

# QUALITY OF LIFE IN ROAD TRAFFIC ACCIDENT SURVIVORS KAKOVOST ŽIVLJENJA PREŽIVELIH V CESTNOPROMETNIH NESREČAH

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## ABSTRACT

### Keywords:

road traffic accident,  
quality of life, injury  
severity, health status,  
compensation

**Introduction:** The loss of quality of life is the major consequence following a non-fatal road traffic accident (RTA). Previous research regarding quality of life did not include uninjured RTA survivors. The research aim was thus to evaluate the quality of life of the RTA survivors regardless of whether or not they sustained injuries, and to identify factors associated with decreased quality of life after the RTA.

**Methods:** A cohort of 200 RTA survivors with and without injuries was followed after experiencing an RTA. The quality of life and mental health outcomes were assessed 1 month following RTA. A vast range of sociodemographic, pre-RTA health-related, RTA related, RTA injury-related, compensation-related factors and mental health outcomes were investigated.

**Results:** Decreased quality of life following an RTA showed an association with the low socioeconomic status of the RTA victims, poor pre-RTA health, injury-related factors, compensation-related factors and psychological disorders after the RTA.

**Conclusions:** Identifying predictors of decreased quality of life following an RTA will enable planning interventions targeting the most important factors that influence recovery of RTA victims. Assessing and recording of self-reported quality of life should be a part of the routine protocol in RTA survivors' health-care.

## IZVLEČEK

### Ključne besede:

cestnoprometna  
nesreča, kakovost  
življenja, resnost  
poškodbe, zdravstveno  
stanje, odškodnina

**Uvod:** Poslabšanje kakovosti življenja je glavna posledica cestnoprometne nesreče (CPN), ki nima smrtnega izida. Pretekle raziskave kakovosti življenja niso vključevale preživelih CPN, ki se niso poškodovali. Cilj raziskave je bil oceniti kakovost življenja preživelih CPN, ne glede na to, ali so bili poškodovani, in prepoznati dejavnike, povezane z zmanjšano kakovostjo življenja po CPN.

**Metode:** Spremljali so kohorto 200 ljudi, ki so preživeli CPN, s poškodbami ali brez njih. En mesec po CPN so ocenili kakovost življenja in izide duševnega zdravja. Raziskali so širok spekter socialno-demografskih dejavnikov; dejavnikov, povezanih z zdravjem pred CPN; dejavnikov, povezanih s poškodbami v CPN; dejavnikov, povezanih z odškodnino, in izidov duševnega zdravja.

**Rezultati:** Izkazalo se je, da je zmanjšana kakovost življenja po CPN povezana z nizkim socialno-ekonomskim statusom žrtev CPN, slabim zdravjem pred CPN, dejavniki, povezanimi s poškodbami, dejavniki, povezanimi z odškodnino, in psihološkimi motnjami po CPN.

**Sklepi:** Prepoznavanje napovednih znakov zmanjšane kakovosti življenja po CPN bo omogočilo načrtovanje intervencij, usmerjenih v najpomembnejše dejavnike, ki vplivajo na okrevanje žrtev CPN. Ocenjevanje in evidentiranje samoocenjene kakovosti življenja bi morala biti del rutinskega protokola zdravstvenega varstva preživelih CPN.

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## 1 INTRODUCTION

About 50 million people around the world suffer from non-fatal road traffic accident (RTA) injuries every year (1). In 2018, 13,989 people were injured in RTAs in Croatia (2). The non-fatal consequences of RTAs are numerous: functional and cognitive impairments, psychological consequences and a decrease in the quality of life of the survivors (3).

Decreased quality of life (QoL) is the major consequence of RTAs (4). Research shows that the physical and mental components of health-related QoL are decreased in the long-term, even in RTA survivors with minor injuries (5-7). QoL consistently and independently predicts return to pre-injury employment and life participation among RTA survivors who sustained mild/moderate injuries (8). Research also shows that psychiatric disorders in RTA survivors decrease QoL (9), especially PTSD (4, 7, 10, 11), depressive disorder (4, 9) and anxiety disorder (9). Other potential factors that influence QoL in RTA survivors are expectations regarding recovery, pain level, social support, perceived life-threat in the RTA (4, 12, 13), level of education, injury severity, compensation claim, early medical complications and socioeconomic factors, especially financial problems (11). The research regarding the impact of RTA injury severity on the QoL following the RTA is inconsistent, some studies found that injury severity does not predict later QoL (4, 6, 9), while others found the contrary (11, 14).

However, all published studies on QoL following an RTA only include the injured RTA survivors, and thus there is no knowledge on the QoL of the uninjured survivors. Furthermore, there are no QoL studies conducted among RTA victims in Croatia.

The research aim was therefore to evaluate the quality of life of the RTA survivors regardless of whether or not they sustained injuries, and to identify factors associated with decreased quality of life after the RTA.

## 2 METHODS

A cohort of 200 RTA survivors recruited at the Institute of Emergency Medicine of the Vukovar-Srijem County in Croatia were included in a prospective study. They were assessed 1 month following the RTA. Inclusion criteria for participating were being an RTA survivor and aged 18 and older. RTA survivors with cognitive dysfunctions and inability to give consent were excluded, as well as those aged under 18. Recruitment of the participants and data collection was done by a medical doctor.

During the research period, from October 2016 to December 2017, 640 people were involved in RTAs. Figure 1 gives details on the formation of the prospective cohort.

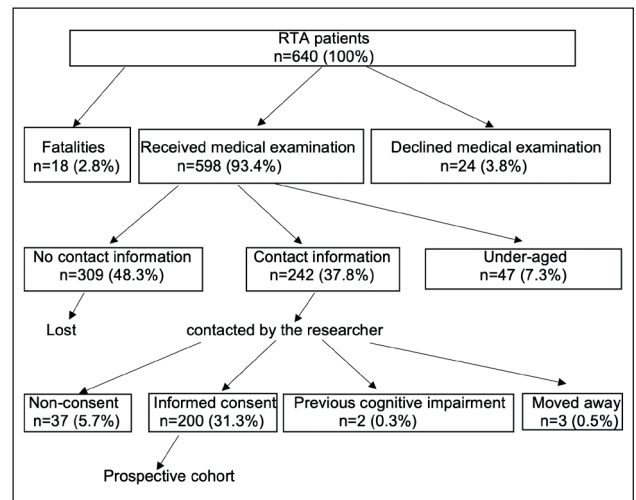


Figure 1. Cohort recruitment diagram.

Using a specially designed questionnaire the following data about RTA survivors was collected in this study: age, gender, place of residence, education, employment, marital status, self-assessed economic status and religiousness. Using the same questionnaire, data regarding pre-RTA health-related factors such as smoking, alcohol consumption, drug abuse, earlier road crash experience, traumatic exposures, prior PTSD, chronic diseases, psychiatric diseases and previous permanent pain was also collected.

Finally, the RTA-related factors explored through the same questionnaire were the type of road user, number of motor vehicles that were involved in the RTA, the injured and fatalities, fault for causing the RTA, compensation status, memory loss after the RTA, loss of consciousness in the RTA, injury status and severity, hospitalization, surgery and rehabilitation, self-assessed life-threat and pain following the RTA. The classification and detailed description of all collected data are shown in Tables 1, 2 and 3.

Based on medical records related to the RTA, the injury severity was assessed using the Abbreviated Injury Scale (AIS) (15). The final score was assigned using the New Injury Severity Scale (NISS). NISS classifies injuries as minor, moderate, serious, severe and critical (16).

The PTSD Checklist for Civilians (PCL-C) was used for the assessment of PTSD symptoms following the RTA (17). A cut-point of 30 was used, as suggested for general population (18).

The Beck Anxiety Inventory (BAI) was used for the assessment of anxiety symptoms following the RTA, with the cut-point of 22 (19).

The Beck Depression Inventory–I (BDI–I) was used for the assessment of depression symptoms following the RTA, with the cut-point of 11 (20).

The Short Form-36 (SF-36) was used for the assessment of QoL following the RTA (21). In this QoL is a multidimensional concept describing a satisfactory, balanced and healthy life comprising both biopsychosocial and socioeconomic aspects (22), such as physical health, psychological status, independence level, social relations, personal beliefs and relations within a specific environment (11). SF-36 is the most widely used instrument for assessing health-related QoL, and has been standardized and validated. This self-reporting measure contains 36 items and is used for the assessment of health status across eight domains: physical function (PF), role limitations due to physical health (RP), role limitations due to emotional problems (RE), vitality (VT), mental health, referring to the absence of anxiety and depression, (MH), social functioning (SF), bodily pain (BP) and general health (GH). The result scores range from 0 to 100, and higher obtained values present better perception of the QoL (23). The Croatian version of SF-36 was validated and found reliable in the Croatian population (24).

The normality of data distribution was tested with the Kolmogorov-Smirnov test; thereafter descriptive statistics were applied. The Mann-Whitney U test and Kruskal-Wallis test were applied for the comparison of numerical variables. Spearman's correlation was applied to test the correlation between the QoL domains and psychological outcomes following the RTA. The statistical significance level was set at  $p < 0.05$ . The statistical package Statistica for Windows 2010 (version 10.0, StatSoft Inc., Tulsa, OK, USA) was used for the analysis.

### 3 RESULTS

#### 3.1 RTA Survivors' Characteristics

Participants' median age was 42.5 years (interquartile range 28.3-56.0), 54.0% were males, 56.5% had rural residence, 62.5% finished high-school education, 58.0% were employed, 64.5% had a partner, 58.0% reported self-assessed average economic status, 90.5% were religious, 64.5% were non-smokers, 49.5% never used alcohol, 51.0% used medications, 42.0% had prior RTA experience, 52.0% reported previous traumatic exposures, 42.0% had previous chronic disease, 11.0% had previous psychiatric disease and 9.5% suffered previous permanent pain (Table 1). Non-participants and participants had similar age, gender and primary injury location.

**Table 1.** Sociodemographic factors and health status before the RTA.

Sociodemographic factors and health status	N	%
<b>Sex</b>		
Male	108	54.0
Female	92	46.0
<b>Age group (years)</b>		
Younger (18-41)	97	48.5
Older ( $\geq 42$ )	103	51.5
<b>Place of residence</b>		
Urban	87	43.5
Rural	113	56.5
<b>Education</b>		
Primary	38	19.0
Secondary	125	62.5
Higher education	37	18.5
<b>Employment</b>		
Employed	116	58.0
Out of work	52	26.0
Retired from work	32	16.0
<b>Relationship status</b>		
Single	71	35.5
Has a partner	129	64.5
<b>Self-assessed economic status</b>		
Under average	40	20.0
Average	116	58.0
Above average	44	22.0
<b>Religiousness</b>		
No	19	9.5
Yes	181	90.5
<b>Smoking</b>		
No	129	64.5
Yes	71	35.5
<b>Alcohol use</b>		
No	99	49.5
Yes	101	50.5
<b>Drug abuse</b>		
No	197	98.5
Yes	3	1.5
<b>Use of medications</b>		
No	98	49.0
Yes	102	51.0
<b>Type of medications</b>		
None	98	49.0
Non-psychiatric	78	9.0
Psychiatric	7	3.5
All types	17	8.5
<b>Previous RTAs</b>		
No	116	58.0
Yes	84	42.0
<b>Traumatic exposures</b>		
No	96	48.0
Yes	104	52.0

Sociodemographic factors and health status	N	%
<b>Prior PTSD</b>		
No	193	96.5
Yes	7	3.5
<b>Chronic disease</b>		
No	116	58.0
Yes	84	42.0
<b>Psychiatric disease</b>		
No	178	89.0
Yes	22	11.0
<b>Permanent pain</b>		
No	181	90.5
Yes	19	9.5

RTA details are shown in Table 2, and these reveal that 61.0% of the participants were drivers of motor vehicles, 53.5% were involved in the RTA involving two or more vehicles, 42.0% were in the RTA with one victim, 2.5% were in the RTA with fatalities, 61.5% of the participants were not at fault for causing the RTA, 43.5% of the participants claimed compensation and 10.0% received compensation.

Table 2. RTA details.

RTA details.	N	%
<b>Type of road users</b>		
Driver of motor vehicle	122	61.0
Co-driver or a passenger	61	30.5
Pedestrian or a cyclist	17	8.5
<b>Motor vehicles crashed</b>		
None	1	0.5
One	92	46.0
Two or more	107	53.5
<b>Injured</b>		
None	29	14.5
One	84	42.0
2-3	72	36.0
More than 3	15	7.5
<b>Fatal outcomes</b>		
No	195	97.5
Yes	5	2.5
<b>At fault</b>		
No	123	61.5
Yes	70	35.0
Unknown	7	3.5
<b>Claimed compensation</b>		
No	113	56.5
Yes	87	43.5
<b>Obtained compensation</b>		
No	180	90.0
Yes	20	10.0

The health status of the participants following the RTA is shown in Table 3. Multiples injures were sustained by 62.0% of the participants, 15.5% of the participants had no injuries, 48.0% sustained minor injuries, 18.0% sustained moderate injuries, 14.0% sustained serious injuries, 3.0% sustained severe injuries and 1.5% sustained critical injuries in the RTA. Threat to life was experienced by 46.0% of the participants, 16.0% reported unconsciousness, 14.0% reported amnesia, 32.0% were hospitalized, 10.0% underwent surgical treatment, 23.0% underwent rehabilitation procedures, 76.5% reported pain following the RTA, 35.5% reported PTSD symptoms, 20.0% reported depression symptoms and 4.5% reported anxiety symptoms following the RTA.

Table 3. Health status following the RTA.

Health status following the RTA	N	%
<b>Number of injuries</b>		
Without injures	31	15.5
One	45	22.5
Multiple	124	62.0
<b>Injury location</b>		
None	31	15.5
Head	18	9.0
Face	2	1.0
Neck	8	4.0
Chest	8	4.0
Abdomen	1	0.5
Spine	3	1.5
Upper extremities	3	1.5
Lower extremities	10	5.0
Several locations	116	58.0
<b>Major injury</b>		
Without injuries	31	15.5
Head	58	29.0
Neck	37	18.5
Chest	19	9.5
Abdomen	12	6.0
Upper extremities	17	8.5
Lower extremities	26	13.0
<b>Injury level</b>		
Without injury	31	15.5
Minor	96	48.0
Moderate	36	18.0
Serious	28	14.0
Severe	6	3.0
Critical	3	1.5
<b>Self-assessed life-threat</b>		
No	108	54.0
Yes	92	46.0
<b>Loss of consciousness</b>		
No	168	84.0
Yes	32	16.0

Health status following the RTA	N	%
<b>Loss of memory</b>		
No	172	86.0
Yes	28	14.0
<b>Hospitalization</b>		
No	136	68.0
Yes	64	32.0
<b>Days in hospital</b>		
None	136	68.0
1-3	27	13.5
4-10	19	9.5
11 and more	18	9.0
<b>Surgery</b>		
No	180	90.0
Yes	20	10.0
<b>Rehabilitation</b>		
No	154	77.0
Yes	46	23.0
<b>Pain following the RTA</b>		
No	47	23.5
Yes	153	76.5
<b>Symptoms of PTSD</b>		
No	129	64.5
Yes	71	35.5
<b>Symptoms of depression</b>		
No	160	80.0
Yes	40	20.0
<b>Symptoms of anxiety</b>		
No	191	95.5
Yes	9	4.5

The sociodemographic factors that were found to be associated with lower QoL domains were female gender, older age group, lower education level, unemployment, lower self-assessed economic status and irreligiousness. Pre-RTA health showed an association with lower QoL domains after the RTA, in terms of alcohol abstinence, previous traumatic exposure, previous chronic disease, previous psychiatric disease, previous permanent pain, use of medications and especially psychiatric medication use. Injury-related factors found associated with lower QoL domains were injury affliction, injury severity, self-assessed life-threat, pain following the RTA, hospitalization and its duration, surgery, unconsciousness in the RTA and rehabilitation following the RTA. Among RTA-related factors, not being at fault in the RTA, claiming compensation, obtaining compensation and vulnerable road users had lower QoL (Table 5).

### 3.2 Quality of Life After the RTA

The median values of QoL obtained across eight domains are presented in Table 4.

Table 4. Quality of life of the participants after the RTA.

QoL domains	Median	Interquartile range
Physical functioning	70.0	30.0-100.0
Role limitations due to physical health	0.0	0.0-100.0
Role limitations due to emotional health	100.0	67.0-100.0
Vitality	60.0	50.0-75.0
Mental health	68.0	52.0-76.0
Social functioning	75.0	50.0-100.0
Bodily pain	55.0	33.0-80.0
General health	70.0	55.0-84.0

Table 5. Factors influencing quality of life following the RTA.

Factors	QoL domains							
	PF	PR	ER	VT	MH	SF	BP	GH
<b>Sociodemographic</b>								
Gender	p=0.681 <sup>a</sup>	p=0.651 <sup>a</sup>	p=0.020 <sup>a</sup>	p=0.072 <sup>a</sup>	p=0.064 <sup>a</sup>	p=0.408 <sup>a</sup>	p=0.052 <sup>a</sup>	p=0.118 <sup>a</sup>
Age group	p=0.084 <sup>a</sup>	p=0.204 <sup>a</sup>	p=0.226 <sup>a</sup>	p=0.078 <sup>a</sup>	p=0.012 <sup>a</sup>	p=0.079 <sup>a</sup>	p=0.959 <sup>a</sup>	p<0.001 <sup>a</sup>
Place of residence	p=0.795 <sup>a</sup>	p=0.098 <sup>a</sup>	p=0.876 <sup>a</sup>	p=0.427 <sup>a</sup>	p=0.096 <sup>a</sup>	p=0.069 <sup>a</sup>	p=0.224 <sup>a</sup>	p=0.469 <sup>a</sup>
Education	p=0.478 <sup>b</sup>	p=0.045 <sup>b</sup>	p=0.182 <sup>b</sup>	p=0.344 <sup>b</sup>	p=0.152 <sup>b</sup>	p=0.828 <sup>b</sup>	p=0.118 <sup>b</sup>	p=0.034 <sup>b</sup>
Employment	p=0.087 <sup>b</sup>	p=0.403 <sup>b</sup>	p=0.037 <sup>b</sup>	p=0.094 <sup>b</sup>	p=0.067 <sup>b</sup>	p=0.988 <sup>b</sup>	p=0.007 <sup>b</sup>	p<0.001 <sup>b</sup>
Marital status	p=0.628 <sup>a</sup>	p=0.965 <sup>a</sup>	p=0.101 <sup>a</sup>	p=0.465 <sup>a</sup>	p=0.671 <sup>a</sup>	p=0.874 <sup>a</sup>	p=0.525 <sup>a</sup>	p=0.708 <sup>a</sup>
Self-assessed economic status	p=0.014 <sup>b</sup>	p=0.032 <sup>b</sup>	p=0.049 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p=0.245 <sup>b</sup>	p=0.003 <sup>b</sup>	p<0.001 <sup>b</sup>
Religiousness	p=0.898 <sup>a</sup>	p=0.407 <sup>a</sup>	p=0.868 <sup>a</sup>	p=0.010 <sup>a</sup>	p=0.041 <sup>a</sup>	p=0.130 <sup>a</sup>	p=0.072 <sup>a</sup>	p=0.862 <sup>a</sup>
<b>Pre-RTA health</b>								
Body mass index	p=0.182 <sup>b</sup>	p=0.496 <sup>b</sup>	p=0.754 <sup>b</sup>	p=0.319 <sup>b</sup>	p=0.538 <sup>b</sup>	p=0.141 <sup>b</sup>	p=0.612 <sup>b</sup>	p=0.182 <sup>b</sup>
Smoking	p=0.620 <sup>a</sup>	p=0.214 <sup>a</sup>	p=0.260 <sup>a</sup>	p=0.056 <sup>a</sup>	p=0.096 <sup>a</sup>	p=0.198 <sup>a</sup>	p=0.510 <sup>a</sup>	p=0.097 <sup>a</sup>
Alcohol consumption	p=0.020 <sup>a</sup>	p=0.007 <sup>a</sup>	p=0.046 <sup>a</sup>	p=0.009 <sup>a</sup>	p=0.028 <sup>a</sup>	p=0.036 <sup>a</sup>	p=0.005 <sup>a</sup>	p=0.003 <sup>a</sup>
Drug abuse	p=0.637 <sup>a</sup>	p=0.314 <sup>a</sup>	p=0.969 <sup>a</sup>	p=0.214 <sup>a</sup>	p=0.566 <sup>a</sup>	p=0.500 <sup>a</sup>	p=0.425 <sup>a</sup>	p=0.272 <sup>a</sup>
Previous RTAs	p=0.840 <sup>a</sup>	p=0.774 <sup>a</sup>	p=0.709 <sup>a</sup>	p=0.589 <sup>a</sup>	p=0.083 <sup>a</sup>	p=0.793 <sup>a</sup>	p=0.864 <sup>a</sup>	p=0.133 <sup>a</sup>
Previous traumatic exposures	p=0.983 <sup>a</sup>	p=0.510 <sup>a</sup>	p=0.471 <sup>a</sup>	p=0.032 <sup>a</sup>	p=0.116 <sup>a</sup>	p=0.394 <sup>a</sup>	p=0.604 <sup>a</sup>	p=0.031 <sup>a</sup>
Prior PTSD	p=0.890 <sup>a</sup>	p=0.612 <sup>a</sup>	p=0.986 <sup>a</sup>	p=0.941 <sup>a</sup>	p=0.308 <sup>a</sup>	p=0.882 <sup>a</sup>	p=0.776 <sup>a</sup>	p=0.206 <sup>a</sup>
Chronic disease	p=0.039 <sup>a</sup>	p=0.026 <sup>a</sup>	p=0.410 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.043 <sup>a</sup>	p=0.073 <sup>a</sup>	p<0.001 <sup>a</sup>
Psychiatric disease	p=0.435 <sup>a</sup>	p=0.061 <sup>a</sup>	p=0.024 <sup>a</sup>	p=0.057 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.452 <sup>a</sup>	p=0.039 <sup>a</sup>	p=0.010 <sup>a</sup>
Previous permanent pain	p=0.828 <sup>a</sup>	p=0.771 <sup>a</sup>	p=0.069 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.033 <sup>a</sup>	p=0.172 <sup>a</sup>	p=0.052 <sup>a</sup>	p=0.014 <sup>a</sup>
Use of medications	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.058 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>
Types of medications	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p=0.253 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>
<b>RTA injury-related</b>								
Injury affliction	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.228 <sup>a</sup>	p=0.061 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.003 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.008 <sup>a</sup>
Injury severity	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p=0.347 <sup>b</sup>	p=0.081 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>
Self-assessed life-threat	p=0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.013 <sup>a</sup>	p=0.002 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>
Pain following the RTA	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.002 <sup>a</sup>
Hospitalization	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.200 <sup>a</sup>	p=0.177 <sup>a</sup>	p=0.053 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>
Hospitalization duration	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p=0.318 <sup>b</sup>	p=0.244 <sup>b</sup>	p=0.128 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>	p<0.001 <sup>b</sup>
Surgery	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.281 <sup>a</sup>	p=0.045 <sup>a</sup>	p=0.036 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>
Loss of consciousness	p=0.033 <sup>a</sup>	p=0.088 <sup>a</sup>	p=0.334 <sup>a</sup>	p=0.393 <sup>a</sup>	p=0.597 <sup>a</sup>	p=0.298 <sup>a</sup>	p=0.311 <sup>a</sup>	p=0.355 <sup>a</sup>
Loss of memory	p=0.226 <sup>a</sup>	p=0.150 <sup>a</sup>	p=0.962 <sup>a</sup>	p=0.196 <sup>a</sup>	p=0.097 <sup>a</sup>	p=0.116 <sup>a</sup>	p=0.984 <sup>a</sup>	p=0.190 <sup>a</sup>
Rehabilitation	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.086 <sup>a</sup>	p=0.095 <sup>a</sup>	p<0.001 <sup>a</sup>	p<0.001 <sup>a</sup>	p=0.012 <sup>a</sup>
<b>RTA-related</b>								
Fault	p=0.109 <sup>b</sup>	p=0.659 <sup>b</sup>	p=0.393 <sup>b</sup>	p=0.322 <sup>b</sup>	p=0.657 <sup>b</sup>	p=0.537 <sup>b</sup>	p=0.024 <sup>b</sup>	p=0.461 <sup>b</sup>
Fatalities	p=0.953 <sup>a</sup>	p=0.541 <sup>a</sup>	p=0.618 <sup>a</sup>	p=0.762 <sup>a</sup>	p=0.147 <sup>a</sup>	p=0.157 <sup>a</sup>	p=0.343 <sup>a</sup>	p=0.421 <sup>a</sup>
Compensation claim	p=0.072 <sup>a</sup>	p=0.140 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.005 <sup>a</sup>	p=0.178 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.031 <sup>a</sup>	p=0.367 <sup>a</sup>
Obtained compensation	p=0.474 <sup>a</sup>	p=0.102 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.232 <sup>a</sup>	p=0.537 <sup>a</sup>	p=0.155 <sup>a</sup>	p=0.370 <sup>a</sup>	p=0.607 <sup>a</sup>
Type of road users	p=0.007 <sup>b</sup>	p=0.053 <sup>b</sup>	p=0.502 <sup>b</sup>	p=0.156 <sup>b</sup>	p=0.070 <sup>b</sup>	p=0.113 <sup>b</sup>	p=0.017 <sup>b</sup>	p=0.004 <sup>b</sup>

<sup>a</sup>Mann-Whitney U test; <sup>b</sup>Kruskal-Wallis test; PF = physical health; RP = role limitations due to physical health; RE = role limitations due to emotional health; VT = vitality; MH = mental health; SF = social functioning; BP = bodily pain; GH = general health

Mental health outcomes showed a reverse correlation with all QoL domains after the RTA. The correlations between QoL domains and the symptoms of depression, anxiety and PTSD are presented in Table 6.

**Table 6.** Correlation between quality of life and mental health outcomes after the RTA.

Mental health	QoL domains							
	PF	PR	ER	VT	MH	SF	BP	GH
Depression symptoms	$r_s = -0.410$ $p < 0.001^*$	$r_s = -0.364$ $p < 0.001^*$	$r_s = -0.430$ $p < 0.001^*$	$r_s = -0.588$ $p < 0.001^*$	$r_s = -0.586$ $p < 0.001^*$	$r_s = -0.582$ $p < 0.001^*$	$r_s = -0.438$ $p < 0.001^*$	$r_s = -0.593$ $p < 0.001^*$
Anxiety symptoms	$r_s = -0.274$ $p < 0.001^*$	$r_s = -0.263$ $p < 0.001^*$	$r_s = -0.523$ $p < 0.001^*$	$r_s = -0.446$ $p < 0.001^*$	$r_s = -0.378$ $p < 0.001^*$	$r_s = -0.485$ $p < 0.001^*$	$r_s = -0.427$ $p < 0.001^*$	$r_s = -0.442$ $p < 0.001^*$
PTSD symptoms	$r_s = -0.380$ $p < 0.001^*$	$r_s = -0.345$ $p < 0.001^*$	$r_s = -0.449$ $p < 0.001^*$	$r_s = -0.476$ $p < 0.001^*$	$r_s = -0.552$ $p < 0.001^*$	$r_s = -0.549$ $p < 0.001^*$	$r_s = -0.527$ $p < 0.001^*$	$r_s = -0.437$ $p < 0.001^*$

\*Spearman's correlation; PF = physical health; RP = role limitations due to physical health; RE = role limitations due to emotional health; VT = vitality; MH = mental health; SF = social functioning; BP = bodily pain; GH = general health

#### 4 DISCUSSION

The study explored the QoL following an RTA and the prospective cohort included RTA survivors both with and without injuries, unlike other studies exploring RTA outcomes only among the injured. The QoL of the RTA survivors one month after the experienced RTA was below the average scores for the general Croatian population in the following QoL domains: RP (0.0 vs. 61.5) and BP (55.0 vs. 64.6) (24). Other studies also found RTA survivors had lower QoL than general population norms (4, 6, 12, 23, 25).

The sociodemographic factors found associated with lower scores of the QoL domains in this study, i.e. older age, female sex, lower education level, unemployment, and lower economic level, are consistent with other research data. The Croatian general population sample reported lower QoL scores in the older age group and among females (24). Other studies of RTA victims also found older age to be associated with lower QoL after the RTA (4-6, 9, 11, 23, 25-27). A few studies also found female RTA survivors reporting lower QoL than males (5, 25, 28). Lower education level (7, 11, 12), unemployment (6, 9, 11) and lower economic status (11) of RTA victims were associated with lower QoL after the RTA in several studies. Irreligiousness has not been explored in the earlier studies, but was found relevant in this cohort.

Pre-RTA health status was found to be associated with lower QoL after the RTA. Other studies also found pre-injury health status (6, 9, 11, 12, 23, 27, 29), pre-injury chronic illness (6, 9, 11, 12, 23, 29) and pre-injury psychological history (7, 12, 23, 27, 29) to be associated with decreased QoL in the RTA victims. Use of medications and psychiatric medication use were found associated with all QoL domains except RE. This factor should be further explored, since people may not want to report a psychiatric disease due to stigmatization, but may report information regarding medications they use (30). This study also found previous traumatic exposure to be associated with lower VT and GH. Alcohol consumption was found to

be positively associated with all QoL domains, indicating that moderate alcohol use has a positive effect on the QoL (31).

The most important injury-related factors associated with all QoL domains were pain following the RTA and self-assessed life-threat, with the latter also found to be significant in other studies (9, 12). Pain following an RTA is a well-known predictor of QoL (4, 6, 7, 9, 13, 27, 29). Given that a high baseline pain after the RTA is associated with poor long-term health outcomes, strategies to reduce pain levels should be introduced early following an RTA to reduce the risk of long-term health consequences (28). The results with regard to injury severity are inconsistent in the literature, some studies found it to be associated with lower QoL (3, 11, 12, 14, 23, 28, 32), while others found no association (5, 6, 9) or a negative association (4). However, in all studies where RTA survivors with mild injuries reported similar or worse QoL scores than RTA victims with more severe injuries, data were obtained from compensable injury claim registers restricted to a certain level of injuries i.e. mild to moderate. It can be argued that decreased QoL outcomes are the result of the compensable nature of the injury, leading to reporting bias for secondary gain (12). The current study showed not only that more severely injured had lower QoL scores, but also that RTA survivors without injuries had better QoL scores. Other research exploring traumatic injuries also showed that sustaining a traumatic (not RTA) injury was associated with lower QoL (33). Therefore, in order to obtain reliable data, research regarding the impact of RTA injury on health outcomes should include RTA victims with all injury levels along with those who are uninjured, possibly outside compensation settings.

Factors indirectly injury-related, i.e. hospitalization, duration of hospitalization, surgery, loss of consciousness during RTA and rehabilitation after the RTA, had a negative impact on the QoL after an RTA. Other research also found hospitalization to be associated with lower QoL scores (3, 9, 12, 27). Psychological consequences after the RTA,

namely PTSD, depression and anxiety symptoms, showed correlations with all QoL domains. Other studies also found psychological distress (27), PTSD (4, 7, 11, 29) and anxiety/depression (4-6, 9) to be independent predictors of QoL following the RTA. Vulnerable road users, i.e. pedestrians/cyclists reported lower scores of PF, BP and GH. This association is also probably injury-related, since there were no uninjured cyclists nor pedestrians in this study. These findings all corroborate that RTA injury and its severity are both relevant for the QoL outcomes.

Compensation claim is a thoroughly investigated factor showing a negative association with the QoL following an RTA in many studies (5, 7, 11, 27, 34, 35). In addition to the negative association of compensation claim with the QoL, this study showed that obtaining compensation was associated with a lower score of RE. Furthermore, not being at fault in the RTA was associated with higher scores of BP. Other research also found that not-at-fault RTA victims had lower QoL and reported significantly higher rate of neck and back pain than the at-fault group (28). This suggests that non-physical factors such as victimization, frustration and anger at being involved in an RTA that was the fault of someone else all affect well-being (28).

Most of the studies investigating the QoL of RTA survivors used the SF-36 questionnaire (4, 5, 14, 23, 28, 33-35) or its shortened version, the Short Form - 12 (SF-12) (6, 8, 9, 12, 13, 26, 27), while a minority used other available instruments for assessing QoL (7, 26, 31). Therefore, the data from this study are comparable with that in other QoL studies.

#### 4.1 Strengths and Limitations

This study investigated a vast range of variables, sociodemographic, psychosocial, health-related, injury-related, RTA-related and compensation-related factors. Unlike other research, this one included uninjured RTA survivors with the traumatic experience of an RTA. Furthermore, the injured RTA victims included all levels of injury severity. Cohort recruitment was conducted outside any compensation scheme to eliminate secondary gain bias. All patients received immediate post-RTA healthcare in public healthcare settings irrelevant of their injury and health insurance status. Emergency and acute care, rehabilitation and other healthcare services for the RTA patients in Croatia are provided by public hospitals and are paid for by the state health insurance, and not like in some countries by third-party insurers in the scheme of a fault-based or no fault-based compensation system. As such, Croatian RTA victims receive equal healthcare and social benefits regardless of their involvement in compensation procedures. Given all the above, the studied cohort might be similar to general population in Croatia.

The limitations of this study include self-reported data collection. Pre-RTA physical and mental health problems were self-reported, without specific diagnostic tools or medical records. The recruited participants represent only 31.3% of registered RTA survivors, mostly due to the absence of contact information of the RTA victims (48.3%). The response rate was high, and 82.6% of the contacted RTA victims gave consent to participate. The telephone contact information of the patient is not a routinely obtained in Croatian emergency medicine institutes. Furthermore, there are objective reasons, such as the medical condition of the patients and absence of relatives, that hinder obtaining contact information. Nevertheless, given the relatively small sample size, more resources should be invested in obtaining RTA victims' contact information and implementing this procedure in the routine protocols.

## 5 CONCLUSIONS

Decreased QoL following an RTA showed associations with the low socioeconomic status of the RTA victims, poor pre-RTA health, injury-related factors and psychological disorders after the RTA. Identifying the predictors of decreased QoL following an RTA will enable planning interventions targeting the most important factors influencing health of RTA victims. Assessing and recording of self-reported QoL should be a part of the routine protocol in RTA survivors' healthcare.

## CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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## ETHICAL APPROVAL

The research was approved by the Ethics Committee of the Faculty of Medicine Osijek, Croatia (Ethical Approval Code: 2158-61-07-17-211).



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