CHARACTERISTICS OF HELMET USE AND MOTORCYCLE OCCUPANCY IN JAKARTA

Leksmono Suryo Putranto
Senior Lecturer
Civil Engineering Department
Tarumanagara University
Jln. Let.Jen. S. Parman No.1
Jakarta 11440
Telp:(021)5672548 ext 332
ls.putranto@ftuntar-id.com

Upik Adri Yanti
Student
Civil Engineering Department
Tarumanagara University
Jln. Let.Jen. S. Parman No.1
Jakarta 11440
Telp:(021)5672548 ext 331
upik_1988@yahoo.com

Abstract

In recent years the use of motorcycle increase drastically in Indonesia. Most of the accident in Indonesia was motorcycle related. Therefore the attention of protecting the riders through promoting compliance to the helmet use and the maximum number of riders per motorcycle is required. This present study is intended to observe the characteristics of helmet use and motorcycle occupancy in Jakarta. Data collection was made on Tuesday (representing normal working days) and Saturday (representing weekend). Each day the observation was carried out in three periods (morning, noon and afternoon) and each period consists of two hours. Traffic count for other vehicle types (light vehicle and heavy heavy vehicle) was also done to allow V/C analysis as a proxy of riders awareness of possible police enforcement. The result shows that about 85% of the riders and passengers wore helmet and less than 2% of motorcycle occupancy was exceeding maximum number of riders.

Key Words: mototcyele use, accident, helmet use, motorcycle occupancy, Jakarta

INTRODUCTION

In recent years the use of motorcycle increase drastically in Indonesian cities. Although based on the data from Indonesian National Police (summarized in National Agency of Statistics in http://www.bps.go.id/) the proportion increase of motorcyle in overall motorized vehicle was only from 69.5% in 1987 to 74.1% in 2009 but this involved ownership increase from 5,554,305 motorcycles to 52,433,132 motorcycles. Other important issue regarding this issue is the fact that substantial additional number of motorcycles was existed in highly populated cities. If in Indonesian Highway Capacity Manual (IHCM), 1997, the highest the number of population the less the proportion of motorcycle in the overall motorized vehicle, a publication by Putranto and Setyarini (2011) reported that such pattern was no longer exist at least in his study areas in Jakarta, Bandung, Surabaya, Medan, Makassar and Mataram (although third year research in this area is still ongoing in Palembang and Denpasar, but similar results are expected from these cities). This is due to sever congestion in large cities. As people felt that public transport could not fulfil their needs for punctuality, they tried to solve their daily transport needs by owning and using motorcyle. Most of the accident in Indonesia was motorcycle related. Therefore the attention of protecting the riders through promoting compliance to the helmet use and the maximum number of riders per motorcycle is required. This present study is intended to observe the characteristics of helmet use and motorcycle occupancy in Jakarta.

PREVIOUS STUDIES

In terms of the relationship between red light violation rate and V/C as a proxy to riders awareness on police enforcement, Putranto and Sucipto (2007) found that the higher the V/C the lower the percentage of motorcycliests red light vioation by keep passing the stop line after red and the lower the V/C the higher the higher the percentage of motorcyclists red light violations by passing the stopline before green. As a consequences, motorcyclists red light violations by keep passing the stopline after red were more dominant in the early morning observation period, whilst motorcyclists red light violations by passing the stopline before green were more dominant in the other observation periods (morning, noon and afternoon).

In terms of the characteristics of helmet users, Putranto, Pramana and Kurniawan (2006) found that motorcylist who always use helmet in every ride, tend to be more careful in riding and felt annoyed by reckless riders. They also tend to always bring their riding license in every ride.

METHODOLOGY OF DATA COLLECTION

Data collection was made on Tuesday, 5 April 2011 (representing normal working days) and Saturday, 26 March 2011 (representing weekend) by video recording. The observation site is in two-lane two-way road in Rawa Belong, West Jakarta near a large private university campus shown in Figure 1. The choice to observe two-lane two-way road is to minimize the complication of video observation. The reason to choose the site was to ensure availability of moderate traffic flow with various travel purposes within reasonable distance from the surveyors residence.

Figure 1 Observation Site

Each day the observation was carried out in three periods (morning 8 a.m.-10 a.m., noon 11.00 a.m.-01.00 p.m. and afternoon 04.00 p.m.-06.00 p.m.). Traffic count for other vehicle types (light vehicle and heavy vehicle) was also done to allow V/C analysis based on IHCM (1997) vehicle classification for urban road. V/C was used as a proxy of riders awareness of possible police enforcement. The video recordings were then replayed in on-

desk observation to allowed counting in 15 minutes period. For the purpose of helmet use and motorcycle occupancy classification following table was used:

Table 1 Classification of Helmet Use and Motorcycle Occupancy

Helmet Use Class	Motorcycle Occupancy	The Rider* Wore Helmet	First Passenger** Wore Helmet	Second Passenger** Wore Helmet	Motorcycle Occupancy Class
1	1	no			A
2	1	yes			
3	2	no	no		B
4	2	yes	no		
5	2	no	yes		
6	2	ya	yes		
7	3	no	no	no	C
8	3	yes	no	no	
8	3	no	yes	no	
8	3	no	no	yes	
9	3	yes	yes	no	
9	3	yes	no	yes	
9	3	no	yes	yes	
10	3	yes	yes	yes	
11	4	all possible helmet use variation			D

*   Rider means the driver of motorcycle
** In the case of motorcycle occupancy class B the first passenger was obviously the only passenger riding behind the rider. In the case of motorcycle occupancy class C, the first passenger was a little kid sat in front of the rider or a passenger riding behind the rider. The remaining passenger called the second passenger

Traffic count for overall traffic was also grouped into 15 minutes period of observation. This was to allow correlation analysis between helmet use, motorcycle occupancy and V/C.

METHODOLOGY OF DATA ANALYSIS
The analysis consists of the following:
- T-test of difference between mean percentage per helmet use class based on days and based on periods of the day.
- T-test of difference between mean percentage per motorcycle occupancy class based on days and based on periods of the day.
- Pearson correlation analysis between V/C and percentage per helmet use class.
- Pearson correlation analysis between V/C and percentage per motorcycle occupancy class.

The t-tests were done beween pairs of days and pairs of period of the day to show possible behaviour between weekday and weekend and between different time period of the day. In all analysis significant level of 0.05 was used.

RESULTS

In general about 85% of the observed riders and passengers wore helmet and only less than 2% of observed motorcycles occupied by 3 or more riders/ passengers. Table 2 shows that mean percentages of helmet use class 6,7,8,9, on Tuesday were lower than on Saturday and significant at $\alpha=0.05$ whilst mean percentage of helmet use class 2 on Tuesday was higher than on Saturday and significant at $\alpha=0.05$.

Table 2 Comparison of Mean Percentage of Each Class of of Helmet Use between Tuesday and Saturday

Helmet Use Class	Percentage of Each Class of of Helmet Use by Day		Diffrerence in Mean Percentage	α	Significant at $\alpha =0.05$?
	Tuesday	Saturday			
1	6.4	7.3	-0.8	0.084	No
2	68.5	64.4	4.1	0.004	Yes
3	3.7	3.9	-0.2	0.571	No
4	6.9	6.8	0.2	0.672	No
5	0.2	0.3	-0.1	0.830	No
6	13.0	15.4	-2.4	< 0.001	Yes
7	0.3	0.5	-0.2	0.036	Yes
8	0.4	0.6	-0.2	0.014	Yes
9	0.3	0.6	-0.4	< 0.001	Yes
10	0.0	0.1	-0.1	0.177	No
11	0.1	0.1	-0.1	0.141	No

Table 3 shows that mean percentages of motorcycle occupancy class A, on Tuesday was higher than on Saturday and significant at $\alpha=0.05$ whilst mean percentage of motorcycle occupancy classes B and C on Tuesday were lower than on Saturday and significant at $\alpha=0.05$.

Tabel 3 Comparison of Mean Percentage of Each Class of of Motorcycle Occupancy between Tuesday and Saturday

Motorcycle Occupancy Class	Percentage of Each Class of of Motorcycle Occupancy by Day		Diffrerence in Mean Percentage	α	Significant at $\alpha =0.05$?
	Tuesday	Saturday			
A	75.0	71.7	3.3	0.005	Yes
B	23.9	26.3	-2.4	0.027	Yes
C	1.1	1.9	-0.8	< 0.001	Yes
D	0.1	0.1	-0.1	0.143	No

Table 4 shows that mean percentages of helmet use class 1 and 3, in the morning were lower than at noon and significant at $\alpha=0.05$ whilst mean percentage of helmet use class 2 in the morning was higher than at noon and significant at $\alpha=0.05$.

Table 4 Comparison of Mean Percentage of Each Class of of Helmet Use between
Morning and Noon

Helmet Use Class	Percentage of Each Class of of Helmet Use by Day		Diffrerence in Mean Percentage	α	Significant at α =0.05?
	Morning	Noon			
1	5.3	7.6	-2.29	<0.001	Yes
2	71.5	66.2	5.39	<0.001	Yes
3	2.5	3.7	-1.17	0.001	Yes
4	6.1	6.5	-0.43	0.226	No
5	0.2	0.3	-0.12	0.091	No
6	13.1	14.3	-1.17	0.136	No
7	0.3	0.4	-0.15	0.144	No
8	0.4	0.6	-0.13	0.216	No
9	0.5	0.5	0.03	0.780	No
10	0.1	0.1	0.06	0.810	No
11	0.1	0.1	0.05	0.311	No

Table 5 shows that mean percentage of motorcycle occupancy class A, in the morning was higher than at noon and significant at α=0.05 whilst mean percentage of motorcycle occupancy class B, in the morning was lower than at noon and significant at α=0.05.

Tabel 5 Comparison of Mean Percentage of Each Class of of Motorcycle Occupancy Between Morning and Noon

Motorcycle Occupancy Class	Percentage of Each Class of of Motorcycle Occupancy by Day		Diffrerence in Mean Percentage	α	Significant at α =0.05?
	Morning	Noon			
A	76.9	73.7	3.08	0.003	Yes
B	21.8	24.7	-2.88	0.002	Yes
C	1.3	1.6	-0.24	0.308	No
D	0.1	0.1	0.05	0.311	No

Table 6 shows that mean percentages of helmet use class 1, 3, 4, 5, 6 and 7 in the morning were lower than in the afternoon whilst mean percentage of helmet use class 2 in the morning was higher than in the afternoon. All significant at α=0.05.

Table 7 shows that mean percentage of motorcycle occupancy class A, in the morning was higher than in the afternoon and significant at α=0.05 whilst mean percentage of motorcycle occupancy class B, in the morning was lower than in the afternoon and significant at α=0.05.

Table 8 shows that mean percentages of helmet use class 3 and 4 at noon were lower than in the afternoon and significant at α=0.05 whilst mean percentage of helmet use class 2 in at noon was higher than in the afternoon and significant at α=0.05.

Table 6 Comparison of Mean Percentage of Each Class of of Helmet Use between Morning and Afternoon

Helmet Use Class	Percentage of Each Class of of Helmet Use by Day		Diffrerence in Mean Percentage	α	Significant at $\alpha =0.05$?
	Morning	Afternoon			
1	5.3	7.7	-2.40	<0.001	Yes
2	71.5	61.8	9.78	<0.001	Yes
3	2.5	5.2	-2.69	<0.001	Yes
4	6.1	6.0	-1.98	<0.001	Yes
5	0.2	0.3	-0.17	0.013	Yes
6	13.1	15.3	-2.20	0.005	Yes
7	0.3	0.6	-0.34	0.005	Yes
8	0.4	0.5	-0.08	0.448	No
9	0.5	0.4	-0.08	0.567	No
10	0.1	0.1	0.01	0.810	No
11	0.1	0.1	-0.01	0.911	No

Tabel 7 Comparison of Mean Percentage of Each Class of of Motorcycle Occupancy Between Morning and Afternoon

Motorcycle Occupancy Class	Percentage of Each Class of of Motorcycle Occupancy by Day		Diffrerence in Mean Percentage	α	Significant at $\alpha =0.05$?
	Morning	Afternoon			
A	76.9	69.5	7.38	<0.001	Yes
B	21.8	28.8	-7.02	<0.001	Yes
C	1.3	1.6	-0.36	0.177	No
D	0.1	0.1	-0.10	0.911	No

Table 8 Comparison of Mean Percentage of Each Class of of Helmet Use between Noon and Afternoon

Helmet Use Class	Percentage of Each Class of of Helmet Use by Day		Diffrerence in Mean Percentage	α	Significant at $\alpha =0.05$?
	Noon	Afternon			
1	7.6	7.7	-0.11	0.805	No
2	66.2	61.8	4.39	0.001	Yes
3	3.7	5.2	-1.52	<0.001	Yes
4	6.5	6.0	-1.56	0.01	Yes
5	0.3	0.3	-0.05	0.474	No
6	14.3	15.3	-1.02	0.272	No
7	0.4	0.6	-0.19	0.06	No
8	0.6	0.5	0.04	0.685	No
9	0.5	0.4	0.04	0.721	No
10	0.1	0.1	<0.01	>0.999	No
11	0.1	0.1	-0.06	0.181	No

Table 9 shows that mean percentage of motorcycle occupancy class A, at noon was higher than in the afternoon and significant at α=0.05 whilst mean percentage of motorcycle occupancy class B, at noon was lower than in the afternoon and significant at α=0.05.

Tabel 9 Comparison of Mean Percentage of Each Class of of Motorcycle Occupancy Between Noon and Afternoon

Motorcycle Occupancy Class	Percentage of Each Class of of Motorcycle Occupancy by Day		Diffrerence in Mean Percentage	α	Significant at α =0.05?
	Noon	Afternoon			
A	73.7	69.5	4.3	< 0.001	Yes
B	24.7	28.8	-4.1	< 0.001	Yes
C	1.6	1.6	-0.1	0.616	No
D	0.1	0.1	-0.1	0.181	No

Table 10 shows that the higher the V/C the lower the percentages of helmet use class 1, 3, 6, 7, 8 and 9 and the higher the percentage of helmet use class 2. All significant at α=0.05.

Table 10 Pearson Correlation between Percentage of Helmet Use Class and V/C

Helmet Use Class	Correlation Coefficient	α	Significant at α=0.05?
1	-0.549	<0.001	Yes
2	0.545	<0.001	Yes
3	-0.326	0.012	Yes
4	-0.162	0.136	No
5	-0.021	0.443	No
6	-0.331	0.011	Yes
7	-0.466	<0.001	Yes
8	-0.242	0.049	Yes
9	-0.467	<0.001	Yes
10	0.048	0.374	No
11	-0.211	0.075	No

Table 11 shows that the higher the V/C the lower the percentages of motorcycle occupancy class B and C and the higher the percentage of motorcycle occupancy class A. All significant at α=0.05.

Table 11 Pearson Correlation between Percentage of Motorcycle Occupancy Class and

V/C

Motorcycle Occupancy Class	Correlation Coefficient	α	Significant at α=0.05?
A	0.452	0.001	Yes
B	-0.386	0.003	Yes
C	-0.543	<0.001	Yes
D	-0.211	0.075	No

CONCLUSIONS

From the result in general most of the observed motorcycles (73.6%) were single occupancy. This implies that although its passenger car unit is small, as the general occupancy is less then two persons, this mode of transport is far from efficient in terms of effective use of road space due to its low occupancy rate. Moreover the higher the V/C the higher the perecentage of single occupancy motorcycle and the lower the percentages of multiple occupancy motorcycles and consequently percentage of single occupancy motorcycle was higher in weekday compare to weekend and morning period compare to other periods.

About 85% of the riders/ passengers in observed motorcycles wore helmet. Higher motorcycle occupancy decrease compliance to helmet use. For single occupancy the compliance rate was 91%, for dual occupancy the compliance rate was 71% and for motorcyle occupide by three riders/ passengers the compliance rate was 46%. This implies that multiple occupancy tend to decrease compliance to helmet use and should be the target of helmet use campaign. Regarding the use of V/C as a proxy to awareness of police enforcement, the only clear relationship is in single occupancy motorcycle. i.e. the higher the V/C, the higher the percentage of helmet use class 2 (the rider wore helmet) and the lower the percentage of helmet use class 1 (the rider did not wear helmet)

RECOMMENDATIONS

Further research is required to provide better understanding on the reason behind helmet use and choice of motorcycle occupancy. Interview based data collection would be needed.

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