

An Overview of Riding Behavior Among Junior High School Students in Semarang City

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Abstract

Background: It has been shown that underage individuals are more vulnerable to involvement in traffic accidents. In 2023, a total of 1,339 traffic accidents were documented in the city of Semarang. There were 1,515 traffic accidents involving 3,113 perpetrators with 17.5% (546) aged 5-20 years in 2024. The objective of this study was to identify the factors associated with the riding behavior of junior high school students in Semarang City.

Methods: The present study was conducted as an observational analytical study employing a cross-sectional approach. A total of 447 subjects were selected as a sample for the study. The sampling technique used was cluster sampling. The data were collected via an online questionnaire and subsequently analyzed using the chi-square test and logistic regression.

Results: The findings indicated that knowledge ($p = 0.006$), attitude ($p = 0.001$), and parental involvement ($p = 0.009$) were significantly associated with students' riding behaviors.

Conclusion: The findings of this study indicate that educational and parental involvement are both critical factors in shaping the riding behavior of adolescent motorcyclists.

Keywords: Junior high school student, Riding behavior, Traffic accident

INTRODUCTION

Traffic crashes are a major public health problem in adolescents.¹ Childhood traffic injuries remain a serious public health problem.² According to the World Health Organization (WHO), as reported in the 2023 Global Status Report on Road Safety, there are 1.19 million road traffic deaths annually, with the average age of victims being 5-29 years. The majority of these are pedestrians, cyclists and motorcyclists, mainly in low and middle-income countries.³ In adolescents aged 10-24, road injuries are the leading cause of disability-adjusted life-years (DALYs), with a percentage of 6.6 (5.6 to 7.7) in 2019, according to recent studies.⁴ Traffic crashes can cause material losses, injuries and fatalities.⁵ In Asia, the number of deaths and injuries is increasing annually in numerous low- and middle-income countries.⁶

Injuries have been identified as a primary contributor to child mortality in densely populated middle-income countries, including Brazil, China, Indonesia, and Russia.⁷ In 2021, Indonesia recorded 103,645 cases of traffic accidents, which resulted in 25,266 deaths, 10,553 victims of serious injuries, and 117,913 victims of minor injuries.⁸ In 2022, Indonesia experienced 139,258 traffic accidents, resulting in 28,131 fatalities, 13,364 severe injuries, and 160,449 minor injuries.⁹ From 2021 to 2022, there was an increase in the number of traffic accidents in Indonesia by 35,613 accidents, which corresponds to an increase of 34.36%. The Central Statistics Agency of Central Java Province has documented a total of 30,493 traffic accidents in 2022 which caused 4,390 deaths as well as 80 serious injuries and 35,734 minor injuries.¹⁰ Then in 2023, the number of traffic accidents was 31,425 with

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4,300 deaths, 60 serious injuries, and 36,915 minor injuries.¹¹ There were 932 more traffic accidents in 2023 than in 2022, representing an increase of 3.06% in Central Java.

In 2022, there were 1,116 traffic accidents in Semarang City, with 188 fatalities, 4 serious injuries, and 1,202 minor injuries.¹⁰ In 2023, Semarang City had 1,339 traffic accidents resulting in 200 fatalities, 4 serious injuries, and 1,437 minor injuries.¹¹ This indicates a 19.98% increase in traffic accident incidence in the city from 2022 to 2023, with the number of accidents increasing by 223. According to the police traffic accident report, there were 1,515 traffic accidents involving 3,113 perpetrators with 17.5% aged 5-20 years in 2024.

Children, unlike adults, are not yet fully developed in terms of physical condition and cognitive maturity. As road users, they are consequently at a higher risk of being involved in traffic accidents.¹² Injury prevention and control in young children is critically important.¹³ Numerous risky behaviors are significantly associated with motorcycle crashes involving teenagers.¹⁴ Lack of motorcycle riding knowledge and experience, coupled with personality traits has been demonstrated to result in the adoption of risky behaviors that can trigger most causes of motorcycle crashes.¹⁵ Underage riders are less likely to wear helmets and are often involved in crashes.¹⁶ Safety attitude, risk perception, and confidence in riding have a significant influence, both directly and indirectly, on risky riding behavior.¹⁷

Children's cognitive-perceptual skills naturally develop during early and middle childhood, resulting in inadequate knowledge of safety rules and practices, misunderstanding of risks from traffic, and inadequate attention and visual search skills in traffic.¹⁸⁻²⁰ It is imperative that children have the capacity to traverse their neighborhoods with safety, whether for the purpose of attending school, engaging in play with peers, or partaking in other forms of activity.²¹ Human factors are a prominent factor in the occurrence of accidents, so there is a need for legal awareness of road users to reduce it.²² The minimum age limit for riding has been implemented in Semarang City, but the number of traffic violations by underage motorcyclists has not decreased.²³ Characteristics of risky riding behavior participation in adolescents are important in guiding public health policies and tailoring specific preventive interventions.¹ The objective of this study was to determine the correlation between knowledge, attitudes, and parenting behaviors and the riding behavior of junior high school students in Semarang City.

METHOD

Participants and Study Design

This study employed an analytical observational study with a quantitative approach, using a cross-sectional design. The research was conducted in July 2024 in Semarang City. The result of calculating the minimum sample size using the Slovin formula is 398 participants. The sampling technique used was cluster sampling. A total of 447 junior high school students participated as respondents. The participants were drawn from The State Junior High School 5 Semarang City (148 respondents), The State Junior High School 38 Semarang City (109 respondents), The State Junior High School 8 Semarang City (101 respondents), The State Junior High School 31 Semarang City (47 respondents), and The State Junior High School 2 Semarang City (42 respondents).

Measurements and Procedure

The research data were obtained through an online questionnaire using Google Forms. Google Forms was chosen because it allows for efficient and practical data collection, while ensuring the confidentiality of information. Data were collected by distributing online questionnaires via WhatsApp. The independent variables in this study were knowledge, attitudes, and parenting, while the dependent variable was riding behavior.

Statistical Analysis and Ethical Clearance

The statistical test employed in the study was Chi-square with a 95% confidence level and a significance value of 0.05. The risk factors with p-values lower than 0.05 were included in the logistic regression analysis. Ethical clearance was obtained from the Health Research Ethics Committee (KEPK) Universitas Negeri Semarang with code No. 484/KEPK/FK/KLE/2024. All the participants involved have filled out an online informed consent and agreed to participate in it.

RESULTS

The distribution of characteristics, knowledge, attitudes, parenting, and riding behavior of respondents is shown in Table 1. Most respondents were from The State Junior High School 5 Semarang City (23%). More than half of the respondents were 14 years old (58%), female (57%), had good knowledge (60%), positive attitudes (55%), good parenting (53%), and poor riding behavior (53%).

Table 1 shows the majority of respondents had good knowledge as many as 268 respondents (60%), while respondents with poor knowledge were 179 respondents (40%). In the attitude variable, 245 respondents (55%) had a positive attitude and 202 respondents (45%) had a negative attitude. In addition, respondents with good parenting were 239 respondents (53%) and respondents with poor parenting were 208 respondents (47%).

Table 1 Frequency Distribution of Respondents' Characteristics, Knowledge, Attitude, Parenting, and Riding Behavior

Variable	Categories	Frequency (n)	Percentage (%)
Coming from junior high school	The State Junior High School 2 Semarang City	42	9%
	The State Junior High School 5 Semarang City	14	33%
	The State Junior High School 8 Semarang City	101	23%
	The State Junior High School 31 Semarang City	47	11%
	The State Junior High School 38 Semarang City	109	24%
Age	12 years old	3	1%
	13 years old	102	23%
	14 years old	261	58%
	15 years old	77	17%
	16 years old	4	1%
Gender	Male	191	43%
	Female	256	57%
Knowledge	Good	268	60%
	Less good	179	40%
Attitude	Positive	245	55%
	Negative	202	45%
Parenting	Good	239	53%
	Less good	208	47%
Riding Behavior	Good	208	47%
	Less good	239	53%

Based on Table 2, poor riding behavior was higher among students with poor knowledge (61.5%) than those with good knowledge (48.1%), which was statistically significant with Odds Ratio (OR)=1.717 (95% CI 1.170-2.522). Poor riding behavior is higher among students with negative attitudes (82.7%) compared to those with positive attitudes (29.4%), which is statistically significant with OR=11.465 (95%CI 7.264—18.083). Poor riding behavior was higher among students with poor parenting (60.1%) compared to good parenting (47.7%), which was statistically significant with OR=1.651 (95% CI 1.133—2.404).

Table 2 Relationship between Knowledge, Attitude, and Parenting with Riding Behavior

Variable	Riding Behavior		Total	P-value	OR	95% CI
	Poor	Good				
Knowledge						
Poor	110 (61.5%)	69 (38.5%)	179 (100%)	0.006	1.717	1.170-2.522
Good	129 (48.1%)	139 (51.9%)	268 (100%)			
Attitude						
Negative	167 (82.7%)	35 (17.3%)	202 (100%)	0.001	11.465	7.264-18.083
Positive	72 (29.4%)	173 (70.6%)	245 (100%)			
Parenting						
Poor	125 (60.1%)	83 (39.9%)	208 (100%)	0.009	1.651	1.133-2.404
Good	114 (47.7%)	125 (52.3%)	239 (100%)			

The model in Table 3 shows that only attitude variables can significantly predict riding behavior among junior high school students in Semarang City. In this model, the OR for attitude was 11.465 (95%CI 7.263—18.096). This means that students with a poor attitude are 11.465 times more likely to exhibit poor riding behavior than students with a good attitude.

Table 3. The Model of Riding Behavior among Junior High School Students

Variables	B	Wald	P-value	OR (95%CI)
Attitude	2.439	109.721	0.000	11.465 (7.263—18.096)

DISCUSSION

Knowledge is related to students' riding behavior. In this study, knowledge refers to an individual's understanding of the rules and principles of driving safety, which include administrative obligations, safety equipment, and compliance with traffic regulations. These outcomes bear a resemblance to those reported by Danielle et al., who found that there was a significant relationship between knowledge and the safe riding behavior of high school students.²⁴ In addition, this finding is consistent with that of Iskandar et al. in Paal Merah District, Jambi City who suggested that knowledge is significantly related to safe riding behavior.²⁵ In adolescence, knowledge would have beneficial impacts on traffic behavior.²⁶ It is necessary to improve knowledge about safe riding in students to prevent risky riding behavior. Students who possess a great understanding of traffic rules and riding hazards would be well-aware not to ride. Due to their underage status, it is believed that students tend to practice risky riding behavior. Knowledgeable individuals are more likely to ride safely.²⁷

Attitude has a significant relationship with students' riding behavior. The attitudes assessed in this study reflect an individual's tendency to prioritize their own safety and that of other road users through compliance with traffic regulations and the application of riding safety principles, both in monitored and unmonitored situations. The findings of this study are in agreement with those obtained by Liunesi et al. who reported that there was a relationship between attitude and helmet use in high school students at The State Senior High School 4 Kupang City.²⁸ Similarly, Iskandar et al. also found that attitude is significantly related to safe riding behavior.²⁵ In addition, Djunaedi et al. suggested that attitude has a significant relationship with risky riding behavior.²⁹ Students with positive attitudes tend to practice good riding behavior. This shows that it is necessary to develop attitudes in students. Riding attitudes are considered to play an important role in improving risky riding behavior.³⁰ An increase in risk-taking attitudes leads to frequent mistakes, violations, and deviations in riding.³¹

Parenting is significantly related to student riding behavior. The parenting patterns assessed in this study reflect the role of parents in supervising, directing, and controlling children's riding behavior by granting permission, providing safety information, and enforcing discipline against traffic rule violations. In this study, it was found that there was a relationship between parenting and riding behavior. A similar finding was also reported by Prameswari *et al.* based on their research on teenagers at The State Junior High School 1 Kabuh Jombang.³² Furthermore, research conducted by Suryandari *et al.* suggested that the number of traffic violations by adolescents in Bekasi City was influenced by parental permission.³³ These prove the importance of parenting in affecting adolescent riding behavior. Parents who allow and facilitate their teenage children to ride motorbikes would lead to their risky riding behavior. Based on the results of research at The State Junior High School 2 Sanden, Bantul Regency, students were given private vehicle facilities by their parents because they were busy working and did not have time to take them to school³⁴. One of the factors which influences adolescents to ride motorbikes is their parents and parents have an important role in monitoring their children.³⁵

Based on respondents' answers, there are parents who still allow their children to ride motorcycles underage. Furthermore, some respondents' parents provide motorcycle facilities for their children. Then, despite knowing that children under the legal age are prohibited from riding, some parents still allow their children to ride motorcycles. This is because they consider motorcycles as useful, easy to use, and socially acceptable, which is what teenagers like³⁶. Further studies are needed regarding parents' awareness or concern for children's safety.

One of the study's limitations is the possibility that the data were collected independently by respondents through an online questionnaire. The present study was conducted in public junior high schools in the city of Semarang. It is possible that the results of the study may not be representative of students attending private junior high schools in the city of Semarang.

CONCLUSION

The findings of this study demonstrate that knowledge, attitudes, and parental roles are significant determinants of riding behavior in junior high school students in Semarang City. Attitude is the variable most related to student riding behavior. This finding indicates the importance of reinforcing positive attitudes towards traffic safety. These results contribute to the theoretical understanding of factors influencing riding behavior in adolescent age groups and provide practical insights for designing school- and family-based traffic safety interventions.

These findings can provide useful direction for policymakers as a basis for tailoring riding safety programs for junior high school students in Semarang City. In addition, these results can be used as a basis for future researchers in developing innovative safety riding education models. Thus, it is expected that students' knowledge of riding safety will increase and students will have a positive attitude towards riding safety.

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REFERENCES

1. Lastrucci V, Innocenti F, Lorini C, Berti A, Silvestri C, Lazzeretti M, *et al.* The Prevalence of Several Risky Driving Behaviors and Associated Crash Risk in Adolescent: A Population-Based Study of Tuscany Region. *Int J Public Health*. 2022;67:1604582.
2. Chong SL, Tyebally A, Chew SY, Lim YC, Feng XY, Chin ST, *et al.* Road traffic injuries among children and adolescents in Singapore – Who is at greatest risk? *Accid Anal Prev*. 2017 Mar;100:59–64.

3. Global status report on road safety 2023. Geneva: World Health Organization; 2023.
4. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* [Internet]. 2020 Oct;396(10258):1204–22. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0140673620309259>
5. Rahmadeni, Raudi S. Analisis Tingkat Kerugian Material Akibat Kecelakaan Lalu Lintas dengan Menggunakan Dummy Variable di Provinsi Riau Tahun 2013-2017. *Jurnal Sains Matematika dan Statistika*. 2020;6(1):58–64.
6. Wismans J, Skogsmo I, Nilsson-Ehle A, Lie A, Thynell M, Lindberg G. Commentary: Status of road safety in Asia. *Traffic Inj Prev*. 2016;17(3):217–25.
7. Kyu HH, Pinho C, Wagner JA, Brown JC, Bertozzi-Villa A, Charlson FJ, et al. Global and National Burden of Diseases and Injuries Among Children and Adolescents Between 1990 and 2013: Findings From the Global Burden of Disease 2013 Study. *JAMA Pediatr*. 2016 Mar;170(3):267–87.
8. BPS Indonesia. Jumlah Kecelakaan, Korban Mati, Luka Berat, Luka Ringan, dan Kerugian Materi, 2019-2021 [Internet]. 2024 [cited 2024 Aug 23]. Available from: <https://www.bps.go.id/id/statistics-table/2/NTEzIzI%253D/jumlah-kecelakaan--korban-mati--luka-berat--luka-ringan--dan-kerugian-materi.html>
9. BPS Indonesia. Jumlah Kecelakaan, Korban Mati, Luka Berat, Luka Ringan, dan Kerugian Materi, 2022 [Internet]. 2024 [cited 2024 Aug 23]. Available from: <https://www.bps.go.id/id/statistics-table/2/NTEzIzI%3D/jumlah-kecelakaan--korban-mati--luka-berat--luka-ringan--dan-kerugian-materi.html>
10. BPS Jateng. Provinsi Jawa Tengah dalam Angka 2023. 2023.
11. BPS Jateng. Provinsi Jawa Tengah dalam Angka 2024. Vol. 49. 2024.
12. Sugiyanto G, Santi MY. Karakteristik Kecelakaan Lalu Lintas dan Pendidikan Keselamatan Berlalu lintas Sejak Usia Dini: Studi Kasus di Kabupaten Purbalingga. *Semesta Teknika*. 2016 Jan 9;18(1):65–75.
13. Qiu X, Wacharasin C, Deoisres W, Yu J, Zheng Q. Characteristics and predictors of home injury hazards among toddlers in Wenzhou, China: a community-based cross-sectional study. *BMC Public Health*. 2014 Dec 23;14(1):638.
14. Umniyatun Y, Nurmansyah MI, Farradika Y, Purnama TB, Hidayat DN. Motorcycle risky behaviours and road accidents among adolescents in Jakarta metropolitan area, Indonesia. *Int J Inj Contr Saf Promot*. 2021 Sep;28(3):339–46.
15. Romero DL, de Barros DM, Belizario GO, Serafim A de P. Personality traits and risky behavior among motorcyclists: An exploratory study. *PLoS One*. 2019;14(12):e0225949.
16. Piyapromdee U, Adulyanukosol V, Lewsirirat S. Increasing Road Traffic Injuries in Underage Motorcyclists. *The Thai Journal of Orthopaedic Surgery* [Internet]. 2015;39(1–2):3–7. Available from: <http://thailand.digitaljournals.org/index.php/JRCOST>
17. Wang T, Xie S, Ye X, Yan X, Chen J, Li W. Analyzing E-Bikers' Risky Riding Behaviors, Safety Attitudes, Risk Perception, and Riding Confidence with the Structural Equation Model. *Int J Environ Res Public Health*. 2020 Jul 2;17(13).
18. Koekemoer K, Van Gesselleen M, Van Niekerk A, Govender R, Van As AB. Child pedestrian safety knowledge, behaviour and road injury in Cape Town, South Africa. *Accid Anal Prev*. 2017 Feb;99(Pt A):202–9.
19. Poudel-Tandukar K, Nakahara S, Ichikawa M, Poudel KC, Jimba M. Risk perception, road behavior, and pedestrian injury among adolescent students in Kathmandu, Nepal. *Inj Prev*. 2007 Aug;13(4):258–63.
20. Tabibi Z, Pfeffer K. Finding a safe place to cross the road: The effect of distractors and the role of attention in children's identification of safe and dangerous road-crossing sites. *Infant Child Dev*. 2007;16:193–206.

21. Amiour Y, Waygood EOD, van den Berg PEW. Objective and Perceived Traffic Safety for Children: A Systematic Literature Review of Traffic and Built Environment Characteristics Related to Safe Travel. *Int J Environ Res Public Health*. 2022 Feb 24;19(5).
22. Suryaningsih S. Kesadaran Hukum Berlalu Lintas Kaitannya Dengan Penegakan Hukum. *Jurnal Jendela Hukum*. 2020 Sep 3;7(2):48–56.
23. Manuhoro A, Purnaweni H, Rengga A. Implementasi Kebijakan Batas Usia Terendah Pengemudi Sepeda Motor Di Kota Semarang. *Journal Of Public Policy And Management Review*. 2016;5(1).
24. Danielle C, Kusumawati A, Husodo BT. Analisis Faktor-Faktor yang Berhubungan dengan Perilaku Berkendara Aman (Safety Riding) pada Siswa Sekolah Menengah Atas Kota Semarang. *Media Kesehatan Masyarakat Indonesia*. 2020 Dec 1;19(6):385–91.
25. Iskandar F, Yenni M, Berliana N, Studi Kesehatan Masyarakat P, Tinggi Ilmu Kesehatan Harapan Ibu S, Korespondensi J. Determinan Perilaku Safety Riding Pengendara Sepeda Motor. *CORE (Community Research of Epidemiology) Journal [Internet]*. 2021;2(1):35–44. Available from: <http://journal.uin-alauddin.ac.id/index.php/corejournal>
26. Hardini P, Indriyati EW. Pengetahuan dan Pengaruhnya Terhadap Perilaku Berlalu Lintas; Tinjauan Terhadap Pelaku Lalu Lintas Usia Remaja Di SMK YPT 1 Purbalingga. *Journal of Indonesia Road Safety*. 2018;1(3):138–46.
27. Chumpawadee U, Homchampa P, Thongkrajai P, Suwanimitr A, Chadbunchachai W. Factors Related to Motorcycle Accident Risk Behavior among University Students in Northeastern Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health*. 2015;46(4):805–21.
28. Liunesi JD, Junias M, Doke S. Faktor yang Berhubungan dengan Kepatuhan Remaja dalam Menggunakan Helm pada Siswa SMA Negeri 4 Kota Kupang. *CHMK Health Journal*. 2022;6(2):400–9.
29. Djunaidi Z, Khaliwa AM, Hafia A, Putri N. Daily Income Targets and Passenger Pressure on Safety Risky Riding Behavior Among Online Motorcycle Taxi Riders in Jakarta, Indonesia. *Kesmas: Jurnal Kesehatan Masyarakat Nasional*. 2024 Feb 29;19(1):8.
30. Vuong XC, Mou RF, Vu TT, Nguyen TA, Cu TTA, Nguyen CT. Assessing Significant Factors Affecting Risky Riding Behaviors of Vietnamese Motorcyclists Using a Contextual Mediated Model. *J Adv Transp*. 2023 Nov 21;2023:1–13.
31. Hoang H, Bui HT, Cools M. Assessing the impact of traffic climate and risk-taking attitude on the risky riding behaviour of young motorcyclists in Vietnam. *Transp Res Part F Traffic Psychol Behav*. 2025 Feb;109:336–53.
32. Prameswari HA, Rosyidah I, Baderi. Hubungan Pola Asuh Orang Tua dengan Perilaku Berkendara Remaja (Usia 12-15 Tahun) Di SMP Negeri 1 Kabuh Jombang [Internet]. *STIKes Insan Cendekia Medika Jombang*; 2020 [cited 2024 Aug 21]. Available from: <http://repository.itskesicme.ac.id/id/eprint/3870>
33. Suryandari M, Lestari AD, Krisna AABO, Ermanto SA. Fenomenologi Perilaku Pelanggaran Lalu Lintas Anak Bawah Usia Di Kota Bekasi (Studi Kasus Kecamatan Bekasi Timur). *Jurnal Teknologi Transportasi dan Logistik*. 2022;3(1):1–12.
34. Anggraeni M. Fenomena Pengendara Sepeda Motor Anak Di Bawah Umur Dan Upaya Penanggulangannya Di SMPN 2 Sanden Kabupaten Bantul. *E-Societas: Jurnal Pendidikan Sosiologi*. 2019;8(5).
35. Marwantika SA, Marwantika AI. Peran Pengawasan Orang Tua Terhadap Pengendara Motor Di Bawah Umur. *ASANKA: Journal of Social Science and Education*. 2020;1(2):76–91.
36. Nguyen MH, Pojani D, Nguyen-Phuoc DQ. What leads underage teenagers to ride motorcycles without a permit? Utility vs parental permissiveness. *J Transp Health*. 2023 Mar;29:1–13.