Proceeding of International
Conference on Science and Technology
Lembaga Penelitian Pengabdian kepada Masyarakat dan Dakwah Islamiyah, Universitas Islam Kuantan Singingi, Indonesia, November 10th 2022
DOI : https://doi.org/10.36378/internationalconferenceuniks.v0i0.2828
ISSN 2985-8739
Page: 73-77

Characteristics of Traffic Accidents Frequency on Connection Road Between 3 Cities in Riau - Indonesia

Khairul Fahmi[1*], Muhidin Arifin[2]
[1]Department Civil Engineering, Faculty of Engineering, Universitas Pasir Pengaraian, Indonesia
[2]Faculty of Engineering and Life Sciences, Universiti Selangor, Malaysia
e-mail: [1]fahmi_riau@yahoo.co.id, [2]irmuhidin@unisel.edu.my
e-mail[*]: fahmi_riau@yahoo.co.id

Abstract

The main cause of road accidents in outside of cities is the driver's lack of awareness about road safety. Efforts to reduce these accidents can be done if the characteristics and causes are known. The purpose of this study was to determine the characteristics of road accidents in three areas in Riau province. Analysis used a descriptive quantitative analysis. This study was done to identify the characteristics of traffic accidents occurred from 2014 to 2019 on the connection road between 3 cities in Riau, namely in the Kuantan Singingi, Kampar and Rokan Hulu areas of Riau Province, Indonesia. The analysis used is descriptive quantitative analysis. The greater accidents were occurred in 2018, in which 192 cases. The least accidents were occurred in 2017, in which 115 cases, the month of June had the highest number of accidents since it was a month of school holidays. The percentage of total deaths on traffic accidents reached 60%. Meanwhile, 75.6% of traffic accident victims were injured, with the most accidents occurring on flat and straight roads. The types of vehicles that are often involved are motorcycle, which occur from 06.00 to 11.59 pm.

Keywords: Characteristics, Connection Road, Motorcycle, Traffic Accidents

1. Introduction

A traffic accident occurs when a vehicle crashes with an object or diverges from its route, causing property damage, injuries to drivers, passengers, and/or other road users [1]. High vehicle speeds and poor road geometry are the main causes of traffic accidents outside of cities [2]. The incidence of traffic accidents is interesting to study because the number of accidents continues to increase every year. This condition occurs due to lack of attention to the problem of traffic accidents. In addition, the absence of accurate data causes road traffic accidents such as the iceberg phenomenon, in the sense that the problems that arise on the surface do not reflect the actual road traffic accidents, so they seem nothing to worry about. However, based on WHO studies in developing countries, there has been an increase in the number of traffic deaths or injuries [3]

The amount of traffic accidents outside the cities are significantly increased through the years. According to the data from Regional Police in Riau Province, it showed that there were 40 locations identified as “Hot spot” location due to the high number of traffic accidents [4]. The causes of accidents recorded were mostly caused by the human factor. However, there were other causes contributed to the accidents, such as road geometry, traffic sign, lighting and its vehicles. Therefore, the study aims to identify the characteristics of traffic accidents frequency on a connection road between 3 cities in Riau.

Traffic safety depends on the effectiveness of traffic management, geometric design, lighting, roadside features, maintenance, power augmentation, traffic control devices, and traffic operations. This is aimed to reduce accidents that might result in fatalities, injuries, and property damage [5]. Road deterioration, geometrical characteristics, ambient conditions and activities, weather, and street lighting, are factors that contribute to accidents. Moreover, the car also has inappropriate operation and poor technical issues. Age, gender, and educational levels are characteristics of highway users. Higher vehicle speeds, poor roadside conditions, poor road geometry and lower road maintenance are some of the factors causing a rise in out-of-town incidents with internal accidents [2]. Only 20.9% of accidents in cities resulted in injuries, compared to 38.6% of accidents in rural areas. This was almost twice as many injuries as accidents in inner cities. In contrast, approximately 0.9% of accidents occurring in cities resulted in mortality within 30 days, similar to 10.8% of accidents that was occurred outside of a city. These statistics demonstrated that the rate of death in an out-of-town accident was more than 10 times higher than it would be in an urban accident [6].

Based on the problems above and the limitations of several previous studies, an exploratory investigation of road traffic on roads outside the city of Riau Province is needed to identify various factors that cause accidents and find the right solution to reduce traffic accidents in the road

segment and is expected to create a sense of security for road users.

2. Research Methods

This study was done to identify the characteristics of traffic accidents occurred from 2014 to 2019 on the connection road between 3 cities in Riau.

Table 1. Name of Road Segment and Length

Connection Road between Cities		Road Length (km)
From	To	
Pekanbaru	Simpang Tribrata (Kampa	83.18
Rantau Berangin (Kampar)	Rokan Hulu	154.31
Pekanbaru	Kuantan Singingi	163
Total		400.49

Primary data was obtained from survey by identifying the road segment, including identification of initial and final point of road segment number. The road is straight, winding, and broken with potholes. Over hand, secondary data used was traffic accidents data from 2014 to 2019, which was obtained from regional police of Riau, particularly Regional Police of Kampar, Kuantan Singingi and Rokan Hulu

3. Results and Discussions

Primary arterial routes defined the connecting traffic lines between Pekanbaru and Kampar Simpang Tribrata (83.18 km), Rantau Berangin Kampar to Rokan Hulu (154.31 km), and Pekanbaru and Kuansing (163 km). Motorcycles, small trucks, and big trucks were types of vehicles that mostly passing through the roads. The amount of traffic was massive and diverse, which increased the likelihood of accidents. Based on the data, from 2014 to 2019, the number of accidents and their frequency per road section are as follows:

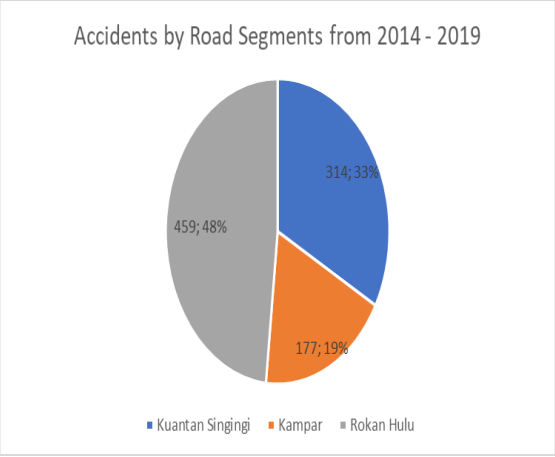

Figure 1. Frequency of Traffic Accidents by the Road Segments

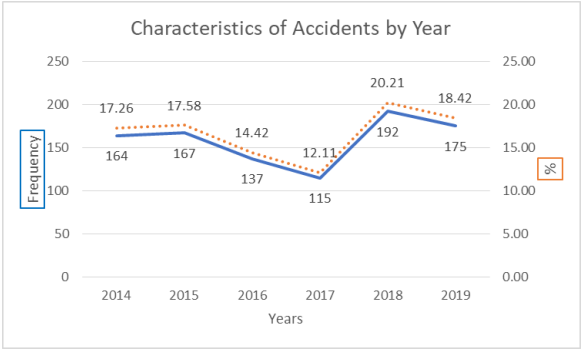

Figure 2. Frequency of Traffic Accidents by the Years

Based on figure 1 describes the number of accidents in each road segment, where the Rokan Hulu road segment experienced the highest number of accidents with 459 or 48 percent. This is because the geometry of the road does not meet the standards, irregular and poorly maintained roads, many inconsistent road surfaces, uneven and bumpy road surfaces, even potholed sections of roads, height differences between the shoulder and the road body, narrow shoulders due to bushes covering roadside markings [7]. In addition, because this road connects two regions, namely Riau region and North Sumatra region, many drivers who are not used to crossing the road or crossing it for the first time do not understand the condition of the road. Another thing, because the rural road is a long distance away and the roadside is full of palm trees, there are many farming machinery and non-motorized vehicles that move slowly and animals on the road that disturb the flow of traffic.

According to the frequency of accidents by month, as shown in Figure 3, the month of June had the highest number of accidents since it was a month of school holidays.

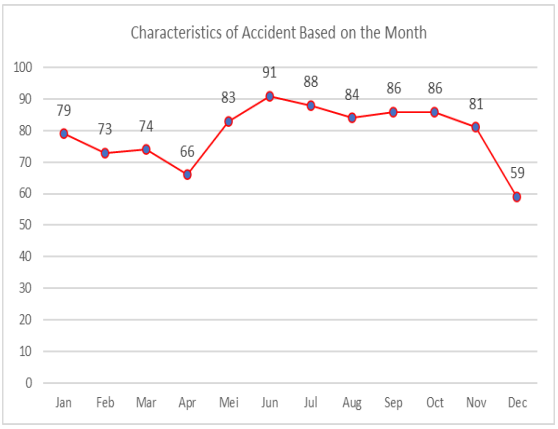

Figure 3. Frequency of Accidents by Months

Figure 4 illustrated the classification of total traffic accident severity during the last five years.

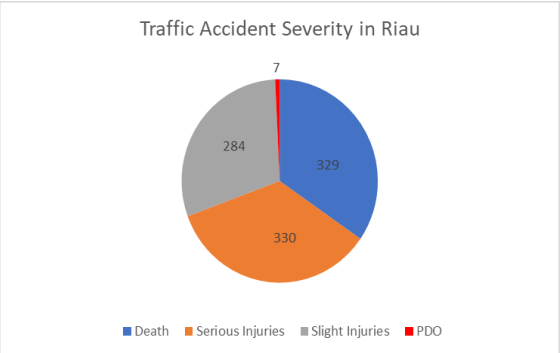

Figure 4. Classification of Traffic Accidents Severity in Riau

As shown in Figure 4, the total deaths on traffic accidents reached 329 cases and serious injuries reached 330 cases. The reason for the high number of serious injuries and deaths on rural roads is that drivers on rural roads have lower seat belt use and higher fatality rates, and those who have had accidents on rural roads are more often found not to be wearing seat belts [8]. Lack of seat belts is not the only reason why there are more deaths on the road, but it is an important one. Vehicle speed is also higher due to quiet road conditions. Unfortunately, the higher speed limit can cause more deaths [9].

Another problem on connecting-roads in Riau province is the digging of roads to lay/repair telephone wires or water pipes. These roads after digging will not be covered perfectly causing cracks in the road. This disruption will cause roadblocks, traffic jams and accidents as a result [10]. In addition, rural areas are inhabited by a higher number of elderly drivers and this age group generally has greater frailty, making their chances of dying in road accidents higher [11].

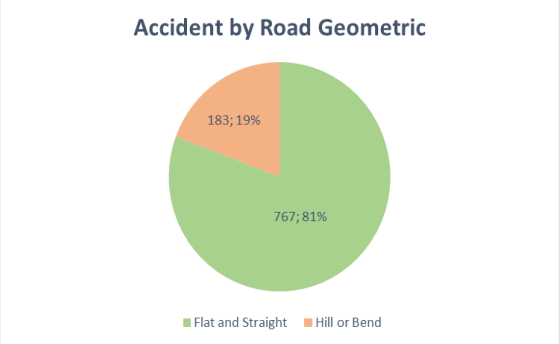

Figure 5. Accidents by road geometry

Based on figure 5, which illustrates the frequency and percentage of accidents that occur on flat and straight roads. It achieved 767 cases with a percentage of 81%. Because of the condition of the road, many drivers tended to drive recklessly, pay less attention to their surroundings, and become so sleepy. Therefore, they losed all control of their vehicles.

The results of this study are consistent with the findings of [12], where hilly terrain causes 30% more accidents than flat terrain. In addition, [13] said that the risk of accidents on curved roads is approximately twice as high as on straight roads; and the risk may be lower at night than during the day. A study conducted by [14], that the risk of an accident is higher on a horizontal bend than on a straight road. Accident rates for horizontal curves are higher than tangential sections, with rates between 1.5 and 4 times greater than straight sections [15].

Meanwhile, accidents caused by the types of vehicles were shown in Figure 6 and the frequency of accidents by the time were shown in Figure 7. Figure 6 illustrated frequency of accidents by the type of vehicles. In the past five years, there were 592 accidents in the type of motorcycle. Meanwhile, there were 194 heavy trucks (21%) and 164 light trucks (17%).

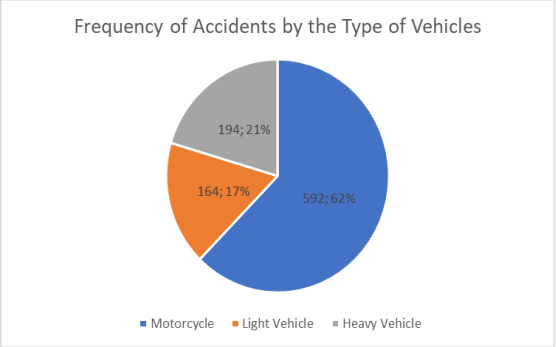

Figure 6. Frequency of Accidents by the Type of Vehicles

Motorcycles are the most popular vehicles among the community, to ensure community mobility in many Asian countries [16]. In the Riau region, motorcycles were widely used as a means of transportation to work and also go to school. Motorcycles were most often used by students going to school, because parents do not have time to take their children to school, so children were told to drive their own motorcycles. In addition, the position of motorcycles in the form of traffic facilities and urban transport planning is not clear and it is not considered as a main subject in traffic practice. However, motorcycles were widely used by low-income groups and a major factor in accidents and traffic congestion [17].

It is said that 70% of road accidents in Thailand, Cambodia and Laos involve motorcycles and three-wheelers, but despite this situation, the regulatory framework for motorcycles has not yet been developed. In the case of Cambodia, speeding by young people remains the main cause of road deaths and this can be explained by the fact that people can now travel at higher speeds due to road development [18].

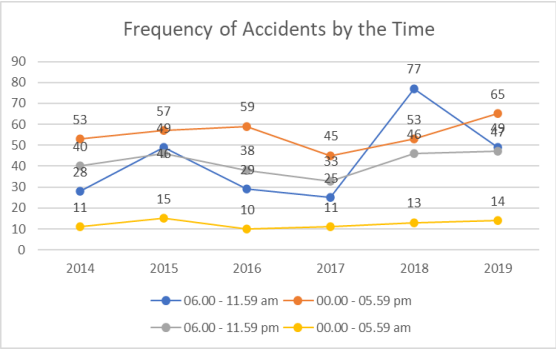

Figure 7. Frequency of accidents by the times

Based on Figure 7, the highest frequency of accidents by the time of occurrence was at 06.00 until 11.59 pm, which was 36.36% with a frequency of 332. While the lowest was at 00.00 until 05.59 am, which was 8.11 with a frequency of 74. There were several reasons why accidents often happen in the morning. For example, high movement of motor vehicles, because there is more activity in the morning [19]. Majority of Indonesian people start their activities in the morning such as going to work or going to school. Then, the attitude of haste because of worry if arriving late at the destination. In addition, emotions are running high because of the congested road conditions. As it is known that almost all road points are congested in the morning, as a result of traffic jams, the driver's psychology becomes disturbed so that the power of concentration is reduced [20].

4. Conclusion

The results of the analysis of accident data that occurred in 3 cities in Riau Province in 2014 - 2019 were the number of accidents in each road segment, where the Rokan Hulu road segment experienced the highest number of accidents with 459 or 48 percent. There were fluctuations on the accidents. The greater accidents were occurred in 2018, in which 192 cases and the month of June had the highest number of accidents since it was a month of school holidays. The classification of total traffic accident severity during the last five years, the total deaths on traffic accidents reached 329 cases and serious injuries reached 330 cases.The accidents that occur on flat and straight roads. It achieved 767 cases with a percentage of 81%. The accidents caused by the types of vehicles motorcycles 592 or 62%.

Reference

[1] Heinrich H. W., Petersen Dan, and . R. N., Industrial accident prevention : a safety management approach. New York: New York : McGraw-Hill, 1980.

[2] J. Oxley et al., “Cost-Effective Infrastructure Measures on Rural Roads,” no. Report No. 217, p. 157, 2004.

[3] T. Tjahjono, “The Effect of Traffic and Road Conditions to the Fatality Rates on Rural Roads in Eastern Indonesia,” J. East. Asia Soc. Transp. Stud., vol. 8, pp. 2201–2213, 2010.

[4] Tribunnews, “40 Titik Rawan Lakalantas di Riau Selama Mudik,” 2013. http://pekanbaru.tribunnews.com/2013/07/18/40-titik-rawan-lakalantas-di-riau-selama-mudik.

[5] A. M. Ismail, H. Y. Ahmed, and M. A. Owais, “Analysis and Modeling of Traffic Accidents Causes for Main Rural Roads in Egypt,” JES. J. Eng. Sci., vol. 38, no. 4, pp. 895–909, 2010, doi: 10.21608/jesaun.2010.125546.

[6] M. Tziotis, P. Roper, C. Edmonston, and M. Sheehan, “Road Safety in Rural and Remote Areas of Australia,” 22nd ARRB Conf. – Res. into Pract. Aust., no. January, pp. 1–23, 2010.

[7] K. Fahmi and Zulkifli, “Solusi Penanggulangan Kecelakaan Lalu Lintas di Kabupaten Rokan Hulu,” Simp. Nas. Teknol. Terap. (SNTT)2, vol. 3, pp. 46–53, 2014.

[8] L. F. Beck, J. Downs, M. R. Stevens, and E. K. Sauber-Schatz, “Rural and Urban differences in passenger-vehicle-occupant deaths and seat belt use among adults - United States, 2014,” MMWR Surveill. Summ., vol. 66, no. 17, p. ss6617a1, 2017, doi: 10.15585/mmwr.ss6617a1.

[9] A. Kusumawati, K. N. S. Ayuningtyas, and E. Ellizar, “the Effect of Speed Limit Violation on Motorcycle Crash Rate: Case Study Bandung National Road,” J. Indones. Road Saf., vol. 2, no. 3, p. 171, 2019, doi: 10.19184/korlantas-jirs.v2i3.15024.

[10] Y. R. Bhat, “Reasons And Solutions For The Road Traffic Accidents In India,” Int. J. Innov. Technol. Res., vol. 4, no. 6, pp. 4985–4988, 2016.

[11] N. Casado-Sanz, B. Guirao, and M. Attard, “Analysis of the risk factors affecting the severity of traffic accidents on spanish crosstown roads: The driver’s perspective,” Sustain., vol. 12, no. 6, 2020, doi: 10.3390/su12062237.

[12] M. H. Islam, L. Teik Hua, H. Hamid, and A. Azarkerdar, “Relationship of Accident Rates and Road Geometric Design,” IOP Conf. Ser. Earth Environ. Sci., vol. 357, no. 1, 2019, doi: 10.1088/1755-1315/357/1/012040.

[13] B. B. Nambuusi, T. Brijs, and E. Hermans, A review of accident prediction models for road intersections. UHasselt, 2008.

[14] R. Elvik, “The more (sharp) curves, the lower the risk,” Accid. Anal. Prev., vol. 133, no. August, p. 105322, 2019, doi: 10.1016/j.aap.2019.105322.

[15] A. Aram, “Effective Safety Factors on Horizontal Curves of Two-lane Highways,” Journal of Applied Sciences, vol. 10, no. 22. pp. 2814–2822, 2010, doi: 10.3923/jas.2010.2814.2822.

[16] A. S. K. Cheng, K. P. Y. Liu, and N. Tulliani, “Relationship between driving-violation behaviours and risk perception in motorcycle accidents,” Hong Kong J. Occup. Ther., vol. 25, no. July, pp. 32–38, 2015, doi: 10.1016/j.hkjot.2015.06.001.

[17] J. Berecki-Gisolf, V. Yiengprugsawan, M. Kelly, R. McClure, S. A. Seubsman, and A. Sleigh, “The impact of the thai motorcycle transition on road traffic injury: Thai cohort study results,” PLoS One, vol. 10, no. 3,

2015, doi: 10.1371/journal.pone.0120617.

[18] Y. Kitamura, M. Hayashi, and E. Yagi, “Traffic problems in Southeast Asia featuring the case of Cambodia’s traffic accidents involving motorcycles,” IATSS Res., vol. 42, no. 4, pp. 163–170, 2018, doi: 10.1016/j.iatssr.2018.11.001.

[19] G. Li, Y. Liao, Q. Guo, C. Shen, and W. Lai, “Traffic crash characteristics in shenzhen, china from 2014 to 2016,” Int. J. Environ. Res. Public Health, vol. 18, no. 3, pp. 1–24, 2021, doi: 10.3390/ijerph18031176.

[20] S. P. Santosa, A. I. Mahyuddin, and F. G. Sunoto, “Anatomy of injury severity and fatality in Indonesian traffic accidents,” J. Eng. Technol. Sci., vol. 49, no. 3, pp. 412–422, 2017, doi: 10.5614/j.eng.technol.sci.2017.49.3.9.