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Cycling injuries and alcohol

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ABSTRACT

Background: Most of the cycling accidents that occur in Finland do not end up in the official traffic accident statistics. Thus, there is minimal information on these accidents and their consequences, particularly in cases in which alcohol was involved. The focus of the present study is on cycling accidents and injuries involving alcohol in particular.
Methods: Data on patients visiting the emergency department at North Kymi Hospital because of a cycling accident was prospectively collected for two years, from June 1, 2004 to May 31, 2006. Blood alcohol concentration (BAC) was measured on admission with a breath analyser. The severity of the cycling injuries was classified according to the Abbreviated Injury Scale (AIS).
Results: A total of 217 cycling accidents occurred. One third of the injured cyclists were involved with alcohol at the time of visiting the hospital. Of these, 85% were males. A blood alcohol concentration of $\geq$ 1.2 g/L was measured in nearly 90% of all alcohol-related cases. A positive BAC result was more common among males than females ($p < 0.001$), and head injuries were more common among cyclists where alcohol was involved (AI) (60%) than among sober cyclists (29%) ($p < 0.001$). Two thirds (64%) of the cyclists with AI were not wearing a bicycle helmet. The figure for serious injuries (MAIS $\geq$ 3) was similar in both groups. Intoxication with an alcohol level of more than 1.5 g/L and the age of 15 to 24 years were found to be risk factors for head injuries. The mean cost of treatment was higher among sober cyclists than among cyclists with AI (€2143 vs. €1629), whereas in respect of the cost of work absence, the situation was the opposite (€1348 vs. €1770, respectively).
Conclusions: Cyclists involved with alcohol were, in most cases, heavily intoxicated and were not wearing a bicycle helmet. Head injuries were more common among these cyclists than among sober cyclists. As cycling continues to increase, it is important to monitor cycling accidents, improve the accident statistics and heighten awareness of the risks of head injuries when cycling under the influence of alcohol.

Introduction

As cycling has become more popular, admissions to hospital due to cycling injuries are rising. According to previous studies, a third of patients tested for alcohol after bicycle-related accidents were found to be intoxicated [1,2]. Previous studies show that alcohol has a serious effect on cycling injuries. However, in most cyclist injury cases, data on alcohol impairment is missing. In a recent German study (n = 2 250), only 6% of cases contained information on acute alcohol use at the time of admission to hospital [3].

A strong correlation has been shown between cycling under the influence of alcohol and head injuries [4]. Alcohol intoxication is associated with higher medical costs when patients are hospitalised or discharged as a result of bicycle-related injuries [1,2,5]. According to a German study, only 13% of injured cyclist cases could be found in police reports [3]. The main reason for the high level of underreporting is the high proportion of singlecycling accidents, i.e. accidents that do not involve another party and the police [6,7]. In Sweden, however, there is a national information system (STRADA) containing data on traffic accidents and injuries based on traffic accident reports provided by the police, and on medical reports provided by hospitals [8].

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According to a study on the health burden of serious road injuries (defined as a hospitalised non-fatal road casualty with an injury score) in the Netherlands from 2000 to 2011, about half of the serious road injuries were due to bicycle accidents not involving a motor vehicle [9]. The proportion of casualties among ≥60-year-olds was relatively high (43% in 2011) in these accidents. Head injuries (31%) and injuries to the lower extremities (37%) were most prevalent [9].

In Finland, bicycle injuries are also highly underreported because most incidents are single accidents, which are not recorded in official statistics. In such cases the information is only recorded in the hospitals' patient record systems and possibly in the rescue services' statistics. Finland's official traffic accident statistics are maintained by Statistics Finland and are based on information from the police [10,11].

The purpose of the present study was to describe an overall picture of the involvement of alcohol in bicycle accidents occurring in a catchment area comprising 100,000 inhabitants over a period of two years. We analysed the injuries, their severity and the consequences of accidents involving alcohol (AI) and compared the findings with cycling accidents in which the cyclists were sober. Furthermore, the aim was to estimate the risk factors for head injuries.

Patients and methods

The staff in the Emergency Department (ED) of the North Kymi Hospital, Kouvola, Finland, prospectively registered consecutive cycling accident victims who visited the ED for 2 years, from June 1, 2004 to May 31, 2006. During this period, it was possible to collect the injury data directly in the electronic patient record system via an injury database created for this purpose. According to population statistics during the study years, the North Kymi Hospital (level II trauma centre) was responsible for an area comprising nearly 100,000 inhabitants. The catchment area is a typical area in Finland, including both urban and rural municipalities.

The data included type of injury, external cause of injury and diagnoses of injuries, all in accordance with ICD-10 (FM) classification (International Classification of Diseases, 10th version, Finnish modification) and the use of a bicycle helmet (yes/no/not known). In all cases the blood alcohol concentration (BAC) of the patient was routinely checked by the staff of the ED with a breathalyser, and expressed as g/L.

Bicycle accidents were identified according to the external cause of injury (codes V10–V19 in ICD-10 FM). If the patient was referred for further treatment to the nearest central hospital of Kymenlaakso (level I trauma centre) or to the Department of Orthopaedics and Traumatology, Helsinki University Central Hospital (level I trauma centre), the patient's injury data was obtained from these hospitals.

The data was then checked and augmented with the following data, obtained from patient records or determined by the researchers: treatment of injury, length of stay as an inpatient in hospital (LOS), severity of injuries through two classifications and the period of absence from work.

The severity of the injuries was classified retrospectively according to the Abbreviated Injury Scale (AIS) version 2005 [12], and the New Injury Severity Score (NISS) [13] by one of the authors (P. L., surgeon in orthopaedics and traumatology). AIS classification has become internationally recognised due to its coverage and sensitivity [12]. On the AIS, injuries have been divided into nine categories according to body region: head; face; neck; thorax; abdomen; spine; upper extremity; lower extremity; unspecified. Severity has been assessed on a scale from 1 to 6 (1 = minor; 2 = moderate; 3 = serious; 4 = severe; 5 = critical; 6 = maximal. More generally, injuries have been classified as minor (AIS 1–2) or major (AIS 3–6). AIS classification does not involve assessing the combined effect of injuries; each injury is assessed separately, and an individual patient may be assigned several AIS values. The overall severity of injuries has been depicted with the MAIS (Maximum AIS) value. MAIS is defined as the patient's highest AIS value if there is more than one injury [12].

Furthermore, as a complementary classification to MAIS, the New Injury Severity Score (NISS) was calculated. The NISS [13] is a simple modification of the Injury Severity Score ISS [14]. ISS does not take into account multiple injuries in the same body region. NISS sums the squares of the three most severe injuries, regardless of the injured body region.

Direct costs (i.e. healthcare costs) of bicycle-related injuries were calculated using the hospital district price list and indirect costs (i.e. sick leave costs) to employers were estimated on the basis of the Finnish average salary statistics (€3378). All costs were expressed according to the 2017 price level.

The risk for head injury was analysed by calculating odds ratios (OR) with 95% confidence intervals for selected variables. Consequently, the adjusted odds ratio (OR) curves with 95% confidence intervals were drawn to graphically describe in detail the OR values for the observed risk factors. The detailed OR values were calculated densely using a smoothing procedure. The-weighted smoothing was performed with weights 1–2-4-2-1.

A statistical analysis was performed using SPSS software version 25. The χ^2 –test, the *t*-test and the Mann-Whitney test were used. The p-values of < 0.05 were considered statistically significant.

The study protocol was approved by the Ethics Committees of the Kymenlaakso Hospital District.

Results

During the two-year period, a total of 217 cyclists were involved in accidents, leading to a total of 307 injuries. The proportion of male drivers was 60% (n = 131). One third (31%, 67/217) of the injured cyclists were involved with alcohol (AI) at the time of visiting the hospital and 85% of them were males (n = 57). High alcohol levels predominated; 87% of all patients with AI had a breathalyser reading equal to or more than 1.2 g/l. The mean age of cyclists with AI was 43.7 years (SD 13.5) and the median was 39.3 years. The corresponding figures of sober cyclists were 37.0 years (SD 24.5) and 40.9 years. There was significant difference in mean age between these groups (t = 2.553, d.f. = 205.78, p = 0.011).

There was a significant difference in the figures of positive breathalyser results between males and females (57/131, 44% vs. 10/86, 12%, respectively) (χ^2 = 23.26, d.f. = 1, $p < 0.001$). Of the male cyclists with AI, nearly half (46%) were in the age group 35 to 49 years. (Table 1)

There were also two fatalities (not included in the data). Both involved collisions with a motor vehicle. Head injury was the cause of death in both cases. Neither of the victims was wearing a helmet. One of the victims died at the scene of the accident and the other was transported from the accident site via an ambulance rescue helicopter to Helsinki University Central Hospital, where the patient died.

Circumstances of accidents

Single accidents, i.e. accidents not involving another party, accounted for 81% of the cycling accidents (n = 174). The figures for accidents involving cyclists falling off their bicycles on their own were even higher for cyclists with AI (61/67, 91%) than for those without AI (113/150, 75%) (χ^2 = 6.24, d.f. = 1, p = 0.012). Cyclists with AI were more likely to have an accident on a weekend than those who were sober (43/67, 64% vs. 48/150, 32%) (χ^2 = 18.40, d. f. = 1, $p < 0.001$). The time of the accident remained unknown in 54