

## **O 24. ENGINEERING ANALYSIS AS A GUIDE FOR PREVENTION OF EPIDEMIOLOGY OF ROAD ACCIDENTS IN ALBANIA**

Kumbim Shala<sup>1</sup>, Altin Dorri<sup>2\*</sup>

<sup>1</sup>*University of Pristina, Faculty of Mechanical Engineering, St. Agim Ramadani, Pristina, Republic of Kosovo*

<sup>2</sup>*Polytechnic University of Tirana, Sheshi "Nene Tereza", nr. 4, Tirana, Albania*

E-mail: [adorri@fim.edu.al](mailto:adorri@fim.edu.al), [kumbim.shala@uni-pr.edu](mailto:kumbim.shala@uni-pr.edu)

**ABSTRACT:** Road accidents are a serious problem of the modern world. They are one of the main causes of injuries and are the third most frequent cause of death. Every year, more than one million people, adults and children, die on the roads and several millions get injured. Mortality rate due to injuries from road accidents amounts to 2.2% of all deaths in the world. The research presents epidemiology of road accidents with particular emphasis on the key issues of road safety in Albania, related to the dangerous behavior of road users (disregard toward traffic rules). Despite the various measures which are taken to improve safety on Albanian roads, the number of dead and wounded in the vehicle mishap is still large, and losses borne by society are high. To improve safety on Albanian roads, it is necessary to continue multi- action plan to systematically progress in the level of road safety.

**Keywords:** *Road accidents, traffic, road safety*

### **INTRODUCTION**

The main purpose of this study was to analyze the main factors of road accidents in Albania. Furthermore, in this article, the statistics of the number of accidents are analyzed and other influential and contributing aspects are shown. The main causes of traffic accidents can be divided into three risk factors, such as: people, vehicles and road infrastructure [1]:

- *Driver*-dependent risk factors include speeding, driving under the influence of alcohol and other psychoactive substances, driving a helmet without helmets, not wearing a seat belt, children transported without child seats, driver's psychological attitude, distractions during driving (e.g. cell phone use) and driver behaviour. Driver experience and observation skills allow to avoid possible traffic incidents. The authors of the paper [2, 3] distinguished three types of behaviour that increase the risks of causing an accident: errors, lapses and violations.
- The *vehicle* factor is related to the road suitability of the vehicle or fleet, technical condition, age, etc.
- Another risk factor is *road infrastructure*, with its characteristics such as: geometric design conditions, maximum speed allowed, number of turns and their radius, climatic conditions, type of road surface, area, category, signage, lighting, etc.

The death rate as a result of road accidents per 1 million inhabitants is an indicator of (un) safety used by the European Union. In Albania, this indicator in 2020 reached 64 deaths per 1 million inhabitants (Tab. 1, Fig.2), while for the entire European Union it was 51 [4,5].

During the last 10 years, 20,529 road accidents occurred in Albania, as a result of which 3146 people were killed and 23587 were injured. On average, 286 people die each year on the country roads as a result of accidents. In 2019, the number of accidents increased by 18.9% and injuries decreased by 10% compared to 2018. Unfortunately, the number of victims as a result of a road accident increased by 6%. From 2009 to 2019, there was an increase in the number of vehicle accidents by 39% and a decrease in the number of victims by 40%. Even in 2020 there was a decrease in cases but still the exposure was reduced when considering the pandemic period.

When analyzing the number of vehicle accidents, attention should be paid to the average number of fatalities per 10,000 vehicles which has decreased by close to 56% when comparing 2009 with 2019 or 68% compared to 2020. (TABLE 1) .

**Proceeding Book of ISESER 2021**

**Table 1.** Road accidents and indicators by years of occurrence

ACCIDENTS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total	1564	1876	1870	2075	1914	1992	2033	1978	1718	2044	1234
Fatalities	352	322	334	295	264	270	269	222	213	227	181
Injuries	1716	2150	2235	2503	2353	2422	2510	2389	2030	1817	1417
Fatalities / 10,000 vehicle	8.38	7.84	8.46	6.61	5.38	5	4.78	4.1	3.68	3.62	2.67
Fatalities / 10,0000 inhabitants	12.1	11.09	11.52	10.18	9.15	9.38	9.35	7.73	7.44	7.97	6.35

\*(Source: Research thesis, Shala K. “Engineering analysis of accidents in Albania, as preventive approach to road safety”)

Based on the type of collision (TABLE 2), it should be noted that the number of side accidents is the most common form of accidents between vehicles. Moreover, from 2009 to 2019, their number remains on average close to 500 per year. Also, the number of frontal collisions in 2019 is 329 while rear-end collisions close to 300 per year. It should be noted that deaths in accidents between vehicles resulted in a quarter of fatalities or a third of annual accidents (TABLE 2):

**Table 2.** Types of collision

Accidents	Type of collision				
	No injury	Slight injury	Serious injury	Fatalities	Total
Self-inflicted accidents	29	77	15	20	<b>141</b>
Flooded vehicle	6	16	6	1	<b>29</b>
Rollover vehicle	24	76	12	20	<b>132</b>
Head on collisions	106	154	22	13	<b>295</b>
Curve collisions	13	11		3	<b>27</b>
Vehicle overtaking	34	28	6	2	<b>70</b>
Side collision	171	170	11	12	<b>364</b>
Rear-end collisions	94	102	5	12	<b>213</b>
Two-wheeled vehicle collisions	136	113	19	20	<b>288</b>
Collisions with animals	1			1	<b>2</b>
Pedestrian collision	367	301	61	52	<b>781</b>
Collisions vehicle/other	169	142	18	17	<b>346</b>
Bicycle/pedestrian collision			1		<b>1</b>
Other un-identified	27	44	7	8	<b>86</b>
<b>Total</b>	<b>1177</b>	<b>1234</b>	<b>183</b>	<b>181</b>	<b>2775</b>

**INTERPRETATION AND ANALYSIS OF THE CAUSES OF ACCIDENTS**

**Self-inflicted accidents and flooded vehicle accidents** - include 170 cases of self-inflicted accidents which are most often caused by human error, distraction, driving under the influence of illicit substances, excessive speed, fatigue and drowsiness, technical defects of the vehicle, infrastructural defects including and improper maintenance, climatic conditions;

**Rollover vehicle** - includes 132 accidents that are caused by: high speed inappropriate to road conditions, driving under the influence of narcotics or alcohol, vehicle or pneumatic defects, infrastructure defects.

**Head-on collisions** - include 295 accidents that almost all occur on two-lane roads without traffic dividers, outside urban areas and off highways. Again the causes result drowsiness, the influence of alcohol, distraction by phone.

**Proceeding Book of ISESER 2021**

**Side collision** - includes 364 accidents with close to 3% fatality rate and has the highest prevalence in the type of collisions between vehicles. It turns out that such with fatal consequences mainly occur at non-urban intersections, where the vehicle moving in the direction is hit by the other coming from the side road or vice versa. At urban intersections such accidents cause injury and damage. The reasons are: distraction, non-evaluation of traffic circumstances, negligence of information, non-processing of information, speeding above the allowed limits, non-compliance with the priority, side slip, inability to brake or accelerate.

**Rear-end collisions** - include 213 cases with 5% fatality rate. So, 95% of these collisions occur on urban roads, respectively with minor injuries and material damage. Rear shocks are fatal when they occur as a result of chain collisions of vehicles or the wave of vehicles reaching the accident. The dominant causes are: distraction, not keeping distance, alcohol, speeding, inability to avoid an accident. Cases in urban areas are characterized by injuries or material damage and come as a result of distraction from long driving in congested traffic

**Curve collisions** - there are 27 cases with a fatality rate of 11%. The main causes are human violations such as inadequate speed in relation to road conditions, climatic conditions and technical condition of the vehicle.

**Car crashes with two-wheeled vehicles** - includes 288 accidents with 7% fatal frequency. These mainly occur on urban roads towards cyclists where during the turns to the right no attention is paid to the traffic on the cyclists' path. Cyclists in urban areas are often distracted or even lack sensitivity to the environment from the use of headphones in both ears. There are also cases of collisions on non-urban roads, mainly at night, where contributing reasons for not noticing these participants in addition to speed are the lack of two-wheeled light signalling, the colour of the cyclist's clothes and the lack of street lighting.

**Vehicle collisions with pedestrians** - are 781 cases with a fatality rate of 7%. The main causes that influence pedestrian accidents are because of distraction, driver incompetence, impatience, carelessness, dark coloured clothes on unlit roads, workshops on the street, left turns at intersections. Pedestrians are also contributing factors, especially those with headphones on both ears crossing the road in places not marked for crossing, unexpected exits on the road, the simultaneous free movement of left turns and pedestrians at traffic light intersections.

**ANALYSIS OF THE CIRCUMSTANCES OF THE OCCURRENCE OF FATAL ACCIDENTS**

In addition to the causes of accidents, the circumstances of fatal accidents have been analyzed and after analyzing the data processing, the following table 2 results.

**Table 3.** Analysis of the circumstances of the occurrence of fatal accidents

Analysis of the circumstances of the occurrence of fatal accidents	Fatalities	%
By day	104	62 %
In dry weather	165	91%
Road in good contion / promissioning road	169	93.3%
Straight road	144	79.5%
Asphalted road	179	98.8%
Vehicle age over 12 years	134	55.8%
Driving experience 3 to 6 years	46	23%
Driving experience over 9 years	79	39%
For violation of rules by pedestrians (crossing the road carelessly)	22	38%

**CONCLUSIONS**

The types of accidents reviewed based on official records from the Accident Information System show that:

**Distraction** (mistakes, carelessness and omissions) - is a widespread phenomenon among albanian drivers. Distraction is any activity that distracts the driver from the driving task. Driving the vehicle deserves full attention. The most common distraction comes from using the phone while driving,

## Proceeding Book of ISESER 2021

especially from texting, then from the mental and spiritual state associated with the personality traits of the individual. It should be noted that even the interior of the vehicle is able to distract the driver. Also billboards, large screens, illuminated signs, all those elements that attract the driver's attention can cause the driver's inattention, and thus cause a road accident [1,8].

**Drunk driving** - are the cause of decreased brain performance, respectively slows down the reaction and reduces the skills required for safe driving. Driving under the influence of alcohol is considered a legal violation.

**Speed above the allowed limits** (violation) - accompanies the vast majority of accidents. Speed is more than a violation of the law, and is a supplementary factor that in harmony with some other circumstances increases the consequences and chances of an accident. Increases the potential for loss of control over the vehicle, reduces the effectiveness of the user's protective equipment, increases the stopping distance after the danger is perceived, increases the severity of the accident, leading to more serious injuries, economic consequences, increased consumption of fuel / cost and emissions.

**Technical deficiencies** - respectively age-related defects of road vehicles constitute the cause of 55.8% of fatal accidents. Unmaintained and technically uninspected vehicles are a source of accidents

**Driving experience** - is a factor that causes Albanian drivers carelessness, negligence, self-confidence and disregard for traffic signs and traffic rules. From the analysis it seems that drivers with over 9 years of experience are the most common cause.

## REFERENCES

- [1] Shala, K., & Dorri, A. 2021, Identification of the Accidents Causes and their Engineering Analysis: The Case of Albania, *International Journal of Innovative Technology and Interdisciplinary Sciences*, 4(2), pp. 706-715, <https://doi.org/10.15157/IJITIS.2021.4.2.706-715>;
- [2] Reason J., Manstead A., Stradling S., Baxter J. and Campbell, K. (1990). Errors and violations on the roads: A real distinction? *Ergonomics*, 1990; 33; 1315-1332;
- [3] Åberg L., Afram G. and Nilsson M. Perception of other drivers' errors and violations and easiness of error detection. *18th International Cooperation on Theories and Concepts in Traffic Safety*, Helsinki, Finland, 2005; pp. 1-10.
- [4] Shala K. 2021, Research thesis, "Engineering analysis of accidents in Albania, as preventive approach to road safety", Polytechnic University of Tirana, Faculty of Mechanical Engineering;
- [5] Global Status Report on Road Safety 2019, World Health Organization 2018, from <https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annualreport-2019.pdf>
- [6] Obaidat, M.T. & Ramadan, T.M. Traffic accidents at hazardous locations of urban roads. *Jordan Journal of Civil Engineering*, 2012; 6(4); 436-447.
- [7] <https://statystyka.policja.pl/st/ruch-drogowy/76562,wypadki-drogowe-raporty-roczne.html> (accessed on 08/10/2020).
- [8] Polityka transportowa Państwa na lata 2006–2025 (State transport policy for 2006–2025), Ministerstwo Infrastruktury, Warszawa (2005), from [http://archiwum-ukie.polskawue.gov.pl/HLP%5Cfiles.nsf/0/6EDB2FBCDE37665EC1257266004241F6/\\$plik/transport.pdf](http://archiwum-ukie.polskawue.gov.pl/HLP%5Cfiles.nsf/0/6EDB2FBCDE37665EC1257266004241F6/$plik/transport.pdf).