

An Analysis of Serious Bodily Injuries in Road Traffic and the Role of the Emergency Room

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Abstract:

Research Question (RQ): How many serious bodily injuries occurred as a result of traffic accidents, and what kind of injuries were those in 2020?

Aim: To determine how many seriously injured participants in traffic accidents were in 2020, our purpose was to determine what is the proportion of serious bodily injuries by sex, in which age group the most severe injuries occurred and what is the impact of weather on the number and severity of serious bodily injuries.

Method: After reviewing the relevant literature, we used frequency statistics and chi-square tests for the data obtained from the official police website. For the quantitative method, we used an in-depth semi-structured interview with two relevant experts in the field.

Results: Regarding road traffic hazards, there are differences between males and females, the youngest and oldest are most at risk in road traffic, and more severe injuries occur in nice weather.

Organization: The establishment of an effective traffic safety system is possible only with the prior identification, analysis and elimination of critical causes that affect safety.

Society: Greater road safety requires changes in the individual's thinking and acting as a road user.

Originality: The originality of the research lies in using a combination of quantitative and qualitative research methods. The topic is very interesting from a social point of view.

Limitations/Future Research: The COVID-19 pandemic affects the results. The research should be done for a more extended period, at least ten years.

Keywords: traffic, accident, serious, bodily, injury, sex, age, weather.

1 Introduction

Life is unique and unrepeatable. In different segments of life, we adapt from day to day to a given situation marked by pleasant or unpleasant events. Injuries and dangers lurk at every turn and if we do not pay attention to them or do not anticipate them, they can leave lasting consequences.

The development of technology is a part of human evolution. The fast pace of life led to the creation of fast and more advanced means of transport, sometimes even too much to manage, resulting in consequences such as material damage, bodily injury or even loss of life. Minor injuries are easier to manage and heal easily (abrasions, scratches), while more extensive injuries are harder for the body to compensate, which often results in further malfunctions or even permanent deficiency (Traumatic amputation - removal of a limb or part of it due to serious bodily injury or accidents, ...).

Different means of transport require different handling and different abilities, and each of them requires certain knowledge, skills and regulations that need to be followed. The younger population of drivers are known as "reckless speeding drivers", so we anticipate that there will be more serious traffic accidents during this period. Due to aging and longer response time, an increased number is expected even after 65 years of age. By sex, women still fall into the category of "poorer" drivers, and in terms of weather, it is expected that due to the slippery road and opacity, there will be more seriously injured road users. We achieve anticipation of situations through experience and practice as road users.

Any injury can radically change the lives of survivors and their relatives. Rehabilitation (functional therapy) is long-lasting, and the consequences are manifested in the physical, mental, emotional and behavioral areas, as well as in the subsequent inability to work, social dependence and decline in quality of life (Trdan, 2010, p. 239).

The research question refers to the number of serious bodily injuries in traffic and the nature of these injuries.

The consequences of serious traffic accidents are bodily injuries that can leave a certain permanent disability as well as death. The aim is to determine the number of serious bodily injuries after traffic accidents, the proportion by gender of participants, the proportion by age groups and the impact of weather, with the aim of establishing a safe road traffic system with prior identification, analysis and elimination of key causes for the lack of traffic safety. We strive to achieve the goal: "Zero dead and zero seriously injured", by respecting road traffic regulations and observing driving ethics while participating in road traffic.

2 Theoretical background

2.1 Literature review

The first fatality of the car dates back to the time of its creation. Since the end of the 19th century, more than 50 million people have died on the road worldwide. Every day, 3,700 deaths are recorded worldwide, which means one death every 24 seconds, and the consequences are immeasurable human suffering (WHO, 2020). Although the number of deaths has almost halved in the last century, 34,500 people died on EU roads in 2009 (European Commission, 2011, p. 12), and in 2018 about 25,100 people, which is 21 % less than in 2010 and 1 % less than in 2017. In 2018, 44 people per million inhabitants died on the roads in Slovenia. In 2017, the death rate decreased by 13 %, the largest decline in the EU as a whole and by 34 %, compared to 2010. In addition to fatalities, the EU also focuses on the seriously injured and it is estimated that there were five other seriously injured people on the roads of the EU last year for every fatal accident (around 135,000). Even though progress has been made over the long term, it is not enough to meet the 2020 target, but the Commission, in its Road Safety Policy for 2021-2030 and the Strategic Action Plan published in May 2018 as part of "Europe on the move", confirms the long-term goal of "Vision Zero" by 2050, which shows the need for thorough action by countries in synergy with the EU (European Commission, 2019).

The persistently high number of fatalities and serious bodily injuries in road transport, at a meeting in Valletta in March 2017, is assessed by the transport ministers of the EU Member States as a major social problem, human suffering and unacceptable economic costs, which amount to more than 100 billion euros just in the case of serious bodily injuries. The number of deaths among pedestrians and cyclists is worrying (Malta EU, 2017, p. 1).

Road safety is an important social issue in the Republic of Slovenia and the EU. As a consequence of traffic accidents, we monitor the loss of life and severe disability as irreplaceable and irreparable losses in families, society and the damage that society suffers as a result of traffic accidents. The worst consequences of traffic accidents are felt mainly by families with fatalities and serious bodily injuries (ReNPVCP13-22, 2013, p.1). Countries such as Norway, Sweden, Switzerland and the United Kingdom are designing a safe transport system that takes into account human error; they are building roads with safety features, adopting and enforcing strict laws for speeding, driving under the influence of substances as well as strengthening emergency medical care. With all of the above mentioned measures they managed to reduce the number of deaths by 80 % and more (WHO, 2020). In Slovenia, the number of road deaths has been declining for decades and has more than halved in the last 20 years. In the last 10 years, traffic accidents have claimed more than 190 lives per year, which is still too high, and the trend is also typical for most other European countries (ARSO, 2016). In 2017, 46 people lost their lives due to unadjusted speed. This is the cause of almost every other fatality on our roads, which puts us in the middle of the scale of all countries (Slovenian traffic safety agency, n.d.a).

However, transport is crucial for our economy and society. It enables economic growth and job creation. As it takes place on a global scale, effective action requires close international cooperation, which poses a major problem in congestion, especially on roads and in the sky, as it threatens accessibility. Mobility is essential for the internal market and the quality of life of citizens so that they can travel freely, so the quality, accessibility and reliability of transport services will become increasingly important in the coming years. Initiatives in technology, education and special attention to vulnerable road users will be of a key importance to further sharply reduce the number of accident victims (European Commission, 2011, pp. 3-12). Due to the aging population (Statistical Office of the Republic of Slovenia, 2017), a greater need to promote public transport is expected in the coming years.

From 2013 to 2022 The National Road Safety Program deals with professionally demanding and most visible road traffic problems in the Republic of Slovenia (RS) and is based on three common principles: (1) enforcement of the best road safety standards, (2) a comprehensive approach to road safety and (3) subsidiarity, consensus and shared competence. The European Road Safety Charter is an example of commitment from individual actors. The common goal of the Member States was to save as many lives as possible in road transport by 2020 and to halve the number of deaths and serious bodily injuries. The global goal is the same as in previous years, although it has not been fully achieved. Continuing to achieve the United Nations Global Road Safety Goal - to reduce the number of deaths and serious bodily injuries by 50 % by 2030, is also supported by the Stockholm Declaration adopted at the 3rd Global Ministerial Conference on Road Safety in Stockholm. This Resolution for the period 2021-2030 is an urgent development priority and a milestone on the road to "Vision Zero" when there will be no more deaths and serious bodily injuries by 2050 (General Assembly, 2020, pp. 2-3; Malta, 2017, p. 4; ReNPVCP13-22, 2013, pp. 1-10; Stockholm Declaration, 2020, pp. 1-4). In 2019, the city of Helsinki in Finland managed to achieve this status (WHO, 2020). Nevertheless, the World Health Organization (WHO) and the Centers for Disease Control (CDC) cite road accidents as the leading cause of death due to injuries in the most productive age, more than 90 % of road accidents in developing countries (American College of Surgeon, 2018, pp. XXX).

2.2 Rescue in traffic accidents

A traffic accident is an accident on a public road or uncategorised road used for public road traffic in which at least one moving vehicle was involved and in which at least one person died or was physically injured or material damage was caused (ZPrCP- UPB2, 2013, Art. 109, para. 1). According to the consequences, traffic accidents are divided into four categories (ZPrCP-UPB2, 2013, Art. 109, item 2):

- traffic accident of the 1st category - a traffic accident in which only material damage occurred;
- traffic accident of the 2nd category - a traffic accident in which at least one person may be lightly injured;

- traffic accident of the 3rd category - a traffic accident in which at least one person is seriously injured;
- traffic accident of the 4th category - a traffic accident in which someone died or died as a result of the accident within 30 days after the accident.

The approach to rescuing participants in a traffic accident is multidisciplinary, as medical staff, firefighters and police officers are activated at the same time. Firefighters are present in most serious traffic accidents; they protect the terrain, extinguish possible fires, prevent the spillage of hazardous substances as well as insure and stabilize unstable vehicles. By cutting down vehicles, they enable the access and removal of trapped victims and, last but not least, they take part in medical care. Police officers mark and secure the scene of an accident, take care of the smooth work of rescue teams and assist in rescue (Slovenian Society for Emergency Medicine, 2013).

Treatment for the severely injured in the field is an important link in the survival chain and depends largely on time. This time includes the arrival of the Emergency Medical Services (EMS) team at the scene of the accident, the time of treatment for the injured in the field, the time of transport to the hospital and the time lost with emergency diagnostics before final treatment for life-threatening injuries. This shows that treatment for the injured person in the first few hours is extremely important, so it is essential that everything that increases the chances of survival is done in the field and to avoid anything that is potentially life-threatening. The treatment is complex. In stressful circumstances and under time pressure, coordinated teamwork according to treatment protocols is required. These protocols enable the systematic identification of life-threatening conditions and their appropriate care in the shortest possible time. In the Slovenian system of pre-hospital treatment of emergency medical services, the approach to the injured person is carried out according to the ITLS protocol (International Trauma Life Support), in the hospital environment or in the emergency center, the approach according to ATLS (Advanced Trauma Life Support) (Skutnik, 2019, pp. 30-31; Škufca Sterle, 2015, pp. 50-51).

2.3 Most common severe bodily injuries in traffic accidents

Most injuries (80 %) of the abdominal organs are due to blunt force injury, although the incidence of penetrating injuries (the object that caused the wound and penetrated one of the body cavities) has been increasing in recent years. The most common causes are traffic accidents (75 %) with the most commonly damaged liver and spleen and it is associated with a high rate of morbidity and mortality (Strgaršek Vovk, 2019, p. 50). Chest injuries are the third most common, just behind head and limb injuries. They rarely occur in isolation and most casualties have associated injuries to other regions, most commonly the head. They are the second most common cause of fatal injuries after head injuries (Demetriades et al., 2004, p. 20; Verma, White & Mohammed, 2018, p. 171; Žličar, 2014, p. 137).

Approximately 6,000 people a year in Slovenia suffer various head injuries. In 25 % of patients, head injury is associated with traffic injuries. About half of patients die before they arrive at the hospital (Prestor, 2014, p. 109). Gradišek (2014, p. 113) states that at first glance this is small, but head injury is a public health problem, as it is the cause of premature mortality and disability, especially among the younger, working population. The incidence of head injuries is also affected by alcohol consumption and poorer economic status. Similar observations are cited by Matvoz (2019, pp. 75, 82). The population is aging, anticoagulant therapy (anticoagulant therapy) is on the rise, making falls more frequent as well as bleeding in the brain area. In the case of a severe head injury, we always think of the simultaneous injury of the cervical spine.

The incidence of falls increases with age and is the most common mechanism of injury in persons over 65 years of age. The problem of falls is not only in frequency, as athletes and children are more often injured, the problem is a combination of frequency and consequences. Falls are usually a combination of several environmental factors, and it is also necessary to take into account the anatomical and functional changes of the individual. Injuries occur more quickly in the elderly and as a result of weaker forces; risk factors include, in addition to age, the individual's state of health, the use of drugs that, when known during treatment, allow targeted treatment and prevention of the worst possible consequences or even death. The consequences of all falls are major or minor injuries, but they can also leave mental (fear, depression) and social consequences (long-term care, placement in a home for the elderly). Due to the aging of the population, which is predicted in the future, the number of hospitalizations will also increase (Šmid, 2019, pp. 181-188).

Spinal cord injuries are certainly one of the worst injuries in the world, psychophysically devastating for an individual and a very heavy burden for society as a whole. According to US data, the average patient with a spinal cord injury is 38 years old. In 2013, the University Clinical Center (UKC) Ljubljana recorded 1,050 total spinal injuries. (Omerović, 2014, p. 120). Pelvic fractures, according to dr. Kristan et al. Vidmar (2014, p. 133) account only for 3 % of all injuries, of which almost half of the cases are due to high energy damage (traffic accidents, falls from a height), and in just over 50 % as a result of low energy damage (fall from standing height - osteoporosis). According to the age distribution, there are two peaks, the first is in people aged 20 to 40 (male predominance) and the second is in people older than 65 (female predominant). The mortality rate varies between 3 and 20 %, most often as a result of bleeding or multiple injuries (multiple injuries) of the injured person.

The data obtained at the site of the injury is very important:

- fatalities at the scene;
- vehicle type and speed;
- vehicle rotation (overturning mechanism is associated with a risk of serious injury);
- the location of the injured person in the vehicle (side impact to the injured person's side);

- extent of intrusion into the passenger compartment (vehicle intrusion into the passenger compartment);
- the extent of damage to the vehicle;
- deformation of the steering wheel (increased probability of damage to the internal organs of the driver and front passenger);
- use of seat belts (Chance's fracture of the spine - injured in a collision with a seat belt only around the belt);
- actuation of front or side airbags;
- a strong blow to the abdomen;
- contusion marks (change in the body / skin that usually results from a blunt blow; subcutaneous bleeding - spotted, capillary, such as redness or bruising and may indicate the possibility of severe damage to internal organs).

The extent of pedestrian injury varies depending on the speed and size of the vehicle involved in the accident. Pedestrians are often affected by a triad of injuries, namely leg, torso and head injuries. Therefore, in the event of damage to one of these sites, a rapid and careful evaluation of the other two must follow. Regardless of the injury, the initial approach to treatment of the injured is the same. The primary examination is based on a systematic examination of the injured person and is aimed at finding life-threatening conditions. Patients with severe blunt (closed) injury rarely have damage to only one system, so other causes of obstructive (reduced blood flow due to mechanical obstruction) or hemorrhagic shock (reduced blood flow due to bleeding) should be actively sought and ruled out. Further treatment depends on a risk assessment for significant injury. Most abdominal injuries are due to blunt force injury (80 %). The most common causes are traffic accidents (75 %), blows to the abdomen (15 %) and falls (6-9 %). It is necessary to know the anatomy (morphology - shape and structure of man) and pathophysiological processes (changes in bodily functions) that the injury triggers. The approach will vary according to the patient's age, comorbidity (co-morbidity), mechanism of injury, clinical status (description of the condition according to examination findings), and hospital capacity. Injuries can have a wide range of clinical pictures, from an injured person with normal vital signs and minimal pain to an affected injured person in shock. The details of the mechanism of injury of the prehospital team are of great help in predicting the severity and specificity of injuries and deciding on additional investigations (Strgaršek Vovk, 2019, pp. 50-64; Žličar, 2014, p. 140).

Based on the forecast in the research, we assess how many seriously injured participants were in traffic accidents in the past year and what was the type of these injuries (minor, serious bodily injuries or fatal injuries). We are interested in whether there are differences in the gender of the severely injured and in which age group the most severe injuries belong. As weather conditions affect road conditions, visibility, concentration and responsiveness, we are also interested in whether they affect the number of serious injuries in road accidents and in which weather they are more severe.

Based on the above-mentioned questions, we came up with three hypotheses:

- Hypothesis 1: There are more men than women among those seriously injured in road accidents.
- Hypothesis 2: The frequency of serious injuries varies between age groups.
- Hypothesis 3: Serious bodily injuries are more common in bad weather.

3 Methods

3.1 Quantitative method

The theoretical part of the study will be devoted to a review of the literature on the number of road accidents, fatalities and serious injuries in road traffic in Slovenia. Collisions between road vehicles, between road vehicles and pedestrians, between road vehicles and animals or between immovable obstacles and a road vehicle, and collisions between road and rail vehicles are taken into account. Fatalities are those who died directly in the accident or after its consequences within 30 days. An injured person is any person who did not die but was slightly or severely injured in a traffic accident and needed medical care (SURS, 2015).

The data was obtained from the Ministry of the Interior (Policija, n.d.), accessible online. The data is reliable and valid. The file (Excel table) contains 26,073 data on participants in road traffic accidents for 2020 in Slovenia, which we used in the survey. We focused on serious bodily injuries that occurred in road traffic as a result of traffic accidents, calculated the proportion by gender between women and men, the division by age groups and the impact of weather on severe bodily injuries.

The following variables are therefore important for our research:

- Injury of the participant (severe bodily injury, death);
- Sex (male, female);
- Age (1-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90, >90);
- Weather (nice, bad).

The sample of the research represents the population of the participants in traffic accidents. Frequency statistics and the Hi-square test were used to analyze the data. All variables are of the nominal type. The results of the calculations are shown in the form of tables. Program R was used for the calculations.

3.2 Qualitative method

Qualitative research methods are increasingly used in the field of healthcare. The qualitative research process will be carried out in stages by the author Punch (2009, p. 17). To analyze the issue of serious bodily injuries, we chose one of the most commonly used methods in qualitative research, a semi-structured interview (Vogrinc, 2008, pp. 108-109). We conducted an interview with two experts who have been carrying out activities in the field of road safety and preservation of human life and health for many years. From an ethical point of view and

integrity, we will maintain their anonymity and name them in the article only as an expert / interviewee. The interview was conducted in person within a one-hour time frame. Guidance questions were compiled to conduct the interview: (1) How many people were seriously injured in traffic accidents this year and what were those injuries? What do serious injuries mean to you? Classification? (2) What is the proportion by sex of severely injured in road accidents? (3) To which age group do serious bodily injuries belong the most? and (4) Does the weather affect the number of serious traffic injuries and in which weather are they more severe? The interviews were recorded with a dictaphone. The result of the interview is two sound recordings. We made two transcripts and then two refined transcripts in Word files. The ATLAS.ti program was used for further processing.

Qualitative analysis was performed in six steps by the author Mesec (1998, p. 103): (1) editing the material, (2) determining the coding units, (3) open coding, (4) selecting and defining relevant terms and categories, (5) relational coding and (6) construction of the final theoretical formulation (paradigmatic model). In the first step, we edited the refined transcripts so that the files were suitable for import into ATLAS. In the second step, we determined the coding units. These are the key concepts that characterize completed whole interviews. In the third step, we performed the coding. Important segments of the text were associated with the corresponding codes. In the fourth step, we selected the relevant codes. In doing so, we combine, disaggregate, omit, or add new codes to certain codes. The term code is a common term for terms and categories. A category is a group (family) of related codes or related terms. In the fifth step, we looked for relations, superiority, subordination, causality, consequence, in short, relationships between codes. In the last step, we built a research model, a graphical and descriptive representation of the relationships between the codes.

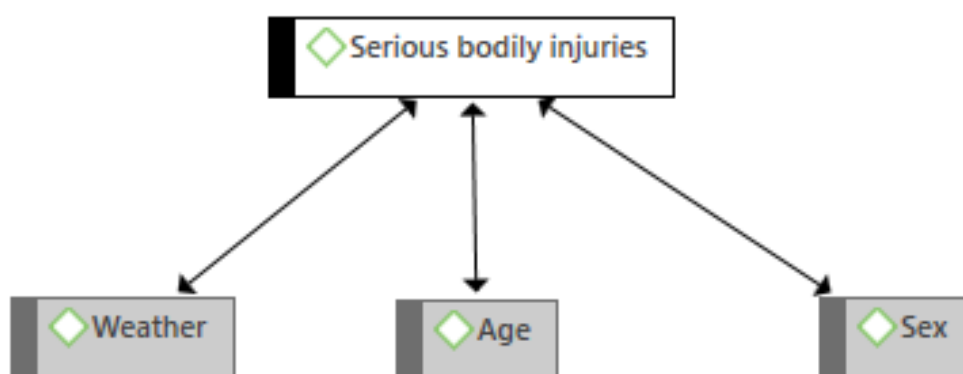


Figure 1. Research model (serious bodily injuries, sex, age, weather)

Figure 1 shows the research model: hypothesis 1 establishes the ratio of severely injured by gender; hypothesis 2 compares the ratio of severely injured by age and hypothesis 3 identifies serious bodily injuries as a result of the weather.

4 Results and discussion

4.1 Introduction to results

Table 1 shows the consequences of road accidents for 2020. The study covered all participants in road accidents regardless of gender or age, and we focused on serious bodily injuries, how much these injuries differ according to gender and at what age period they prevail. Because we consider all participants, the sample represents the population.

“A serious bodily injury is any that is potentially life-threatening,” a health expert explains: “fracture of 3 or more ribs, femoral fracture, cerebral hemorrhage, ... Injuries are diagnosed at a medical facility. All further procedures are related to the severity of the injuries and differ according to the treatment.”

The classifier of bodily injuries was written a few decades ago, in 1999 at the Institute of Forensic Medicine (ISM) in accordance with the rules of the medical profession and is used as a device issued by the Ministry of the Interior of the Republic of Slovenia. It is compiled on the basis of the legal classification of bodily injuries according to the Criminal Code (CC) of the Republic of Slovenia from 1994, which divides bodily injuries into 3 groups (categories): (1) minor bodily injury (Article 133 of the Criminal Code), (2) serious bodily injury. injury (Article 134 of the Criminal Code of the Republic of Slovenia) and (3) particularly serious bodily injury (Article 135 of the Criminal Code of the Republic of Slovenia) (Ministry of the Interior of the Republic of Slovenia, 1999; KZ-UPB1, 2004).

4.2 Hypothesis 1: There are more men than women among those seriously injured in road accidents

There were 26,073 participants in traffic accidents. There were 18,048 men and 8,025 women. There were 62 dead men, representing 0.3 % of all men, and 18 dead women, representing 0.2 % of all women. From this we can conclude that the risk of death is higher for men than for women. 678 people, 486 men and 192 women were seriously injured (Table 1).

Table 1. Frequency statistics of injuries of participants by sex

		Sex		Total	
		Male	Female		
Injury to the participant	Without injury	Frequency	14571	5727	20298
		% by sex	80.7 %	71.4 %	77.9 %
	Minor bodily injury	Frequency	2929	2088	5017
		% by sex	16.2 %	26.0 %	19.2 %
	Serious bodily injury	Frequency	486	192	678
		% by sex	2.7 %	2.4 %	2.6 %
	Fatality	Frequency	62	18	80
		% by sex	0.3 %	0.2 %	0.3 %
Total	Frequency	18048	8025	26073	
	% by sex	100.0 %	100.0 %	100.0 %	

According to statistics, men are more at risk than women in terms of serious bodily injury and death as participants in a traffic accident.

According to the interviewee in the field of traffic safety, this is in the ratio of 60 % : 40 % (men : women). While the health expert does not state the gender differences of the severely injured.

The CHI-square test (χ^2) has a value of 343.827, the degree of freedom (df) is 3, and the statistical characteristic (p) is less than 0.001 (Table 2). We can conclude that there are differences between men and women. Men are more at risk for severe injuries and fatal injuries, while women are more at risk for minor injuries.

Table 2. Pearson's CHI-squared test on injuries of participants by sex

	Value	df	p (2-sided)
Pearson's CHI-squared test	343.827	3	<0.001

"So there were more deaths among men than among women. From this it follows that women drivers are a bit more careful, following road traffic regulations and consequently less involved in road accidents. Traditionally, this can be largely attributed to the fact that women have lower driving intensities, drive fewer kilometers per year and are generally less risky road users than men. If we compare both sexes in the same risk group, with similar use of the vehicle and similar driving habits, the risk of accidents is very similar," says the expert in the field of traffic safety.

The results of a research conducted by a leading Spanish insurance company among young drivers under the age of 30 between 2009 and 2011 show a higher number of kilometers driven per day for men (34.02 compared to 28.10 for women), as well as more frequent violations of speed limits (9.08 % for men compared to 7.09 % for women), a higher percentage of night driving than women (8.41 % compared to 6.08 %). The test results show that the differences between men and women are statistically significant for the age of vehicles, which is on average lower in vehicles owned by women than men, years of experience, km / day, percentage of city and night driving and violations of speed limits. Therefore, we conclude that men generally represent more risky driving patterns than women (Ayuso, Guillen & Pérez-Marin, 2016, pp. 3-5), thus allowing Hypothesis 1 to be confirmed.

4.3 Hypothesis 2: The frequency of serious injuries varies between age groups

Our goal in the research was to find in which age group were the serious bodily injuries most frequent. In the case of minor bodily injuries, serious bodily injuries and fatal injuries, young people up to 20 years of age and those over 70 years of age are most at risk (Table 3).

Table 3. Frequency statistics of injuries of participants by age

Injury of the participant	Frequency-share	Age [years]										Total
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	>90	
Without	Frequency	31	1061	3860	4286	4114	3317	2144	1097	374	14	20298
	% by age	14.4 %	58.8 %	78.8 %	81.1 %	81.0 %	80.7 %	78.7 %	77.1 %	74.4 %	56.0 %	77.9 %
Minor	Frequency	165	659	957	911	827	661	469	264	96	8	5017
	% by age	76.4 %	36.6 %	19.5 %	17.2 %	16.3 %	16.1 %	17.2 %	18.6 %	19.1 %	32.0 %	19.2 %
Serious	Frequency	17	77	72	79	123	120	100	58	30	2	678
	% by age	7.9 %	4.3 %	1.5 %	1.5 %	2.4 %	2.9 %	3.7 %	4.1 %	6.0 %	8.0 %	2.6 %
Fatality	Frequency	3	6	12	12	13	14	12	4	3	1	80
	% by age	1.4 %	0.3 %	0.2 %	0.2 %	0.3 %	0.3 %	0.4 %	0.3 %	0.6 %	4.0 %	0.3 %
Total	Frequency	216	1803	4901	5288	5077	4112	2725	1423	503	25	26073
	% by age	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Over the last few years, people over the age of 65 have accounted for more than half of the perpetrators and victims of road accidents. The most common reasons are impaired hearing, vision, associated health problems with consequences, and medications, especially if these affect psychophysical abilities. As pedestrians, they stand out as a vulnerable group in traffic, who can suffer serious bodily injuries with bleeding due to falls and anticoagulants.

Both experts cite a problem with older drivers with fatalities and serious injuries. They are on the rise in the last 2 or 3 years, due to the presence of alcohol, slowness and confusion. However, awareness among young people and children is improving.

The expert in the field of traffic safety highlights the problem of alcohol and illicit substances in all age groups. It is slightly more pronounced among young people, reaching peak between the ages of 40 and 60, which coincides with the working population, busy pace of life, families, quality of life and employment. The problem is mainly posed by younger drivers in the first 3 years of driving experience, mopeds, motorcyclists and cars, with unadjusted speed to road conditions, which is also the most common cause of accidents. Among the victims and severely injured are very young, aged 18, 20, 22, 23, 24, 48, 54 years. We strive for the goal of no dead, no badly injured.

During the year, there are differences in the kind of activities related to the most vulnerable road users in a given period. From March and April to October, traffic control is adapted and tightened for single-seater cyclists, moped riders and motorcyclists. In October, however, the traffic control is tightened for pedestrians, because the night is longer. In a settlement without a street system and with a street system, compared to the motorway and the main road, there are more deaths and serious injuries due to unadjusted speed, to which vulnerable groups of road traffic (pedestrians, cyclists) are exposed, the traffic safety expert continues. By day, more casualties were reported on Monday, Thursday, Friday, Saturday and Sunday. More accidents occurred during rush hour from 6 to 9 a.m., from 12 to 11 p.m., a bit more in the afternoon. Road traffic control is also adapting to this. Friday, Saturday and Sunday are quite critical in the long run. "Disco" traffic accidents have improved compared to the past, in which young drivers can be a role model for further groups. The public, which condemns the most serious offenses, also draws attention to them by informing by calling 113.

2/3 of all fatalities are from the most vulnerable groups, the expert continues: pedestrians, cyclists, moped riders, motorcyclists, today's new means of transport such as electric scooters. The causes are very standard: more than 50 % of deaths are due to unadjusted speed, incorrect driving direction and disregard for traffic lights. Wrong way of driving direction and deprivation of right of way are a very common cause of traffic accidents (20 %), alcohol consumption is very problematic, which also differs by region - Dolenjska, Štajerska, Primorska have higher averages of fatal traffic accidents due to the higher alcohol consumption per person. In the last 10 years in the Celje Police Department 50 % of fatalities have been related to alcohol consumption.

The CHI-square test (χ^2) has a value of 1094.768, the degree of freedom (df) is 27, and the statistical characteristic (p) is less than 0.001 (Table 4). The HI-square test is statistically significant, meaning that there are statistically significant differences in the frequency of injuries between age groups.

Table 4. Pearson's CHI-squared test of the injuries of participants by age

	Value	df	p (2-sided)
Pearson's CHI-squared test	1094.768	27	<0.001

We can conclude that there are statistically significant differences between age groups and by this hypothesis 2 is confirmed.

4.4 Hypothesis 3: Serious bodily injuries are more common in bad weather.

The share without injuries is higher in bad weather (79.6 %) compared to all participants in bad weather, compared to the share without injuries in good weather (76.7 %). And this is true in terms of shares and absolute values (Table 5).

Table 5. Frequency statistics of injuries of participants due to the weather

		Weather		Total	
		Nice	Bad		
Injury of the participant	Without injury	Frequency	11846	8452	20298
		% by weather	76.7 %	79.6 %	77.9 %
	Minor bodily injury	Frequency	3116	1901	5017
		% by weather	20.2 %	17.9 %	19.2 %
	Serious bodily injury	Frequency	441	237	678
		% by weather	2.9 %	2.2 %	2.6 %
	Fatality	Frequency	50	30	80
		% by weahter	0.3 %	0.3 %	0.3 %
Total	Frequency	15453	10620	26073	
	% by weahter	100.0 %	100.0 %	100.0 %	

The weather conditions for the occurrence of severe traffic injuries coincide with three factors: the road, the vehicle and the driver. Deviation of one can have serious consequences. The statistics and data of the traffic safety expert differ here.

According to the expert, there are more serious traffic accidents in worse weather conditions, mainly due to poor visibility, slippery roads, damaged roads and unadjusted speed, which is the main cause of traffic accidents.

However, the calculation data show that there are more serious bodily injuries in good weather (441, 2.9 %) compared to bad (237, 2.2 %), which probably again confirms the fact of speeding and the higher number of road users.

$\chi^2(1) = 33.414$, $p < 0.001$. The test is statistically significant (Table 6). More minor bodily injuries, serious bodily injuries and fatalities occur in nice weather conditions, compared to the bad weather conditions.

Table 6. Pearson's CHI-squared test of injuries of the participants by weather

	Values	df	p (2-sided)
Pearson's CHI-squared test	33.414	3	<0.001

Hypothesis 3 is rejected on the basis of statistical calculation.

5 Conclusion

According to the data of the last few years, the situation on our roads is improving as a result of several factors: road construction, improvement of the vehicles of vulnerable groups in traffic, construction of dedicated areas for the most vulnerable groups: sidewalks, bike paths for pedestrians and cyclists - these are still lacking in some areas.

Traffic accidents are recorded in greater detail by days, hours, months, for a longer period of time. The statistics are very accurate, predictions are made of what will be happening in the future. Minor deviations are monitored, analyzed and measures for traffic control are adjusted accordingly. Serious bodily injuries in traffic accidents and fatal traffic accidents are a priority. The type, causes and goals of preventive and repressive activities in road traffic control go in the direction of prevention, reduction of the number of dead and severely injured. These include the implementation of activities with a national program in all areas of road safety, public debate and stricter control on the roads for people responsible for serious traffic accidents.

Compared to the previous five years, the number of seriously injured road users is increasing, but there is an improvement in the condition of both injured in traffic accidents and fatal traffic accidents. Based on the analysis of the situation and knowledge of traffic safety issues, in terms of planned and coordinated work, the most problematic areas are highlighted: speed, alcohol, mobile phones, safety of the most vulnerable groups in traffic (children, pedestrians, cyclists, the elderly) and the use of seat belts, which significantly mitigates the consequences of traffic accidents.

The Ministry of Public Health and the Council for Prevention and Education in Road Traffic (SPV) are cooperating in many activities, which are carried out according to the national

program. Activities are carried out for the elderly population: comprehensive preventive events or training for seniors and pensioners throughout Slovenia (Slovenian Traffic Safety Agency, n.d.b).

The problem, which will only increase, are drivers who, for health reasons, do not abide by road traffic restrictions. The elderly present a problem in individual situations in which they are no longer able to drive (driving at night, driving longer distances, etc.). The problem is in the system because the validity of the driver's license is too long and the formal system will need to be supplemented and systemic solutions introduced, including temporary incapacity for driving due to the current state of health - the expert appeals to change the traffic safety system. Problems also arise in the introduction of innovations, where there is always a lack of a practical introduction (roundabouts, a safe lane on the motorway) and it takes some time until all road users are informed. All innovations require several years of prevention and repression for the novelty to be taken into account and implemented.

A traffic accident is the result of many factors, among which the unadjusted speed is a key factor, which does not mean that it is also the main cause of the traffic accident itself. Alcohol is the most frequent associated cause of an accident, along with speeding and wrong direction of travel. The consequences are minor or serious bodily injuries or even death. In the best case, only material damage occurs.

Initial care in the field and in the emergency center is the first and most important step in the treatment of an injured person, which greatly affects the final outcome. Each injury requires a specific approach, diagnosis and treatment. Therefore, it is extremely important that all team members are well acquainted with the algorithms and procedures during the treatment, identify life-threatening conditions and work in harmony with each other in the necessary diagnostic procedures and proper follow-up care.

In order to achieve the objectives of the national program, it is necessary to constantly monitor and evaluate the developments and deviations of individual measures. With the rapid development of technology, the introduction of high-tech devices is expected in the future in order to ensure greater traffic safety.

A limitation of the research is the analysis of serious traffic accidents only for 2020. In addition, this year is somewhat specific due to the COVID-19 pandemic. In the research we considered a small number of variables or road safety factors. This type of research is socially important and needs to be continued. Quantitative research could be expanded by addressing a number of factors. However, it would be advisable to continue the qualitative research with an expanded set of guiding interview questions and the inclusion of more road safety experts, and the role and work of emergency centers in helping victims.

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Povzetek:

Analiza hudih telesnih poškodb v cestnem prometu in vloga urgentnega centra

Raziskovalno vprašanje (RV): Koliko je bilo hudih telesnih poškodb v prometnih nesrečah in kakšne so te poškodbe v letu 2020?

Namen: Ugotoviti, koliko hudo poškodovanih udeležencev v prometnih nesrečah je bilo leta 2020, kakšen je delež hudih telesnih poškodb po spolu, v katero starostno skupino spada največ hudih telesnih poškodb in kakšen je vpliv vremena na število in resnost hudih telesnih poškodb.

Metoda: Po pregledu relevantne literature smo pridobile kvantitativne podatke z uradne spletne strani Policije analizirali s frekvenčno statistiko in HI-kvadrat testom. Za kvalitativno metodo pa smo uporabili poglobljeni pol-strukturirani intervju z dvema relevantnima strokovnjakoma iz tega področja.

Rezultati: Glede ogroženosti v cestnem prometu obstajajo razlike med moškimi in ženskami, najmlajši in najstarejši so bolj ogroženi v cestnem prometu in več hudih telesnih poškodb se zgodi ob lepem vremenu.

Organizacija: Vzpostavitev učinkovitega prometno-varnostnega sistema je možna le ob predhodni prepoznavi, analizi in odpravi ključnih vzrokov, ki vplivajo na varnost.

Družba: Večja varnost v cestnem prometu zahteva spremembe v razmišljanju in delovanju posameznika kot udeleženca v prometu.

Originalnost: Originalnost raziskave je v uporabi kombinacije kvantitativne in kvalitativne raziskovalne metode. Tema je iz družbenega stališča zelo zanimiva.

Omejitve/nadaljnje raziskovanje: Rezultati so pod vplivom pandemije COVID-19. Potrebno bi bilo narediti raziskavo za daljše časovno obdobje, vsaj 10 let.

Ključne besede: prometne nesreče, hude telesne poškodbe, spol, starost, vreme.

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