Traffic Accident Rate in Makassar City

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Abstract: Traffic accidents are an important transportation problem in several major Indonesian cities, especially Makassar City. Completion of the problem requires a study that is in particular, the severity of traffic accidents. Therefore this study aims to reveal the traffic accidents rate in Makassar City. Data was obtained secondary from the Makassar Traffic Accident Unit between January 2012 and December 2015. The results showed that the number of traffic accidents was 3,603 with a total of 5,489 people. The number of victims who experienced the death category was 10.3%, seriously injured 17.1%, slightly injured 72.6%. Based on these results, male victims, adults victims, senior high school educated victims, the driver victims, double accident type and side collision were very dominant variables affecting traffic accidents rate. The proportion of victims who had an accident was male, 72.3%. The portion of accident victims in adulthood 52.9%. While the percentage of accident victims with high school education is the highest proportion of 55.7% compared to other levels of education, the driver victim has the highest probability of experiencing minor injuries with a risk of 62.6%. Besides, based on accident type, double accidents have the highest proportion of 72.4%, while collision type has the highest percentage occurs in side-direction collisions with a percentage of 53.6%. Therefore, intensive socialization of vehicle use is needed, especially for high school riders.

Index Terms: Transportation problem, accident rate, victims, intensive socialization.

1 Introduction

Transportation developments and growth in an area besides providing benefits also has a negative impact. This impacts can be congestion and queues, of course, will cause significant losses to road users, especially waste of time and low levels of comfort [1]. Also, highly increasing motorized vehicles population in heterogeneous traffic conditions in the metropolis, especially in developing countries, it has an impact on the decline in road performance [2]. Another effect that is caused by traffic safety is accidents on the road network. [3, 4].

The World Health Organization (WHO) noted that deaths from non-communicable diseases are expected to rise from 28.1 million in 1990 to 49.7 million in 2020 (an increase in the absolute number of 77%). Road traffic accidents will contribute significantly to this increase. According to the report, road traffic accidents are expected to move from the ninth place to take third place in the burden ranking of disease in 2020 and every year the incidence of traffic accidents has caused an average of 1.24 million people died and 50 million the soul experiences injuries and permanent disability [5].
In Indonesia, the primary factor that increasing traffic accidents are the growing number of vehicles and human error. Indonesia Police data shows that in 2011, there were 109,776 accidents causing the death of 31,185 people, while in 2012 there were 109,038 accidents which caused the death of 27,441 people, with a potential socio-economic loss around IDR 203 trillion to IDR 217 trillion per year (2.9% - 3.1% of Indonesia's GDP) or around USD 17.5 billion [6] (Directorate of Transportation Safety, 2014).

Some factors affected the accident and interacted with each other. In making a decision related to policy, it is necessary to know the characteristics of the factors related. The characteristics of traffic accidents are an illustration of the accident condition which is quality and quantity occur. For this reason, the purpose of this study is to obtain a description of traffic accident victims characteristics based on severity condition. It is hoped that an appropriate solution will be obtained to reduce the accident rate in Makassar City.

2 Terms and Definitions

2.1 Traffic accident

Road safety is one of the issues that need to get serious attention in efforts to prevent collisions and reduce victims risk in a collision or traffic accident at present and in the future. Traffic accidents are currently a problem for developing countries, and the problem is the same as what is happening in Indonesia which faces severe road safety problems. This problem is likely to worsen as a result of the rapid growth in vehicles number (especially motorbikes), population growth, economic growth, and various other factors.
Accidents do not happen casually, but there is a reason, and there is a cause. Therefore, accidents must be analyzed and found, accordingly corrective actions to those causes can be carried out and further preventive steps can be taken. Traffic accidents defined as an unexpected or unplanned accident that occurs on the highway or as a result human activity error,

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which results in injury, illness, loss both to humans, goods and the environment.

Another definition relating to traffic accidents states that traffic accidents are incident which difficult to predict where and when will occur. Someone who experiences an accident will have an impact on the physical and mental — resulting in trauma, injury to disability and death — the accident rate increases from year to year as population growth and vehicle ownership. Heterogeneous traffic, less traffic experience and less robust law enforcement exacerbate the risk of accidents. The character and behavior of each also increase the risk of accidents [7].

Another definition reveals that a traffic accident is an incident on an unexpected and accidental road involving a vehicle that is moving with or without other road users, resulting in human casualties and property losses [8, 9].

2.2 Severity of Traffic Accidents

Victims of traffic accidents are people who are victims of traffic accidents. In general, the severity caused by a traffic accident can be divided into four types, that is: 1) fatal; 2) serious injury; 3) slight injury; 4) accident do not involve other road users are called single accidents. Besides, there are still types of traffic accidents without victims, and it is called accidents with loss of property only (property damage only = PDO accident). The impact of traffic accidents can be classified based on accident victims into four levels [10] as follows.

1. Fatal Accident is an accident victim who was confirmed dead as a result of a traffic accident for a maximum period of 30 days after the accident.
2. Heavy Accidents are victims of accidents who suffer from permanent injuries or have to be hospitalized for more than 30 days after the accident. An event is classified as a permanent defect if something of the limb is lost or cannot be used at all and cannot be healed or healed forever.
3. Minor accidents are victims of accidents who are injured who do not require hospitalization or must be hospitalized from 30 days.
4. Material losses, accidents which only cause material losses

3 METHODOLOGY

This research was conducted in Makassar City. The accident data was obtained from the Traffic Accident Unit of the Makassar City *Polrestabes*. Accident data collected is the last four years (2012-2015). The received data then compiled for further analysis, which is a descriptive analysis. This analysis method was used to describe accident data as though accidents number and accident victims level, the number of victims who died, serious injuries, and minor injuries, as well as the characteristics of victims involved in accidents

4 RESULTS AND DISCUSSION

4.1. The frequency of traffic accidents

As one of the cities in Indonesia which has a high growth rate of vehicles, it has an impact on the increasing number of accidents in the city of Makassar. In general, data collected from the Traffic Accident Unit of the Makassar City *Polrestabes* as the accident management authority in Makassar City provides an overview of the accident within the period of (4) the last four years of the period 2011 - 2015 as in Table 1.

Table 1. Identification of Traffic accidents in Makassar City 2012 – 2015 period

Indicators	Year				Average
	2012	2013	2014	2015	
Number of Accidents	1.051	961	781	810	901
Number of Victims	1.581	1.494	1.192	1.222	1.372
Died	139	133	114	115	125
Major Injury	293	257	228	56	209
Minor Injury	977	927	716	918	885
Material Loss (billion IDR)	1,64	2,21	2,06	1,89	1,95
Number of Location Points	200	207	180	170	189

Table 1 shows that accidents in Makassar City tend to decrease the number of accidents in the 2011-2015 period. Likewise with the number of victims. Generally, accidents risk in Makassar City is quite high reaching 2.5 accidents per day, and the average number of victims reaches 1.5 people/accident. While the material losses incurred from an accident reaches IDR 2,208,189/accident. Based on Table 1, it is also known that there is a tendency for accidents to occur in the same place with the proportion reaching 5 locations per accident.

4.2. Traffic Accidents Characteristics in Makassar City

Victims of traffic accidents in Makassar 2012-2015 period averaged 1,372 people per year. Gender is one factor that affected accidents. As in Figure 1, in that period the accident was dominated by male, which were 3,999 or proportionally the male accident rate was 72.9%. Whereas the accidents occurred in female victims were only 1,490 (27.1%). While 77.4% occurred in male victims, who died. Overall, the average male casualties reached 73.8% at all levels of traffic accidents.

One of the previous studies showed that accidents rate experienced by male riders was significantly higher than accidents suffered by female riders. This difference in accident rates is affected by a lack of patience and attention to the surrounding environment [11, 12]. Severity based on sex is complete as in Figure 1.

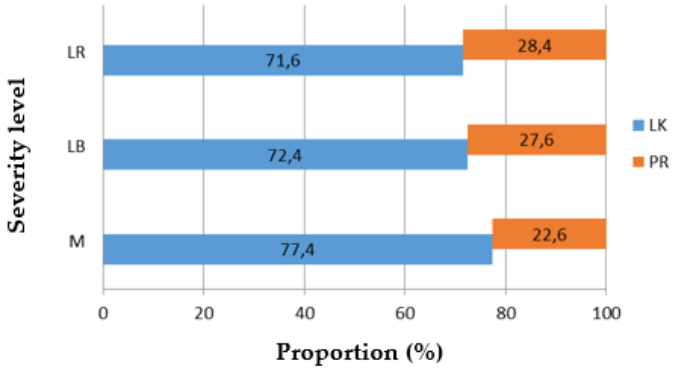

Figure 1. The proportion of Severity Based on Gender

Traffic accidents that occur in Makassar into concern category. This can be seen as shown in Figure 2. Based on the figure it is known that the average accident victims occur in the productive age.

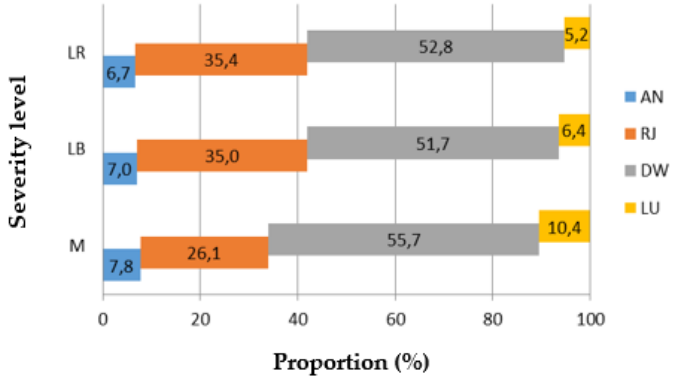

Figure 2. The proportion of Age-Based Severity

As known that productive age is adolescence and adulthood, based on Figure 2, it is understood that the proportion of accidents at this age reaches 87.2%. Judging from the severity, the adult age has the highest percentage of victims who have accidents which result in death is equal to 55.7%. While the smallest proportion occurred in elderly victims with a portion of 5.2%, this is in line with the research conducted by Hidayati and Hendrati, 2016 mentioning that traffic accidents mostly involve motorbike riders including middle school students [13]. However, it is not in line with the research conducted by Nadzira et al., 2017 that there is no relationship between age, genitalia, and type of vehicle that is exposed to lower extremist fracture types in traffic accidents [14].

An overview of the severity of victims based on education level is illustrated as shown in Figure 3. From the figure, it is known that victims with high school education have the highest proportion of all severity. There is 53.7% occurred in victims who suffered minor injuries, 56.2% occurred in victims suffered serious injuries, and as many as 49.9% of victims experienced death. The next highest proportion occurred in victims with tertiary education; the average percentage of the overall severity was 16.9%. Another thing shows that a high level of education does not directly reduce the severity of the accidents.

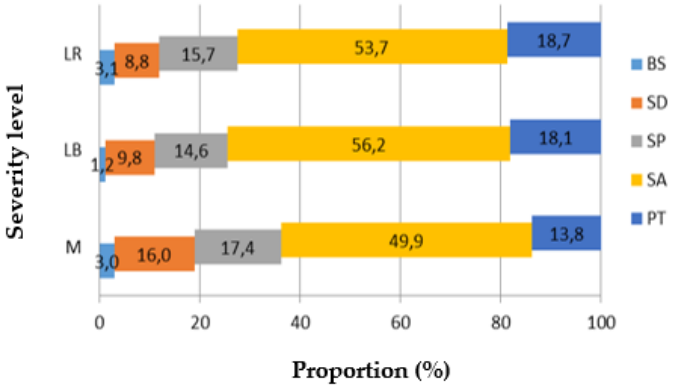

Figure 3. The proportion of severity based on education level

In general, road users are divided into two categories that are pedestrians and drivers. Road users can be defined as people who use the road system and who control the movement of vehicles or themselves. In this study, the role of the victim was divided into three categories, i.e., pedestrians, drivers, and passengers. Figure 4 shows that the driver has the highest proportion of severity. In this category, drivers are cyclists, motorists and car drivers. The most significant contribution from the driver is caused by motorcycle riders of 94.7% and the rest from cyclists and car drivers. Victims who experienced deaths from accidents reached 68.3% compared to the others. Likewise, those who suffered serious injuries and minor injuries had the most significant proportion of 68.1% and 63.8% respectively. This shows that motorists have a high risk of accident severity or in other words that the victim's role is the most important factor in the occurrence of accidents [15].

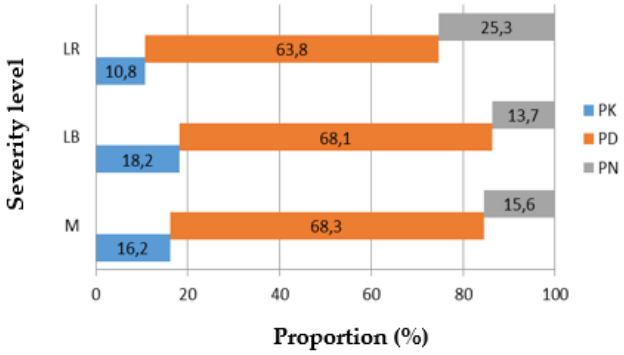

Figure 4. The proportion of Severity Based on Victim Role

The accident type is divided into three categories like the single accident, double accident, and consecutive accident. Figure 5 shows that multiple accidents involving only two vehicles had the highest proportion of 74.4% in these minor injuries. While, as many as 71.2% in double type accident will cause serious injuries, while the death toll is 60.1% in this

accident type. The average percentage of accidents reaches 68.57% at all severity levels. The smallest proportion occurs in the accidental type that is an accident involving three or more vehicles. In this type, the proportion severity is <6%.

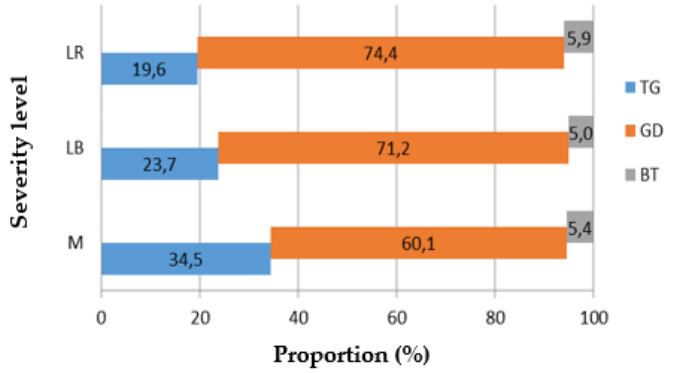

Figure 5. The proportion of Severity Based on Accident Type

In Makassar, accidents are generally caused by rear end, head on, hit and run, hit sites and sideswipe collisions. The whole of collisions types, side collision, has the highest risk that will cause death, serious injuries and minor injuries. The average of this type is 48.03%. While the smallest risk occurs in the collision type from the rear with an average percentage of 8.82%, as seen in Figure 6.

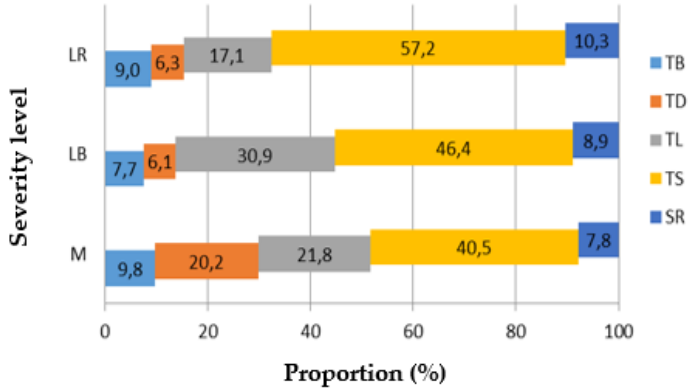

Figure 6. The proportion of Severity Based on Collision Type

5 Conclusions

Makassar City is one of the cities with a high accident rate. It was recorded that from 2012 through 2015 there were 3,603 with the number of accident victims reaching 1,372 per year with an annual loss of IDR 1.95 billion. There are six variables analyzed; it is known that male sex tends to experience traffic accidents with the severity of death with a percentage reaching 77.4%. The same can be seen in adult-aged victims having a percentage of 55.7%. Likewise in the role category of victims as drivers, 68.3% will experience a death due to traffic accidents. Whereas in the severity of severe injuries, the highest percentage occurred in the education category, which 56.2% at the level of senior high school. For the severity of minor injuries, the highest percentage occurred in the double collision and side-hit categories with a percentage of 74.4% and 57.2%.

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