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Original Article

Risky beginnings: knowledge, attitudes, and safe motorcycle riding behaviors among novice motorcycle riders in Northern Thailand

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ABSTRACT

Introduction: Thailand has the ninth-highest road fatality rate globally (32.7 deaths/100,000 population), with young adults accounting for 73% of motorcycle-related deaths. This study examines risk knowledge, attitude, and riding behaviors among novice motorcycle riders at the University of Phayao to inform targeted interventions reducing road traffic accidents (RTAs).

Methods: A cross-sectional study (January–March 2025) surveyed 426 first-year public health undergraduates using a validated questionnaire (CVI=0.87; Cronbach's α=0.82). Non-riders were excluded. Descriptive statistics, independent t-test, Pearson's correlation, and logistic regression analysis were employed. Ethical approval and informed consent were secured.

Results: Participants (89.44% female; mean age=18.36 ± 0.6 years) predominantly used motorcycles (91.78%), yet 46.24% were unlicensed. Informal training (77.46%) exceeded formal instruction (4.93%). Accident prevalence was 38.26% (3.28% hospitalized), primarily on multi-lane roads (31.92%). Key risk factors included speeding (AOR=1.65, 95% CI:1.09–2.49, p=0.017), phone use (AOR=2.40, 95% CI:1.30–4.40, p=0.005), and poor vehicle maintenance (AOR=1.65 95% CI:1.04–2.63, p=0.033). Road law knowledge was moderate (46.48%) or low (30.52%), contrasting with predominantly good/excellent safety attitudes (79.11%) and behaviors (79.35%). Attitudes strongly correlated with safe riding (r=0.55, p<0.001).

Conclusion: Non-compliance with licensing, reliance on informal training, and risky behaviors elevate RTA risks. Policy priorities include mandating certified training, enforcing speed/phone-use laws, and upgrading high-risk infrastructure. The attitude-behavior link underscores the need for psychological interventions to reinforce safety mindsets, aligning with the UN Global Road Safety Framework (2021–2030).

Keywords: Motorcycle safety, Novice riders, Road traffic accidents, Safety attitudes, Safe motorcycle riding behaviors

Introduction

Road traffic accidents (RTAs) claim approximately 1.3 million lives annually worldwide, with low- and middle-income countries bearing 93% of this burden.[1] In Thailand, RTAs are the leading cause of death among individuals aged 5–29 years, with an annual fatality rate of 25 per 100,000 population.[2] Motorcycle riders are particularly vulnerable,

accounting for 73.8% of road fatalities, often due to speeding, alcohol impairment, and non-use of helmets.[3] This aligns with global studies identifying speeding and risky behaviors as primary contributors to motorcycle crashes, especially among young adults.[4,5] Phayao Province exemplifies this crisis, reporting 141 accidents in 2023—66% above the projected target.[6] First-year university students face heightened risks as novice riders, compounded by limited practical experience and exposure to unsafe road environments.[7]

Studies in Thailand underscore that motorcycle accidents among students are frequently linked to informal training, peer influence promoting reckless behaviors, and inconsistent enforcement of traffic laws.[8,9] For instance, research on young motorcyclists (18–24 years) emphasizes sensation-seeking tendencies, social pressures, and nighttime riding, which exacerbate risk-taking.[10,11] Additionally, inadequate infrastructure—such as poorly lit roads and a lack of pedestrian-safe zones—further elevates accident risks in academic settings.[12,13] A study in Algeria found that dangerous driving behaviors (e.g., speeding) and poor urban planning contribute to 29.5% of accidents involving pedestrians, underscoring systemic safety gaps.[1,14]

Despite their public health education, first-year undergraduate students often lack situational awareness and defensive riding skills, leaving them susceptible to collisions.[7,15] Human factors, including judgment errors, impulsivity, and decision-making under pressure, account for over 90% of accident causation, as demonstrated in studies analyzing driver behavior and sociocultural influences.[16,17] For example, research in Portugal and California identifies demographics (e.g., age, gender) and vehicle-road interactions as critical predictors of crash severity.[18,19] Furthermore, studies in suburban and mountainous regions highlight that environmental factors, such as adverse weather and road alignment, significantly increase accident likelihood among inexperienced riders.[20,21] However, limited studies specifically address the intersection of academic stress, social dynamics, and riding behaviors among university students in northern Thailand. Research in South Africa and Uzbekistan emphasizes the importance of policies that target law enforcement, public awareness campaigns, and infrastructure improvements to reduce RTAs.[15,22] Similarly, interventions promoting helmet use, vehicle maintenance, and sobriety checkpoints have proven effective in reducing fatalities in Southeast Asia.[23,24]

This study addresses this gap by examining the attitudes, perceptions, and riding behaviors of first-year public health students at the University of Phayao. By integrating insights from sociocultural frameworks and crash severity analyses, the research identifies modifiable risk factors, such as helmet non-compliance and motorcycle riding experience, while proposing context-specific strategies.[18,20] The findings aim to inform targeted interventions, including peer-led safety campaigns, enhanced licensing protocols, and infrastructure upgrades, to mitigate RTAs among young riders. This aligns with the WHO's Decade of Action for Road Safety 2021–2030, emphasizing evidence-based policies to reduce preventable deaths in high-risk populations.[25,26]

Methods

This cross-sectional study aimed to assess road traffic law knowledge, safety attitude, and safe motorcycle riding behaviors among first-year undergraduate public health students at the University of Phayao, Thailand, as novice motorcycle riders. Additionally, the study examined the relationships between knowledge, attitudes, and riding behaviors, and proposed policy recommendations to promote a safer riding culture and reduce road traffic accidents within the university and surrounding communities.

The study was conducted between January and March 2025 among 867 eligible students. Participants were selected using simple random

sampling to enhance representativeness. The inclusion criteria encompassed students aged 17 years or older, enrolled in the first year of the public health program at the University of Phayao, who voluntarily participated and regularly used motorcycles for commuting. Exclusion criteria involved individuals with physical impairments affecting their riding ability, those unable to comprehend the Thai language, and non-motorcycle riders. The final sample size of 426 was determined based on statistical calculations, ensuring a 95% confidence level with a 3% margin of error, accounting for potential attrition. Participants were randomly selected using computer-generated numbers from the university's enrollment registry to minimize selection bias and enhance the study's validity.

Data was collected using a structured, self-administered questionnaire validated for content and reliability. The instrument comprised five sections: (1) Demographics: Captured age, gender, vehicle ownership (motorcycle, car), licensing status (none, motorcycle-only, car-only, dual license), insurance compliance (regular, occasional, none), motorcycle training sources (e.g., family, driving school, self-taught), riding experience (<1 year, 1–5, 6–10, >10 years), car driving experience, and patterns of compulsory motor insurance renewal; (2) Accident Involvement: Assessed motorcycle accidents in the past five years (yes/no). For those with prior accidents, additional items recorded medical treatment (none to hospitalization), road type at the time of incident (4-lane to gravel), and injury locations across 12 body regions (left/right specific); (3) Knowledge: Evaluated understanding of traffic laws and safe riding practices via 10 multiple-choice items, scored dichotomously (1 = correct, 0 = incorrect). Total scores (0–10) were categorized into five levels: *Very Good* (9–10), *Good* (7–8), *Moderate* (5–6), *Low* (3–4), and *Very Low* (0–2); (4) Behaviors: Measured self-reported riding practices through 15 items rated on a 4-point frequency scale (1 = never to 4 = always). Total scores (15–60) were stratified into: *Excellent* (54–60), *Good* (48–53), *Moderate* (36–47), and *Needs Improvement* (<36), covering helmet use, speed adherence, and phone avoidance; and (5) Attitudes: Assessed risk perception and safety compliance via 15 Likert-scale items (1 = strongly disagree to 5 = strongly agree), including statements such as "Speeding increases accident risk." Scores (15–75) were categorized as *Excellent* (67–75), *Good* (58–66), *Moderate* (45–57), and *Needs Improvement* (<45). Content validity was established through review by three independent experts, with all items achieving an Item-Objective Congruence Index (IOC) > 0.50. Reliability was confirmed via a pilot study (n = 30), demonstrating strong internal consistency for attitudes (Cronbach's α = 0.82) and behaviors (α = 0.78).

Data analysis was performed using SPSS v.28. Descriptive statistics summarized participant characteristics, while inferential analyses included: Independent *t*-tests to compare differences in knowledge, attitudes, and behaviors between accident-involved and non-involved riders. Pearson's correlation was used to explore relationships between road traffic law knowledge, safety attitudes, and safety riding behaviors. Stepwise logistic regression analysis (entry $p < 0.05$, exit $p > 0.10$) to identify predictors of motorcycle accidents, adjusting for covariates such as speeding, phone use, and vehicle maintenance. Statistical significance was set at $p < 0.05$, with odds ratios (ORs) and 95% confidence intervals (CIs) reported.

Ethical approval was obtained from the University of Phayao's Institutional Review Board (IRB No. UP-EC 2567/001). Written informed consent emphasizes confidentiality.

Results

The 426 participants were predominantly female (89.44%), with a mean age of 18.36 years (SD = 0.567; range: 17 to 21), representing a young and gender-skewed population. Most participants (91.78%) could operate motorcycles, whereas only 8.22% could drive both motorcycles and private cars. The majority of participants

acquired riding skills through informal means, with parental or guardian instruction being the most common (77.46%), followed by self-directed learning (5.87%). Conversely, formal instruction from certified driving institutions was relatively uncommon, with only 4.93% undergoing such training. Compliance with licensing requirements remained suboptimal, as 46.24% lacked official credentials, while 49.77% possessed motorcycle-specific permits. Although compulsory motor insurance renewal rates were comparatively high (74.65%), a notable proportion (16.67%) did not own a personal vehicle (Table 1).

Over five years, 38.26% of the participants experienced motorcycle-related accidents. Among them, 3.28% required hospitalization, while 10.56% received outpatient treatment. Serious injuries resulting in permanent physical impairment were uncommon (0.23%), suggesting that the majority of incidents led to minor injuries. Most accidents occurred on four-lane paved roads (31.92%), whereas single-lane paved roads accounted for a smaller proportion (3.05%) (Table 1).

Table 1: Demographic characteristics (n=426)

Demographic Characteristic	n (%)
Gender	
Male	45 (10.56)
Female	381 (89.44)
Age (years)	
<18	5 (1.17)
≥18	421 (98.83)
Min=17, Max=21, Mean=18.36, SD=0.567	
Vehicle operation capability	
Motorcycle	391 (91.78)
Motorcycle and Private Car	35 (8.22)
Motorcycle training source	
Parent/Guardian	330 (77.46)
Sibling	27 (6.34)
Friend	16 (3.76)
Relative/Acquaintance	7 (1.64)
Driving school	21 (4.93)
Self-taught	25 (5.87)
Motorcycle riding experience (years)	
<1	51 (11.97)
1–5	223 (52.35)
6–10	137 (32.16)
>10	15 (3.52)
Private car driving experience (years)	
None	391 (91.79)
<1	11 (2.58)
1–5	22 (5.16)
6–10	2 (0.47)
Official driving license	
No license	197 (46.24)
Motorcycle license only	212 (49.77)
Private car license only	6 (1.41)
Both Motorcycle and Private Car Licenses	11 (2.58)

Demographic Characteristic	n (%)
Compulsory motor insurance renewal	
Regular renewal	318 (74.64)
Occasional/Delayed renewal	21 (4.93)
No renewal	87 (20.43)
Accident involvement	
Never	263 (61.74)
Ever	163 (38.26)
Medical treatment	
No accident	263 (61.74)
No treatment received	12 (2.82)
Self-administered first aid	67 (15.73)
Community hospital treatment	25 (5.87)
Outpatient department treatment	45 (10.56)
Hospitalized	14 (3.28)
Physical disability	
None	425 (99.77)
Disability	1 (0.23)
Accident road type	
No Accident	263 (61.74)
4-Lane Asphalt Road	136 (31.92)
2-Lane Asphalt Road	10 (2.35)
1-Lane Asphalt Road	13 (3.05)
Gravel Road	4 (0.94)

The analysis of accident-related injuries among 426 participants revealed distinct patterns in affected body regions. Upper limb injuries predominated, with hands and wrists being the most frequently injured areas, accounting for 10.80% of injuries on both the left and right sides. Elbow injuries followed, occurring in 7.98% of cases on the left and 6.10% on the right. Shoulder injuries showed a slight lateral imbalance, with left-side injuries (4.46%) marginally exceeding right-side injuries (3.99%).

For lower body injuries, knee injuries exhibited near-symmetry, with 4.69% on the left and 4.93% on the right. In contrast, injuries to the lower leg/calf and foot/ankle demonstrated a left-side predominance (1.64% and 2.35%, respectively) compared to the right side (0.47% and 1.41%, respectively) (Table 2)

Most participants demonstrated moderate knowledge of road traffic laws (46.48%), while only a small proportion exhibited good (15.49%) or very good (0.94%) understanding. Mean scores increased incrementally across categories, ranging from very low (M = 2.10, SD = 0.80, 95% CI: 4.23–8.92) to very good (M = 9.80, SD = 0.20, 95% CI: 0.23-1.88), highlighting significant disparities in legal comprehension among students. Regarding attitudes toward safety, 79.11% of participants held positive views, with 39.67% classified as good and 39.44% as excellent. Those in the excellent category achieved the highest mean score (M = 8.90, SD = 0.80, 95% CI: 34.98–44.13), reflecting strong adherence to safe riding principles. In terms of safe riding behaviors, 42.50% of students exhibited excellent practices, followed by good (36.85%) and moderate (19.95%) levels. Only 0.70% required behavioral intervention. Participants with excellent behaviors had significantly higher mean scores (M = 9.10, SD = 0.60, 95% CI: 38.03–47.18), indicating rigorous compliance with motorcycle safety standards (Table 3).

Table 2: Distribution of accident-related injuries by body parts (n = 426)

Left side injuries		Right side injuries	
Body Part	**n (%)**	**Body Part**	**n (%)**
Head	4 (0.94)	Head	4 (0.94)
Face	10 (2.35)	Face	6 (1.41)
Neck	4 (0.94)	Neck	4 (0.94)
Shoulder	19 (4.46)	Shoulder	17 (3.99)
Upper Arm	10 (2.35)	Upper Arm	3 (0.70)
Elbow	34 (7.98)	Elbow	26 (6.10)
Lower Arm	12 (2.82)	Lower Arm	5 (1.17)
Hand/Wrist	46 (10.80)	Hand/Wrist	46 (10.80)
Upper Leg	11 (2.58)	Upper Leg	11 (2.58)
Knee	20 (4.69)	Knee	21 (4.93)
Lower Leg/Calf	7 (1.64)	Lower Leg/Calf	2 (0.47)
Foot/Ankle	10 (2.35)	Foot/Ankle	6 (1.41)

Notes: 1. Injury types include wounds, abrasions, lacerations, and fractures.

2. Percentages are calculated based on valid responses in each category.

Table 3: Levels of road traffic law knowledge, safety attitudes, and safe motorcycle riding behaviors among participants (n = 426)

Level	n (%)	Mean (SD)	95% CI
Road traffic law knowledge			
Very good	4 (0.94)	9.80 (0.20)	0.23, 1.88
Good	66 (15.49)	8.70 (0.60)	12.21, 19.25
Moderate	198 (46.48)	6.50 (0.90)	41.55, 51.40
Low	130 (30.52)	4.30 (1.20)	26.06, 35.21
Very low	28 (6.57)	2.10 (0.80)	4.23, 8.92
Safety attitudes			
Excellent	168 (39.44)	8.90 (0.80)	34.98, 44.13
Good	169 (39.67)	5.80 (1.10)	34.98, 44.13
Moderate	87 (20.42)	3.20 (0.90)	16.67, 24.41
Needs improvement	2 (0.47)	1.50 (0.70)	0.00, 1.17
Safety behavior			
Excellent	181 (42.50)	9.10 (0.60)	38.03, 47.18
Good	157 (36.85)	6.80 (1.00)	32.39. 41.31
Moderate	85 (19.95)	3.50 (0.70)	16.20, 23.71
Needs improvement	3 (0.70)	1.20 (0.40)	0.00, 16.64

While knowledge showed negligible correlations with attitudes ($r = -0.01$, $p > 0.05$) and behaviors ($r = -0.01$, $p > 0.05$), a strong positive correlation emerged between safety attitudes and safe riding behaviors ($r = 0.55$, $p < 0.01$) This suggests that participants with more safety-conscious attitudes were significantly more likely to adopt safe riding practices, independent of their legal knowledge. The lack of association between knowledge and behavior highlights potential disconnections between theoretical understanding and practical application, emphasizing the need for hands-on training programs (Table 4)

Table 4: The relationship between road traffic law knowledge, safety attitudes, and safe motorcycle riding behaviors among participants (n = 426)

Variable	Knowledge	Attitude	Behavior
Knowledge	1		
Attitude	-0.01	1	
Behavior	-0.01	0.55**	1

Notes: ** Correlation is significant at the 0.01 level (two-tailed).
Pearson's correlation coefficient (*r*) was used.

The analysis identified three statistically significant independent predictors ($p < 0.05$): exceeding speeds of 60 km/h, phone use while driving, and adherence to regular vehicle maintenance. In Step 1 of the analysis, exceeding speeds of 60 km/h increased the risk of accidents by 1.58 times (OR = 1.584, 95% CI: 1.063–2.361, $p = 0.024$). After adjusting for additional covariates in Step 3, the adjusted OR for this factor remained significant at 1.65 (95% CI: 1.092–2.493, $p = 0.017$), underscoring the persistent role of excessive speed in elevating accident risk, even after accounting for confounding variables. Phone use while driving exhibited a substantial increase in risk. In Step 2, this behavior was associated with a 2.08-fold increase in accident risk (OR = 2.078, 95% CI: 1.149–3.758, $p = 0.016$). Notably, when combined with vehicle maintenance data in Step 3, the risk escalated to 2.40 times (OR = 2.396, 95% CI: 1.304–4.400, $p = 0.005$), identifying phone use as the most influential risk factor in the model. Neglecting regular vehicle maintenance was linked to a 1.65-fold increase in accident likelihood (OR = 1.655, 95% CI: 1.043–2.625, $p = 0.033$), emphasizing the crucial role of vehicular maintenance in accident prevention. The model's robustness was confirmed through statistically significant intercept terms across all steps ($p< 0.001$). Furthermore, incremental adjustments in OR values for existing predictors upon the inclusion of new variables underscored the multifactorial nature of behavioral and mechanical determinants contributing to motorcycle accidents (Table 5).

Table 5: Behavior factors associated with motorcycle accidents among participants: results of stepwise logistic regression analysis (n = 426)

Step	Variable	B	SE	Wald	*p*-value	OR	95% CI
Step 1	Speeding over 60 km/h	0.460	0.204	5.110	0.024	1.584	1.063–2.361
	Constant	-0.664	0.131	25.641	<0.001	0.515	-
Step 2	Speeding over 60 km/h	0.547	0.209	6.887	0.009	1.728	1.149–2.601
	Phone use while riding	0.731	0.302	5.853	0.016	2.078	1.149–3.758
	Constant	-0.795	0.144	30.438	<0.001	0.451	-
Step 3	Regular vehicle maintenance checks	0.504	0.236	4.570	0.033*	1.655	1.043–2.625
	Speeding over 60 km/h	0.501	0.211	5.655	0.017*	1.650	1.092–2.493
	Phone use while riding	0.874	0.310	7.929	0.005*	2.396	1.304–4.400
	Constant	-0.929	0.159	34.022	<0.001	0.395	-

Discussion

This study offers critical insights into demographic characteristics, driving behaviors, and risk factors influencing road safety among young drivers, particularly undergraduate students in their early driving years. Demographic analysis indicates that the majority of participants were female (89.44%) with limited driving experience, with an average age of 18.36 years. This cohort is developmentally predisposed to risk-taking behaviors. This increases their vulnerability to road-related incidents.[27,28] A significant proportion (77.46%) relied on informal driving instruction from parents or guardians, whereas only 4.93% received formal driver education. This reliance on unstructured training highlights a systemic gap in driver education programs, reinforcing the need for comprehensive training initiatives designed to enhance crash-avoidance skills.[29] Additionally, the prevalence of unlicensed drivers (46.24%) and motorcycle riders without proper licensing (49.77%) parallels findings from Nepal, where inadequate compliance with licensing requirements exacerbates road safety concerns.[30]

Analysis of accident data reveals that 38.26% of respondents experienced motorcycle-related accidents, with injuries predominantly affecting the upper limbs, such as hands and wrists, as well as joints including elbows, shoulders, and knees. These injury patterns are consistent with global evidence indicating that the extremities are the most vulnerable body parts in motorcycle collisions.[28,31] Such findings emphasize the necessity of enforcing the use of protective gear, including gloves and elbow pads, to mitigate injury severity. Moreover, the higher frequency of accidents on four-lane roads (31.92%) compared to two-lane roads (3.05%) mirrors infrastructure-related risks observed in Sri Lanka, where road design and environmental factors significantly influenced injury severity.[28]

Participants demonstrated moderate knowledge of traffic regulations, though only a minority exhibited a high level of proficiency. This phenomenon reflects a "knowledge-attitude-practice gap," a trend previously reported in studies from Nepal and Ghana.[32,33] While knowledge alone did not directly predict safer driving behavior, a positive safety-oriented attitude was significantly correlated with improved driving practices, reinforcing the role of psychological interventions targeting the internal locus of control.[27,33] Key risk factors identified in this study include excessive speeding (exceeding 60 km/h), phone use (which increased accident risk by a factor of 2.40), and poor vehicle maintenance. These trends align with research from Indonesia and Malaysia, where traffic violations and distractions were major contributors to road accidents.[27,34,35]

Conclusion

Overall, this study underscores the critical need for a comprehensive approach to accident prevention and road safety enhancement. Effective strategies should extend beyond traffic law education. They should include attitude development and practical training that fosters behavioral change. The implementation of accessible learning programs and sustained public awareness campaigns targeting risky driving behaviors is essential. Future efforts should focus on developing practical, hands-on driver training curricula tailored to young drivers, incorporating appropriate educational media, and implementing continuous road safety initiatives. Such measures could significantly reduce accident rates and improve overall road safety for all users.

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