquids and solids that is three cases (27.3%) and due to corrosive [two cases (18.2%)]. Similarly majority of burns occurring outdoors [seven cases (50.0%)] were due to fire and flames followed by due to hot liquids and solids [five cases (35.7%)] and due to corrosive [one case (7.1%)]. One case (7.1%) had missing data.

As for injury due to foreign bodies, majority of injury occurring indoors that is ten cases (40.0%) were foreign bodies in the other parts of the body, followed by in the eyes [seven cases (28.0%)] and entering through orifices [four cases (16.0%)]. Four cases (16.0%) had missing data. For injuries due to foreign bodies occurring outdoors, majority [eight cases (40.0%)] were foreign bodies in the other parts of the body. The rest four cases (20.0%) were foreign bodies in the eyes, four cases (20.0%) entering through orifices and four cases (20.0%) had missing data. Others include bites by animals / insects / snakes , hit by person / object, collided / knocked against person / object were responsible for 18.5% of injury occurring indoors and 16.2% of injuries occurring outdoors (Figure 5).

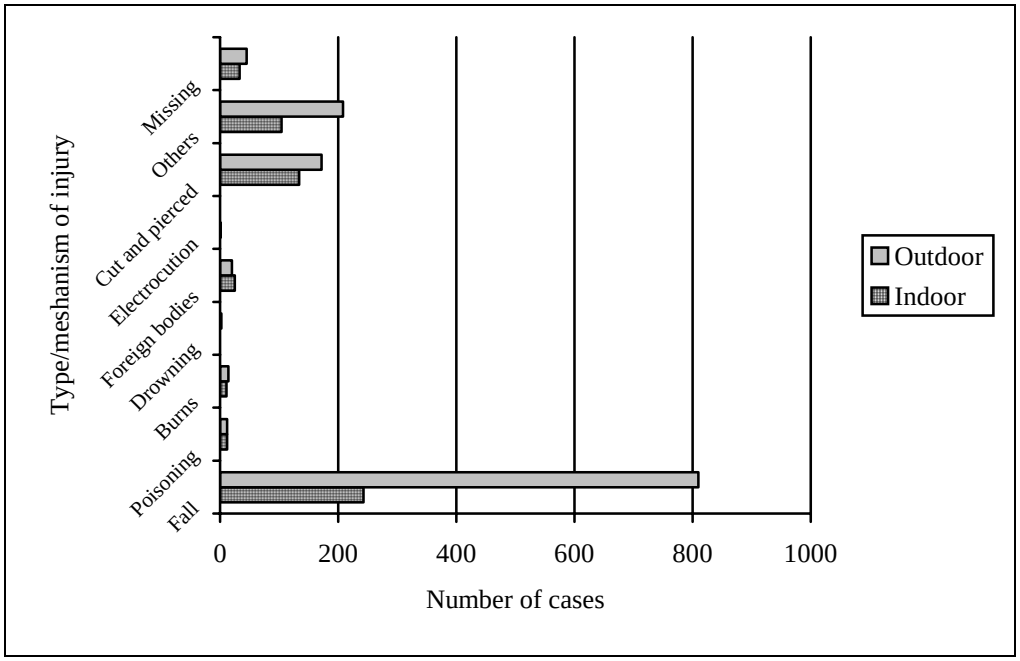

Figure 5: School injury cases by location and types/mechanism of injury

Distribution by nature of injury (indoor versus outdoor)

Open wounds including cuts or lacerations constituted a high proportion of indoor injury cases (35.2%) and outdoor injury cases (31.0%). Superficial injuries and contusions were also common in both indoor and outdoor injury cases. Fractures (9.9%), sprains and strains of joints and adjacent muscles (9.9%) and dislocations (2.6%) constituted a relatively higher proportion of injury outdoors compared to injury indoors (Table 1).

Distribution by body parts (indoor versus outdoor)

For both indoor and outdoor school injury cases the head was the main body part injured (36.6%) and (32.7%) respectively. The upper extremities (29.1%) and the lower extremities (20.2%) were the next most commonly injured parts in indoor injury cases, however in outdoor injury cases lower extremities were more frequently injured (32.5%) compared to upper extremities (26.6%). In contrast most outdoor and indoor injury cases occur to the upper extremities (Stephen Goss 1992). The distribution of body parts injured is illustrated in Figure 6

Table 1: Indoor and outdoor school injuries by ethnicity

Ethnicity	Indoor		Outdoor		Total	
	No.	%	No.	%	No.	%
Malays	330	58.6	674	52.5	1004	54.4
Chinese	75	13.3	184	14.3	259	14.0
Indians	89	15.8	203	15.8	292	15.8
Kadazans	11	2.0	27	2.1	38	2.0
Bajaus	6	1.1	15	1.1	21	1.1
Muruts	1	0.2	6	0.5	7	0.4
Dusuns	2	0.4	22	1.7	24	1.3
Other Indigenous Groups in Sabah	19	3.4	56	4.4	75	4.1
Melanaus	3	0.5	10	0.8	13	0.7
Ibans	11	2.0	38	3.0	49	2.7
Bidayuhs	2	0.4	5	0.4	7	0.4
Other Indigenous Groups in West Malaysia	0	0.0	5	0.4	5	0.3
Others	9	1.6	33	2.6	42	2.3
Missing	5	0.9	5	0.4	10	0.5
Total	**563**	**100**	**1283**	**100**	**1846**	**100**

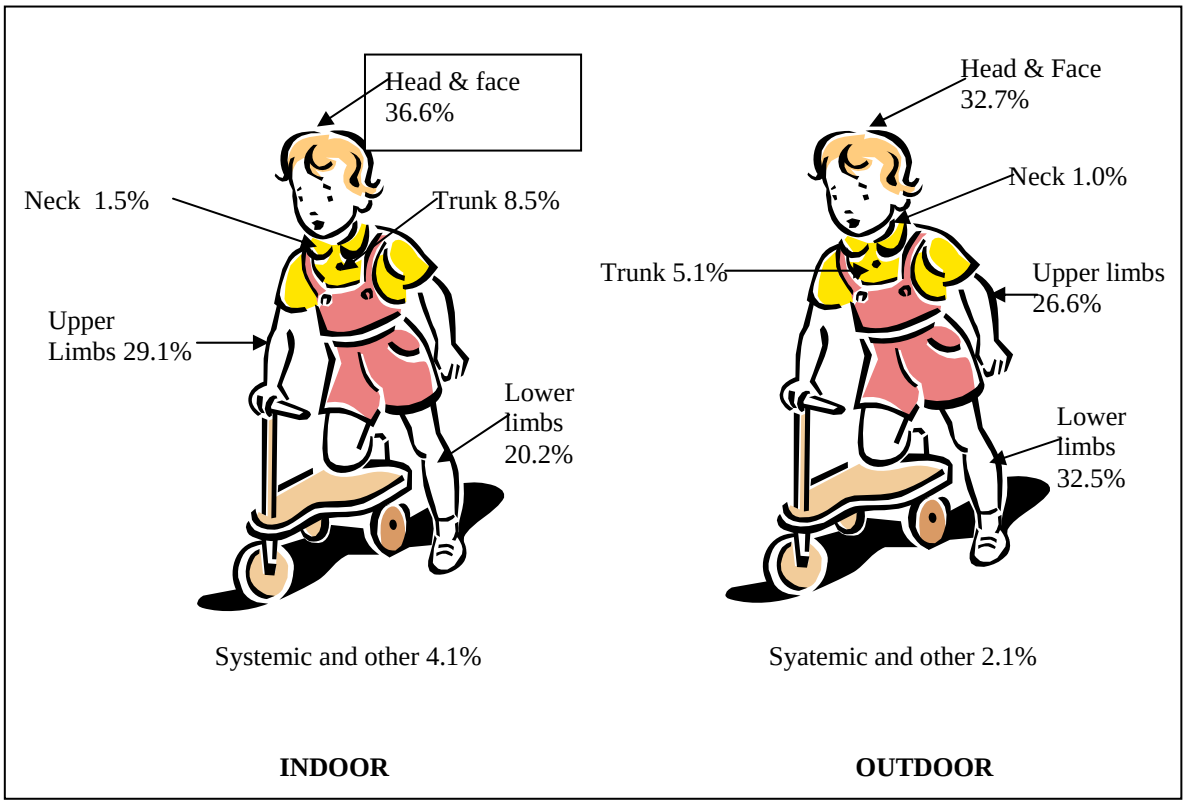

Figure 6: Distribution of injury by body parts (indoor versus outdoor)

Distribution by products/agency involved (indoor versus outdoor)

When indoor environment is considered, sharp objects or cutting instruments, floor and flooring surface, others which include insects/ persons/ blunt objects and furniture were the products / agents frequently identified that could contribute to injury. For outdoor injury cases, playground surface, floor and flooring surface, others and sharp objects or cutting instruments were the factors frequently identified as shown in Table 2.

Distribution by circumstances of injury (indoor versus outdoor)

The majority of both indoor (91.1%) and outdoor injury cases (91.3%) were accidental. Only a small percentage of both indoor and outdoor injury cases were homicidal that is 2.5% and 1.4% respectively. Suicide was also uncommon and constituted only 0.4% of indoor injury cases and 0.2% of outdoor injury cases. In 6.0% of indoor injury cases and 7.1% of outdoor injury cases the circumstances of injury were unknown.

Distribution by outcome (indoor versus outdoor)

A higher proportion of outdoor injury cases (10.5%) required in-patient treatment compared to indoor injury cases (6.9%). Five out of six deaths (83.3%) were outdoor injury cases. Two were accidental that is due to falls and three were due to homicide. Two of the fatal outdoor injury cases were either brought in dead or died on arrival and the rest (three cases) died in the ward within seven days. One fatal indoor injury case was a suicide case involving glue poisoning and died in the ward within seven days

Distribution by types/mechanism of injury (according to age group)

Figure 7, illustrates the types or mechanism of injury in the different age groups. Falls were the most frequent mechanism of injury in all the age groups accounting for 60.6% of injury in preschool age group, 61.8% of injury in primary school age group and 52.2% in secondary school age group.
Others (14.9%), cutting and piercing (11.7%) were the next common mechanism of injury in preschool age group after falls. Only 4.3% of injuries in this age group were due to poisoning and there was no case of burns, drowning and electrocution.

In the primary school age group cutting and piercing (16.6%) and others (13.0%) were the other common mechanisms of injury. A small percentage that is 2.9% were as a result of foreign bodies, 1.5% was due to burns, 1.1% was due to poisoning and 0.1% was due to electrocution. There was no drowning in this age group.

For the secondary school age group others (21.4%) and cutting and piercing (17.4%) were the next common mechanism of injury after falls. Similar to primary school age group a small percentage of cases were due to foreign bodies 1.5%, poisoning 1.1%, burns 1.1% and drowning 0.1%. There was no injury due to electrocution.

Table 2: Nature of injury sustained by 1,846 indoor and outdoor school injury cases

Nature of Injury	Indoor		Outdoor	
	No.	%	No.	%
Superficial injuries	193	32.6	399	28.7
Contusions (haematoma / bruise)	63	10.7	165	11.9
Foreign body entering through orifice	7	1.2	10	0.7
Foreign body in soft tissues	5	0.8	22	1.6
Open wound including cuts / laceration.	208	35.2	431	31.0
Sprains and strains of joints and adjacent muscles	41	6.9	138	9.9
Dislocations	4	0.7	37	2.6
Fractures	32	5.4	138	9.9
Crush injury	6	1.0	4	0.3
Amputations and enucleations	2	0.3	1	0.1
Injury to nerves and spines	1	0.1	1	0.1
Injury to blood vessels	2	0.3	4	0.3
Internal injury of chest, abdomen and pelvis	2	0.3	6	0.4
Intracranial injuries including concussion, contusion and haemorrhage	4	0.7	13	0.9
Poisoning	11	1.9	9	0.6
Burns	11	1.9	13	0.9
Asphyxiation	0	0.0	1	0.1
Total	**592**	**100**	**1,392**	**100**

Note: One or more injuries recorded per case

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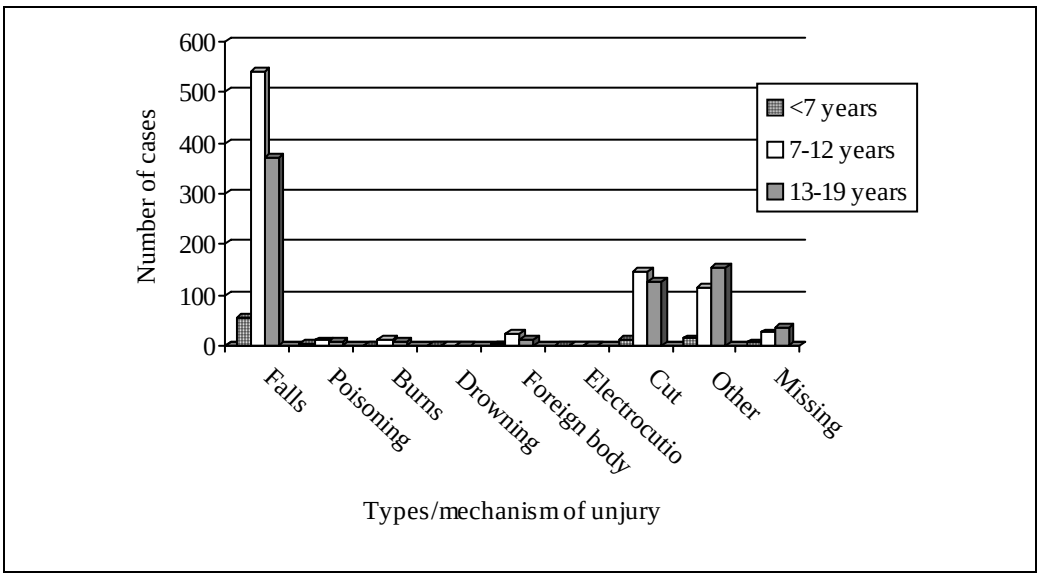

Figure 7: School injury cases by age group and types/mechanism of injury

Distribution by products or agents (according to age group)

Playground surface, others, floor and flooring surface, sharp objects and playground equipment were the main products or agents identified that could contribute to injuries in the preschool age group. Playground surface was also the main products or agents identified that could contribute to injuries in primary school age group and secondary school age groups. (Table 3)

Table 3: Products or agents identified by location

Products	Indoor		Outdoor	
	No.	**%**	**No.**	**%**
Furniture	70	12.4	21	1.6
Sharp objects/ cutting instruments	100	17.8	142	11.1
Doors	30	5.3	14	1.1
Floors and flooring surfaces	77	13.7	152	11.8
Steps and stairs	23	4.1	38	3.0
Gymnastic equipment	2	0.4	3	0.2
Sports equipment	15	2.7	63	4.9
Physical education equipment	3	0.5	6	0.5
Playground surface	36	6.4	337	26.3
Playground equipment	6	1.1	35	2.7
Chemicals	6	1.1	2	0.2
Stationery	7	1.2	9	0.7
Household items	5	0.9	15	1.2
Food items	7	1.2	7	0.5
Toys	2	0.4	25	1.9
Electrical appliances	3	0.5	1	0.1
Others	75	13.3	153	11.9
Missing	96	17.0	260	20.3
Total	**563**	**100**	**1,283**	**100**

Distribution by outcome (according to age group)

Among the different age groups, the rate of admission was highest in the preschool age group (11.7%) followed by the secondary school age group (10.8%), and the primary school age group (8.2%). There was no death in the preschool age group and all the cases that were admitted were discharged within seven days. Among those in the primary school age group, there was one death that occurred within seven days after admission. Five out of the six deaths (83.3%) occurred among those in the secondary school age group; two were brought in dead and three died in the ward within seven days after admission.

DISCUSSION

Data on school injuries were collected over period of three months and not twelve months, therefore any variation during the period has to be taken into account when studying the information. Information gathered could be biased since data were collected from Government hospitals and clinics only. Nevertheless since most school injury cases occurred outdoors, consideration should be given to improve supervision when children are outdoors, especially at preschool and primary school levels. At school, a large number of children are brought together in a comparatively small area, especially at peak times such as recess. Given that falls were the main mechanism involved in both outdoor and indoor school injury cases, prevention strategies should be targetted towards prevention of falls. Some possible strategies include examining design and location of furniture particularly its stability and height in relation to the child. The surface of stairways, steps and classrooms floor should be non-slip. Provide adequate handrails for stairs and monitor the use of steps and stairs especially at during recess. Attention should also be given to safe design of playground equipment and its maintenance. David J Chalmers et al 1996 showed that the risk of injury being sustained in a fall was increased if the equipment failed to comply with the maximum fall height (OR=3.0), surfacing (OR=2.3), or safe fall height (OR=2.1) requirements.

Since playground surface was identified in 26.3% of all outdoor injury cases and were the main product identified that could contribute to injury in preschool, primary school and secondary school, attention should be given to provide appropriate playground surfaces for the purpose of impact absorption. Playground surface should also be well maintained.

Sinniah D et al 1994 in their study found that 80% of 135 playground surfaces in primary schools in Petaling Jaya are concrete/ asphalt or brick and 30% of 10 secondary school playground surfaces are of either concrete or asphalt. No protective equipment, such as rubber mats was observed in any of indoor and outdoor gymnasia. Similarly David J Chalmers et al 1996 found that a significant proportion of school playground equipment does not comply with the surfacing requirement.

Attention should also be given to the fact that half of the school injury deaths were due to homicide and preventive strategies should be targetted towards reducing violence in school.

Further research in school injuries would be extremely useful for its prevention programme. Schools should collect and review their own data on

injuries so that they could identify specific hazards in their own premises and thereby implement prevention strategies.

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