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Efforts to Improve Road Safety on Teuku Umar Bekasi

Feri Wisudawanto[1*], Torang Hutabarat[2], Penni Cahyani[3]
[1]Barombong Maritime Polytechnic, Makasar, Indonesia, ferywanto13@gmail.com
[2]Indonesian Land Transportation Polytechnic-STTD, Bekasi, Indonesia
[3]Indonesian Land Transportation Polytechnic-STTD, Bekasi, Indonesia

*Corresponding Author: ferywanto13@gmail.com[1]

Abstract: Road safety is a crucial issue in developing Indonesia's transportation infrastructure. Jalan Teuku Umar in Tambun, Bekasi, is one of the primary routes connecting Bekasi with neighboring areas, yet it experiences a high rate of traffic accidents. Accidents on this road, driven by user behavior, inadequate road conditions, and frequent traffic violations, lead to significant material losses and, in some cases, severe injuries or fatalities (Salvapour et al., 2020). This study aims to analyze factors contributing to the high accident rate on Jalan Teuku Umar and proposes measures to enhance traffic safety. Previous research highlights driver behavior as a primary cause of accidents, with frequent violations such as red light running, speeding, and lack of attention to pedestrians (Moshki et al., 2019; Sullman et al., 2012). Additionally, infrastructure issues, including inadequate pedestrian facilities and irregular traffic flow, further compromise road safety (Demiroz et al., 2015). This research focuses on identifying risk factors specific to Jalan Teuku Umar and recommends solutions to mitigate accidents and improve safety. The study employs a quantitative, descriptive approach, incorporating field observations, surveys, and accident data analysis. A survey was conducted with 200 respondents, including drivers and pedestrians, to assess traffic behavior and safety awareness. Secondary data from police reports over three years provided insight into accident patterns and dominant causes (Sullman et al., 2012). Descriptive analysis of the collected data highlights the correlation between safety awareness, road conditions, and accident frequency. Key findings indicate that traffic violations, limited geometry road capacity, the dominance of motorcycles, inadequate road use, and the impact of land use all significantly contribute to the high accident rate. Traffic violations, helmet particularly non-use, unlit headlights, and seatbelt neglect, account for most accidents, aligning with similar findings in other areas (Kurniastuti et al., 2021). Motorcycles dominate the traffic flow, increasing fatal accident risks due to low helmet use. High-density commercial activities also create complex traffic interactions. Recommendations include stricter law enforcement on violations, infrastructure improvements, road capacity expansion, and educational campaigns on traffic safety. Regular road geometry maintenance, improved signage, and better land use management are essential to reduce accidents on Jalan Teuku Umar. This study contributes to policy development for enhancing road safety in Bekasi and similar urban areas by providing a comprehensive analysis of risk factors and proposing targeted interventions.

Keywords: road safety, risky behavior, road infrastructure, traffic violations

INTRODUCTION

Road safety is an important issue in the development of transportation infrastructure in Indonesia. Jalan Teuku Umar Tambun Bekasi is one of the main routes connecting the Bekasi area with its surrounding areas, but it has a fairly high accident rate. Traffic accidents often occur on this road, either due to road user factors, inadequate road conditions, or frequent traffic violations. These accidents not only cause material losses, but can also cause serious injuries or even death (Salvapour et.al, 2020).

Based on the available data, many factors contribute to the high number of accidents on Jalan Teuku Umar Tambun. Among them are the lack of safe crossing facilities, lack of safety awareness among drivers and pedestrians, and the often congested and irregular road conditions. This study aims to analyze the factors causing accidents on the road and formulate efforts to improve traffic safety.

Several previous studies have shown that the main cause of accidents is the behavior of drivers who do not obey traffic rules, such as breaking red lights, driving at high speeds, and lack of attention to pedestrians (Moshki et al., 2019; Sullman et al., 2012). In addition, road condition factors such as the lack of adequate crossing facilities, as well as traffic irregularities, also worsen road safety (Demiroz et al., 2015). Therefore, this study will focus on identifying risk factors on Jalan Teuku Umar Tambun Bekasi and provide recommendations for solutions to reduce accidents and improve road safety.

By using an integrated accident factor analysis approach, this study is expected to contribute to designing policies and strategies to improve road safety in the Bekasi area, especially on Jalan Teuku Umar Tambun. Various efforts that can be made include improving road infrastructure, increasing awareness through traffic education, and stricter law enforcement against traffic violations (Lenne, 2013).

METHOD

This study uses a quantitative approach with a descriptive design to analyze the factors causing accidents on Jalan Teuku Umar Tambun Bekasi and to identify efforts that can be made to improve traffic safety. The method used
used includes data collection through field observation, surveys, and analysis of accident data that occurred on the road. The following steps describe the procedures applied in this study:

Location and Subject of Research

This research was conducted on Jalan Teuku Umar Tambun Bekasi, which is one of the main routes connecting Bekasi with its surrounding areas. The research location was chosen because it has a high accident rate, both involving motorized vehicles and pedestrians. The research subjects consisted of two main groups, namely motorized vehicle drivers and pedestrians who use this road routinely.

Data collection

The data used in this study includes primary and secondary data.

1. **Primary Data**: Primary data collection was conducted through surveys and direct observation at the research location. The survey was conducted using a questionnaire distributed to 200 respondents consisting of drivers and pedestrians around Jalan Teuku Umar Tambun. This questionnaire contains questions related to traffic behavior, road safety awareness, and factors that influence their decisions when crossing or driving. In addition, field observations were conducted at several accident-prone points to identify road conditions, crossing facilities, and road user behavior (Moshki et al., 2019).
2. **Secondary Data**: Secondary data was obtained from accident reports recorded by the

local police for the past 3 years. This data includes information on the type of accident, location of the incident, time of the incident, and parties involved. Analysis of this accident data is used to identify accident patterns that occur and determine the most dominant causal factors (Sullman et al., 2012).

Research Instruments

The instrument used in this study was a questionnaire that focused on collecting data on road user safety behavior, such as:

1. Habits of using crossing facilities (zebra crossings, pedestrian bridges, etc.).
2. The level of awareness of drivers about traffic rules.
3. Frequency of traffic violations, such as running red lights, vehicle speed, and use of helmets or seat belts.
4. Drivers' and pedestrians' perceptions of factors influencing their safety on the road (Demiroz et al., 2015).

Data analysis

The data obtained from the questionnaire and observation will be analyzed descriptively to identify the behavior patterns of road users on Jalan Teuku Umar Tambun Bekasi. This analysis aims to identify the relationship between factors such as the level of safety awareness, road conditions, and accident frequency. Furthermore, the accident data collected will be analyzed using frequency analysis to determine accident-prone points and the most dominant causal factors (Moshki et al., 2019; Sullman et al., 2012).

RESULTS AND DISCUSSION

This study aims to identify and analyze factors that affect traffic safety on Jalan Teuku Umar, especially related to traffic violations, road capacity, motorcycle dominance, road geometric conditions, and the role of land use. The results of the study indicate that these factors significantly contribute to the high accident rate in the area. The following discussion details the main findings of the analysis conducted.

Traffic violations are one of the main factors that increase the risk of accidents on Jalan Teuku Umar. Based on observations, common violations such as drivers not wearing helmets, not turning on headlights, and not wearing seat belts, significantly worsen traffic conditions. It is noted that traffic violations are the main cause of accidents, with more than 76% of accidents caused by human factors. High speed is also a dominant factor, contributing 52.14% to the accidents that occur. In addition, research in Bitung shows that driver behavior that does not comply with traffic rules plays a major role in increasing the risk of fatal accidents, which is also relevant to the findings on Jalan Teuku Umar. Therefore, stricter law enforcement against traffic violations in this area is needed to reduce the number of accidents.

Road capacity and traffic density also play an important role in increasing the risk of accidents on Jalan Teuku Umar. Based on the data obtained, the Jalan Teuku Umar road section has a traffic capacity/volume of 1803.4 pcu/hour. Based on the analysis of the volume-capacity ratio (V/C ratio), the road capacity is often exceeded during peak hours, resulting in unstable traffic flow. This condition is exacerbated by unclear road markings and damaged traffic signs, which make it difficult for drivers to follow the rules and anticipate potential hazards. This is in accordance with the findings of Kurniastuti et al. (2021) on Jalan Pantura, which stated that geometric road conditions that do not meet safety standards, such as the lack of clear road markings and inappropriate traffic signs, also cause accidents. In addition, traffic density with mixed flows also adds complexity to traffic flow management and increases the potential for accidents (Viandany et al., 2013). Therefore, improving road capacity and maintaining road signs and markings are important steps in improving traffic safety on Jalan

Teuku Umar.

The dominance of motorcycles as the majority of road users on Jalan Teuku Umar also contributes to the high risk of accidents, especially fatal accidents. Motorcycles account for around 88% of the total vehicles passing by, and accidents involving motorcycles are often fatal. This is in accordance with the results of research by Kurniastuti et al. (2021) which shows that motorcycles are the majority contributor to fatal accidents on Jalan Pantura. The low level of use of safety equipment, such as helmets, also increases the severity of injuries in accidents. Most motorcyclists on Jalan Teuku Umar tend not to wear helmets, which risks worsening head injuries during an accident. Therefore, increasing awareness of the importance of wearing helmets and stricter supervision of motorcyclists is needed to reduce the number of fatal accidents in this area.

In addition, inadequate road geometric conditions, such as limited stopping visibility, are also important factors that increase the risk of accidents. On Jalan Teuku Umar, many road sections have faded road markings and traffic signs that do not meet standards, which reduce the driver's reaction time to potential hazards. Research in Indramayu revealed that inadequate stopping visibility is one of the causes of accidents, and signs that are adjusted to the minimum stopping visibility distance are needed to increase the driver's reaction time to potential hazards (Kurniastuti et al., 2021). In Bitung, improving road markings and signs is also a priority step to reduce accidents (Viandany et al., 2013). Therefore, improving road geometric conditions, including improving road markings and installing appropriate signs, is very important in reducing the risk of accidents on Jalan Teuku Umar.

The role of land use also affects traffic safety around Jalan Teuku Umar. The dense commercial activities in this area create complex interactions between heavy and light vehicles. A study conducted in Indramayu showed that mixed-use land use can increase the potential for accidents on arterial roads, especially with the high frequency of heavy vehicles entering and exiting the main route (Kurniastuti et al., 2021). This dense commercial activity has the potential to create traffic conflicts, especially during rush hour. Therefore, better land use regulation and rearrangement of vehicle flow in this area are important steps to improve traffic safety.

Overall, the results of this study indicate that traffic violations, limited road capacity, motorcycle dominance, poor geometric conditions, and irregular land use all contribute to the high risk of accidents on Jalan Teuku Umar. Therefore, to improve traffic safety in this area, comprehensive improvement measures are needed, including stricter law enforcement against traffic violations, improving road capacity, increasing driver awareness of the importance of safety, as well as improving road geometric conditions and better land use arrangements.

Figure 1. Condition of Study Location Jl. Teuku Umar Bekasi

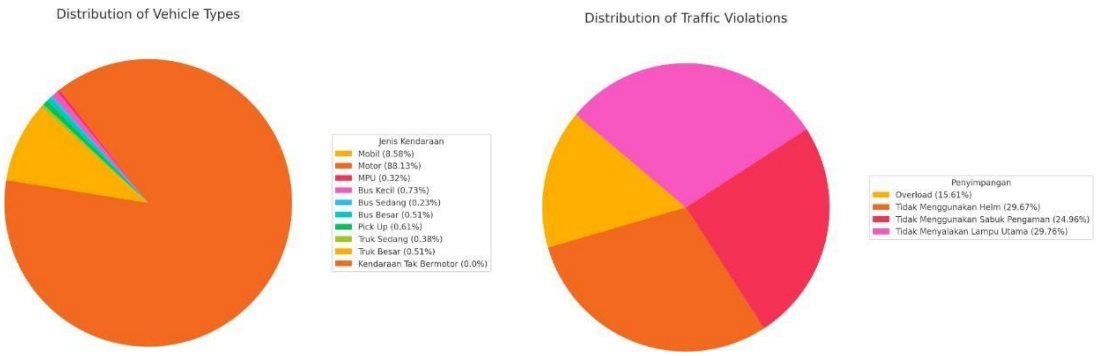

Diagram 1. Distribution of passing vehicles & Distribution of Violations

Spot Speed Survey data shows that the speed of vehicles traveling on Jalan Teuku Umar is divided into motorcycles, light vehicles and heavy vehicles, where each type of vehicle has

its own speed value. Judging from the average speed of motorcycles, it is 39.33 km/hour, the average speed of light vehicles is 34.41 km/hour, and the average speed of heavy vehicles is 24.99 km/hour. The speed value is of course influenced by the mass/specific gravity of the vehicle and the density of the road section passed. Both roads are fairly wide with busy traffic conditions. The few road obstacles that exist also increasingly affect drivers in controlling the speed of their vehicles.

CONCLUSION

The research on Jalan Teuku Umar revealed important factors that significantly affect the level of traffic accidents in the area. These factors include traffic violations, limited road capacity, motorcycle dominance, inadequate geometric conditions, and the role of land use. This conclusion summarizes the main findings of the research and provides recommendations to improve traffic safety in the area.

Traffic violations are one of the dominant factors that increase the risk of accidents on Jalan Teuku Umar. Violations such as not wearing a helmet, not turning on the headlights, and not using a seat belt worsen traffic conditions. Data shows that human factors are the cause of more than 76% of accidents, with high speed contributing 52.14% of these accidents. Similar findings were also found in Bitung, where disobedience to traffic rules contributed greatly to fatal accidents (Viandany et al., 2013). Therefore, stricter law enforcement against traffic violations is urgently needed, accompanied by educational campaigns to increase public awareness of the importance of safety (Zhou, et.al., 2018)

Limited road capacity often causes congestion and unstable traffic flow on Jalan Teuku Umar, especially during peak hours. Analysis of the volume-capacity ratio (V/C ratio) shows that this road often exceeds its capacity. This is exacerbated by faded road markings and damaged traffic signs, which reduce the ability of drivers to follow regulations and anticipate hazards. Similar findings were reported by Kurniastuti et al. (2021) on Jalan Pantura, where geometric road conditions that do not meet safety standards increase the risk of accidents. Time-based traffic flow management and increasing road capacity are important steps to address this problem.

Motorcycles dominate vehicles on Jalan Teuku Umar, reaching 88% of the total traffic volume. This makes motorcycles the main contributor to accidents, especially fatal accidents. Low helmet use among motorcycle riders increases the severity of injuries during accidents. Research on Jalan Pantura and Bitung shows a similar pattern, where motorcycles are the majority contributor to fatal accidents (Kurniastuti et al., 2021; Viandany et al., 2013). To reduce this risk, an educational campaign is needed that emphasizes the importance of helmet use as well as stricter supervision of motorcycle rider compliance with safety rules.

Inadequate geometric conditions, such as limited stopping visibility, are important factors that increase the risk of accidents on Jalan Teuku Umar. Faded road markings and substandard traffic signs reduce the driver's reaction time to potential hazards. Ehsani (2023) stated that insufficient minimum stopping visibility increases the risk of accidents, while installing signs that comply with visibility standards can improve safety. Therefore, improving road markings and installing signs according to standards is very important to reduce accidents (Zhang, et.al., 2022).

The dense commercial activities around Jalan Teuku Umar create complex interactions between heavy and light vehicles, especially during peak hours. This is similar to the findings in Indramayu, where mixed-use land use increases the potential for accidents on arterial roads due to the high frequency of heavy vehicles entering and exiting the main route (Kurniastuti et al., 2021). Better land use regulation and rearrangement of vehicle flow are needed to reduce traffic conflicts in this area.

Based on the research findings, the following steps can be taken to improve traffic

safety on Jalan Teuku Umar:

1. **Stricter Law Enforcement**: Stricter penalties for violations such as not wearing a helmet, breaking speed limits, and not using a seat belt can reduce traffic violations.
2. **Increasing Road Capacity and Infrastructure**: Expanding road capacity, repainting markings, and repairing damaged traffic signs will help reduce traffic congestion and improve safety.
3. **Safety Campaign**: Educational programs targeting motorcyclists, including promoting the use of standard helmets, can reduce fatal crash rates.
4. **Road Geometric Improvements**: Regular maintenance of road markings and installation of signs according to minimum visibility standards will improve driver safety.
5. **Land Use Regulation**: Separating heavy and light vehicle lanes and arranging commercial activities around the road will reduce complex traffic interactions.

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