

Factors Associated with Traffic Accidents in Sleman, Yogyakarta, Indonesia

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ABSTRACT

Background: Traffic accidents are still a significant problem in the transportation sector. Many factors can cause traffic accidents and affect their severity.

Objective: This study aims to determine the factors associated with the incidence of traffic accidents in Sleman Yogyakarta, Indonesia.

Methods: This retrospective study uses secondary data from the Sleman Resort Police Office and the Highway Traffic and Transportation Service. The sample is accident data from October 2018 to January 2020, totalling 1381 people using total sampling. The research data was entered into the excel program and tested using Chi-Square.

Results: The majority of respondents were aged ≤ 60 (84.8%), in higher school (84.2%), and male (65.1%). Most accidents occurred during day time (63.6%) and included in the low severity (94.6%). The bivariate test of age, education, and sex with the seriousness of the accident was found to be $p0.176$, $p0.589$, and $p0.866$. The results of the accident time test with the severity of the accident showed $p0.012$.

Conclusion: There is a relationship between the time of the accident and the severity of the accident, while age, education, and gender are not significantly related to the severity of the accident.

KEY WORDS

accidents, age, education, gender, traffic accident

INTRODUCTION

The number of deaths worldwide from traffic accidents in 2018 was 1.35 million¹⁾. Accurately death is 1,130.8 per 10,000 accidents²⁾. Many traffic accidents occur in schools and hospitals' Traffic Analysis Zone (TAZ)³⁾. Road conditions also impact the severity and mortality of traffic accidents⁴⁾. The type of vehicle also affects the incidence of traffic accidents. As many as 60% of cases of injury or death occur in motorcycle drivers⁵⁾. Research in India found that every hour as many as 16 people die and 53 are injured due to traffic accidents⁶⁾.

The causes of the Traffic Accident Rate (RTA), namely 21.9% drivers, 35.0% passengers, and 36.0% vulnerable road users⁷⁾. Factors in terms of humans such as socioeconomic, gender, education level, and age. Low socioeconomic levels will be more at risk of accidents and fatal injuries²⁾. In addition, drivers with low levels of education affect traffic accidents⁸⁾. Older age, male gender, and bad behaviour as causes of traffic accidents⁹⁾.

Driver behaviour used to be an essential factor causing traffic accidents. The incidence of traffic accidents due to the influence of marijuana is 3.4%. Drivers under the influence of alcohol are 17.8 times more likely to have a fatal accident. Alcohol is the most significant risk factor as a cause of traffic accidents¹⁰⁾. The health condition of the driver also plays a role in causing accidents. People with vertigo, heart attack, and epilepsy are particularly at risk for driving. Respondents who experience vascular attacks, vertigo, syncope, and younger age have a higher risk of developing vertigo attacks while driving a car¹¹⁾.

Environmental factors such as road conditions and weather also

cause accidents. Lousy weather, rural areas, and wet roads are risk factors for traffic accidents^{9,12)}. The number of accidents in autumn is 0.44 times less than in summer⁸⁾. Overturning accidents often occur during rainy weather¹³⁾. Professional drivers, fatigue, large vehicle types, overload, and terrain are associated with severe road accidents¹⁴⁾. Driving at night and monotonous road conditions indirectly affect the level of accident risk. Night conditions and a resting time for some people lower their alertness and increase driver fatigue¹⁵⁾.

Accident prevention efforts are significant in preventing death. Specific interventions regarding road safety should be given to drivers who use vehicles with a low level of safety²⁾. Knowledge about the factors at risk of causing traffic accidents in an area can be used as primary data to determine policies to be taken by the relevant agencies. Previous studies have presented data on several causes of accidents, but none have explained the comparison and risk factors for accidents that occur day and night. This study aims to determine the factors associated with accidents in Sleman.

METHODS

Study Design

This study is a retrospective study using secondary data. The research population is all traffic accidents in Sleman Regency, Yogyakarta Special Region.

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Table 1: Univariate Data of Respondents (N = 1381)

Variables		Number (n)	Percentage (%)
Time of Accident	Night	502	36.4
	Day time	879	63.6
Age (years)	> 60	210	15.2
	≤ 60	1171	84.8
Education	Elementary School	218	15.8
	Higher School	1163	84.2
Gender	Male	899	65.1
	Female	482	34.9
Accident	High Severity	75	5.4
	Low severity	1306	94.6

Table 2: Factors Related to Traffic Accidents in Sleman Yogyakarta, Indonesia (N = 1381)

Variables		Accident				Total	p	PR (95% CI)	
		High Severity		Low Severity					
		n	%	n	%				N
Time of Accident	Night	38	7.6	464	92.4	502	100,0	0.012	1.86
	Day time	37	4.2	842	95.8	879	100,0		(1.16-2.97)
Age (years)	> 60	46	21.9	164	78.1	210	100,0	0.176	1.55
	≤ 60	59	5.0	1112	95.0	1171	100,0		(0.87-2.75)
Education	Elementary School	14	6.4	204	93.6	218	100,0	0.589	1.24
	Higher School	61	5.2	1102	94.8	1163	100,0		(0.68-2.25)
Gender	Male	50	5.6	849	94.4	899	100,0	0.866	1.07
	Female	25	5.2	457	94.8	482	100,0		(0.65-1.76)

Samples

The sample is people who have traffic accidents and are taken based on the criteria of complete recorded data, accidents taken from October 2018 to January 2020. The number of samples was 1381 people. Sampling was done by total sampling technique.

Instruments

The research instrument used a secondary data recap sheet from the Sleman Resort Police Office. Researchers used the Excel program in Microsoft Office to recap the data obtained.

Data Collection

The researcher applied for a research permit for the data collection process. The research was conducted at the Sleman Resort Police Office and the Highway Traffic and Transportation Service (DLLAJR) on 3-14 February 2020. The data provided is in the form of a soft file data recap of all traffic accidents in the work area of Sleman Regency. The independent variables are the time of occurrence, age, gender, and education. The categories of each independent variable are the time of occurrence (day and night), age (≤ 60 years and > 60 years), and education (Elementary and Higher Education). The dependent variable is the accident's severity; the categories are minor (low severity) and significant (high severity).

Data Analysis and Ethical Consideration

The research was conducted after obtaining an ethical suitability letter numbered 024.3/FIKES/PL/I/2020 from the Health Research Ethics Commission, Faculty of Health Sciences, Universitas Respati Yogyakarta. Univariate data is presented using frequency distribution, while bivariate data is tested using Chi-square.

RESULTS

Univariate Data of Respondents

Table 1 shows that based on the time, the majority of accidents occurred during day time (63.6%) and included in the low severity (94.6%). The majority of research respondents were aged ≤ 60 (84.8%), had a higher school education level (84.2%) and were male (65.1%).

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Table 2 shows that the incidence of accidents at night causes a higher level of severity than during day time (38 events > 37 events). The bivariate test between accident time and accident severity showed $p=0.012$, proving a significant relationship between the two variables. Age data shows that respondents aged > 60 experienced more high-severity accidents compared to those aged ≤ 60 years (21.9% > 5.0%). The incidence of high severity in respondents with elementary school education is more than in higher education levels (6.4% > 5.2%). Male drivers are more likely to experience accidents with a high severity level than female drivers (5.6% > 5.2%). The bivariate test showed that age, education, and gender were not related to the severity of the accident, with details of $p=0.176$, $p=0.589$, and $p=0.866$.

DISCUSSION

Compliance with road safety standards is a significant concern in reducing the number of deaths due to traffic accidents. The application of safety standards is the key to reducing the number of deaths due to accidents⁹. The results showed that the incidence of accidents in the low-severity category was more than in the high-severity category. However, the presence of a high-severity condition to death requires severe treatment. Accident factors can occur due to environmental factors. Environmental conditions such as weather from various studies

show that rainy weather conditions can increase the incidence of accidents. The accident data in autumn is 0.44 times smaller than in summer⁹. Meanwhile, Mao *et al.* stated that most fatal accidents occur in snowy weather¹³. Furthermore, road and traffic conditions also trigger traffic accidents; traffic density causes frequent accidents³.

The results show that most accidents occur during the day. This finding supports previous research that found that the number of accidents during the day was twice as high as at night¹⁶. Meanwhile, the bivariate analysis showed a significant relationship between time and the severity of traffic accidents. The highest traffic density affects accidents^{13,17}. During the day, the density of the highway is higher than at night because humans are carrying out their productive activities. There are more road users during the day than at night¹⁸. Research results of Daytime accidents show that fatal conditions can be caused by various factors, such as road and driver conditions. Standard road conditions reduce the incidence of accidents¹⁹, study on improving chicle services reduces the incidence of deaths due to accidents⁸.

The time of the accident at night tends to be fatal compared to the day. This condition is caused during the day, the condition of the road is visible while at night it is less clear. The driver's condition and behaviour are the factors in fatal accidents on the highway. Due to lousy weather, slippery roads pose a greater risk for drivers to have accidents²⁰. Previous research has shown the high use of two-wheeled motorcycles by people in Indonesia, especially in Yogyakarta²¹. Motorcycle accidents can be caused by speed (31.5%), damaged roads (23.3%), collisions with other motorcycles (50.7%), and slippery road surfaces (24.7%)²². Environmental factors, especially road conditions, also trigger high-traffic accidents^{4,5}.

More victims suffered minor injuries than severe injuries and died. Factors that cause serious road accidents include professional drivers, fatigue, type of large vehicle, overload, and time of the accident. In contrast, previous studies found that the gender and age of the driver were factors in the occurrence of fatal accidents^{7,13}. Tadege stated that the driver's age is the leading cause of fatal traffic accidents⁹. Vulnerable young adult men have an increased risk of road accidents^{4,5}. This study showed different results; age and gender were unrelated to the accident's severity. This result is probably due to the unbalanced ratio of age and sex in each category. The majority of drivers in this study were aged ≥ 60 and women.

Most drivers in this study have a higher education category and low severity. This finding supports previous research, which found that the level of driver education affects traffic accidents; traffic accidents occur because drivers lack driving experience and have low levels of education⁸. Different things can be seen from the results of the bivariate test, which shows that there is no relationship between education and the severity of traffic accidents. Education is only categorized into 2, namely low and higher, with an unbalanced number of proportions. The researcher did not explain in detail the education included in higher education.

Another factor contributing to traffic accidents is the driver's behaviour factor. Driver behaviour while driving can put people at risk of causing an accident or increasing the severity of the accident. The type of vehicle and the use of seat belts have a significant relationship with the incidence of accidents⁹. Other factors of the driver are driving speed¹³, alcohol consumption^{10,22}, fatigue¹⁴, and depression²³. Fatal accidents can be caused by other external factors such as the type of road, obstructed visibility, accident location, accident site, climate, and lighting¹⁹. This study has several limitations; researchers use secondary data, so they cannot get more information about driver behaviour and external factors as the cause of traffic accidents. Researchers only analyze the driver factor seen from personal characteristics. Even so, many samples can provide an overview of the incidence of traffic accidents in Sleman, Yogyakarta.

CONCLUSION

The results showed that the time of the accident was significantly related to the severity of the accident victim. Daytime is a risk that causes more severe accident conditions. On the other hand, age, education level, and gender are factors that are not related to the severity of the accident.

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CONFLICT OF INTEREST

There was no conflict of interest in this study.

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