

Analysis of the Unsafe Road User Behavior in Ternate City Using AHP Method

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ABSTRACT

Unsafe road user behavior is something that can affect the implementation of transportation as data from the police states that 61% of accidents are caused by human factors. This study aims to determine the types and factors that cause violations committed by road users who have passed intersection three (Jalan Hasan Esa-Jalan Ahmad Yani) and (Jalan Pemuda-Jalan A.M Kamaruddin) along with the handling of these violations. The results of the analysis found that the most common type of violation was not using a rear helmet by 88.8% caused by not having a helmet. Meanwhile, based on the analysis with the AHP method, the violation that must be prioritized in handling is against the flow with priority alternative handling, including education, sanctions and training.

INTRODUCTION

Unsafe road user behavior is a factor that can affect the implementation of transportation. For example, driving while using a device, riding more than one person, not using a seat belt, not using a helmet, running a red light and so on. Violation of traffic rules can be the beginning of a traffic accident. Therefore, to reduce accidents, it is necessary to reduce or eliminate such violations.

Ternate City monitored by ETLE cameras (*Electronic Traffic Law Enforcement*) At the beginning of 2023 has recorded approximately 1000 traffic violations within 1x 24 hours committed by car drivers and motorists, the most common types of violations are playing mobile phones while driving, not using helmets and not using seat belts for car drivers. The Directorate of Traffic (Ditlantas) of the North Maluku Regional Police recorded that the number of lakalantas cases in 2022 from January to September 6 increased compared to 2021 in the same period. The increase occurred by 37 cases, from 130 cases to 167 cases.

Based on this background, this research needs to be carried out to identify the types of violations, their causes and impacts so as to determine the priority scale for handling violations.

LITERATURE REVIEW

Behaviour

Behavior, also called attitude, according to Natawidjaja (1978) is a statement of activities that can be observed by others and is the result of a combination of understanding external influences and internal influences. In addition, Kartono (1984) explains that the word behavior or action has a very broad meaning, which not only includes morality such as talking, walking, running, exercising, moving and others but also discusses various functions such as seeing, hearing, remembering, thinking, fantasy, re-recognition, the appearance of emotions in the form of crying or smiling and so on.

Unsafe Road Users

Unsafe road user behavior can be interpreted as road users, both motorists, pedestrians and other road users who do not apply or obey the rules in traffic so as to endanger themselves and others while driving. Examples of unsafe road user behavior are using gadgets when driving, not using personal safety equipment (AKD) such as helmets, violating traffic signs, careless driving, exceeding predetermined speed limits, and other unsafe behaviors.

Traffic Violations

Understanding traffic in relation to road traffic, Naning Ramdlon (2009) explained that what is meant by road traffic violations is actions or actions that are contrary to the provisions of traffic laws and regulations.

Factors Causing Traffic Violations

According to Soedjono Soekamto, the factors causing traffic violations are as follows:

1. Human Factor
2. Road Facilities Factor
3. Vehicle Factors
4. Natural State Factors

Analytical Hierarchy process (AHP)

Analytical Hierarchy Process (AHP) (Saaty, 2006) is a decision-making approach designed to help find solutions to complex multi-criteria problems. The final result of AHP is a ranking or priority weighting of each decision alternative

According to Saaty (2008), hierarchical structures can be formed using a combination of ideas, experiences and views of others.

The AHP procedure consists of several stages (Suryadi and Ramdhani, 1998), namely:

1. Hierarchy arrangement by determining the objectives that are the goals of the system as a whole at the top level. The next level consists of criteria for considering and determining these alternatives.
2. Prioritization of elements through pairwise comparison.

Expert Choice App

Expert Choice (EC) is one of the tools to help decision makers in making decisions. EC offers several facilities ranging from input of criteria data, and several alternative options, to goal setting. EC is easy to operate with a simple interface.

METHODOLOGY

Population and sample

The population in this study includes car drivers and motorcyclists who live in Ternate City and are willing to fill out the questionnaire provided. Before complete data collection is carried out, a preliminary survey is carried out with the aim of determining the actual sample size. To be able to determine the minimum number of samples that can represent actual conditions, a minimum of 30 samples were taken in this preliminary survey. If the sample is sufficient, there is no need to add samples.

The technique used to find out the number of samples needed with the following formula:

- a. Calculating Variance (S²)

$$S^2 = \frac{\sum (\bar{X} - X)^2}{n - 1}$$

Where:

n = Number of Samples

S² = Variant

X = Age of Respondent

\bar{X} = Sample Mean (average age of Respondents)

With the preliminary survey data, the required number of samples will be calculated, so that it meets statistically. By setting the trust level (*Level of confidence*) 95.5%, from the normal distribution table obtained the value $z = 2$. Further calculated as follows:

b. Calculating *Acceptable sampling error* (Se)

$$Se = 0.045 \times \bar{X}$$

Where:

Se = *Acceptable sampling error*

\bar{X} = Sample Mean

c. Calculating *Acceptable standard error* ($Se_{(x)^2}$)

$$Se_{(x)^2} = \left(\frac{Se}{z}\right)^2$$

d. Calculating the Actual Number of Samples (n)

$$n = \frac{s^2}{se(x)^2}$$

Data Collection Techniques

This data collection is carried out by distributing questionnaires *Online* in the form of *Google Forms* to car drivers and motorcyclists. As well as taking data on traffic violations recorded by ETLE cameras and conducting interviews with experts.

Data Analysis Methods

The data analysis method used by researchers in this study is the AHP Method assisted by the Expert Choice Application ver.11

RESULTS AND DISCUSSION

Table 1 Description of Respondents' Demographic and Travel Characteristics

Gender	Man	124	46,1%
	Woman	145	53,9%
Gene	X (43-58 yrs)	23	8,60%
	Y (28-42 yrs)	49	18,20%
	Z (13-27 yrs)	197	73,20%
Vehicle Type	Motorbike	237	88,10%
	Car	8	3%
	Both	24	8,90%

In Table 1 obtained respondents based on gender, men 46.1% (124), women 53.9% (145). By generation, gen X 8.6%(23), gen Y 18.20%(49), gen Z 73.20%(197) and based on the type of vehicle often used by motorcycles 88.1%(237), cars 3%(8) and those using both 8.9%(24).

Table 2 Description of traffic violations in general

P1	Yes	148	55,00%
	Not	121	45,00%
P2	Yes	178	66,20%
	Not	91	33,80%
P3	Yes	91	33,80%
	Not	178	66,20%
P4	Yes	146	54,30%
	Not	123	45,70%
P5	Yes	184	68,40%
	Not	85	31,60%
P6	Yes	170	63,20%
	Not	99	36,80%
P7	Yes	146	54,30%
	Not	123	45,70%
P8	Yes	137	50,90%
	Not	132	49,10%
P9	Yes	239	88,80%
	Not	30	11,20%
P10	Yes	164	61,00%
	Not	105	39,00%
P11	Yes	172	63,90%
	Not	97	36,10%
P12	Yes	90	33,50%
	Not	179	66,50%

Information:

Q1: Have you ever parked your vehicle in a prohibited area?

Q2: Have you ever used a cellphone while driving?

Q3: Have you ever raised and/or dropped off passengers carelessly?

Q4: Have you ever stopped a vehicle suddenly without signaling while driving?

Q5: Have you ever turned a turn without turning on the turn signal?

Q6: Have you ever ridden a motorcycle with more than one passenger?

Q7: Have you ever driven against the current?

Q8: Have you ever driven an unsafe distance?

Q9: Have you ever not worn a rear helmet when you were a passenger?

Q10: Have you ever run a red light?

Q11: Have you ever not used a seat belt? (driver and passenger next to him)

Q12: Have you ever stopped a vehicle at a zebra crossing?

In Table 2, it is found that the most frequent violations committed by road users in Ternate are not using a rear helmet by 88.8% (P9) then in the next position turning not turning on the turn signal 68.4% (P5), using a cellphone while driving 66.2% (P2), not using seat belts 63.9% (P11), riding a motorcycle

with more than one passenger 63.2% (P6), running a red light 61% (P10), parking in the prohibition area 55%(P1), sudden stopping of the vehicle without a signal 54.3%(P4), going against the flow 54.3%(P7), not driving at a safe distance 50.9%(P8), raising and/or lowering passengers carelessly 33.8%(P3) and finally stopping at zebra crossing 33.5%(P12).

Description of Traffic Violation with SPSS

The following reasons for committing violations are as follows:

Table 3 Description of the causes of the violation

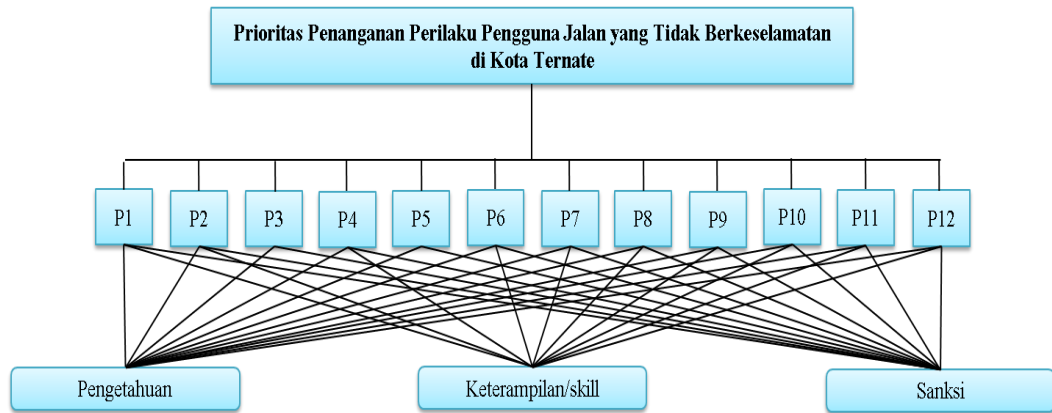
A1	Tidak ada polisi yang mengawasi	22	14,90%
	Tidak ada tempat parkir	67	45%
	Tidak tahu area tersebut dilarang parkir	51	34,50%
	Lainnya	8	5,40%
		148	
A2	Tidak ada polisi yang mengawasi	7	3,90%
	Karena ditelepon/pesan masuk	150	84,30%
	Hanya karena ingin saja	10	5,60%
	Lainnya	11	6,20%
		178	
A3	Tidak ada polisi yang mengawasi	7	7,70%
	Sedang terburu-buru	53	58,20%
	Tidak tahu hal tersebut adalah pelanggaran	29	31,90%
	Lainnya	2	2,20%
		91	
A4	Tidak ada polisi yang mengawasi	4	2,70%
	Kurang konsentrasi	69	47,30%
	Bertemu kenalan di jalan	51	34,90%
	Lainnya	22	15,10%
		146	
A5	Tidak ada polisi yang mengawasi	3	1,60%
	Lupa	134	72,80%
	Lampu sein tidak berfungsi	43	23,40%
	Lainnya	4	2,20%
		184	

A6	Tidak ada polisi yang mengawasi	25	14,70%
	Sedang terburu-buru	92	54,10%
	Hanya karena ingin saja	23	13,50%
	Lainnya	30	17,60%
		170	
A7	Tidak ada polisi yang mengawasi	28	19,20%
	Sedang terburu-buru	94	64,40%
	Hanya karena ingin saja	8	5,50%
	Lainnya	16	11%
		146	
A8	Tidak ada polisi yang mengawasi	11	8%
	Sedang terburu-buru	71	51,80%
	Tidak tahu ada ketentuan jarak aman	45	32,80%
	Lainnya	10	7,30%
		137	
A9	Tidak ada polisi yang mengawasi	63	26,40%
	Sedang terburu-buru	63	26,40%
	Tidak punya helm	101	42,30%
	Lainnya	12	5%
		239	
A10	Tidak ada polisi yang mengawasi	36	22%
	Sedang terburu-buru	109	66,50%
	Tidak suka menunggu	11	6,70%
	Lainnya	8	4,90%
		164	
A11	Tidak ada polisi yang mengawasi	49	28,50%
	Tidak suka	59	34,30%
	Merasa tidak penting	33	19,20%
	Lainnya	31	18%
		172	
A12	Tidak ada polisi yang mengawasi	10	11%
	Sedang terburu-buru	34	37%
	Tidak tahu hal tersebut adalah pelanggaran	25	27,80%
	Lainnya	21	23,30%
		90	

In Table 3, the most dominating causes of traffic violations are parking in the prohibited area because there is no parking space by 45%, using cellphones while driving because of calls/incoming messages 84.3%, raising and/or dropping off passengers carelessly because they are in a hurry 58.2%, stopping the vehicle suddenly without a signal due to lack of concentration 47.3%, turning not turning on the turn signal because of forgetting 72.8%, riding a motorcycle with more than one passenger because it is in a hurry 54.1%, going against the flow because it is in a hurry 64.4%, not driving a safe distance because it is in a hurry 51.8%, not using a rear helmet because it does not have a helmet 42.3%, running a red light because it is in a hurry 66.5%, not using a seat

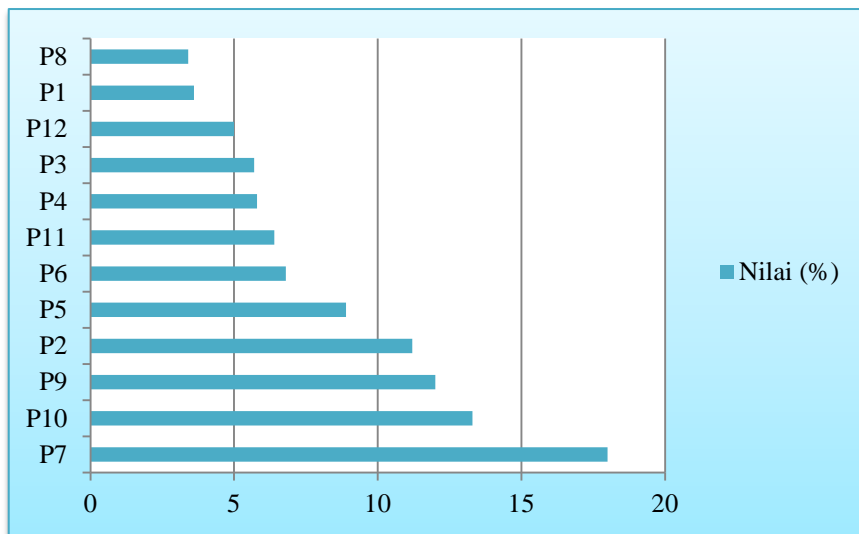
belt because it does not like 34.3%, and the last one stopping at a zebra crossing because of a rush 37%.

Priority Traffic Violation Handling with Expert Choice



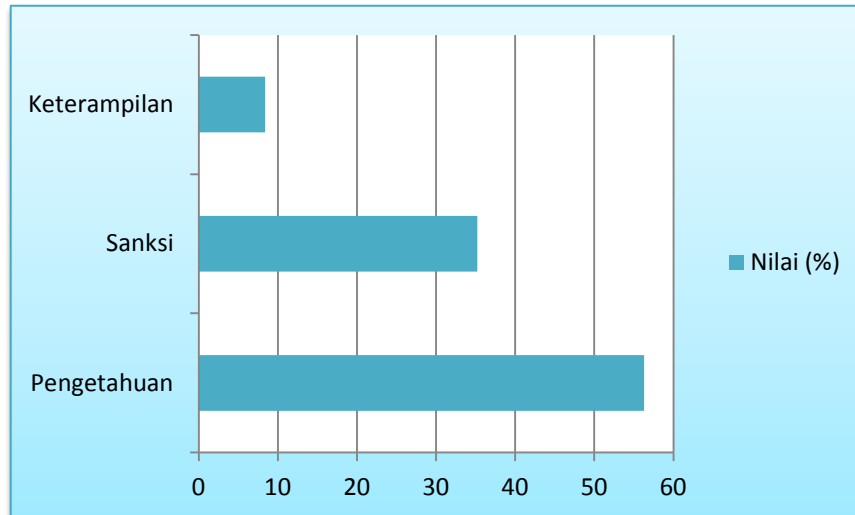
Picture 1 Hierarchy of Handling Priorities

In the analysis process using the AHP method, a hierarchy is needed first, as shown in Figure 1 above. As for the results of the analysis using the application *Expert Choice* can be seen in Figure 2 and Figure 3 below.



Picture 2 Priority Criteria

Based on Figure 2, it is found that going against the current (P7) is a violation that must be dealt with immediately then running a red light (P10), not using a rear helmet (P9), using a cellphone while driving (P2), turning not turning on the turn signal (P5) and so on. Analysis on *Expert Choice* It is also obtained that the consistency ratio (CR) value meets the requirements of < 10%, which is 0.03 or 3%.



Picture 3 Alternative Priorities

Based on Gamba 3, it is found that alternative priorities in handling unsafe road user behavior are providing education about traffic, then giving strict sanctions to violators, and finally providing training to form skills in road users. Analysis on Expert Choice also obtained the consistency ratio value (CR) qualified $< 10\%$, which is 0.00435 or 0.435%.

CONCLUSION AND SUGGESTION

Based on the research that has been conducted, road users who have passed through the intersection of three Jalan Hasan Esa - Jalan Ahmad Yani and Jalan Pemuda - Jalan A.M Kamaruddin tend to commit the type of violation, specifically not using a back helmet by 88.8%, because they do not have a helmet by 42.3%, there is no police supervising 26.4%, being in a hurry 26.4% and other reasons 5%. According to the analysis using expert choice, the violation that is prioritized in handling is a violation against the flow. For the first priority alternative handling is to provide education about traffic, strict sanctions and training.

This research can be used for policy making related to unsafe behavior such as adding ETLE cameras, adding types of violations caught by ETLE cameras, intensive coaching for the community to increase awareness in traffic and strict sanctions on all parties.

FURTHER STUDY

Suggestions for future research may be further deepened by focusing on other aspects that affect unsafe road user behavior such as road geometric conditions, completeness of road infrastructure, *Stakeholder* policies and others.

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