

HEADING FOR A FALL – MOPED AND SCOOTER ACCIDENTS FROM 2002 TO 2007

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ABSTRACT

Background and Aims: Mopeds and scooters have become increasingly popular among Finnish teenagers. The aim of this retrospective study was to assess incidence of and injury patterns associated with moped and scooter accidents in adolescents.

Materials and Methods: All 222 patients treated for moped and scooter-related injuries at Helsinki Children's Hospital and Töölö Trauma Centre from January 2002 to December 2007 were included. Information was drawn from patient records and compared with nation-wide Finnish data gathered from public data-bases.

Results: The annual number of patients at our centres increased from 14 to 76 and the proportion of girls increased from 7% to 25%. A similar trend was found on a national level. In our material, collisions between mopeds and other motorized vehicles accounted for 52% of accidents, and 33% of patients were injured from falling. Seventy-five percent of patients were hospitalized, and 50% needed at least one procedure requiring general anaesthesia. Five percent of the patients were under the influence of alcohol. Trauma of the head occurred in 22%; helmets did not protect against severe trauma. On a national level the proportion of 15- to 17-year-old road traffic victims has doubled in five years. Among this age group, more than half of all road-traffic accidents involve mopeds and scooters.

Conclusions: Over a time span of six years, moped accidents among adolescents have become very common. Our results suggest that measures should be taken to diminish the number of moped and scooter accidents and to improve driver safety.

Key words: Adolescent; moped; scooter; traffic accident; injury; helmet; alcohol; driver safety

INTRODUCTION

Mopeds and scooters have gained strongly in popularity among Finnish teenagers in recent years. Ac-

cording to Finnish law, a 15-year-old is allowed to drive a moped or scooter that has a maximum speed of 45 km/h and maximum motor capacity of 50 cm³. In addition to age, a written permit from the legal guardian, health certificate and theory examination are required. It has been legal to have a passenger on a moped or scooter from October 15th 2005 (1).

Between 2002 and 2007, the number of new moped licenses issued increased more than two-fold (1). During the same time period, the proportion of 15- to 17-year-old road traffic victims doubled, while injuries in other age groups decreased (2). In a Swedish study, the risk of injury for moped drivers was especially high among 15-year-olds (3).

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The purpose of this study was to determine the incidence of trauma from moped and scooter accidents and associated injury patterns in Finnish adolescents treated at Finland's largest paediatric hospital and Finland's largest trauma centre. Helsinki Children's Hospital is the only paediatric hospital in Helsinki, and it has the only children's ICU in the province of Uusimaa (population 1,4 million). Töölö Hospital provides treatment of severe trauma and neurosurgical patients. The data from these two hospitals was also compared with that from three national registers, Statistics Finland, Finnish Vehicle Administration and the Central Organization for Traffic Safety in Finland.

MATERIAL AND METHODS

We assessed patient records of all children aged 16 years and younger treated for trauma at Helsinki Children's Hospital and Töölö Hospital, Helsinki, Finland, between January 2002 and December 2007. We first gathered all the patients, whose records at admission to the hospital indicated a motorcycle-related injury. After exclusion of patients injured in motocross accidents, children who had been passengers on large motorcycles and pedestrians hit by mopeds, 222 patients were included in the analysis.

From the patient records, the following information was collected: date of birth, date of admission, gender, helmet use, mechanism of accident, reported speed, diagnoses, Glasgow coma scale (GCS) scores at admission for patients with head trauma, days hospitalized and need of operation under general anaesthesia.

Traumas were categorized according to location and severity. They were also divided into the following groups for analysis: head trauma, fractures, multiple trauma and minor trauma. Multiple trauma was defined as severe injury of two or more body parts, whereas minor trauma meant superficial injuries, which did not demand hospitalization.

Demographic data were collected from Statistics Finland (1). Yearly statistics on driver's license numbers and vehicle registrations were acquired from the Finnish Vehicle Administration (2). Detailed annual statistics on traffic accidents in Finland are available from the Central Organization for Traffic Safety in Finland (3).

RESULTS

Altogether 222 adolescents injured as drivers or passengers of mopeds and scooters were treated at Helsinki Children's Hospital and Töölö Hospital during the six-year period. The number of patients increased from 14 in 2002 to 76 in 2007 and the proportion of girls increased from 7% (1/14) to 25% (19/76), respectively (Fig. 1). Most of the patients (163 youths, 72%) were 15 years of age. Fifteen percent (33 patients) were under the legal driving age of 15 years. The youngest injured drivers of mopeds or scooters were 10 years old. Twelve patients (5%) were under the influence of alcohol at the time of the accident. They were all drivers of mopeds.

Twenty-six adolescents (12%) had been driving at a speed of less than 20 km/h according to their own estimate, and 88 patients (40%) estimated their speed

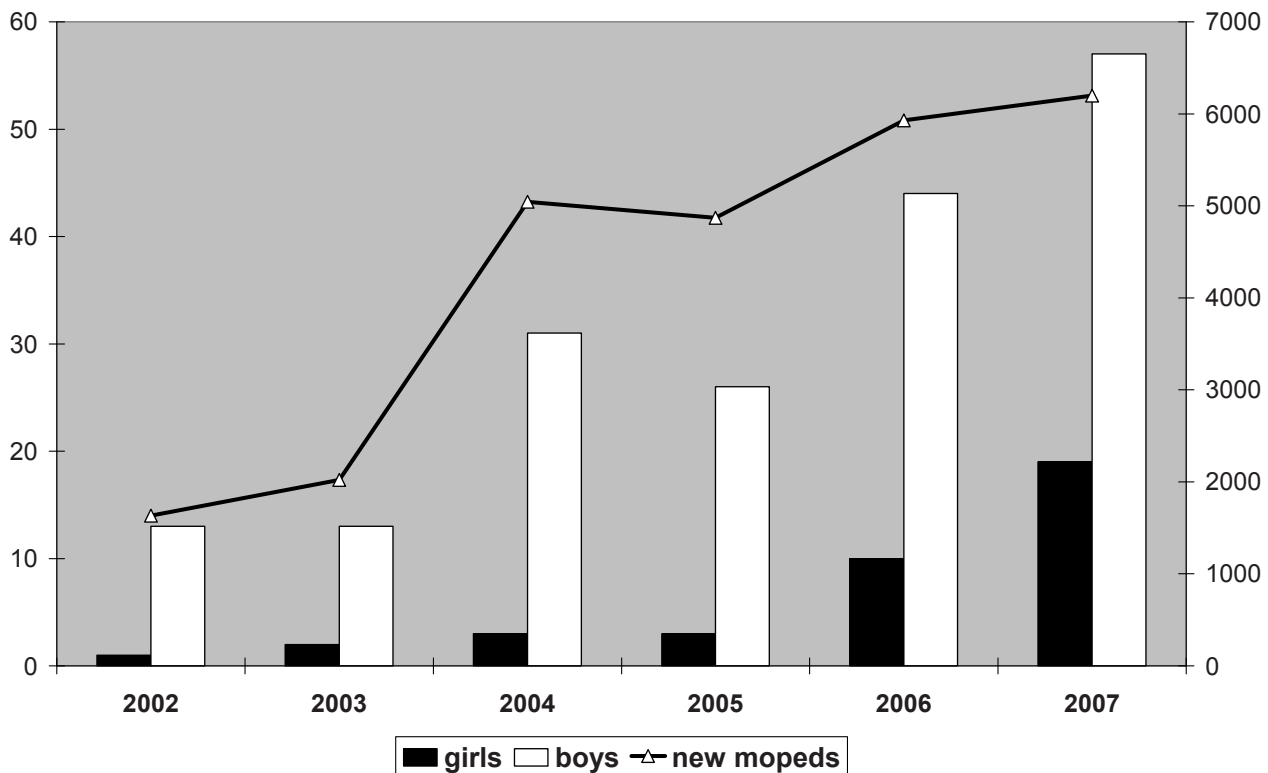


Fig. 1. Number of girls and boys treated annually for injuries acquired from moped and scooter accidents at Helsinki Children's Hospital and the number of new mopeds in the province of Uusimaa (thousands).

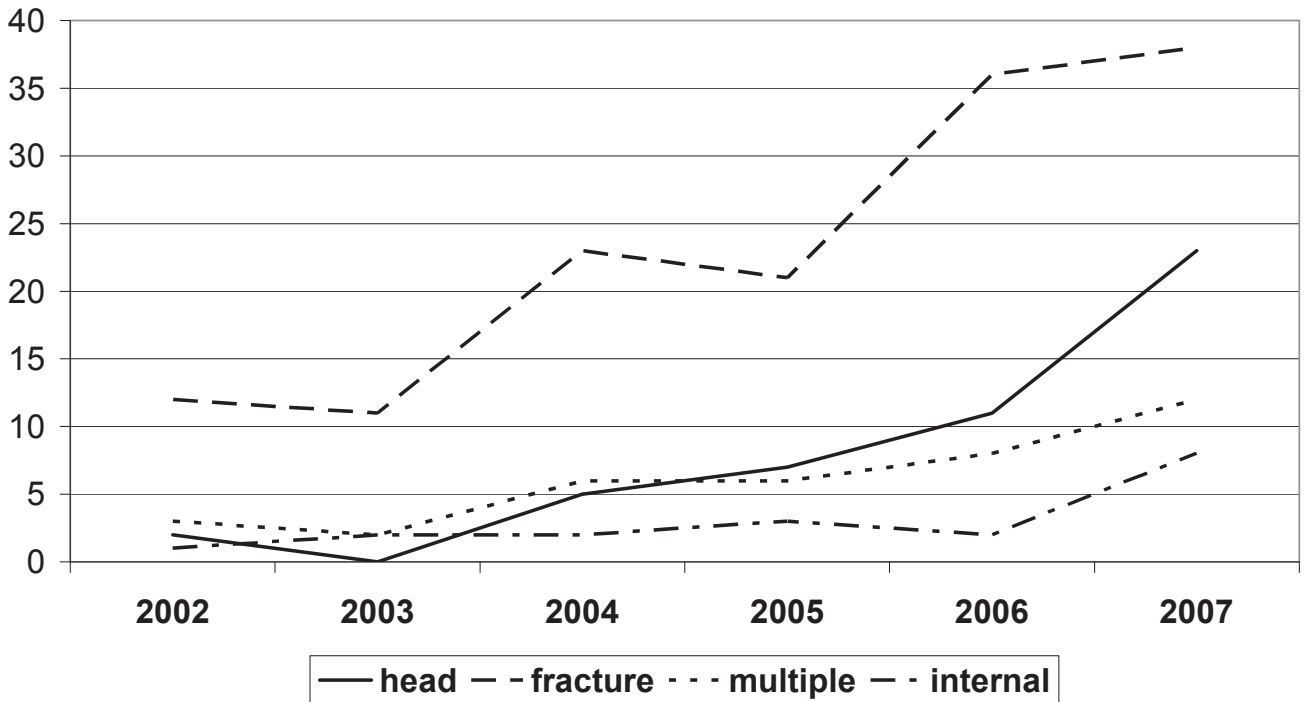


Fig. 2. Patients according to leading type of injury.

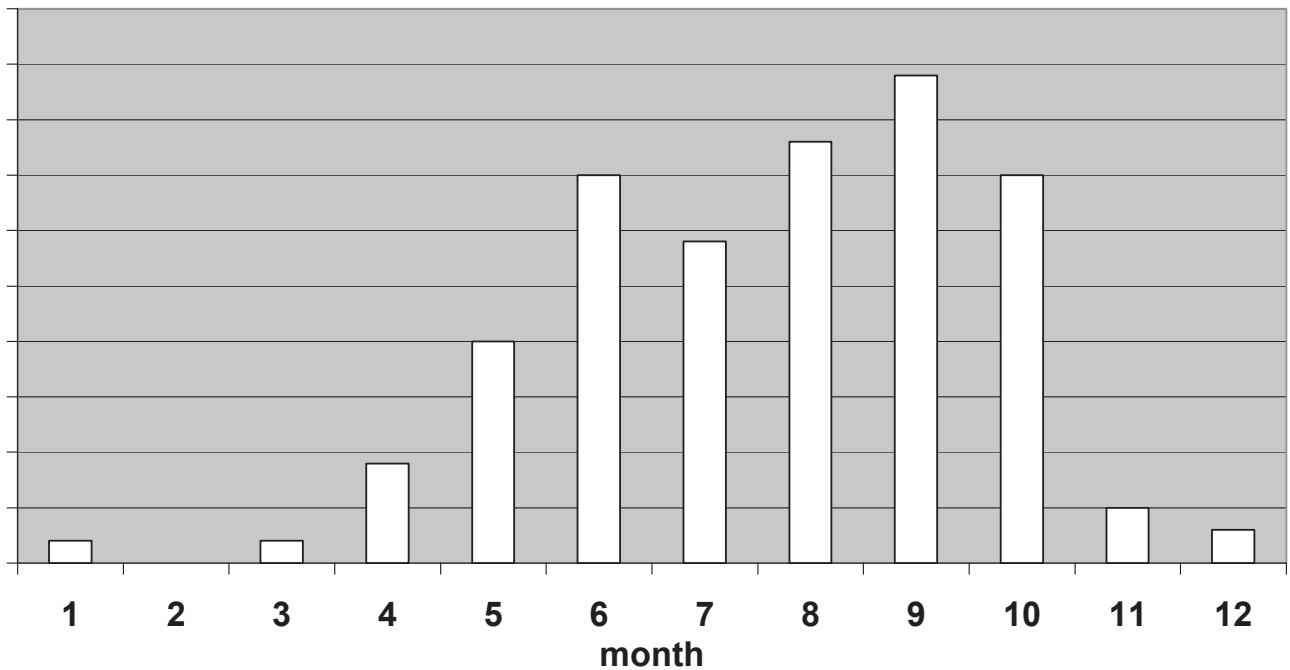


Fig. 3. Amount of patients from moped accidents according to month.

to less than 40 km/h at the time of accident. Nineteen youths (8%) reported a velocity exceeding 50 km/h, which suggests illegal “tuning” of the vehicle.

Almost all of the patients were drivers of mopeds (205 cases), and 16 were passengers. A third of the passengers were injured before having passengers on

mopeds became legal. In only three instances both driver and passenger were treated for their injuries at our hospitals.

Of all moped and scooter accidents, 116 (52%) were collisions of mopeds with other motorized vehicles. In 58 incidents the moped hit a car, in 40 cases a car

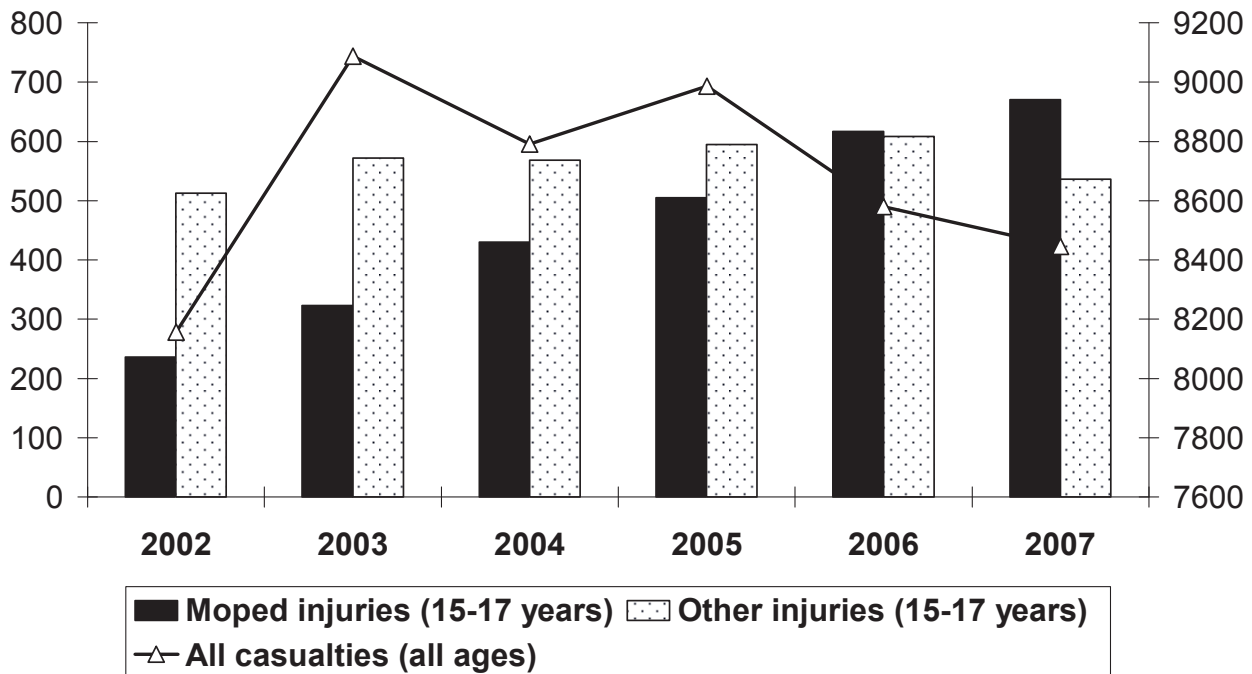


Fig. 4. Number of moped injuries and other traffic injuries of 15- to 17-year-olds (scale on left), and all traffic casualties of all ages (scale on right).

drove into a moped and in 18 accidents two mopeds were involved. Seventy-four moped or scooter drivers (33%) hurt themselves after falling down. Twelve patients were injured driving off the road. Other mechanisms of injury were met 19 times. They included hitting pedestrians, bicycle riders, traffic signs as well as railings.

A helmet was worn by 129 patients (58%), nine (4%) were without and information on helmet usage was missing in 84 cases. Head trauma was present with 67 patients (30%). Concussions were most common (32 cases), followed by skull fractures ($n = 12$), diffuse brain injuries ($n = 6$) and subdural haematomas ($n = 4$). Seven out of nine drivers without a helmet had head injuries. However, moped drivers wearing helmets sustained eight of the ten severe head injuries met in this study (diffuse brain injury, subdural haematoma and subarachnoid haemorrhage).

The most commonly injured parts of the body were the lower extremities (120 cases). Fractures were found in 139 patients (63%), altogether 169 diagnoses. The most common sites for fractures were the forearm, tibia and femur (23%, 20% and 16% of fractures, respectively). Eighteen patients experienced trauma to the internal organs.

Half of the patients (111 cases) required at least one operation under general anaesthesia. Speed at the moment of the accident or mechanism of injury did not correlate with the need of surgery. The patients who underwent surgery were hospitalized for an average of 9 days. For the 56 out of 108 conservatively treated patients, who required follow-up in the hospital, the average hospitalization was 3 days.

None of the patients brought to Helsinki Children's Hospital or Töölö Hospital with trauma from moped and scooter accidents died during the follow-up period. One patient is in rehabilitation for hemiparesis, and four youths are left with neuropsychological impairments which affect their every day lives more than three years after the accident. These five patients had head injuries and the lowest GCS scores at admission, range 3 to 8. Also, three patients' treatment continues because of complex fractures more than 18 months after the accident.

During our study period, severe injuries became more common (Fig. 2.). There were two patients presenting with head trauma in 2002, but 23 patients in 2007. Multiple injuries increased from three in 2002 to 14 in 2007.

In general, the moped season in Finland lasts from April to October. Occasional moped accidents occur all year round. Of the summer months, least accidents happened in July (Fig. 3.). Accidents peaked during August and September, with the beginning of a new school year.

Between 2002 and 2007, the number of new moped licenses rose from 11379 to 26756. These numbers cover 18% and 40% of the population of 15-year-olds, respectively. (1, 2) The number of road traffic victims in Finland has remained at approximately 9000 per annum for several years. However, casualties among 15- to 17-year-olds have increased from 749 to 1206 between 2002 and 2007. At the same time, the proportion of moped and scooter injuries has risen from 31% to 56% of all traffic injuries 15- to 17-year-olds were involved in (1) (Fig. 4.). In 2006, more 15-year-old moped drivers were injured in traffic than 18-year-

old car drivers (365 versus 352 cases, respectively) (1, 3). Fatalities of 15-year-old moped drivers are fortunately rare, with one or two annual cases at the beginning of the millennium and five cases in 2007. For Finnish moped drivers of all ages, four to thirteen annual deaths have been recorded with no clear trend during the past six years.

DISCUSSION

Between 2002 and 2007, mopeds and scooters became increasingly popular among Finnish teenagers. More 15-year-old moped drivers have been injured annually than 18-year-old car drivers. Also severe injuries from moped accidents increased in number. Half of all accidents involved another motorized vehicle, most often a car. Surprisingly many adolescents were driving under the influence of alcohol, as the legal age for alcohol consumption is 18 years. Helmets did not protect against severe head trauma in our material, possibly due to the properties of the helmets, exposed nature of a moped driver and relatively high speed.

Retrospective studies have weaknesses, such as inaccuracies in patient records, missing data and subjective estimates, such as accident velocity. Our material may be skewed since minor injuries are treated in smaller hospitals of Southern Finland while all patients under the age of 16 with severe trauma are brought to Helsinki Children's Hospital or Töölö Hospital.

However, our results are in line with data from other Nordic countries (4, 5). In a Swedish study the injury pattern of adolescents injured in moped accidents had a clear resemblance to our own (4). A Norwegian study on traffic accidents involving children and adolescents showed a very similar distribution of trauma mechanisms. Moped accidents were found to be an important cause of severe trauma among adolescents (5).

In Rome, severe head trauma diminished dramatically after a law requiring helmets of scooter drivers was passed (6). However, wearing a helmet cannot prevent all head trauma (7). In our study, most drivers who did not wear a helmet acquired head injuries compared with every third among helmet users. Still almost all severe head injuries appeared among drivers despite the use of a helmet.

Most adolescents in our study had been driving at speeds which they estimated to be only slightly higher than bicycle riders. Still, adolescents driving mopeds have had an almost 24-fold risk of injury compared to bicyclists (8). Young drivers have been

proven to take unnecessary risks in traffic (9, 10, 11) and inadequate capability to master the vehicle also adds to the risk. Even adults need practice before they can participate in road traffic driving a scooter (12). Nevertheless, only a written examination is required for moped drivers in Finland.

Based on our study and international results, we are concerned about the rapid rise in the numbers of moped and scooter related injuries. In Sweden and the USA preventive programs designed for adolescents have been found effective in decreasing the prevalence of traffic accidents (3, 13).

We suggest the launch of a preventive program including additional traffic education and mandatory driving practice for moped drivers.

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