

Sport accidents in childhood

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Injuries among children during sporting activities are common. This study is a one year study including children between five and fourteen years of age who sustained their injuries during sporting activities and were treated at Trondheim Regional and University Hospital.

Sport accidents account for 27 per cent of all childhood accidents in this age group. Fifty-three per cent of the injured were boys, and 47 per cent were girls. The boys sustained more severe injuries than the girls. Soccer caused the greatest number of injuries. Horse riding and alpine skiing were the cause of the most severe injuries.

A more widespread use of protective guards, better technique and body control, better coaching and not allowing the younger children to take part in technically advanced sporting activities might reduce the number and the severity of the sport injuries in children.

Keywords: Injuries, children, sport, study

Introduction

Sport is an engaging and enjoyable activity for children and adolescents. The participation in both organized and recreational sport starts at preschool age. The children, their parents, the physical education teachers and the coaches seem to accept the risk of injury as an unavoidable part of sport participation¹.

Most studies of sport related injuries have focused on the incidence rate in adults²⁻⁴. A few authors have studied childhood accidents in sport and accidental risks in non-organized and organized sporting activities^{1,5-7}.

The aim of this study was to identify risk factors, in different age groups and different types of sport, in relation to equipment, sport arenas and children's behaviour which could influence the number of accidents and the severity of the injuries. Based on these risk factors, preventive measures are proposed.

Materials and methods

All patients admitted to the Regional and University Hospital at Trondheim, as a result of an accident, from June 1985 to June 1986, were recorded. Trondheim is a regional hospital with a primary catchment area of about 200 000 inhabitants. The inpatients as well as the

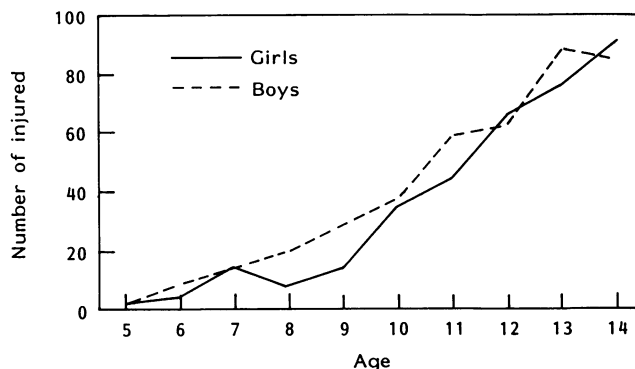


Figure 1. Distribution of sport injuries according to age and gender

outpatients were registered. Children from five to fourteen years old were given a questionnaire which was filled out by the injured or their companions on arrival in the hospital. Bicycle accidents were only identified as sports accidents if they occurred during cycle training or competition. Playground accidents were only identified as sport accidents if a sport activity was practised on the playground.

Each patient was identified as one case even if they had more than one injury. Information on each patient including personal data, when, where and how the accident occurred, when they arrived in the hospital, the body part injured, the diagnoses, the treatment, the severity of the injury, the number of consultations, the number of days in hospital and the degree of permanent disability at the time of discharge from hospital were collected and analysed.

An accident was defined as a sudden external occurrence leading to a personal injury which required medical care. The injury must not be more than one month old at the first visit to the hospital. The AIS code (AIS, 76) was used for grading the severity of the injuries. The chi-square test and the student t-test (two-tail) were used for statistical analysis. p-values below 0.05 were regarded as significant.

Results

During the year of study, 2841 children were recorded as injured, with 27 per cent (758 children) of these sustaining their injuries during sporting activities. Thirty-nine per cent of the injured were below the age of 12 years and 61 per cent were 12 years old or older. The distribution of gender was the same in all age groups; 47 per cent of the injured were girls, and 53 per cent were boys (Figure 1).

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0306-3674/90/010040-05

Table 1. Distribution of injured girls and boys according to type of sport

Sport activity	Number of injured			Total	
	Girls	Boys	Total		
Soccer	47	131	178	24%	
Handball	106	18	124	16%	
Alpine skiing	25	61	86	11%	
Cross country skiing	22	42	64	8%	
Ball, unspecified	24	16	40	5%	
Gymnastics	21	19	40	5%	
Ice skating	21	7	28	4%	
Horse riding	20	3	23	3%	
Ice hockey	1	11	12	2%	
Judo/karate	4	8	12	2%	
Skijumping	1	13	14	2%	
Swimming	8	9	17	2%	
Volleyball/basketball	12	6	18	2%	
Roller skating	2	1	3	1%	
Other	38	51	91	12%	
Track	5	3	8	1%	
Total	359 47%	399 53%	758	100%	

Table 2. Distribution of mechanisms of injury and severity

Type of sport	Falling	Falling from heights	Collision	Other	Total
Soccer	66	1*	101	9	178
Handball	42	2	76	4	124
Alpine skiing	66	3	16	1	86
Skiing	55*	0	7	2	64*
Ball, unspecified	11	2	44	1	58
Gymnastics	11	14	14	1	40
Ice hockey and ice skating	21	0	13	8	40
Horse riding	2*	12*	6	3	23*
Other	53	17	39	35	145
Total	311 (41%)	51 (11%)	314 (41%)	52 (7%)	758 (100%)

* = Mean AIS > 1.5

Soccer was the most common cause of injury. Among girls, handball was the sport leading to the greatest number of accidents (Table 1). In this study the older children sustained more injuries than the younger children. Softball, swimming and ice skating were the only activities with a higher percentage of injured below the age of 12 years.

Collision with other objects or other persons accounted for 41 per cent of the accidents. Falling from heights accounted for 11 per cent of the accidents (Table 2). The mechanism of the injury followed the same pattern when the older and younger children and the two sexes were compared. The older children were more often injured in collision accidents with other persons than the younger children. There was no difference in severity of the collision accidents according to age. The injuries caused by falling were significantly more severe than the collision accidents in all age groups and in both sexes ($p < 0.05$).

The upper extremities were the most common body part injured (Table 3). There was no difference in severity between the different body parts injured. Fractures

were as common as sprains in the upper extremities. Sprains were the most common cause of injury in trauma to the lower extremities. Contusions were the most common cause of head injuries. Sprain in the upper extremity was the most common diagnosis, and fracture of the forearm was the most common type of fracture (Table 4).

There were no fatal injuries. There was no difference in severity according to age. Alpine skiing and horse riding caused the greatest number of severe injuries (according to AIS). The boys sustained significantly more severe injuries than girls. Two children with epidural haematomas now both suffer from reduced brain function. They were the only two discharged from hospital with permanent disability.

Ten per cent of the injured required hospitalization. Mean hospitalization time was six days (range 1–60 d, median 2 d). There was no difference in mean age between the inpatients and the outpatients. Cross country skiing, alpine skiing and soccer led to the highest number of hospital admission. The horse riding, track and cross country accidents had the highest per cent-

Table 3. Distribution of types of injuries according to sport and injury severity

Type of sport	Type of injury				Total
	Fractures	Distortions	Contusions	Other	
Soccer	47*	62	59	10	178
Handball	26*	63	32	3	124
Alpine skiing	29*	27	26	4	86
Skiing (cross country)	20*	28	13	3	64*
Ball, unspecified	10	23	18	7	58
Gymnastics	9*	15	14	2	40
Ice skating	6*	12	6	4	28
Horse riding	9*	1	9*	4	23*
Swimming	5	1	7	4	17
Skijumping	7*	1	6	0	14
Ice hockey	1	1	5	5	12
Judo/karate	6*	3	3	0	12*
Track	3*	4	0	1	8*
Other	19	18	14	43	94
Total	197* (26%)	259 (34%)	212 (28%)	90 (12%)	758 (100%)

* = Mean AIS > 1.5

Table 4. Distribution of diagnoses according to age

Diagnosis	Number of injuries			Total
	5–11 years old	12–14 years old		
Sprain, overextension	44	82		126
Sprain, underextension	49	76		125
Contusion/laceration, under extension	40	58		98
Contusion/laceration, over extension	25	59		84
Contusion/laceration, head	32	30		62
Forearm fracture	30	31		61
Hand/finger fracture	10	45		55
Contusion/laceration, other	17	18		35
Ankle/foot fracture	10	18		28
Tibia/fibula fracture	11	9		20
Concussion	9	10		19
Humerus fracture	3	8		11
Rib/clavicle fracture	6	4		10
Head/face fracture	0	6		6
Femur fracture	4	1		5
Dislocation, other	2	2		4
Epidural haematoma	2	1		3
Dislocation, hip	0	2		2
Dislocation, overextension	0	2		2
Sprain, others	0	2		2
Total	294	464		758

age of hospital admission. The injured required an average of 1.7 medical consultations (range 1–9, median 1).

Discussion

This study is not an incidence study. The incidence of children's sport accidents is difficult to determine due to problems in defining the population at risk. Soccer, for example, is a very popular activity, especially among younger boys. They practice soccer whenever and wherever they get the opportunity. A calculation of the time at risk or the population at risk would give vague figures. These facts are supported by Tursz *et al.*⁷.

In the present study, the sport accidents accounted for 27 per cent of the childhood accidents. In the Tursz

et al. study the sport injuries represented only 11 per cent of all childhood accidents⁷. Our percentages are similar to the percentage which Jacobson *et al.* found in their Swedish study⁸. In other studies, not only are the injuries requiring medical care registered^{9,10}, but they also include the minor injuries treated by the coaches or the school nurses. This makes a comparison of the distribution of injury severity and accident occurrence in the different sporting activities difficult.

Sporting activities, as well as sport accidents, are more common among older children. An important fact is that the sport accidents sustained by younger children are just as severe and follow the same mechanism of injury as those sustained by older children. The younger children are not as well trained and have poorer body control than the older children^{6,10,11}. We still do not have enough knowledge of why this is

so, either in the high skilled sporting activities, or in the sporting activities that do not require a high skill performance. More research is required in this field.

Sport activity is the only type of activity where girls sustain the same percentage of injuries as boys¹². The relatively high number of injuries among girls may be due to the fact that girls receive less qualified coaching and less technical advice compared to boys^{1,6,13}.

The distribution of different types of sport in this study is different from other studies on the same topic^{1,9,14-16}. In these American studies, football is the main source of sport injury. Since we do not play American football in this part of the world, the results are bound to be different. Therefore, there is need for national data.

A notable group of accidents are the swimming accidents. None of the swimming accidents occurred during swimming itself, but by slipping on the floor in the swimming pool area or shower room. A different type of floor might reduce these accidents. No submersion accidents were registered. Neither did we record any diving accidents. Diving accidents account for between four and 14 per cent of all spinal cord injuries among adolescents according to Bruce *et al.*¹⁷.

The number of accidents during handball are surprisingly high. Handball is very popular in this part of the country and the number of accidents reflects the high numbers participating in this sport.

The use of protective guards may reduce the severity of sport accidents¹⁸. The use of shin guards are already required in soccer tournaments in this country. In the present study, three children sustained tibial fractures; two of these occurred during school activities. Shin guards are not required in school soccer play, in practice or in school tournaments. By making this mandatory, the number of tibial fractures in soccer may be diminished.

The severity of the sport injuries and the percentage requiring hospitalization follow the same pattern as childhood accidents in general¹². The most severe injuries in this study were intra-cranial bleeding. They were life threatening events and led in two out of three cases to permanent disability. They occurred in horse riding, alpine skiing and handball activities. The one handball player who sustained an epidural haematoma slipped on the floor. This has not been described as a common cause of injury¹⁹ and may be due to unpreventable accident.

The epidural haematoma sustained in alpine skiing and horse riding is well known type of accident²⁰⁻²². The severe head injuries in alpine skiing as well as in horse riding might be reduced by using protective helmets^{20,22,23}. The fact that minor head injuries in children are not leading to any sequelae stresses even more the importance of using a helmet²⁴.

It is too early to grade the degree of permanent disability, especially in fractures of long bones, when the child is discharged from hospital because of growth disturbance and epiphyseal fractures. MacDonald states that most epiphyseal injuries are benign in relation to growth disturbances⁶.

Conclusions

Sport accidents are common and could be reduced

in number and severity by implementing the following proposals:

- Mandatory use of protective equipment such as helmets and shin guards
- Provision of more skilled coaches
- Increased practice in general training, leading to better body control, especially among young children
- Preventing younger children from participating in technically advanced sporting activities
- Further research to acquire more knowledge on the mechanisms of injury according to age and technical skill.

Acknowledgement

This study was supported by grants from Sør-Trøndelag county. The author would like to thank Prof. Inggard Lereim, Trine M. Stene and Per Balstad for helpful suggestions.

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