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Understanding Risky Riding Behavior Among Motorcyclists in Indonesia: A Systematic Literature Review

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ABSTRACT : Motorcycle safety is a significant concern in Indonesia due to the high incidence of traffic accidents, where motorcycles are the most frequently involved vehicles. This study conducts a systematic literature review (SLR) to identify and analyze research on risky riding behavior among motorcyclists in Indonesia. Using the PRISMA framework, studies published between 2019 and 2024 were selected based on predefined inclusion criteria. The review highlights various factors contributing to risky riding behavior, including external pressures such as daily income targets and passenger demands, insufficient road safety education, and socio-demographic influences. Gender differences also emerge, with men demonstrating a higher tendency for risky behaviors compared to women, often shaped by social and cultural norms. The findings underscore the need for evidence-based interventions, including safety-oriented incentive policies, integration of road safety education into formal curricula, and stricter traffic law enforcement supported by technology. Furthermore, future research is recommended to address structural issues, particularly regarding the legitimacy of driver's licenses in Indonesia. An integrated approach combining education, enforcement, and cultural interventions is essential to promote safer riding behavior and reduce traffic accidents in the country.

Keywords - Risky riding behavior, Motorcycle safety, Systematic literature review, Road safety education, Driver's license legitimacy

1. INTRODUCTION

Motorcycle safety is a critical issue in Indonesia, given the steadily increasing number of motorcycles each year and the high incidence of traffic accidents, the majority of which involve motorcycles [1], [2]. Research on traffic accidents consistently indicates that their causes are multifaceted, involving human behavior, vehicle-related factors, and environmental conditions [3]. Human-related factors, such as driving frequency and duration, social and peer influence, substance abuse, alcohol consumption, and habitual speeding, are frequently identified as key contributors to accidents, particularly among adolescents [4], [5]. These findings emphasize the intricate interplay of factors leading to motorcycle accidents and underscore the necessity of conducting a comprehensive analysis that considers multiple perspectives rather than a singular viewpoint.

As further evidence of the importance of addressing this issue, the WHO reports the highest number of trafficrelated fatalities in Southeast Asia, with India recording 153,972 deaths, followed by Indonesia with 25,266, and Thailand with 16,957 [6]. In recent years, research focusing on understanding and mitigating risky riding behavior in these countries has increased significantly. Figure 1 illustrates the surge in publications on risky riding behavior from 2022 to 2024, based on data from Scopus using the keyword "risky riding behavior." Scopus was selected as the primary source for this study because it is recognized as the world's largest abstract and citation database for peer-reviewed literature and an essential resource for researchers [7]. With the growing emphasis on risky riding behavior, it is crucial to develop comprehensive strategies to prevent accidents. These strategies include wearing helmets, avoiding riding under the influence of alcohol, ensuring motorcycles are in safe condition, possessing a valid driver's license, and adhering to speed limits. Such measures are grounded in the understanding that human behavior plays a significant role in causing accidents [6].



Although several studies on driving behavior in Indonesia have been conducted, a comprehensive understanding of the interactions among various influencing factors, such as gender, safety education, religiosity, and socioeconomic conditions, remains limited. This systematic review aims to provide a comprehensive synthesis of existing research examining risky driving behavior in Indonesia. Furthermore, it seeks to identify gaps in the current literature, offer directions for future research, and present evidence-based recommendations to assist stakeholders in developing more effective policies and intervention programs to enhance road safety in Indonesia.

2. RESEARCH METHODS

This study employs a systematic literature review (SLR) as it is a repeatable method with clear guidelines and is suitable for analyzing extensive literature [8]. This approach provides a comprehensive overview of previous research and directions for future studies [9]. The SLR is used to review risky driving behavior, identify key influencing factors, and offer recommendations for further research or policy development. The SLR process follows the methodology proposed by Denyer and Tranfield, as well as Fahma [10], [11].



Figure 2 Steps of systematic literature review

2.1 Literature search strategy

The second stage outlines the literature search procedure using the PRISMA framework to select articles for analysis [12]. PRISMA includes three stages: identification, screening, and eligibility of articles (see Figure 3), from which the final selected articles are derived for analysis.



Figure 3 Flow diagram for the review process (Adapted from Saaludin, et al [12])

In the PRISMA method, the process begins with the identification stage. For this study, the Scopus database was used to find articles for analysis. The identification process took place on 21 December, 2024, utilizing search strings from Scopus with Boolean operators AND/OR, as follows:

TITLE-ABS-KEY (((*riding AND behavior*) OR (*risky AND riding AND behavior*) OR (*safety AND riding AND behavior*)) AND *indonesia*)

2.2 Inclusion and Exclusion Criteria

The screening phase uses inclusion and exclusion criteria to ensure that the articles selected for analysis meet the research scope and the criteria set by the researchers. The main inclusion and exclusion points are as follows:

- a. Document type: Only research articles are considered, excluding conference papers, reviews, and editorials.
- b. Publication year: Limited to studies published between 2019 and 2024, excluding those before 2019.
- c. Scope: Focused on Indonesian motorcyclists, excluding studies from other regions.
- d. Language: Only articles in English are accepted.
- e. Accessibility: Articles must be fully open access and downloadable.
- f. Relevance: The title, abstract, and full text must be relevant to the research topic
- 2.3 Synthesis and Analysis of Selected Literature
- a. Publication distribution and research trends





Figure 4 Visualization of Publication Distribution (a) Per Country, (b) Per Year, and Research Trends

The first figure 4 (a) illustrates the distribution of publications by region. The data reveals that Jakarta and Semarang have the highest number of publications, with 2 each, while Jember, Parepare, and Aceh each account for 1 publication. The second figure (b) presents the distribution of publications by year. In 2019 and 2021, there was 1 publication each, while the number increased to 2 in 2023. The highest number of publications was recorded in 2024, with a total of 3. No publications were documented in 2020 and 2022. Overall, the data indicates an increasing trend in the number of publications in recent years, both by region and by year.

b. Summarize of studies included in systematic review

Author(s)	Region	Objective	Target	Sample	Main Finding
			population	size	
[13]	Jember	To analyze the factors related to safety riding among the Gojek Rider community in the urban areas of Jember Regency	Gojek driver partners from three sub- districts in Jember Regency: Sumbersari, Patrang, and Kaliwates	75	The study found that Gojek drivers with good riding knowledge, moderate work fatigue, mobile phone use while riding, and roadworthy vehicles showed correlations with unsafe riding behavior. No correlation was found between the length of service and safety riding
[14]	Jakarta	To analyze the correlation between daily income targets, passenger pressure, risk perception, safety attitudes, and risky riding behavior among online motorcycle taxi riders in Jakarta, Indonesia.	Motorcycle taxi riders in Jakarta	500	The study found a significant relationship between daily income targets, passenger pressure, risk perception, safety attitudes, and risky riding behavior among online motorcycle taxi riders. A pragmatic attitude towards rule violations was the most impactful factor. The findings suggest that regular training on traffic laws, passenger awareness, and improved

Table 1 Brief overview of studies included

					management can
					enhance road safety.
[3]	Semarang	This research aimed to identify risky riding behavior among university students using the motorcycle rider behavior questionnaire (MRBQ)	Students across 12 faculties at a State University in Semarang City	37	Traffic violations in the past 12 months were related to risky riding behavior (p = 0.057, RP = 0.671; 95% CI = 0.389- 1.159), while factors such as gender, driver's license ownership, history of accidents reported to the police, and driving frequency were not significantly related to risky riding behavior.
[15]	Parepare	To analyze the influence of knowledge, attitude, personality, and safety riding practices on traffic accidents among transportation workers in Parepare City	Transportation workers in Parepare City	100	Attitude, safety riding practices, and knowledge significantly influence traffic accidents among transportation workers, while personality shows no significant effect
[16]	Aceh	To investigate traffic risk behavior among motorcyclists by considering gender as a factor to reduce traffic accidents.	Motorcyclists in Banda Aceh City and neighboring areas in Aceh Province	155	Themainfindingindicatesthatgenderdoesnotsignificantlyaffecttrafficriskbehavior, butmenare athigher riskthan women inmostcategories,particularlydriving

					without helmets, with an odds ratio of 3.930.
[17]	Semarang	To identify factors contributing to road traffic accidents among adolescents during the COVID-19 pandemic in Semarang City, Indonesia.	Adolescents aged 15-20 years in Semarang City, Indonesia	725	Gender is significantly associated with road traffic accidents, with male adolescents having a higher risk (AOR = 1.455, 95% CI [1.048–2.020], P = 0.025), highlighting the need for targeted road safety education for male students during the pandemic.
[18]	Jakarta	To evaluate the relationship between children's education within the family and car driving and motorcycle riding behavior in Indonesia.	Indonesian car drivers and motorcycle riders	10	Some constructs of Indonesian Family Values (IFV), such as religious, disciplinary, ethical and politeness, and law norms, are significantly correlated with certain constructs of driving behavior (IDBQ) and motorcycle riding behavior (IMRBQ)

c. Keyword



Figure 5 Network visualization of keyword relationships in VOS viewer

The network visualization illustrates the relationships between various factors influencing risky riding behavior, with "risky riding behavior" positioned as the central connecting node between two distinct clusters. The red cluster on the left highlights individual and behavioral factors, including personal traits such as being a young adult, university student, or female, as well as risky behaviors like alcohol consumption and motorcycle racing. It also includes factors related to skills and legal compliance, such as driver's license and motorcycle rider

behavior assessment, along with risk outcomes like accidents and on-road crash risk. In contrast, the green cluster on the right focuses on external pressures and motivations, such as passenger pressure, daily income targets, and rule violations, which may drive individuals to engage in unsafe riding practices. This visualization emphasizes the interplay between personal, behavioral, and external factors in shaping risky riding behavior, providing a framework for targeted interventions to reduce such behavior.

3. RESULT AND DISCUSSION

3.1 Report of Findings

The research findings indicate variations in risky driving behavior among different population groups in Indonesia. These findings encompass factors influencing behavior, such as external pressures, education, legal enforcement, and social and demographic dimensions. Analyzing these population groups provides insights into behavioral patterns and their implications for road safety.

Online Ride-Hailing Drivers: The Conflict Between Economic Needs and Safety

Among online ride-hailing drivers, external pressures such as daily income targets and passenger demands have been identified as key factors driving risky driving behavior [14]. For example, drivers often accelerate their vehicles at the request of passengers or hasten their trips to maintain ratings and order frequency (daily income). Furthermore, these external pressures can also lead to work-related fatigue [19]. Most Gojek drivers reported experiencing symptoms of fatigue, such as reduced concentration and memory lapses, due to frequently working late into the night and irregular rest patterns. The drowsiness caused by fatigue can impair focus, jeopardize safety, and increase the likelihood of traffic accidents [13]. Additionally, the majority of Gojek drivers were found to use mobile phones while driving without stopping or using hands-free devices, which can increase the risk of accidents by up to six times [20]. However, drivers with good driving knowledge were shown to be more likely to engage in safe driving behaviors. Adequate driving knowledge enables drivers to make wiser decisions that prioritize road safety [13], [21].

University Students and Adolescents: The Role of Education in Reducing Risk

Among university students and adolescents, risky behaviors such as traffic violations and mobile phone use while driving have been found to occur significantly [3], [17]. A study conducted in Semarang revealed that many adolescents use mobile phones while driving, including activities such as checking map applications, making calls, listening to music, and sending messages [17]. The level of road safety education is a crucial factor influencing these behaviors. Adolescents who have not received road safety education are at a higher risk of accidents compared to those who have undergone such training [17]. Although greater driving experience is often associated with improved skills, studies indicate that experience alone is insufficient to mitigate risky behaviors [3]. For university students and adolescents, formal education and training programs are more effective in fostering safe driving habits.

Transport Workers: High Risk in Certain Working Conditions

For transportation workers, risky driving behavior is often influenced by a lack of understanding of basic traffic rules [15], [22]. The majority of accidents occur during night shifts, when physical fatigue and reduced concentration pose significant challenges [15]. Additionally, the lack of external supervision is another significant factor. Some workers report that they tend to maintain risky behavior even when aware of the risks, particularly when there is no direct oversight from authorities [15].

Gender Dimension: Higher Risk Among Men

Men show a higher tendency to engage in risky driving behavior compared to women [3], [16], [23], [24]. Men are more likely than women to engage in higher-risk behaviors [25], [26], exhibit lower compliance with traffic regulations [61], and have a higher involvement in traffic accidents [25], [27], [28]. Additionally, male drivers are reported to commit traffic violations more frequently than female drivers [29]. A study conducted in Aceh

revealed that men are more likely to ride without wearing helmets, increasing the risk of accidents by nearly four times compared to women [16]. However, gender is not always a significant factor across all dimensions of risky behavior. Other studies suggest that risky behavior among men is often influenced by social factors and cultural stereotypes, such as the tendency to demonstrate bravery or resilience on the road [30].

3.2 Implications of Findings and Recommendations

This study highlights the need for an evidence-based approach to reduce risky driving behavior in Indonesia. Economic pressures, lack of road safety education, and weak law enforcement have been identified as key factors contributing to unsafe behavior. For instance, ride-hailing drivers often sacrifice safety for time efficiency, suggesting that safety-based incentive policies could be an effective solution. Road safety education should be intensified, particularly for students and youth, through school- and community-based programs that not only raise awareness but also build practical skills. Consistent law enforcement, such as monitoring traffic violations using technology, is also an important step. Furthermore, interventions must consider social and cultural dimensions, including gender tendencies in risky driving behavior. Further research is recommended to explore the impact of driver's license legitimacy in the structural context of Indonesia, where intermediary practices still occur. A combination of educational interventions, incentive-based policies, and law enforcement could significantly improve road safety in a sustainable manner.

4. CONCLUSION

This systematic review explores the key aspects of risky motorcycle riding behavior in Indonesia, identifying contributing factors and potential interventions to improve road safety. The findings reveal that risky riding behavior is influenced by a variety of factors, including external pressures, insufficient road safety education, and socio-demographic characteristics. Practices such as speeding, fatigue-related risks, and mobile phone use while riding are common among certain groups, such as ride-hailing drivers and adolescents. Gender differences also emerge, with men displaying a higher tendency for risky behaviors, influenced by social and cultural norms. However, limitations of this review include the reliance on secondary data and its focus on the Indonesian context, which may reduce the generalizability of the findings to other regions. Moreover, the structural aspects of driver's license acquisition and enforcement remain insufficiently explored. To address these issues, policymakers should implement targeted interventions, such as safety-based incentive programs for ride-hailing drivers, incorporate road safety education into school curricula, and enforce stricter traffic laws with the help of technological solutions like automated monitoring systems. Future research should focus on the structural challenges related to the legitimacy of driver's licenses and intermediary practices, as well as evaluate the effectiveness of combined educational, enforcement, and cultural interventions in promoting long-term behavioral change. By addressing these factors, this research contributes to the goal of creating a safer road environment and reducing traffic accidents in Indonesia.

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