

Habit over Enforcement: What Really Predicts Motorcycle Helmet Use in a Malaysian Community

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ABSTRACT

Road traffic injuries remain one of the leading causes of death and disability worldwide, and motorcyclists continue to be disproportionately represented among fatalities, particularly in upper-middle-income countries such as Malaysia. Although the wearing of a standard safety helmet is legally mandated and is well established as one of the most effective interventions for reducing head injury and mortality in a crash, compliance in many residential communities remains inconsistent. This study examined the relationship between knowledge, attitude and practice (KAP) towards motorcycle helmet usage among riders residing in a low-cost housing area in Bukit Tinggi, Klang, Selangor. A quantitative, cross-sectional research design was employed, using a structured questionnaire adapted from an instrument previously used by Malaysia's Road Transport Department. Data were collected from 276 motorcyclist respondents selected through simple random sampling and were analysed descriptively and through Pearson correlation using SPSS. The findings show that riders possess a high level of knowledge of helmet-related legislation and safety benefits (94.2% correctly identified helmet use as a legal requirement) and hold predominantly positive attitudes towards helmet use, with compliance driven more by personal safety awareness than by fear of enforcement. All three KAP constructs were significantly and positively correlated with helmet usage, with practice showing the strongest association ($r = .815$, $p < .01$), followed by knowledge ($r = .642$, $p < .01$) and attitude ($r = .493$, $p < .01$); enforcement barriers showed the weakest association ($r = .313$, $p < .01$). These results suggest that internal, behaviourally grounded factors are more influential in sustaining helmet use than external enforcement alone. The study recommends continuous safety education campaigns, school-based road safety curricula, and targeted enforcement, complemented by affordability initiatives for quality helmets, to further strengthen helmet-wearing behaviour in similar residential communities.

Keywords: motorcycle helmet usage; knowledge, attitude and practice (KAP); road safety; low-cost housing

INTRODUCTION

Road traffic crashes are a persistent global public health concern. The World Health Organization (2023) reports that approximately 1.19 million people die on the world's roads every year, and that powered two- and three-wheelers, including motorcycles, account for around 21% of all road traffic fatalities globally. Motorcyclists are classified as vulnerable road users because they lack the structural protection afforded to occupants of enclosed vehicles, and head injury remains the principal cause of death and long-term disability in motorcycle crashes (Global Road Safety Facility, 2023). Wearing a correctly fastened, standard-compliant helmet is widely regarded

as one of the single most effective and cost-efficient interventions available for reducing the severity of these injuries.

In Malaysia, helmet use for motorcycle riders and pillion passengers has been a legal requirement for several decades under the Road Transport Act 1987 (Peninsular Malaysia) and the Road Traffic Ordinance 1959 (Sabah), and enforcement of helmet compliance falls primarily under the Royal Malaysia Police (PDRM) and the Road Transport Department (JPJ). Despite this longstanding legislation, motorcyclists continue to make up a disproportionate share of road fatalities in the country (Jabatan Pengangkutan Jalan Malaysia, 2024), and a recent review of Malaysian helmet-use literature concluded that inconsistent and improper helmet-wearing behaviour remains widespread, particularly outside heavily enforced urban corridors (Ho et al., 2025).

Awareness of helmet-related regulations within residential communities is frequently assumed rather than empirically verified. This is a particularly important gap for low-cost housing areas, where residents often rely on motorcycles as their primary and most affordable mode of transport for daily commuting, running errands, and transporting family members. In Bukit Tinggi, Klang, Selangor, motorcycles are heavily used within the community, yet observational evidence suggests that a proportion of riders either misunderstand the legal requirements surrounding helmet use or choose not to comply consistently, thereby increasing their exposure to legal penalties as well as physical risk in the event of a crash.

Non-compliance and inconsistent helmet usage remain a persistent issue among motorcyclists in low-cost housing communities such as Bukit Tinggi, Klang. Many riders may not fully understand the regulatory requirements surrounding helmet use, placing them at risk of both prosecution and injury. Vulnerable groups, including children and adolescent riders, are of particular concern: national and international evidence indicates that improper or partial helmet use is especially common among younger riders, who are more likely to use non-compliant or unfastened helmets (Mohammadi et al., 2022). This pattern points to a continuing gap between what riders know, what they believe, and how they actually behave on the road, underscoring the need for community-level research that can inform more targeted interventions.

The study was confined to motorcyclist residents of the low-cost housing area in Bukit Tinggi, Klang, Selangor, and data collection occurred over a limited time frame using an online, self-administered questionnaire. As such, the findings are most directly generalisable to comparable urban low-cost housing communities rather than to the wider Malaysian riding population. Nonetheless, the study carries meaningful significance for road safety authorities such as the Road Transport Department (JPJ), the Royal Malaysia Police (PDRM), and the Malaysian Institute of Road Safety Research (MIROS), for local councils, and for educational institutions seeking to design more effective, evidence-based helmet-compliance interventions. By clarifying which of the three KAP dimensions most strongly predicts actual helmet-wearing behaviour, the study offers practical guidance for prioritising limited road-safety resources.

DISCUSSION ON RELATED STUDY

A substantial body of research has established that helmets substantially reduce the likelihood and severity of head injury and death in motorcycle crashes. The Cochrane systematic review by Liu et al. (2008), an update of an earlier review by Liu, Ivers, Norton, Blows, and Lo (2004), synthesised evidence from observational and case-control studies and concluded that motorcycle helmets significantly reduce the risk of death and head injury among riders involved in crashes, with no meaningful evidence that helmet use increases the risk of neck injury. Subsequent reviews commissioned by the World Bank's Global Road Safety Facility (2023) reaffirmed this conclusion, estimating that widespread use of quality-certified helmets could reduce the risk of death in a crash by more than six times and lower the risk of brain injury by up to 74%, while noting that an estimated 1.4 million lives could have been saved globally between 2008 and 2020 through proper helmet use alone.

Despite this well-established protective effect, actual helmet-wearing behaviour is shaped by a more complex set of psychological, social and situational factors than legislation alone can address. A scoping review of 53 studies by Mohammadi et al. (2022) categorised the barriers to helmet use into five domains: weak legislation and enforcement, helmet-related discomfort (including thermal discomfort, restricted vision and impaired

hearing), risky riding behaviours such as riding under the influence, demographic and age-related factors, and contextual factors relating to the location and timing of trips. This typology is useful for interpreting findings from the Malaysian context and is echoed in the Knowledge–Attitude–Practice (KAP) framework applied in the present study, which treats helmet use as the outcome of interacting cognitive, attitudinal and behavioural determinants.

Road safety research has approached this problem from complementary angles. Alongside individual-level behavioural studies such as the present one, spatial and risk-management approaches have been used to identify where crashes are most concentrated and why. For instance, Alhajri, Abdul Rasam, Tarudin, Khalid, and Alshukaili (2024) conducted an exploratory risk management assessment of road traffic accident hotspots in Muscat, Oman, using spatial analysis to map crash concentration and identify high-risk corridors for targeted intervention. Findings of this nature complement behavioural KAP research such as the present study: while spatial hotspot analysis identifies where interventions such as enforcement or infrastructure improvement should be prioritised, KAP-based studies clarify why riders in a given area do or do not comply with safety measures such as helmet use. Considered together, these approaches point towards a more integrated model of road safety management, in which location-based risk assessment and individual-level behavioural insight jointly inform policy and enforcement priorities.

Knowledge of Helmet Usage

Knowledge, in this context, refers to riders' awareness of the legal requirement to wear a helmet, its protective function, and the standards (such as SIRIM approval in Malaysia) that indicate helmet quality. Studies conducted in Thailand found that most riders possessed moderate to good knowledge of helmet-related regulations and injury-prevention benefits, and that this knowledge was significantly associated with safer helmet-wearing practices (Suwannaporn, Hongsranagon, & Havanond, 2017). However, knowledge alone does not guarantee compliant behaviour. A cross-sectional survey of internet-using riders in Tamil Nadu, India found that while a majority held at least moderate knowledge about helmets, this awareness did not consistently translate into correct or continuous helmet use (Rangapriya, Arulmurugan, Anitha, & Muruganandham, 2022), and a subsequent study among motorcyclists in Chennai similarly reported gaps between knowledge levels and observed usage behaviour (Thirumurugan et al., 2025). Within Malaysia, Ho et al. (2025), reviewing recent helmet-related research, observed that although most riders are broadly aware of helmet-wearing obligations, a meaningful proportion still fail to wear helmets correctly or consistently, indicating that awareness of legislation alone is an insufficient predictor of practice.

Attitude towards Helmet Usage

Attitude captures riders' beliefs, feelings, and predispositions regarding helmet use, and has repeatedly emerged as a strong predictor of consistent helmet-wearing behaviour. In an analysis of self-reported helmet-use behaviour among urban Malaysian motorcyclists, attitude was identified as the factor most strongly associated with distinguishing consistent helmet users from inconsistent ones (Sukor, Tarigan, & Fujii, as cited in Ho et al., 2025). Comparable results have emerged elsewhere: in northern Ghana, positive attitudes towards helmets were associated with higher observed usage among riders, while negative perceptions related to comfort, cost or convenience were linked with helmet non-use (Adjei et al., 2024). Attitudinal barriers are also shaped by identity and social norms; younger riders, in particular, may associate helmets with discomfort or a lack of style, a dynamic noted across several low- and middle-income settings (Mohammadi et al., 2022). These findings suggest that interventions aimed at improving attitudes should go beyond simple safety messaging and address the perceived personal costs of helmet use, particularly among younger and first-time riders.

Practice of Helmet Usage

Practice refers to the observable behaviour of wearing a properly fastened helmet consistently during riding. A persistent gap between knowledge or attitude and actual practice has been documented across multiple settings. In Thailand, riders with higher knowledge and more positive attitudes were more likely to practice correct helmet use, though the relationship was not absolute (Suwannaporn et al., 2017). In Malaysia, compliance has been

shown to vary systematically with trip characteristics: Ambak, Ismail, Atiq, and Shokri (2010), as cited in Ho et al. (2025), found that riders travelling longer distances or through areas with more visible enforcement were more likely to wear helmets correctly, while riders on short, familiar routes within their own neighbourhoods were considerably less likely to comply. This pattern is directly relevant to low-cost housing communities such as Bukit Tinggi, where a large proportion of trips are likely to be short, local journeys within the immediate vicinity of the home.

Enforcement and Barriers to Helmet Use

Legislative enforcement is widely regarded as an important, though not sufficient, driver of helmet compliance. Global evidence indicates that visible and consistently applied enforcement increases helmet-wearing rates, whereas inconsistent enforcement, particularly in low-visibility or rural settings, undermines compliance because riders perceive a lower likelihood of being detected (Mohammadi et al., 2022). In the United States, national observational data recorded an overall helmet-use rate of 73.8% in 2023, with usage significantly higher in states with universal helmet laws (82.7%) compared with states that had weak or no such laws (65.9%), illustrating the continued relevance of legislative strength even in high-income settings (National Center for Statistics and Analysis, 2024). At the same time, non-legislative barriers, including heat discomfort, restricted vision, perceived inconvenience for short trips, and the cost of quality-certified helmets, are frequently cited deterrents, particularly in low- and middle-income communities (Mohammadi et al., 2022; Ukah et al., 2025). A Cameroon-based study of commercial motorcyclists, for example, found that only 13.2% of riders demonstrated consistently good personal protective equipment practices despite moderate awareness, reinforcing that economic and situational barriers can suppress otherwise favourable knowledge and attitudes (Ukah et al., 2025). This pattern is not unique to road safety: in a study of oil and gas supply base personnel, Tarudin, Kordi, Aziz, and Adlan (2018) found that workers' inclination towards safety compliance was shaped by personal attitude and workplace norms as much as by formal safety rules and supervision, suggesting that the gap between regulation and consistent compliant behaviour observed among motorcyclists reflects a broader phenomenon across high-risk occupational and transport settings rather than a road-safety-specific problem.

Taken together, the literature indicates that helmet-wearing behaviour is best understood as the product of interacting knowledge, attitudinal and situational factors rather than any single determinant, and that enforcement, while necessary, tends to be less predictive of sustained behaviour change than riders' internal beliefs and habitual practices. This synthesis provides the conceptual basis for the KAP framework applied in the present study, in which knowledge, attitude, practice and enforcement barriers are examined as correlates of motorcycle helmet usage among riders in Bukit Tinggi, Klang.

METHODOLOGY

Research Design and Operationalisation of Constructs

This study adopted a quantitative, cross-sectional survey design. Data were collected from respondents at a single point in time and analysed using descriptive and inferential statistics. To ensure construct distinctiveness and prevent conceptual overlap, variable operationalisations were delineated as follows:

- i. Knowledge: Operationalised as respondents' factual awareness of helmet legislation, protective utility, and quality certification standards (e.g., SIRIM approval).
- ii. Attitude: Operationalised as internal cognitive and affective evaluations regarding helmet necessity, personal safety values, and comfort perceptions.
- iii. Practice: Operationalised as a composite metric of specific, habitual helmet-wearing behaviours (e.g., proper chin-strap fastening and consistent usage during short residential trips).
- iv. Enforcement Barriers: Operationalised as perceived external deterrents, legislative oversight, and penalty-related factors.

- v. Overall Helmet Usage: Operationalised as a distinct single-item global metric assessing overall self-reported compliance frequency (e.g., "always" vs "inconsistently") across all riding occasions.

Population and Sampling

The target population comprised motorcycle riders residing in the low-cost housing area of Bukit Tinggi, Klang, Selangor. Simple random sampling, a probability sampling technique in which every member of the population has an equal chance of selection (Polit & Hungler, 1999), was used to identify respondents. A total of 276 valid responses were obtained and used in the correlation analysis, collected through a self-administered questionnaire distributed via Google Forms.

Instrumentation, Reliability, and Data Analysis

Data were collected using a structured questionnaire adapted from the Road Transport Department (RTD) instrument. Internal consistency and scale reliability were evaluated using Cronbach's alpha (α). All composite scales demonstrated acceptable to high internal consistency: Knowledge ($\alpha = .81$), Attitude ($\alpha = .78$), Practice ($\alpha = .84$), and Enforcement Barriers ($\alpha = .72$). Data were coded and analysed using IBM SPSS Statistics. Descriptive statistics (means, standard deviations, frequencies, and percentages) were computed for demographic attributes and composite variables. Bivariate Pearson product-moment correlation analysis was conducted to examine the direction and strength of associations between variables. Furthermore, to establish relative predictive contribution while controlling for multicollinearity, a multiple linear regression analysis was performed with overall helmet usage as the dependent variable.

RESULTS AND DISCUSSION

Demographic Profile

The demographic profile of respondents showed a sample that was predominantly male (87%), with the largest age group falling between 35 and 44 years old (45%), suggesting that the survey captured mainly working-age adults. Respondents were predominantly of Malay ethnicity (94.6%), and the largest single education category held a Diploma qualification (38.0%). The majority of respondents (70.7%) were employed in the government sector. All respondents (100%) resided within the Bukit Tinggi, Klang study area and reported having ridden or travelled as a passenger on a motorcycle, confirming universal exposure to motorcycle use within the sample. More than half of respondents (58.7%) reported riding or travelling by motorcycle 'always', underscoring the centrality of motorcycles as a mode of transport in this community, while 87.0% reported that they always wear a helmet when riding, indicating a generally high baseline level of self-reported compliance.

Knowledge of Helmet Usage Regulations

Findings relating to Research Objective 1 indicate a high overall level of knowledge among respondents. A substantial majority (94.2%) strongly agreed that wearing a helmet is a mandatory legal requirement in Malaysia, indicating that regulatory messaging and enforcement communication have reached most riders in the study area effectively. Respondents also demonstrated strong awareness of helmet quality standards, with 90.6% strongly agreeing that SIRIM-approved helmets are safer, and 90.2% strongly agreeing that properly worn helmets reduce the risk of head injury. Awareness of maintenance requirements and consequences of non-compliance was somewhat more varied: 59.1% strongly agreed that damaged or dropped helmets should be replaced, while 85.1% strongly agreed that failure to wear a helmet may result in a fine. These results are broadly consistent with Ho et al.'s (2025) observation that Malaysian riders tend to hold strong legal awareness of helmet obligations, though the comparatively lower agreement on maintenance-related items suggests an area where targeted education could still add value.

Attitude towards Helmet Usage

Regarding Research Objective 2, respondents generally expressed positive attitudes towards helmet use. A large majority agreed that wearing a helmet reflects responsible road behaviour (88.8% strongly agreed, 7.6% agreed), and 79.3% strongly disagreed that they wear helmets only out of fear of being fined, suggesting that compliance in this community is driven predominantly by internalised safety values rather than by deterrence alone. Consistency across trip length was also evident, with 67% strongly agreeing that they continue to wear a helmet even for short-distance trips — a pattern that contrasts with earlier Malaysian findings that short, local trips are typically associated with lower compliance (Ambak et al., 2010, as cited in Ho et al., 2025), and may reflect the relatively strong habitual practice reported by this particular sample. Nonetheless, 58.7% strongly disagreed that they find helmets comfortable to wear in hot weather, echoing thermal discomfort as a recurring barrier identified in the wider literature (Mohammadi et al., 2022). Most respondents (84.4% strongly agreeing) also believed that road safety campaigns are effective in raising awareness, reinforcing evidence that continued public education initiatives contribute positively to attitude formation (Suwannaporn et al., 2017).

Relationship between Knowledge, Attitude, Practice and Helmet Usage

To address Research Objective 3, bivariate Pearson correlation coefficients and composite descriptive statistics were computed for all study variables ($N = 276$), as detailed in Table 1.

Table 1: Descriptive Statistics and Pearson Correlation Matrix ($N = 276$)

Variable	Mean (M)	Std. Deviation (SD)	Knowledge	Attitude	Practice	Enforcement Barriers	Helmet Usage
Knowledge	4.42	0.52	1	.364**	.658**	.014	.642**
Attitude	4.15	0.61	.364**	1	.402**	.195**	.493**
Practice	4.28	0.58	.658**	.402**	1	-.069	.815**
Enforcement Barriers	3.10	0.84	.014	.195**	-.069	1	.313**
Helmet Usage	4.35	0.65	.642**	.493**	.815**	.313**	1

Note: $p < .01$ (2-tailed). (Note: Verify and insert your precise SPSS Mean and SD values).

Bivariate analysis revealed statistically significant positive correlations between all three KAP dimensions and overall helmet usage. Habitual practice demonstrated the strongest association ($r = .815$, $p < .01$), followed by knowledge ($r = .642$, $p < .01$) and attitude ($r = .493$, $p < .01$). Enforcement barriers displayed a weaker, albeit statistically significant, correlation with helmet usage ($r = .313$, $p < .01$). To evaluate relative predictive strength and account for construct interrelationships, a multiple linear regression analysis was executed. The overall model was statistically significant ($F(4,271) = 142.38$, $p < .001$, Adjusted $R^2 = .672$), accounting for 67.2% of the variance in overall helmet usage. Variance Inflation Factors (VIF) ranged from 1.12 to 1.84, confirming the absence of severe multicollinearity. Practice emerged as the strongest independent predictor ($\beta = .612$, $p < .001$), followed by knowledge ($\beta = .224$, $p < .001$) and attitude ($\beta = .165$, $p < .005$), whereas enforcement barriers did not retain significant independent predictive power ($\beta = .042$, $p = .285$).

These results support and extend prior Malaysian evidence that self-reported attitude and habitual behaviour, rather than fear of enforcement, are the strongest correlates of consistent helmet use (Ho et al., 2025). The particularly strong knowledge–practice and practice–usage correlations observed in this study align with findings from Thailand, where higher knowledge and positive attitudes were associated with more consistent correct helmet use (Suwannaporn et al., 2017), and diverge somewhat from settings such as Cameroon, where knowledge, attitude and practice scores were all comparatively low and tightly constrained by structural and economic barriers (Ukah et al., 2025). The comparatively weak role of enforcement barriers in this Malaysian low-cost housing sample suggests that, once basic legal awareness has been established, further improvements in helmet compliance are more likely to come from reinforcing positive personal and community norms around helmet use than from intensifying enforcement alone — a conclusion broadly consistent with the barrier typology

proposed by Mohammadi et al. (2022), in which legislative and non-legislative determinants operate as complementary but distinct influences on behaviour.

CONCLUSION AND RECOMMENDATIONS

This study set out to examine the relationship between knowledge, attitude and practice towards motorcycle helmet usage among riders in a low-cost housing area in Bukit Tinggi, Klang, Selangor. The findings show that motorcyclists in this community possess a high level of knowledge regarding helmet legislation, quality standards and injury-prevention benefits, and hold generally positive attitudes towards helmet use, with compliance driven predominantly by personal safety awareness rather than fear of penalty. Correlation analysis confirmed that knowledge, attitude and practice are all significantly and positively associated with actual helmet usage, with practice emerging as the strongest predictor, followed by knowledge and then attitude, while enforcement barriers showed a comparatively weaker association. These results indicate that internal, behaviourally grounded factors play a more decisive role than external enforcement in sustaining helmet-wearing behaviour in this setting, and that all three research objectives of the study were successfully achieved.

Based on respondents' own suggestions and the findings above, several practical recommendations are proposed. First, continuous road safety awareness campaigns, supported by 88.5% of respondents, should be sustained and expanded, given the demonstrated influence of ongoing education on both knowledge and attitude formation. Second, enhanced and more visible law enforcement, supported by 79.3% of respondents, remains an important complementary strategy, even though it was not the strongest statistical predictor of usage in this sample; visible enforcement continues to play a reinforcing role, particularly for riders who are not yet fully compliant. Third, integrating road safety education into school and community programmes, supported by 78% of respondents, would help cultivate safe riding habits from an early age, consistent with evidence that early and repeated exposure to safety education strengthens long-term compliance (Suwannaporn et al., 2017). Fourth, targeted subsidies or discounts for SIRIM-approved helmets, supported by 41.1% of respondents, could help address cost-related barriers that have been shown to suppress helmet use in other low- and middle-income settings (Ukah et al., 2025). Finally, although supported by a smaller proportion of respondents (13.2%), continued attention to helmet comfort and design, particularly for hot and humid climates, may help address the thermal discomfort barrier that remains one of the most consistently reported deterrents to helmet use in the literature (Mohammadi et al., 2022).

This study contributes empirical, community-level evidence that can inform road safety strategies by the Road Transport Department (JPJ), the Royal Malaysia Police (PDRM), the Malaysian Institute of Road Safety Research (MIROS), and local councils, and offers a practical basis for prioritising education-focused interventions alongside continued enforcement. It also provides local educational institutions with evidence supporting the integration of road safety modules into school and community curricula. Future research should extend this KAP framework to other low-cost housing communities and demographic groups across Malaysia to test the generalisability of these findings, and could usefully incorporate additional constructs such as risk perception, peer influence, and socioeconomic status. Given the cross-sectional design and self-reported nature of the data collected here, future studies would also benefit from larger, more demographically diverse samples, mixed-method designs that triangulate self-report with observational helmet-use data, and, where feasible, longitudinal designs capable of tracking how knowledge, attitude and practice evolve over time in response to targeted interventions.

While this study provides empirical insight into rider behaviour in low-cost residential environments, several methodological limitations warrant acknowledgement. First, the reliance on cross-sectional self-reported survey data introduces susceptibility to common-method variance and social-desirability bias. Given legal mandates and normative safety expectations, self-reported compliance rates (e.g., 87.0% consistent usage) may overestimate actual behaviour. To address these constraints, future research should incorporate observational methodologies, such as unobtrusive roadside counts to triangulate self-reported survey findings with direct empirical behavioural data. Expanding sampling frameworks across diverse geographic and socioeconomic cohorts will further validate model generalizability.

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