ORIGINAL ARTICLE

Factors Affecting Motorcycle Accidents among High School Students in Sukhothai, Thailand

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Background: Motorcycles accidents were the first cause of death among high school students in Thailand and the world. Therefore, realizing the accident factors for prevention planning were significant.

Objective: To investigate the factors affecting motorcycle-related traffic accidents among high school students in Sukhothai, Thailand. Multiple-stage random sampling was used to select 450 respondents, and the data were collected through a questionnaire survey.

Materials and Methods: The present study was cross-sectional research. The data were analyzed with descriptive statistics using a frequency distribution table, percentage, and inferential statistics by the Enter method of binary logistic regression for every single variable and multiple variables.

Results: From 450 samples, 217 people (48.2%) had traffic accidents. The chance of motorcycle accidents comprised of no driving license (OR 69.596, 95% CI 16.465 to 99.186), male gender (OR 59.898, 95% CI 33.20 to 72.129), risk riding behavior (OR 29.273, 95% CI 6.377 to 39.372), types of motorcycles (OR 17.23, 95% CI 12.02 to 22.2), riding experiences (OR 16.324, 95% CI 3.644 to 26.28), damaged traffic signs (OR 3.32, 95% CI 1.77 to 6.24), riders' attitude toward the risk riding (OR 0.306, 95% CI 0.106 to 0.886), the knowledge level on traffic rules (OR 0.282, 95% CI 0.109 to 0.728), and social support (OR 0.71, 95% CI 0.44 to 0.94), with statistical significant at 0.05.

Conclusion: Based on the present study results, schools and parents should enhance management to cope with accident problems by promoting knowledge of traffic rules, facilitating students to get riding licenses, and reinforcing social support to collaboratively build school models for preventing injuries from riding motorcycles.

Keywords: Traffic accident; Motorcycle; High school students

Received 9 January 2023 | Revised 2 May 2023 | Accepted 8 May 2023

J Med Assoc Thai 2023;106(6):620-6

Website: http://www.jmatonline.com

Every hour, 155 people in the world die from road accidents, or an average of 3,700 people per day. Furthermore, people get injuries at a rate of about 5,707 per hour or 136,987 per day, and more than three-quarters of them are male. In addition, it was found that the rates of injury and death were higher in developing countries[1]. Nearly half of all deaths were motorcycle riders (23.0%), pedestrians (22.0%), and cyclists (4.0%). In Thailand, the 2020 annual report by the Road Safety Center estimated that the death rate from traffic accidents was 2.5 people per hour or 60 people per day, whereas, the injury rate was about 107,542 people per year. Such rates are ranked on the top of the list of ASEAN countries and the ninth in the world at a death rate of 36.2 people per 100,000 population[2]. According to the death certificates, traffic accidents are the top cause of death among youths aged 10 to 14 years[3]. In 2019, the death rate from road collisions among Thai youths per 100,000 population reached 42.6, the highest rate in the world. The highest death rate was found in the youth or high school group aged between 15 to 18 years. Each day, an average of 13 people die, while 800 people are injured, 150 people are seriously injured, and seven people become disabled, of which four out of five deaths are male[4]. Such loss is the second main cause of the disability-adjusted life year (DALY) due to premature death, illness, or disability[5]. The results of the investigation revealed that motorcycles were the vehicles mostly related to injuries from accidents at 40.0 to 70.0%[6].

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How to cite this article:

Thipthimwong K, Noosorn N, Nakkhongkham R. Factors Affecting Motorcycle Accidents among High School Students in Sukhothai, Thailand. J Med Assoc Thai 2023;106:620-6.

DOI: 10.35755/jmedassocthai.2023.06.13735

Sukhothai is one of the provinces in Health Region 2 with statistics of traffic accidents at a high rank and increasing trend. Between 2016 and 2018, injury rates due to traffic accidents were 684.45, 734.2, and 798.31 per 100,000 population, respectively, whereas the death rates were 24.4, 26.7, and 29.3 per 100,000 population, respectively. Such accidents mostly occurred in the group of high school students at high rates of 414.34, 459.31, and 487.32 injuries per 100,000 population and 5.6, 8.3, and 10.5 death per 100,000 population, respectively[7]. The vehicle found to be mostly involved in traffic accidents was the motorcycle at 81.3%, while time frequency was from 3 p.m. to 11 p.m.[8]. As school age population is important for the national future, the researchers were interested in studying the factors affecting traffic accidents from motorcycles in high school students in Sukhothai Province to find a model that can prevent road injuries.

Material and Methods

This descriptive research aimed to study factors affecting traffic accidents from motorcycle riding among high school students in Sukhothai Province, Thailand. The present study was conducted using a cross-sectional research design organized by the Sukhothai student council. The present study was approved by the Human Research Ethics Committee of Naresuan University with project code IRB No. P2-0158/2565 and research project approval, COA No. 307/2022.

Definition of terms: In this study, a rider refers to a student riding a motorcycle or a passenger riding on a motorcycle involved in an accident.

The present study population comprised 8,305 high school students who rode motorcycles from 27 schools in all districts of Sukhothai Province. The sample size was calculated by using the finite population estimation[9] and getting the results of 450 samples selected through multi-stage random sampling[10].

The present study was conducted between October and November 2022. The inclusion criteria were 1) high school students, 2) attending schools in Sukhothai, 3) ability to ride motorcycles, 4) living in Sukhothai, 5) volunteering to provide information.

The researchers developed the questionnaire according to relevant concepts, theories, and research[11] in seven parts as follows:

Part 1: Personal data included gender, age, and educational level in a multiple-choice format.

Part 2: The use of motorcycles and history of accidents was a dependent variable in a multiple-choice format.

Part 3: Knowledge of traffic rules in accident prevention from riding a motorcycle was measured through 21 items with true or false options. The scoring criteria were to give 1 point for a correct answer and 0 points for a wrong answer. The content validity index[12] ranged between 0.67 to 1.00 with KR-21[13] at 0.70. The knowledge scores were interpreted in three levels[14], good knowledge level at 80.0% or higher, moderate knowledge level at 60% to 79%, and poor knowledge level at less than 60.0%.

Part 4: Attitude towards riding a motorcycle was measured through 11 items with a rating scale in five levels, strongly agree, agree, unsure, disagree, and strongly disagree. The scoring criteria were to give 5, 4, 3, 2, and 1 point(s), respectively, for the positive questionnaire items and to give 1, 2, 3, 4, and 5 point(s), respectively, for the negative questionnaire items. The content validity index[12] ranged between 0.67 to 1.00 with Cronbach's alpha coefficient[15] at 0.84. The attitude scores were interpreted in three levels[14]. Normal attitude level at 80.0% or higher, moderate attitude level at 60.0% to 79.0%, and low attitude level at less than 60.0%.

Part 5: Environment data were measured in a multiple-choice format.

Part 6: Motorcycle-riding behavior was measured from 12 items with a rating scale in five levels as always, often, usually, seldom, and never. The scoring criteria were to give 5, 4, 3, 2, and 1 point(s), respectively, for the positive questionnaire items and to give 1, 2, 3, 4, and 5 point(s), respectively, for the negative questionnaire items. The content validity index[12] ranged between 0.67 to 1.00 with Cronbach's alpha coefficient[15] at 0.84. The scores on motorcycle-riding behavior were interpreted in three levels[14]. A normal riding-behavior level at 80.0% or higher, a moderately risky riding-behavior level at 60.0% to 79.0%, and a highly risky riding-behavior level at less than 60.0%.

Part 7: Social support aimed to ask about the activities of the student council. Social support was concerned with participation, student council's activity arrangement, perception, and activity arrangement for preventing traffic accidents. This part consisted of six items (100%) with a rating scale. The content validity index[10] ranged between 0.67 to 1.00 with Cronbach's alpha coefficient[10] at 0.88. The scores on social support were interpreted in three levels[10] with a high social-support level at 80.0% or higher, a moderate social-support level at

60.0% to 79.0%, and a low social-support level at less than 60.0%.

In the data collection process, the researchers submitted an official request to the Sukhothai Provincial Public Health Office and Office of the Basic Education Commission for permission to collect the questionnaire data from students during October 2022. To prevent any bias, in the questionnaire, the respondents' names were not included, and their personal data were kept in confidence.

After receiving the questionnaires, they were checked for completeness. In case of incomplete questionnaires, there would be randomly collected samples again until the questionnaires were completed.

The present study did not have any adverse effects on the respondents. After all the questionnaires were completed, the researchers examined for completeness and accuracy for further analyses.

The data analyses were performed according to the study assumptions by using a computer program. The analyses procedure was as follows:

1. The respondents' personal data regarding gender, age, and educational level were analyzed in terms of percentage, mean, standard deviation, minimum and maximum.

2. The preliminary relationship between the independent variable and the dependent variable, which was a pairwise qualitative variable, was analyzed by chi-squares test.

3. The factors affecting traffic accidents from riding a motorcycle were analyzed with the Enter method of binary logistic regression at the statistical significance of 0.05.

Results

General information of the respondents

Most respondents were male at 55.6%, whereas female respondents accounted for 44.4%. Most were aged 16 years at 30.2%, followed by less than 16 years at 25.1%, and 18 years at 22.2%. Most respondents were studying in the fifth year of secondary level or Grade 11 for 38.4%, while the least percentage were in the sixth year of secondary level or Grade 12 for 25.6%. Most respondents used motorcycles at 55.1%, followed by buses at 29.6%, and parents' cars or student van service at 3.1%.

Use of motorcycles

Most respondents who used motorcycles were riders at 56.7%, while the others were passengers at 43.3%. More than half of them rode manual motorcycles at 63.3%, whereas the others rode automatic motorcycles at 36.7%. Most of them did not have motorcycle licenses at 63.8%, compared to those who had motorcycle licenses at 33.8%. Most had about two to three years of riding experience at 85.1%, while others had no riding experience at 14.9%. In addition, 51.8% had previous traffic accidents, while 48.2% never had traffic accidents. The causes of accidents were hitting animals, animals cutting in front of motorcycles, and crashing with other motorcycles at 18.0%, followed by fast riding at 17.8% and other causes such as flat tires, rough roads, and during the rain with poor vision at 2.2%.

The relationship between independent variables is personal characteristics, motorcycle types, having motorcycle licenses, riding experience, knowledge of traffic rules, riding attitudes, road condition, traffic light condition, problematic riding situations, and social support. The dependent variable is traffic accidents from riding a motorcycle among high school students.

It was found that the personal characteristics of gender, age, and educational level, as well as riding experience, knowledge of traffic rules, width of the road, traffic signs, and social support, were related to traffic accidents of riding motorcycle among high school students with statistical significance, as shown in Table 1.

To find relationships between independent variables and dependent variables in pairs, there were 15 variables with relationships to accidents from riding a motorcycle among high school students. These variables were gender, age, educational level, travelling to school, motorcycle type, having licenses, riding experience, knowledge of traffic rules, attitudes towards motorcycle riding, road conditions, road width, road lighting conditions, conditions of traffic signs, riding behaviors, and social support. These variables were analyzed to find the factors affecting traffic accidents from riding a motorcycle among high school students by using binary logistic regression at a statistical level of 0.05, as described below.

Analysis of riding behavior factors on accidents

To analyze the factors affecting traffic accidents from riding a motorcycle among high school students, the Enter method of binary logistic regression analysis was used. The dependent variable in the present study was traffic accidents, whereas, the independent variables were entered into the equations to investigate the factors affecting traffic accidents from riding a motorcycle among high school students.

Table 1. Relationship of factors affecting the occurrence of traffic accidents from riding a motorcycle among high school student (n=450)

Independent variables	Accidents from riding a motorcycle; n (%)		p-value
	No accidents	Accidents	
Sex			<0.001
Male	110 (24.4)	140 (31.1)	
Female	123 (27.3)	77 (17.1)	
Age			<0.001
Less than 16 years	34 (7.6)	79 (17.6)	
16 years	76 (16.9)	60 (13.3)	
17 years	52 (11.6)	49 (10.9)	
18 years	71 (15.8)	29 (6.4)	
Educational levels			<0.001
Grade 10	59 (13.1)	103 (22.9)	
Grade 11	91 (20.2)	82 (18.2)	
Grade 12	83 (18.4)	32 (7.1)	
Being riders/passengers			0.088
Riders	110 (24.4)	140 (31.1)	
Passengers	123 (27.3)	77 (17.1)	
Motorcycle types			0.008*
Automatic	141 (31.3)	114 (25.3)	
Manual	92 (20.4)	103 (22.9)	
Having motorcycle licenses			<0.001
No	104 (23.1)	183 (40.7)	
Yes	129 (28.7)	23 (5.1)	
Riding experience			<0.001
No	178 (39.6)	205 (45.6)	
Yes	55 (12.2)	12 (2.7)	
Knowledge of traffic rules			
Poor		24 (5.31)	<0.001
Moderate	141 (31.3)	128 (28.4)	<0.001
Good	92 (20.4)	65 (14.4)	
Riding attitudes			0.05
Risky	4 (0.88)	94 (20.88)	
Neutral	30 (6.66)	66 (14.66)	
Normal	199 (44.22)	57 (12.66)	

Independent variables	Accidents from riding a motorcycle; n (%)		p-value
	No accidents	Accidents	
Road conditions			0.159
Smooth (e.g., paved/concrete road)	193 (42.9)	190 (42.2)	
Rough (e.g., unpaved road)	40 (8.9)	27 (6.0)	
Road width			<0.001
Wide & convenience	186 (41.3)	104 (23.1)	
Narrow & inconvenience	47 (10.4)	113 (25.1)	
Traffic light conditions			0.113
Workable	147 (32.7)	121 (26.9)	
Not workable sometimes	86 (19.1)	69 (21.3)	
Road lighting			0.003*
Normal brightness	140 (31.1)	108 (24.0)	
Dark	44 (9.83)	74 (16.4)	
Damaged	34 (7.63)	22 (4.91)	
No lighting	15 (3.3)	13 (2.91)	
Conditions of traffic signs			<0.001
Normal	159 (35.3)	116 (25.8)	
Damaged	24 (5.32)	89 (19.8)	
No signs	50 (11.1)	12 (2.71)	
Problematic riding situations			<0.001
Heavy rain	129 (28.71)	102 (22.7)	
Thick fog	19 (4.221)	0 (0.0)	
Flood	17 (3.812)	16 (3.62)	
Sunlight reflection	68 (15.1)	99 (22.0)	
Riding behaviors			<0.001
Highly risky	31 (2.88)	73 (16.2)	
Moderately risky	56 (12.44)	100 (22.22)	
Slightly risky	146 (32.44)	44 (9.77)	
Social support			<0.001
Low	51 (11.31)	116 (25.8)	
Moderate	79 (17.63)	7 (1.61)	
High	103 (22.92)	94 (20.9)	

These variables included gender, age, educational level, travelling to school, motorcycle type, having licenses, riding experience, law knowledge, attitudes towards motorcycle riding, road conditions, road width, road lighting conditions, conditions of traffic signs, riding behaviors, and social support. When the effects of other independent variables were controlled in the equations at a statistical significance of 0.05, the meaning of each factor can be explained. The predictors of accidents from riding a motorcycle among high school students were arranged. It was found that riders without licenses had a higher chance to get into accidents from riding a motorcycle than riders with licenses by 69.596 times (OR 69.596; 95% CI 16.465 to 99.186, p<0.001). Male riders had higher chances to get into accidents than female riders by 59.898 times (OR 59.898; 95% CI 33.207 to 72.129, p<0.001). Risky riding behavior had higher chance to cause accidents than low-risky riding behavior by 29.273 times (OR 29.273; 95% CI 6.377 to 39.372, p<0.001). Regarding motorcycle types, riding a manual motorcycle had a higher chance to cause accidents than riding an automatic motorcycle by 17.23 times (OR 17.23; 95% CI 12.02 to 22.2, p<0.001). Riders with little riding experience had a higher chance to get into accidents than riders with high riding experience by 16.324 times (OR 16.324; 95% CI 3.644 to 26.28, p<0.001). Damaged traffic signs had a higher chance to cause accidents than normal useable traffic signs by 3.32 times (OR 3.32;

Table 2. Riding-behavior factors affecting accidents from riding a motorcycle among high school students

Variables	p-value	Odds ratio	95% CI
Male	<0.001	59.898	33.20 to 72.12
Motorcycle types	<0.001	17.23	12.02 to 22.2
Having licenses	<0.001	69.596	16.46 to 99.186
Riding experience	<0.001	16.324	3.64 to 26.28
Knowledge of the law	0.009*	0.282	0.11 to 0.728
Attitude toward riding	0.029*	0.306	0.16 to 0.886
Condition of road surface	<0.001	29.273	6.377 to 34.372
Road width	<0.001	0.015	0.004 to 0.052
Condition of traffic signs	<0.001	3.32	1.7 to 6.24
Riding behaviors	<0.001	29.23	6.37 to 39.37
Social support	<0.001	0.715	0.4 to 0.94

95% CI 1.77 to 6.24, p<0.001). Riding attitude at a normal level had a higher chance to reduce accidents than risky-riding attitude by 0.36 times (OR 0.306; 95% CI 0.16 to 0.886, p=0.029). Good knowledge of the law had a higher chance to reduce accidents than poor law knowledge by 0.28 times (OR 0.282; 95% CI 0.109 to 0.728, p=0.009). Wide/convenient roads had a higher chance to reduce accidents than narrow/inconvenient roads by 0.015 times (OR 0.015; 95% CI 0.004 to 0.052, p<0.001). Finally, high social support had a higher chance to reduce accidents than low social support by 0.71 times (OR 0.71; 95% CI 0.44 to 0.94, p<0.001). These results are presented in Table 2.

Discussion

The present study results showed that not having driver licenses resulted in a higher chance of causing accidents from riding motorcycle than having licenses.

This can be explained that riders with licenses have passed riding tests and thus possess the knowledge and skills needed for riding a motorcycle[16]. Moreover, apart from getting motorcycle-riding license, the riders have to comply with the law, their compliance leads to reduction in traffic accidents.

The present study found that males had a higher chance of getting into accidents from riding a motorcycle than females by 59.898 times because male traits include being daring, risk-taking, and exciting. This is consistent with the study[17,18] on factors related to traffic accidents from riding a motorcycle among high school students, which found that male riders got into accidents more often than female riders.

Although age had no effect on the chance of having a traffic accident, it was found that riding experience had a contributory effect on traffic accidents as riders with less experience were 16.324 times more likely to have a motorcycle accident than those with more experience.

It was also found that rough road surfaces contributed to a higher chance of causing accidents from riding a motorcycle than smooth road surfaces. Similarly, a study[19] on road conditions found that rough road surfaces caused riders to be unable to control their motorcycles effectively.

Regarding motorcycle types, it was found that riding a manual motorcycle resulted in a higher chance of causing accidents than riding an automatic motorcycle. This finding is consistent with a study[20] on the violating behaviors that caused accidents, which found that riding a manual motorcycle caused more accidents.

In terms of riding experience, riders with little riding experience had a higher chance of getting into accidents than riders with more riding experience. Similarly, a study[21] found the effects of situational factors and riding experience had a relationship with road accidents from riding a motorcycle.

Damaged traffic signs contributed to a higher chance of causing accidents than normal useable traffic signs. This follows the suggestion[22] that better maintenance of traffic signs can prevent traffic accidents and the road intersections without traffic lights had a higher chance for accidents than the intersections with traffic lights[22].

Moreover, riding attitude at a normal level had a higher chance of reducing accidents. This is consistent with a study[23] on the factors of riding attitudes, which had a direct effect on the risky behaviors that cause accidents.

It was also found that high levels of knowledge about traffic rules and road width resulted in a higher chance of reducing accidents from riding a motorcycle. The present study results are consistent with a study[11] that found that risky behavior factors affected accidents caused by riding a motorcycle[24].

Finally, high levels of knowledge about traffic rules and social support contributed to a higher chance of reducing accidents from riding a motorcycle. Consistently, a study[25] stated that social support can lead to self-protection behaviors that can prevent accidents from riding a motorcycle, and it had a positive relationship with students' self-protection behaviors to prevent accidents from riding a motorcycle.

Limitation

Strength: 1) The instruments were reviewed by theories. 2) There was adequate sampling and good representatives of the population.

Weakness: 1) The answers on the questionnaire might be copied. 2) The information from the questionnaire answers might be untrue.

Limitation: 1) The data might be unreliable due to respondents' embarrassment. 2) The answers given during the data collection might be imitated.

Conclusion

The discussion was carried out in accordance with the study objective as factors affecting traffic accidents from riding a motorcycle among high school students in Sukhothai Province. These factors included personal circumstances, environmental factors, road conditions, and vehicle type. Having licenses, gender, behavior, motorcycle type, riding experience, status of traffic signs, attitude, knowledge of traffic rules, road width, and social support were co-factors that contributed to traffic accidents (63.0%) at a statistical significance level of 0.05.

What is already known on this topic?

Factors that affected traffic accidents by riding motorcycles comprised with personal factor, road condition factor, environmental factor, and motorcycle factor, which in line with the epidemiology information.

What this study adds?

The results show that the social support is able to prevent traffic accidents by high school students riding motorcycles. This information can be contributed to related sectors to drive and promote health and adjust the attitude[26] toward the prevention of road traffic injury.

Acknowledgement

The researchers are grateful for the support provided by the Sukhothai Provincial Public Health Office and the Faculty of Public Health, Naresuan University.

Funding disclosure

This research was made with personal funding.

Conflicts of interest

No conflicts of interest have been declared by the authors.

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