FACTORS INFLUENCING MOTORCYCLE ACCIDENTS AMONG HILL TRIBE YOUTHS IN CHIANG RAI, THAILAND

Tawatchai Apidechkul[1, 2, *], Onn Laingoen[1], Sirinan Suwannaporn[1], Ratipark Tamornpark[2]

[1] School of Health Science, Mae Fah Luang University, Chiang Rai Province, Thailand
[2] Center of Excellence for the Hill Tribe Health Research, Mae Fah Luang University, Chiang Rai, Thailand

ABSTRACT:

Background: Motorcycle accidents are one of the significant causes of death in Thailand. Every year, approximately 20,000 people are killed in road traffic accidents. The hill tribe youths are one of the vulnerable populations. This study aimed to investigate the factors associated with motorcycle accidents, and severe accidents among the hill tribe youth in northern Thailand.

Methods: A cross-sectional study was applied to investigate risky motorcycle use behaviors, and to identify factors associated with severe motorcycle accidents among the hill tribe youths aged 15-24 years old in Mae Fah Luang district, Chiang Rai Province, Thailand. Data were collected by a validated questionnaire and face-to-face interview. A logistic regression was used to assess the associations between variables at alpha = 0.05.

Results: 524 participants were recruited, 67.6% were females, 94.7% were students and 80.9% were aged between 15-20 years old. 462 participants (88.2%) had no driving license, 79.6% had experience of motorcycle use for 1-5 years, 66.2% had motorcycle accidents, 38.6% had severe accidents, 11.7% drank alcohol before riding a motorcycle, and 45.0% usually had aggressive tendencies. After control for all possible confounding factors in the multiple logistic regression, four variables were associated with having a greater chance of having motorcycle accidents: (1) males had a greater chance than females (OR=1.96, 95%CI=1.26-3.04), (2) those who had aggressive tendencies had a greater chance than those who did not (OR=1.72, 95%CI=1.15-2.58), (3) those that reported infrequent use of helmet had a greater chance of being involved in road accidents compared to those that used helmets regularly. (OR= 1.47, 95%CI=1.15-5.43) and (4) those who had engine problems had a greater chance of being involved in road accidents compared to those who did not (OR=2.11, 95%CI=1.4-3.16). Two other factors were associated with severe accident; age and length of motorcycle use. Increase in age results in greater chance of having severe accident (OR=1.18 (95%CI=1.04-1.35), and those who rode their motorcycles for ≥ 6 years had a greater risk of having severe accident than those who rode their motorcycles for ≤ 5 years (OR=1.43, 95%CI=1.04-.95).

Conclusion: Appropriate health promotion programs with emphasis on helmet use, regular engine checks, and encouragement to resist riding motorcycles during periods of aggressive or extreme emotional tendencies should be implemented to reduce morbidity and mortality rates from motorcycle use among the hill tribe youth population.

Keywords: Motorcycle accidents; Hill tribe youths; Severe road accidents; Road safety; Thailand

DOI: *Received: February 2017; Accepted: May 2017*

INTRODUCTION

In 2015, World Health Organization (WHO) reported 1.25 million in total number of road traffic death from 180 countries in the world, 56% of these accidents were reported from low and middle-income countries [1]. Low and middle-income countries had twice the death rate from road accident compared to

[*] *Correspondence to: Tawatchai Apidechkul*
E-mail: tk2516ms@gmail.com; tawatchai.api@mfu.ac.th

Cite this article as: Apidechkul T, Laingoen O, Suwannaporn S, Tamornpark R. Factors influencing motorcycle accidents among hill tribe youths in Chiang Rai, Thailand. J Health Res. 2017; 31(6): 473-80. DOI:

high-income countries [2]. Road traffic accident was a major cause of death among people aged 15-29 years old in the world [3]. Traffic accident is also known to have a wide impact on economic development in a certain country [4]. WHO has set a goal to reduce the number of mortality rate from traffic accident of 50% by 2020 [5].

In Thailand, a motorcycle is the favorite choice for daily transportation among Thai people particularly in the rural areas where the people live in resource scarcity areas. Tanaboriboon, et al. [6] reported that traffic accidents in Thailand were most evident during festive and holiday seasons such as the traditional new year holiday (Songkran holidays falling between period of 12-15 April every year) and year end cerebration (end of December). During these holiday seasons, the number of traffic accidents particularly from motorcycles has dramatically increased. The National Injuries Surveillance, Bureau of Epidemiology, Ministry of Public Health [7] reported that from 2005-2010, severe injuries including admitted cases, observed cases, dead before arrival and dead at emergency room (ER) accounted for the largest proportion of all severe injuries due to transport accident (78.9%). Moreover, in a survey on helmet use among the 1,484,669 motorcycle users in 2013 in Thailand, it was found that 57% did not use helmet, only 29% among motorcycle users in rural areas used helmet, and only 23% among motorcycle users aged 15-20 years old used helmet while driving [8]. Therefore, young children aged 15-20 years old have a significantly high risk of being involved in traffic accidents caused by motorcycle in Thailand.

Mae Fah Luang district is located along the Thailand and Myanmar border in Chiang Rai Province with almost 100 % of its population being the hill tribe people [9]. The landscape is composed of mountains and only land transportation with seasonal poor road is available to reach the villages. The main vehicle is motorcycle particularly among school children. There is no traffic light sign on any road and no traffic police service in the whole area of Mae Fah Laung district [9]. And also there is no information and record on the number of accidents from motorcycle. However, a study of traffic accident in 2011-2013 in northern Thailand reported that the major vehicle on traffic accident in northern Thailand was motorcycle, and the majority age was 15-24 years old [10]. The other information on factors associated with accident and severe condition are also not available. Therefore, this study aimed to investigate the motorcycle use behaviors and factors relating to accident and severe condition regarding the accident caused by motorcycle use among the hill tribe youths, northern Thailand.

MATERIALS AND METHODS

Study design

A cross-sectional study design was conducted to obtain personal information and behaviors of motorcycle riders, including history of being involved in accident and care in a hospital among hill tribe youths.

Study sites

The study took place in Mae Fah Luang district Chiang Rai province, Thailand, from July-December 2015.

Study population

The target population was hill tribe youths aged 15-24 years old [11], living in Mae Fah Luang district and had experience of motorcycle use. Those respondents who had a problem of communication in Thai were excluded from the study.

Study sample and sample size estimation

The sample size of 508 was derived using a power calculation based on an alpha of 5.0%, prevalence from previous study was 16.0% [8] and 80.0% of the power statistic using Epi-Info, version 6.04 (US Centers for Disease Control and Prevention, Atlanta, GA).

Research instruments

A questionnaire was developed based on relevant information including previous studies [10]. It was composed of four sections with a total of 56 questions: (1) personal information, (2) motorcycle use behaviors and (3) medical care history, and (4) attitude and behaviors related to motorcycle use. The questionnaire had been tested for validity and reliability before use. All items of the questionnaire had been reviewed by the Index of Item Objective Congruence (IOC) [12] method, and 0.5 was used as selection criteria. Alpha-coefficient at 0.7 had been used for detecting the reliability of questionnaire. Finally, a pilot test was conducted with 20 participants who had similar characteristics with the study sample. In this study, severe accident was defined as a case of those who had motorcycle accident and had been admitted in a hospital for 24 hours or one night in the past years.

Data collection procedures

After development and detection for the quality of the questionnaire, researchers made a simple random sampling from the list of 57 villages in Mae Fah Luang district by computer program. Finally, 22 villages were selected as study sites. From a total of 3,126 youths (aged 15-24 years [11] old) listed from these 22 villages, 524 participants were recruited into the study by a simple random sampling technique.

The participants had been asked for agreement to participate, and interviewed by face-to-face method in a private and confidential room. Three researchers were the interviewers who developed and executed the whole project. The interview was done by the researchers who knew all contents and procedures of the project. It lasted for about 30 minutes with each participant. All the participants were given a small gift of appreciation for participating in the study.

Statistical analysis

Data were double-entered and validated using Microsoft Excel. Data analysis was carried out by using SPSS version 20, 2014 (SPSS, Chicago, IL), STATA (version 8.2 (Stata Corp, College Station, TX), and Epi-Info version 6.04d (US Centers for Disease Control and Prevention, Atlanta, GA). Descriptive statistics (means, standard deviation, frequency, and percentage) was used to describe the general characteristics of the participants.

Chi-square test was used for testing the difference in interested variables. Logistic regression was used to assess the association between variables. During the analysis in the simple logistic regression model, those variables that had associated significance at alpha level 0.10 were pulled into the multiple logistic regression model. In the multiple logistic regression model, the "ENTER" method was used to find the final model to predict the association between the variables at alpha level 0.05.

Ethical consideration

This study was approved by the Ethics in Human Research Committee of Mae Fah Luang University (REH-55022). A permission to collect the data in 22 villages was granted by the Chief of District Government Officer. Before starting interview, the consent form had been obtained from all participants.

Table 1 Comparison of participants' characteristics by sex

Characteristics	Total	Male		Female		x^2	*p*-value
	n (%)	n	%	n	%		
Total	524(100.0)	170	33.4	354	67.6		
Age (years)							
≤14	43 (8.2)	12	27.9	31	72.1	0.47	0.800
15-20	424 (80.9)	139	32.8	285	67.2		
≥21	57 (10.9)	19	33.3	38	66.7		
mean=17.15, SD=1.83							
Education							
No education	11 (2.1)	6	54.5	5	45.5	5.42	0.067
≤Primary school	13 (2.5)	7	53.8	6	46.2		
≥High school	500 (95.4)	157	31.4	343	68.6		
Occupation							
Student	500 (94.7)	157	31.4	343	68.6	5.42	0.020*
Other	24 (4.6)	13	54.2	11	45.8		
Driver license							
Yes	62 (11.8)	31	50.0	31	50.0		
No	462 (88.2)	139	30.1	323	69.9	9.89	0.002*
Length of motorcycle use (years)							
≤5	348 (66.4)	116	33.3	232	66.7		
≥6	176 (33.6)	54	30.7	122	69.3	0.375	0.540
Position							
Rider	180 (34.4)	74	41.1	106	58.9		
Passenger	62 (11.8)	12	19.4	50	80.6		
Both	282 (53.8)	84	29.8	198	70.2	11.92	0.003*

Table 1 Comparison of participants' characteristics by sex (cont.)

Characteristics	Total n (%)	Male		Female		x^2	*p*-value
		n	%	n	%		
Brand							
Honda	431 (82.3)	138	32.0	293	68.0		
Yamaha	60 (11.5)	18	30.0	42	70.0		
Other	33 (6.3)	14	42.4	19	57.6	1.69	0.428
Gear							
Automatic	82 (15.6)	21	25.6	61	74.4	2.07	0.150
Manual	442 (84.4)	149	33.7	293	66.3		
Insurance							
Yes	347 (66.2)	100	28.8	247	71.2	6.16	0.013*
No	177 (33.8)	70	39.5	107	60.5		
Frequency of motorcycle use per week (day)							
Everyday	393 (75.0)	128	32.6	265	67.4	8.16	0.017*
4-6	73 (13.9)	31	42.5	42	57.5		
1-3	58 (11.1)	11	19.0	47	81.0		
Distance per day (kms)							
≤10	365 (73.3)	114	31.2	251	68.8	2.37	0.306
11-20	114 (22.9)	43	36.8	71	63.3		
≥21	19 (3.8)	8	42.1	11	57.9		
(Missing=26, 5.0%)							
Having passenger							
No	51 (10.3)	23	45.1	28	54.9	9.09	0.028*
Rarely	295 (59.4)	82	27.8	213	72.2		
Often	110 (22.1)	43	39.1	67	60.9		
Always	41 (8.2)	15	36.6	26	63.4		
(Missing=27, 5.2%)							
Length of use in your current motorcycle (years)							
≤5	304 (70.4)	88	28.9	216	71.1	2.37	0.305
6-10	101 (23.3)	37	36.6	64	63.4		
≥11	28 (6.5)	10	35.7	18	64.3		
(Missing=91, 17.4%)							
Engine problem							
No	278 (55.5)	105	37.8	173	62.2	6.61	0.010*
Yes	223 (44.5)	60	26.9	163	73.1		
(Missing=23, 4.4%)							
Frequency of maintenance							
Never	28 (5.5)	10	35.7	18	64.3	0.31	0.855
Rarely	352 (69.5)	112	31.8	240	68.2		
Often	127 (25.0)	43	33.9	84	66.1		
(Missing=17, 3.2%)							
Average speed (kms/hr.)							
< 60	339 (68.5)	95	28.0	244	72.0	17.77	0.001*
60-80	141 (28.5)	56	39.7	85	60.3		
>80	15 (3.0)	11	73.3	4	26.7		
(Missing=29, 5.5%)							
Driving in evening or night time							
No	81 (15.9)	22	27.3	59	72.8	3.97	0.264
Evening	228 (44.9)	70	30.7	158	69.3		
Night	26 (5.1)	12	46.2	14	53.8		
Both	173 (34.1)	60	34.7	113	65.3		
(Missing=16, 3.1%)							
Accident							
Yes	347 (66.2)	121	34.9	226	65.1	2.76	0.097
No	177 (33.8)	49	28.4	128	72.3		

Table 1 Comparison of participants' characteristics by sex (cont.)

Characteristics	Total	Male		Female		x^2	*p*-value
	n (%)	n	%	n	%		
Severe accident	134 (38.6)	54	40.3	80	59.7	2.83	0.092
Yes	213 (61.4)	67	31.5	146	68.5		
No							
Helmet use	31 (6.1)	13	41.9	18	58.1	3.05	0.218
Regular use	298 (58.2)	102	34.2	196	65.8		
Sometime	183 (35.7)	52	28.4	131	71.6		
No							
(Missing=12, 2.3%)							
Having medical condition	449 (93.5)	145	32.3	304	67.7	2.17	0.141
No	31 (6.5)	14	45.2	17	54.8		
Yes							
(Missing=44, 8.4%)							
Drinking with riding	52 (11.7)	26	50.0	26	50.0	6.43	0.011*
Yes	391 (88.3)	126	32.2	265	67.8		
No							
(Missing=81, 15.5%)							
Telephone use while riding							
No	218 (43.5)	71	32.6	147	67.4	1.72	0.423
Rarely	261 (52.1)	83	31.8	178	68.2		
Often	22 (4.4)	10	45.5	12	54.5		
(Missing=23, 4.4%)							
Having aggressive emotion							
Yes	230 (45.0)	52	22.6	178	77.4	19.29	<0.001*
No	281 (55.0)	115	40.9	166	59.1		
(Missing=13, 2.5%)							
Having visual problem							
Normal	465 (91.9)	157	33.8	308	66.2		
Abnormal	46 (9.0)	11	23.9	35	76.1	1.84	0.175
(Missing=13, 2.5%)							

** Significant level at α=0.05*

RESULTS

Five hundred and twenty-four participants were recruited into the study, 67.6% were females, 80.9% were aged 15-20 years old (mean=17.15, SD=1.83), 95.4% completed high school, and 94.7% were a student. About 66.4% had experience of motorcycle use for ≤5 years, 445 (87.6%) did not have driver's license, and 70.4% had used their motorcycle for 1-5 years (Table 1).

Regarding motorcycle use: 33.8% had no insurance, 75.0% used motorcycle daily, 82.3% used Honda brand, 84.4% were manual gear, 75.0% were daily users, 73.3% were a group of <10 km distance users. About 31.5% who had an average speed faster than 60 km/hr. 44.5% experienced engine problem, and 84.1% used a motorcycle in the evening through the nighttime. One hundred and eighty three participants (36.2%) did not use helmet.

Regarding motorcycle use behaviors: 11.7% drank alcohol before riding a motorcycle, 56.5% used a phone while riding a motorcycle, 9.0% had a visual problem, and 16.2% reported traffic abuse.

In terms of comparison between male and female characteristics among the participants: a greater proportion of males that fall within the category of students had driver's license, were more involved in severe accidents, and rode faster when compared to females within the same group. However, females were more emotionally aggressive when compared to males. These differences are statistically significant (Table 1).

Regarding traffic accident, totally 347 participants (66.2%) had had an experience of traffic accident at least once, 38.6% of them had been cared for in a hospital.

In the multiple logistic regression model, four variables were found to have significant association with motorcycle accident; sex, aggressive emotion, helmet use, and engine problem. Males had 1.96 times of chance of being involved in an accident compared to females (95%CI=1.26-3.04). Participants who had aggressive emotion had 1.72 times of

Table 2 Multivariate analysis of factors associated with motorcycle accident among the hill tribe youths.

Factors	Accident		OR	95% CI	*p*-value
	Yes (%)	**No** (%)			
Sex					
Male	121 (71.2)	49 (28.8)	1.96	1.26-3.04	0.003*
Female	226 (63.8)	128 (36.2)	1.00		
Agression emotion					
Yes	166 (72.7)	64 (27.8)	1.72	1.15-2.58	0.009*
No	177 (63.0)	104 (37.0)	1.00		
Helmet use					
Often	16 (51.6)	15 (48.4)	1.00		
Sometime	198 (66.4)	100 (33.6)	1.47	1.15-5.4	0.021*
No	133 (73.7)	50 (27.3)	2.03	0.89-2.03	0.152
Engine problem					
Yes	168 (75.3)	55 (24.7)	2.11	1.41-3.16	<0.001*
No	169 (60.8)	109 (39.2)	1.00		

*Significant level at $\alpha = 0.05$

Table 3 Multivariate analysis of factors associated with having a severe accident among the hill tribe youths

Factors	Severe accident		OR	95% CI	*p*-value
	No (%)	**Yes (%)**			
Age	N/A	N/A	1.18	1.04-1.35	0.013*
Year of motorcycle use					
≤5	157 (66.2)	80 (33.8)	1.00		
≥6	56 (50.9)	54 (49.1)	1.43	1.04-1.95	0.027*

* Significant level at $\alpha = 0.05$

chance of being involved in accidents compared to those who did not (95%CI=1.15-2.65). Participants who used a motorcycle with engine problem had 2.11 times of chance of having an accident than those who used a motorcycle without problem (95%CI=1.41-3.16). Finally, participants who did not use helmet regularly had a 1.47 times of chance of being involved in an accident than those who did regularly (95%CI=1.15-5.42) (Table 2).

In the analysis of finding the factors associated with severe accident by the multiple logistic regression model, two factors were found to be associated with severe accident; age and length of motorcycle use. Increase in age had increased the opportunity of being involved in a severe accident with OR=1.18 (95%CI=1.04-1.35), and those who have a history of motorcycle use for ≥ 6 years had a greater opportunity of being involved in a severe accident than those who used a motorcycle for ≤5 years with OR=1.43 (95%CI=1.04-1.95) (Table 3).

DISCUSSION

This study revealed that "Students" were most of the youths who use motorcycle daily since there is no public transport available in the study area, Mae Fah Luang district [13]. Moreover, a bicycle is also not feasible to use in this area because of the geographical conditions. Majority of the motorcycle users had no driving license and aged between 15-20 years old. Under Thai regulation, those who need to get the motorcycle driving license need to be at least 15 years old [14], however, a few proportion had a driver license. In our study, it was found that among the daily motorcycle users one-third had no insurance, one-half used helmet regularly, and one-fourth used their motorcycle farther than 11 km every day. This reflects on a low level of road safety in the remote areas of Thailand. Moreover, more than half used phones while riding and 11.7% drank alcohol while riding their motorcycle.

The study found that helmet use behavior was a strong predictor of motorcycle accident. Buckley, et al. [15] reported that the overall helmet use rate was 75% in Michigan and it was a protective factor of getting traffic accident. Males had a greater risk of motorcycle accident than females. This result is similar to the study of Mbanjumucyo, et al. [16] which found that males had a greater chance of getting in an accident than females in Rwanda.

The study of de Carvalho, et al. [17] and Curtis, et al. [18], showed that alcohol and drug users had a greater chance of having motorcycle driver injuries.

Heydari, et al. [19] also reported that alcohol consumption two hours before driving and using mobile phone while driving was significantly associated with accident. However, in our study we found that alcohol use was not a significant factor for getting in traffic accident. There were a small proportion of youths who drank alcohol before riding. One more reason is the road characteristic in this area, it is bent, curvy, and does not support increase in speed.

Regarding aggression, the study finding was similar to several other investigations [20 -23] that showed significant statistical association between aggressive feeling of the motorcycle rider and accident. Moreover, Jimenez, et al. [24] reported that less frequency, engine problem, and speed were associated with getting in an accident among the motorcycle users in Colombia.

Erhardt, et al. [25] reported that type of helmet was associated with severe accident among the motorcycle users in California. In the study of Christophersen, et al. [26] on factors associated with severe accident among motorcycle users in Norway, it was reported that alcohol and drug were the major factors that led to motorcycle riders being killed. However, in this study we found that age and a longer experience in motorcycle use are factors associated with being involved in a severe accident.

The study of White, et al. [27] had clearly presented the relationship of age and being involved in severe accident among motorcycle riders in Australia. Jimenez, et al. [24] & McCartt, et al. [28] also reported that older teenagers and drinking behaviors were associated with motorcycle accident in the United States. This coincided with our study which found that increase in age will increase opportunity of being involved in accident among motorcycle users. However, the study of Shell, et al. [29] demonstrated that young teenagers had a greater chance of being involved in severe accident than those in older teenage group.

CONCLUSIONS

Our results indicated several major contributors to motorcycle accident among the hill tribe youths in northern Thailand such as: being male motorists, aggressive emotion while riding, helmet use, and engine problem. Other characteristics including age and longer years of experience in motorcycle use are associated with severe accident among the hill tribe youths.

An appropriate intervention program, to reduce accident from motorcycle use among young motorists with emphasis on increased awareness, emotional control and regular engine check, should be encouraged and initiated by the local government. Reducing the motorcycle accident in this area will enhance the people's safety and also economic safety eventually.

ACKNOWLEWDMENTS

This work was supported by the Mitsui Sumitomo Insurance Welfare Foundation Research (MSIWF) [Grant number 04, 2014]. The authors are grateful to the Center of Excellence for the Hill tribe Health Research, and Mae Fah Luang University for the support in the process of data collection and analysis. The authors also would like to thank the participants for kindly providing the information.

REFERENCES

1. World Health Organization [WHO]. Fact sheet: road traffic injuries. [cited 2016 November 28]. Available from: http://www.who.int/mediacentre/factsheets/fs358/en/
2. World Health Organization [WHO]. Fact sheet: alcohol. [cited 2016 November 28]. Available from: http://www.who.int/mediacentre/factsheets/fs349/en/
3. World Health Organization [WHO]. Risk factors for road traffic injuries. [cited 2016 November 28]. Available from: http://www.who.int/violence_injury_prevention/road_traffic/activities/roadsafety_training_manual_unit_2.pdf
4. Yusuff M. Impact assessment of road traffic accidents on Nigerian economy. Journal of Research in Humanities and Social Science. 2015; 3(12): 8-16.
5. World Health Organization [WHO]. Global status report on road safety 2015. [cited 2016 November 28]. Available from: http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/
6. Tanaboriboon Y, Satiennam T. Traffic accidents in Thailand. IATSS research. 2005; 29(1): 88-100.
7. Ministry of Public Health, Department of Disease Control, Bureau of Epidemiology. Thailand's report situation of severe injuries, 2005-2010. [cited 2017 February 15]. Available from: http://www.searo.who.int/entity/disabilities_injury_rehabilitation/country_experiences/Thailandsituationseverinju2005-10.pdf?ua=1
8. Foundation of Thai Road and The Network of Traffic Accident Surveillance. A survey of helmet use among motorcycle user in Thailand, 2013. [cited 2016 November 28]. Available from: http://trso.thairoads.org/resources/5421
9. Apidechkul T, Laingoen O, Suwannaporn S. Inequity in accessing health care service in Thailand in 2015: a case study of the hill tribe people in Mae Fah Luang district, Chiang Rai, Thailand. Journal of Health Research. 2016; 30(1): 67-71.

10. Apidechkul T, Songla T. Traffic injury in northern Thailand in 2011-2013: A cross-sectional survey. Journal of Medicine and Health Sciences. 2016; 23(3): 26-39.
11. United Nation [UN]. Definition of youth. [cited 2016 December 9]. Available from: http://www.un.org/esa/socdev/documents/youth/fact-sheets/youth-definition.pdf
12. Yaghmale F. Content validity and its estimation. Journal of Medical Education. 2009; 3(1): 25-7.
13. Department of Land Transport, Thailand. Driving licenses: requirements. [cited 2016 December 9]. Available from: https://www.dlt.go.th/th/
14. Chiang Rai Local Officer, Thailand. Local transportation in Mae Fah Laung district. [cited 2016 December 9]. Available from: http://www.chiangrailocal.go.th/maefaluang/website/index.php?site=771&page_id=771
15. Buckley L, Bingham CR, Flannagan CA, Carter PM, Almani F, Cicchino JB. Observation of motorcycle helmet use rates in Michigan after partial repeal of the universal motorcycle helmet law. Accid Anal Prev. 2016 Oct; 95(Pt A): 178-86. doi: 10.1016/j.aap.2016.07.009
16. Mbanjumucyo G, George N, Kearney A, Karim N, Aluisio AR, Mutabazi Z, et al. Epidemiology of injuries and outcomes among trauma patients receiving prehospital care at a tertiary teaching hospital in Kigali, Rwanda. Afr J Emerg Med. 2016; 6(4): 191-7. doi: 10.1016/j.afjem.2016.10.001
17. de Carvalho HB, Andreuccetti G, Rezende MR, Bernini C, Silva JS, Leyton V, et al. Alcohol and drug involvement in motorcycle driver injuries in the city of Sao Paulo, Brazil: Analysis of crash culpability and other associated factors. Drug Alcohol Depend. 2016 May; 162: 199-205. doi: 10.1016/j.drugalcdep.2016.03.007
18. Curtis A, Coomber K, Hyder S, Droste N, Pennay A, Jenkinson R, et al. Prevalence and correlates of drink driving within patrons of Australian night-time entertainment precincts. Accid Anal Prev. 2016 Oct; 95(Pt A): 187-91. doi: 10.1016/j.aap.2016.07.018
19. Heydari ST, Vossoughi M, Akbarzadeh A, Lankarani KB, Sarikhani Y, Javanmardi K, et al. Prevalence and risk factors of alcohol and substance abuse among motorcycle drivers in Fars province, Iran. Chin J Traumatol. 2016 Apr; 19(2): 79-84.
20. Rowden P, Watson B, Haworth N, Lennon A, Shaw L, Blackman R. Motorcycle riders' self-reported aggression when riding compared with car driving. Transp Res Part F Traffic Psychol Behav. 2016; 36: 92-103. doi: 10.1016/j.trf.2015.11.006
21. Cheng ASK, Liu KPY, Tulliani N. Relationship between driving-violation behaviours and risk perception in motorcycle accidents. Hong Kong Journal of Occupational Therapy. 2015; 25: 32-8. doi: 10.1016/j.hkjot.2015.06.001
22. Jia K, King M, Fleiter JJ, Sheehan M, Ma W, Lei J, et al. Drunk driving offenders' knowledge and behaviour in relation to alcohol-involved driving in Yinchuan and a comparison with Guangzhou, China. Transp Res Part F Traffic Psychol Behav. 2016; 38: 182-93. doi: 10.1016/j.trf.2015.12.011
23. Zhang T, Chan AHS, Ba Y, Zhang W. Situational driving anger, driving performance and allocation of visual attention. Transp Res Part F Traffic Psychol Behav. 2016; 42, Part 2: 376-88. doi: 10.1016/j.trf.2015.05.008
24. Jimenez A, Bocarejo JP, Zarama R, Yerpez J. A case study analysis to examine motorcycle crashes in Bogota, Colombia. J Safety Res. 2015 Feb; 52: 29-38. doi: 10.1016/j.jsr.2014.12.005
25. Erhardt T, Rice T, Troszak L, Zhu M. Motorcycle helmet type and the risk of head injury and neck injury during motorcycle collisions in California. Accid Anal Prev. 2016 Jan; 86: 23-8. doi: 10.1016/j.aap.2015.10.004
26. Christophersen AS, Gjerde H. Prevalence of alcohol and drugs among motorcycle riders killed in road crashes in Norway during 2001-2010. Accid Anal Prev. 2015 Jul; 80: 236-42. doi: 10.1016/j.aap.2015.04.017
27. White D, Lang J, Russell G, Tetsworth K, Harvey K, Bellamy N. A comparison of injuries to moped/scooter and motorcycle riders in Queensland, Australia. Injury. 2013 Jun; 44(6): 855-62. doi: 10.1016/j.injury.2013.03.005
28. McCartt AT, Teoh ER. Tracking progress in teenage driver crash risk in the United States since the advent of graduated driver licensing programs. J Safety Res. 2015 Jun; 53: 1-9. doi: 10.1016/j.jsr.2015.01.001
29. Shell DF, Newman IM, Cordova-Cazar AL, Heese JM. Driver education and teen crashes and traffic violations in the first two years of driving in a graduated licensing system. Accid Anal Prev. 2015 Sep; 82: 45-52. doi: 10.1016/j.aap.2015.05.011