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CYCLISTS' INJURIES IN TRAFFIC

ABSTRACT

Among numerous participants in road traffic there are also the cyclists. Cycling has become during the recent years one of the major components of the modern living, even in Croatia. In almost all the developed countries of the world, cycling is emphasised as an activity which improves health and contributes to the improvement of overall physical fitness and environmental protection. During the period between 1 January 1996 and 31 December 1999, an analysis of the number of cyclist accidents in road traffic was carried out. Special attention was paid to the number of injured cyclists. In 1996, in road traffic, there were 1,218 cyclist accidents in which 912 (74.9%) cyclists were injured. In 1997, there were 1,146 incidents and accidents, with 854 (74.5%) injured persons. In 1998, there were 1,167 accidents, 887 (76.0%) injured. In the last study in 1999, the total number of cyclist accidents amounted to 1,230, and the number of the injured cyclists was 924 (75.1%).

Every event resulting in a more or less severe disability is a great distress and great damage to every injured person as individual as well as for the family and eventually for the society as a whole. This paper recommends certain measures and procedures that should substantially reduce the traffic accidents and incidents which involve cyclists.

KEY WORDS

cycling, cyclist injuries, intensity indicators

1. INTRODUCTION

The popularity of cycling has been increasing over the recent years, not only in Croatia but also in the whole world and thus it represents one of the major components of the modern way of living. On the one hand, bicycle is a means of transport and it serves people to travel to work or for work, such as e. g. professional racing riders, couriers, tourist drivers, schoolchildren, students, housewives when going shopping, and workers going to work, mainly from suburban and rural places. On the other hand, cycling may be just fun, recreation or a sports discipline. In almost all the developed countries in the world, the fact is emphasised that cycling contributes to better health and better physical condition of people, as well as to envi-

ronmental protection which is of special significance for today's world ^(1,2).



Figure 1 – Mountain bike

Source: www.marin.co.uk/marin-2003/indianfiretrail.php

In the history of cycling, the first vehicle that could have been similar to a bicycle was mentioned in 1447 in the Chronicle of the City of Meiningen in Germany (Ljubić, S.: 80 years of cycling in Croatia, Almanac, Cycling Association of Croatia and Newspaper Publishing Company: "Sport Press" Zagreb, 1965, p. 9).

The Nuernberg Chronicle mentions that one blacksmith in 1649 made a vehicle similar to a bicycle that could travel a distance of 2000 steps in one hour. In France, Richard, a doctor, designed in 1693 a rider-propelled cart. There were other similar vehicles at that time with wooden wheels that were not iron-rimmed.

A watchmaker, S. Fartler, born in 1663, who was paralysed since his youth, made for himself a three-wheeled cart in order to move around.

In 1769 a two-wheeled, rear-wheel-rider-propelled cart was made. In 1790 the Conte de Sirvac in France made a two-wheeled cart called Célérifère or vélocifère. Both wheels were equal and connected, and the rider propelled himself simply by paddling his feet against the ground. Naturally, these vehicles were of no special practical significance and a whole series of innovations followed. Thus, in 1817, the Baron Karl de Drais de Sauerbrun in Germany designed a two-wheeled, rider-propelled machine, but adding a steering handle. It was called a draisienne. He trav-

elled on this two-wheeled cart from Mannheim to Schwetzingen, a distance of 14.1 km in one hour, which means four times faster than the stage-coach (Stadt Stadtarchiv 1985, p. 45). He made several different patents and was therefore nominated professor of mechanics, and the bicycle, "Fahrrad" became a subject at the High School (Kähler R.: Grundlegende, Betrachtung über das Fahrradfahren zum Hochschulort, in: Woermann tt.: Perspektive Fahrrad, Mayer und Meyer Verlag, Aachen 1994, p. 39).

Further development was a two-wheeled, front-wheel-rider-propelled machine, designed by Prof. J. Bazider made of wood, which had been in use until 1820, and is now exhibited at the Technical Museum in Munich.

In 1839, in Great Britain, Patrick Macmillan designed a two-wheeled pedal-propelled cart. A two-wheeled cart on high wheels was designed by a music-instrument builder, Ficher around 1855, and in 1884, his son founded in Schweinfurt the first factory of steel balls, important component of the ball bearings, which was a great contribution to the development of all kinds of vehicles, including bicycles.

In 1861, a cart-wright, Pierre Michaux designed a two-wheeled cart with a big front wheel propelled by pedals, showing it at the 1867 Paris exhibition. The wheels before that period, either of wood or metal, were impractical, and in 1868 Clément Adler, one of the aviation pioneers, invented a rubber hose, covering the wheels.

It was H. J. Lawson in 1874 in England who invented the chain-driven bicycle and in 1876 John Kemp Starley made a bicycle with the wheels of equal diameter.

Pneumatic tyres were invented in 1888 by an Irish veterinarian, John Boyd Dunlop, and the rhomb-like bicycles date from 1890.

The generally accepted inner tube, which could be replaced, was invented in 1891 by a Frenchman, Michelin. At the end of the 19th century the bicycle became a generally accepted means of transport, which emphasised even more the increasingly advanced innovations reaching to the present types of bicycles, designed for specific purposes.

Bicycle is a transport vehicle which can serve people to transport themselves or some smaller cargoes, providing propulsion of their own. Cycling follows the laws of linear movement and movement along the curves.

In 1790, the Frenchman de Seiverac designed a vehicle called "célerifere" which the rider propelled by pushing his legs against a hard surface. In 1867, the Englishman Madison introduced a wheel with wire spokes, and in 1888 an Irish veterinarian, J. B. Dunlop introduced pneumatic tyres.

When riding a bicycle there is a possibility of colliding with other vehicles. The most frequent types of collisions involving cyclists include road vehicle-cyclist collisions and side collisions. Regardless of the situation in traffic or the circumstances that caused the collision with a motor vehicle, passenger car or cargo vehicle, the cyclist is usually the one who is likely to be more or less severely injured, regardless of who is to blame for the accident. Depending on the speed of the cyclist and the motor vehicle and the angle at which the collision occurred, the cyclist is usually thrown off, and in the majority of cases according to the law of the curve trajectory.

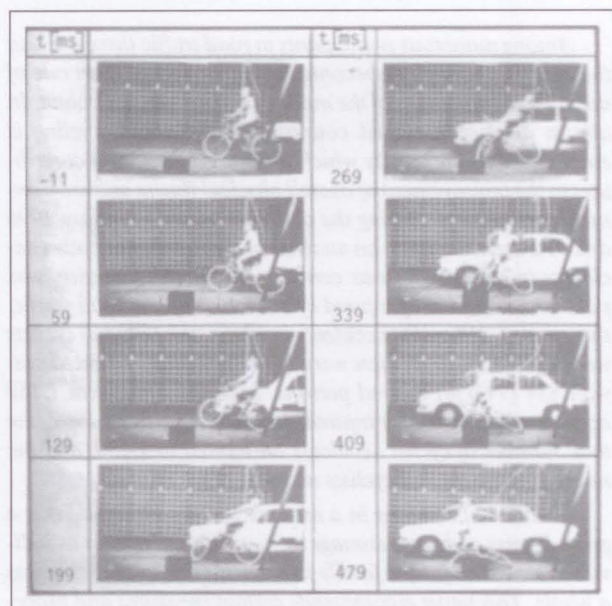


Figure 2 – Cyclist – vehicle collisions

Source: Rotim F. Elementi sigurnosti cestovnog prometa, Vol. 3, Zagreb, 1992.

Since the bicycle represents an unstable and unprotected transport vehicle, every cyclist should take care of the proper functioning of the bicycle. Special attention needs to be paid to the proper functioning of the handlebars, brakes, pneumatics and lights. The handlebars have to be firmly fixed, should not move and have to be aligned with the front wheel. The brakes are the most important mechanical element on the bicycle, as on any other vehicle. The brake pads have to lean properly against the wheel rim (not coming into contact with the outer pneumatic) and they should be checked regularly, and if necessary replaced, since otherwise, braking would be ineffective. The pneumatics have to have adequately deep grooves, be sufficiently inflated and under required pressure that needs to be checked regularly. Worn out and damaged pneumatics should be replaced by new ones, due to the friction forces that occur between the pneumatic and the surface. Obsolete tyres, regardless of the groove depth, also need to be replaced because

over time they lose their elastic properties contributing to the bicycle lack of safety. Bicycle needs to be fitted with front and rear lights. The pedals and the spokes should be equipped with catadioptric lenses that are also recommended on the cyclist's clothes and footwear.

In technical terminology, a traffic incident is defined as a type of traffic event which involves only material damage on the vehicle, road or environment, without human casualties⁽³⁾. Accident is a traffic event which apart from material damage involves also human casualties. Fatal injuries are those that cause direct death at the place of the traffic accident or 30 days from the accident at the latest (according to a recommendation by WHO – World Health Organisation). In forensic medical investigation the death caused by traffic accident is divided into death on the scene of the accident, death in transport or death in the hospital within the period of 30 days.

Analysing the works by Swedish authors (4, 5), who deal with the same issues, some interesting data may be found. The number of cyclists at the age between 25 and 64 doubled in the period between 1980 and 1993. Every third Swede older than 65 uses bicycle the whole year round. In the period between 1967 and 1996, 47% of all cyclist fatalities were accounted for by those older than 65.

The concern due to the great number of fatalities and heavy injuries related to cyclists has brought to extensive efforts and programs for their prevention in many countries of the world. However, the concern is not universal. For instance, in France (6) the attitudes towards safety in cycling are quite different. In order to be able to understand better the distinctions in the safety of the cyclist behaviour in towns, the study compared the cyclists in Paris and in Boston. Special focus was on the usage of protective helmets and lights at night. Among 5,808 registered cyclists, there were big differences in the usage of protective helmets and lights. Only 2.2% of Paris cyclists wore the helmet compared to 31.5% in Boston. As a great contrast – 46.8 % of Paris cyclists had their front or rear light on during night-ride, compared to only 14.8% in Boston. These big and at first glance seemingly contradictory data are the result of different laws and different priorities in the public health, types of cycling, and perception of risk.

2. EXAMINEES AND METHODS

For the needs of this research the data about the cyclist fatalities in the Republic of Croatia were analysed over a period of four years. The data were collected from the police reports of the Department of Traffic Police - RH MUP, written during investigations at the very site of the accident.

In the data analysis the descriptive statistics was used as well as the spreadsheet presentation of data.

3. RESULTS

Table 1 - Data on vehicles, motorists, and the injured persons in road traffic

Year	No. of reg. mot. veh.	No. of inhab. per 1 veh.	No. of motorists	No. of persons killed	No. of persons injured
1996	1,008,878	4.7	1,526,667	721	16,182
1997	1,142,201	4.2	1,628,919	714	16,234
1998	1,241,522	3.9	1,701,736	646	18,118
1999	1,323,653	3.6	1,753,749	662	18,103

The analysis encompassed a four-year period from 1 January 1996 to 31 December 1999, for the whole territory of the Republic of Croatia⁽⁷⁾. In the first observed year, 1996, the number of persons killed was 721. In 1997 the total number of persons killed in road traffic accidents was 714 and in the following year it was 646. In 1999 the number of fatalities was 662.

Cause of special concern is the data indicating that the number of injured persons in road traffic accidents is growing annually. In 1996 there were 16,182 persons injured, and in 1999 as many as 18,103, which means 1,921 more. On the other hand, the total number of fatalities has somewhat decreased. In the initial year of the study, 721 persons lost their lives, and in the last year observed, 59 persons fewer, which means a total of 662. This is still a large number. It should be noted that every killed or injured cyclist represents a huge loss for the family, the work institution, colleagues, associates at work, but also for the human society as a whole.

Table 2 - Share of the injured cyclists in bicycle accidents

Year	Bicycle accidents	Injured cyclists	%
1996	1218	912	74.9
1997	1146	854	74.5
1998	1167	887	76.0
1999	1230	924	75.1

Table 2 shows that the bicycle accidents are constantly present in a great number of every observed year. They show a high share of injured cyclists, ranging from 74.5 to 76.0%. This means that about 1 of bicycle incidents include an injury registered by the traffic police as bicycle accident.

However, this number of the registered injured persons is not the real indicator of the actual condition. It amounts to only 25-30% of the actual number of the injured, which is confirmed by the data available in the world literature. Countries which are very precise in keeping the data about every incident and accident, and in treating the injured in the clinics of first aid medical help and the departments of surgery, claim that the situation regarding the registry of the injured is similar (Sweden, US)^(5,8).

4. CONCLUSION

The study encompassed a four-year period from 1 January 1996 to 31 December 1999 for the whole territory of the Republic of Croatia. The number of the injured persons in road traffic has been growing annually. The number of bicycle incidents and the share of the injured cyclists stay constantly high and vary just slightly.

By analysing the gathered data, the following preventive measures are recommended and they should be implemented in road traffic:

- Ergonomic approach to planning and organising of road traffic:
 - urban planning,
 - physical planning of traffic routes and the environment, with maximum green areas, and cycling lanes for urban and suburban traffic,
 - construction and maintenance of high-quality traffic routes, with special attention to the design of the surfaces along the carriageways;
- Education, upbringing, and maintaining of traffic awareness, warnings of more careful and slower driving. Stimulating of education and courses with adequate literature and experts in the field of traffic medicine;
- Medical checks with differential diagnostic separation between the healthy and the ill persons, with special attention to the functional capabilities of people when driving;
- Stimulating further research presented according to this model over a longer period of time, contributing to the long-term and more precise forecasts and data processing on traffic accidents;
- Every cyclist should take care about the technical safety of their bicycle;
- Wearing helmets especially in case of children and young cyclists who had not acquired enough experience in cycling and in knowing the traffic rules and regulations;
- Introduction of lessons into primary education on teaching about the road traffic regulations and rules of cyclists' behaviour.

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SAŽETAK

OZLJEDE BICIKLISTA U PROMETU

Među brojnim sudionicima u cestovnom prometu kreću se i biciklisti. Vožnja biciklom posljednjih je godina i u Hrvatskoj, jedna od važnih komponenti suvremenog načina života. U gotovo svim razvijenim zemljama svijeta, ističe se da vožnja biciklom pridonosi unapređenju zdravlja i poboljšanju tjelesne kondicije te očuvanju okoliša.

U promatranom razdoblju, od 01. siječnja 1996. godine do 31. prosinca 1999. godine, analizirali smo broj biciklističkih nezgoda u cestovnom prometu. Posebno smo izdvojili ozljede ne bicikliste. U cestovnom prometu 1996. godine ozlijeđeno je 1.218 sudionika. Od toga je 912 (74,5%) bilo ozlijeđenih biciklista. U 1997. godini, bilo je 1.146 nezgoda, ozlijeđenih 854 (74,5%). Godine 1998. desilo se 1.167 nezgoda, 887 (76,0%) ozlijeđenih. Posljednje ispitivane 1999. godine, ukupni broj biciklističkih nezgoda bio je 1.230. a od toga 924 (75,1%) biciklista su ozlijeđeni.

Svako nastajanje lakšeg ili težeg invaliditeta je velika šteta za obitelji i društvo u cjelini. Predlažemo odgovarajuće mjere i postupke, kojima bi se prometne nezgode i nesreće u kojima stradavaju biciklisti bitno smanjili.

KLJUČNE RIJEČI

smrtno stradali biciklisti, indikatori intenziteta

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