Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

A REVIEW OF MOTORCYCLE HELMET STUDIES IN MALAYSIA: ARE WE DOING ENOUGH

Ho Jen Sim*, Kak D Wing, Nor Aznirahani Md Yunin, Azhar Hamzah, Noradrenalina Isah, Alvin Poi Wai Hoong

Malaysian Institute of Road Safety Research, Kajang, 43000, Selangor, Malaysia

E-mail*: jsho@miros.gov.my

Received: 7 April 2025; *Accepted*: 4 August 2025; *Published*: 31 July 2025

ABSTRACT

Motorcycle safety remains a critical challenge in Malaysia, where motorcyclists account for approximately 50% of all road fatalities. While extensive research has demonstrated that helmet use significantly reduces the risk of fatal injuries, the reality indicates persistently low helmet-wearing rates, especially in rural areas, despite the enforcement of helmet laws since 1973. This study conducts a comprehensive review of past research to identify key gaps that hinder helmet compliance and contribute to high motorcycle casualty rates. A total of 32 relevant articles on helmet use in Malaysia were retrieved from the Google Scholar database and categorized into four thematic clusters: behavioral studies, clinical studies, helmet specifications, and enforcement. Surprisingly, the findings consistently noted low helmet-wearing rates among child riders and the widespread use of nonstandard helmets. A key conclusion drawn from these past studies underscores the crucial role of law enforcement in improving helmet compliance. The findings shed important insights into the policymaking and reinforce the strategies or initiatives to enhance motorcycle safety in Malaysia.

Keywords: *Helmet wearing, Traffic Safety, Review*

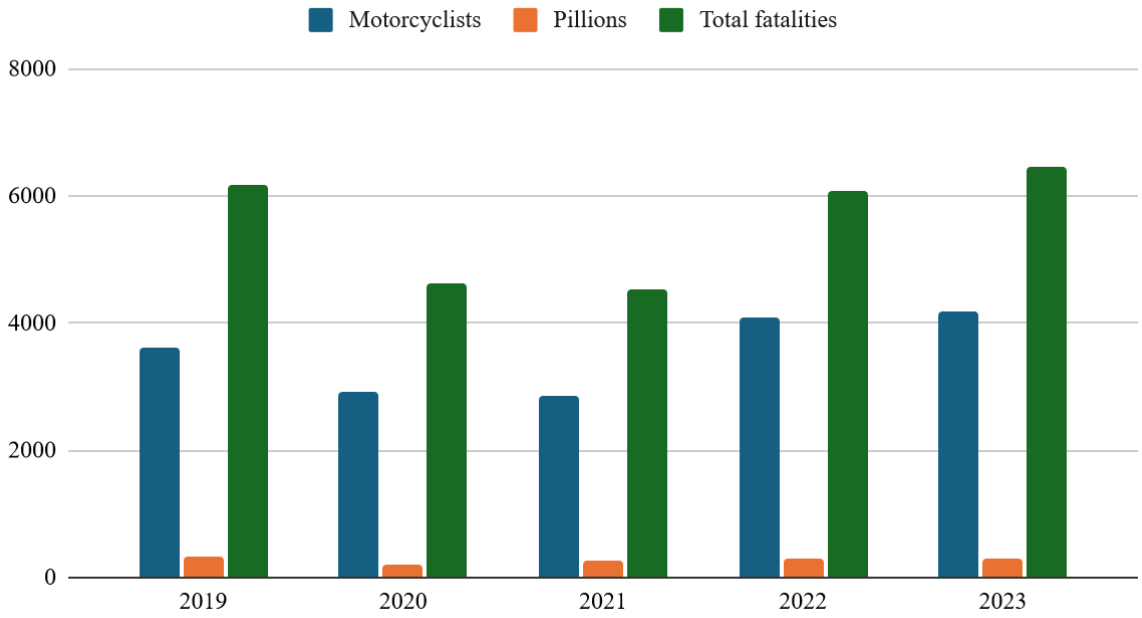
INTRODUCTION

Traffic crashes represent a growing global problem. Annually, about 1.19 million people die on the roads while more than 50 million suffer various degrees of injuries (WHO, 2023). Of this, more than half of the fatalities involve vulnerable road users, inclusive of pedestrians, cyclists, and motorcyclists. It is also reported that traffic crashes are one of the leading causes of death for people aged between 5 – 29 years (WHO, 2023).

Likewise, the traffic crash is the third leading cause of death in Malaysia in 2023 (DOSM, 2023). Motorcyclists accounted for the biggest share of traffic fatalities, with individuals aged between 16 to 25 years being the main victims. In the year 2023 alone, about 69.3% of the fatalities comprised motorcyclists and pillion riders. Figure 1 below presents the motorcyclist fatalities in the past five years. It illustrates the fatalities of motorcyclists and pillion riders between 2019 and 2023.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Figure 1
Motorcycle Fatalities Between 2019 to 2023 in Malaysia (Source: PDRM, 2024)



Note: Number of fatalities involving motorcyclists, pillion and total fatalities in Malaysia between year 2019 to 2023

Table 1 tabulates the types of injuries related to helmet use among the motorcycle victims in 2023. As shown in the table below, not wearing a helmet was the main contributor to the death of riders. In contrast to the pillion riders, it is surprising to note that those wearing helmets accounted for the biggest share of deaths.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Table 1
Type of Injuries Concerning the Helmet Use for Year 2023(Source: PDRM, 2024)

Wearing of helmet	Rider				Pillion Rider			
	Death	Severe	Light	Total	Death	Severe	Light	Total
Helmet wearing	1727	945	15492	18164	193	169	589	951
Serban	0	2	16	18	2	5	6	13
Not fastening the helmet	69	6	86	161	8	8	9	25
Not wearing a helmet	2405	916	8145	11466	85	106	205	396
Total	4201	1869	23739	29809	288	288	809	1385

On the other hand, the crash data also revealed that the head injury is one of the significant contributors to death and severe injury, as the head is the most vulnerable part of the body. Motorcycle helmets have been proven to enhance the safety of the motorcyclists and pillion riders significantly. There has been various evidence on the effectiveness of helmets whereby helmets can reduce the risk of head or brain injury by 70% - 80% and facial injury by 65% (Pinnoji & Mahajjan, 2007). As shown in Table 2, head injury was the main cause of death to the pillion riders, likely due to not wearing a helmet.

Table 2
Body Part Injuries Between Riders and Pillion Riders for the Year 2023 (Source: PDRM, 2024)

Body Part Injury	Rider				Pillion Rider			
	Death	Severe	Light	Total	Death	Severe	Light	Total
Head	124	217	486	827	112	68	81	261
Shoulder	0	48	431	479	0	13	20	33
Neck	2	11	77	90	1	6	16	23
Chest	6	35	196	237	3	20	104	127
Hand	0	150	2874	3024	0	130	353	483
Back	3757	546	9157	13460	92	9	133	234
Lower back	1	30	100	131	0	6	9	15
Leg	14	404	3522	3940	6	12	20	38
Others	297	428	6896	7621	74	24	73	171
Total	4201	1869	23739	29809	288	288	809	1385

The design of the helmet is to protect the head of motorcycle users in the event of collision or fall. A study by Liu et al. (2008) has evidently shown that wearing a helmet can reduce the risk

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

of death and serious head injury by 42% and 69%, respectively. In Malaysia, the helmet law was introduced and enforced since 1973. The law states that every person other than a person exempted under rule P.U. (B) 23/1975, who drives or rides on a motorcycle on a road is required to wear a safety helmet which must be fitted and securely fastened in the manner required by the nature and construction of safety helmet. Any violation of helmet use would be charged a maximum compound of up to RM 300 under Rule 4, Motorcycle (Helmet) Rules 1973. The helmet used in Malaysia, must be certified according to the Malaysian Standard, MS1 (SIRIM) or UN Regulation R22. Figure 2 shows the SIRIM label, indicating the helmet is certified. There are three common types of helmets used in Malaysia: open-face, modular and full-face helmets. Half-shell helmet, though not certified as it did not meet the minimum coverage areas as specified in MS1, it was very popular among the motorcyclists. Nonetheless, it was totally banned for use in January 2009 (Paul, 2008).

Figure 2
Picture of Helmet with SIRIM certification

Over the years, there is an extensive studies examining diverse issues ranging from factors influencing helmet use to the technical aspects of helmets and the injuries resulting from helmet use with the aim to improve the motorcycle safety. The consistently high traffic crashes involving motorcyclists and pillion riders leads to a question whether we are in the right direction and addressing the fundamental issues. Additionally, as the volume of research grows, it might be challenging to identify the evolutionary trends within the research domain, which may result into repetitive research. Therefore, understanding each of the research frameworks and identifying knowledge gaps in the domain of motorcycle safety can be beneficial and provide important insights for future research. However, there is dearth of periodic review of such research particularly in a specific domain of interest as it requires long term accumulation as well as proper mining of the respective studies. This paper fills the knowledge gap by synthesizing all the literature related to helmet use conducted in Malaysia

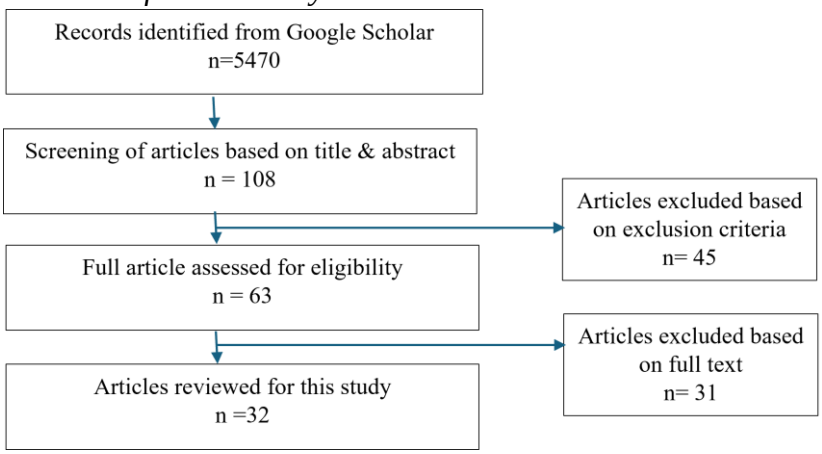
Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

METHODOLOGY

A review of the past work on motorcycle safety and helmet use in Malaysia involves a thorough search on Google Scholar. The Google Scholar database was chosen in this study primarily because preliminary findings indicated that a substantial number of Malaysian research papers are published in journals not indexed by Scopus or Web of Science (WOS). Nonetheless, studies focusing on helmet-wearing behavior were more frequently found in peer-reviewed journals, underscoring the relevance of including broader sources in the literature search. Broader search terms used were (motorcycl*), (safety) OR (injur*) OR (fatal*), and (Malaysia). The search was performed in September 2024, whereby the literature published between 1980 to September 2024 was only selected for the purpose of this study. The starting year of 1980 was selected based on preliminary findings indicating that scholarly papers on this topic were scarce in the 1970s, with the earliest known publication on helmet use in Malaysia appearing in 1984. Additional screening criteria include journals with full-text-only or articles written in English and related to helmet studies in Malaysia. In contrast, the article was excluded if its title strongly suggested no clear association with helmet-related topics. Subsequently, the abstract was screened to determine if the abstract did not contain any information related to helmet use, helmet standard, helmet law or the impact of helmet on injury. The articles that met all the pre-set criteria were only included in this study. Figure 3 illustrates the process of retrieving related articles for this study.

Figure 3

Flowchart for This Study



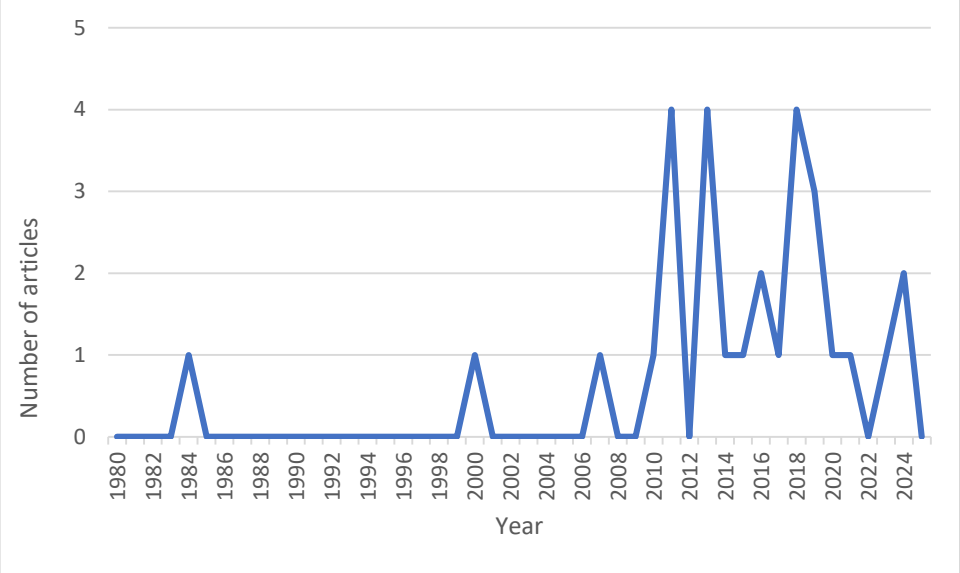
RESULTS

The results on the topic related to motorcycle helmet safety in Malaysia through Google Scholar are still sparse. A total of 32 articles were gathered based on the criteria mentioned earlier. Figure 4 illustrates the distribution of published articles over the years. The highest

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

number of publications was reported in 2011, 2013, and 2018, with four articles in each of these years.

Figure 4
Number of Studies on Motorcycle Helmets from 1980 to 2024



The studies on motorcycle helmets in Malaysia are categorized into four main thematic clusters, as shown in Figure 5, namely behavioral studies, clinical injury studies, helmet specifications/standards, and the enforcement/law. The clusters are discussed in detail in the subsequent section.

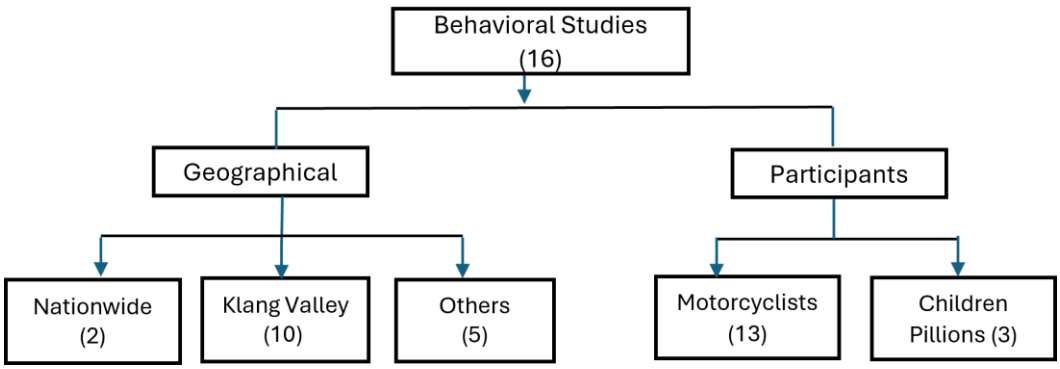
Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Figure 5
Study Cluster Related to Motorcycle Helmets

Behavioral Studies

A literature search on helmet use from behavioural perspectives discovered 16 articles published between 2000 to 2020. Cross-tabulation of the articles by geographical factors indicated that 10 out of 16 articles were conducted in Klang Valley, while other studies were dispersed in Kedah, Johor, and Pahang (as shown in Figure 6). Only one study covered nationwide population sampling, notably on the postal delivery riders. Furthermore, exploring targeted participants shows that 81 % of the studies examined the motorcyclists and the remaining articles specifically focus on the child pillions (as shown in Figure 6).

Figure 6
Breakdown of Articles under Behavioral Cluster



Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Several critical key points can be deduced from the 16 articles reviewed. These studies, conducted between 2000 and 2020, were predominantly focused on the Klang Valley region. Over the years, a noticeable decline in helmet-wearing rates has been observed, with particularly low compliance among child pillion riders, whose helmet usage ranged from only 4.5% to 47.9%. Various demographic and situational factors such as age, gender, income level, educational background, trip purpose, area of travel, and travel distance were found to significantly influence helmet-wearing behavior. Notably, even among those who wore helmets, many used uncertified ones. The likelihood of using certified helmets was found to be affected by factors such as helmet type and cost. Moreover, several studies highlighted the potential of applying behavioral science approaches to better understand and influence the intention to use helmets.

Clinical Studies

Helmets reduce the odds of head and neck injuries by 53 per cent and decrease the risk of death by 72 per cent (Keng, 2005). In other words, motorcyclists without helmets are at higher chance of sustaining facial and brain injuries compared to their counterparts with helmets (Eastridge, 2006). In the context of Malaysia, the search of literature on facial injury due to motorcycle crashes revealed a scarcity study on the topic. Interestingly, there are two prominent researchers and their esteemed teams in this direction. The first researcher, Roszalina /R amli and her team focused on the facial injury due to motorcycle crashes while the second researcher, Ooi and his team explored the relationship between the cervical injury and motorcycle crashes.

A total of three articles were published by Roszalina /Ramli and teams (2014, 2016, 2018). By using the cross-sectional study on a group of patients in major trauma hospitals, they investigated how the helmet visors and helmet fixation influence the level of head and facial injuries. Proper helmet fixation refers to properly securing the helmet on the head using the buckles, thereby maximizing the protection capabilities. However, it is shown that about 35% of motorcycle riders in Asian countries do not fasten or wear helmets properly (Xuequn et al., 2011). Their research findings found that the motorcyclists with dislodged helmets were five times more likely to sustain a head injury and the odds of serious injury increased four times as compared to their counterparts with proper helmet fixation. Further investigation revealed that the retention system, loose-fitting helmet and helmet rotation due to displacement of anchorage chin support were the main factors contributing to the failure of helmet protection. Their work also highlights several important findings, including the inappropriate sizing of the commercially available helmets, the design of retention system and design standard of the visor as well as the wearing behavior.

However, the work by Ooi et al. (2011) on the other hand claimed that the use of a helmet would increase the risk of cervical spine injury instead of protecting the head of the motorcyclist. The helmet increases the overall head weight, which raises the risk of neck injuries during a collision. The ability of a helmet to protect the cervical spine only prevails in frontal collision but tends to fail in rear-end, side impact and skidded crashes. It was suggested by Sarkar et al. (1995) that the helmeted motorcyclists were nine times more likely to sustain cervical spine injury as compared to unhelmet motorcyclists. While the weight of helmet plays

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

a significant role in cervical spine injuries, it is important to note that the mechanism of cervical spine injury in a crash is complex and multifaceted. Therefore, it is essential to take this finding into account in the design of a helmet.

Helmet Specification and Technology

A good helmet could minimize the crash impact energy, maximizing the crash energy absorption and able to resist the penetrative impacts. In Malaysia, helmets must comply with the Malaysia Standard, MS1: 2011, which supersede the Malaysian Standard 1: 1996 in 2012. Additionally, the helmets must also conform with the UN R22, international standard.

About one-third or 10 articles identified in the domain of helmet studies was discussing the specification of helmet and new design technology. The high number of casualties due to head injuries have caught the attention of Hamzah and teams (2014 a,b; 2019) in examining the helmet compliance with the standards (MS1: 1996 and MS1:2012). One of the studies by Hamzah et al. (2014a) supporting the findings by Kaviyarasu et al. (2019), which suggested that the weathering effects and extensive usage greatly diminished the performance of helmets. However, the effective life span of 5 years for a helmet remains a subject of controversy (Hamzah et al., 2014a). Radzuan et al. (2023a, b) highlighted the concern on the influx of diverse non-certified helmet in the online marketplace. Assessment on both certified and non-certified helmets was performed, and the results indicated the poor performance of non-certified helmets on the impacts of frontal crashes. These studies are indeed essential and timely as the authors claimed that no such study was performed in the past. The findings should be taken seriously by relevant authorities to strengthen the regulatory framework for non-certified helmets as well as educating the public on the impacts of the nonstandard helmets as well as the choice of helmet type (i.e. full-face or open face).

Apart from this, researchers were also working on the technology innovations to enhance the safety of the motorcyclists as described in Table 3. In Malaysia, people with hearing impairment are allowed to drive though a study showed that drivers with a certain level of hearing impairment are nine times more likely to be killed or seriously injured in a motor vehicle crash. Mutalib and Seok (2021) proposed a helmet with an alternative alerting system in terms of visual approach, and three alternative materials, carbon fiber material, ABS plastic material, and polycarbonate, were used for the design of the new helmet. The materials have been proven to perform equally well under the impact of energy. However, it is worth highlighting another safety concern, whether the visual approach would create another potential hazard to motorcyclists and other road users.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Table 3
Summary of Studies on Helmet Specification and Technology

Scope	Authors	Findings
Examination of specification	Azhar et al., 2014a	Testing on in-service helmets revealed that the helmets exceeded the requirement of MS1:1996 test protocols irrespective of the service life spans.
	Azhar et al., 2014b	Comparison of new and in-service helmets revealed that wear and tear impact the performance regardless of service duration.
	Hamzah et al., 2019	One of the five on-shelf helmets failed to meet the requirement of MS1: 2011.
	Yellappan et al., 2019a	Helmets with SIRIM certification were 24.2 times more likely to pass all the SIRIM tests as compared to those without SIRIM certification. The relatively new helmets with less than 3 years were 3.75 times more likely to pass the SIRIM tests as compared to helmets used more than 3.8 years.
	Radzuan et al. 2024	The non-certified full-face helmets exposed the users to the concussion risks of side and frontal crashes based on the angular accelerations.
	Radzuan et al., 2023	Full-face and open-face helmets performance very well against linear parameter but demonstrated poor performances under rotational impacts.
Design of new safety features	Mutalib and Seok (2021)	Sound sensor as input and LED light as output on helmet is designed for hearing impairment motorcyclists.
	Shuaeib et al., 2005	The Expanded Polypropylene (EFP) foam meets the mandate requirement of the majority international standard on the 300g head form center of gravity of acceleration limit.
	Zohari et al., 2024	Smart helmet with sensors and communication modules.
	Zi et al., 2023	New helmet with Arduino microcontroller to alert the approaching hazards.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Enforcement and Law

A decade after the implementation of the helmet law, Supramaniam et al. (1984) conducted research to assess its impact on motorcycle fatalities using data from 1973 to 1979. The findings revealed a significant reduction in motorcycle fatalities, highlighting the positive effect of the law. While variations in data quality and reporting standards across Malaysian states may have influenced the results, with integrating hospital and traffic police records to strengthen data completeness can further enhance accuracy and clarity in fatality reporting.

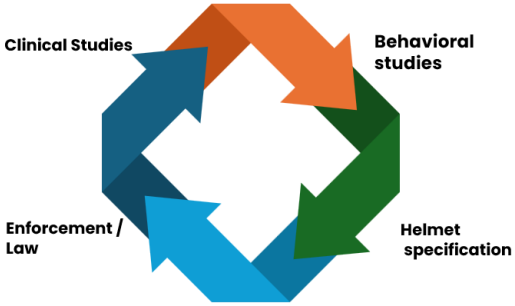
Another article published by Law et al. (2013), which exploring the factors associated with the enforcement of motorcycle helmet law. By using the panel data from 31 countries, it was found that increased democracy, political stability, education level, per capita income and equitable income distribution play significant role in the enactment of road safety laws. In short, the findings asserted that as the income of the population increases, the demand for better traffic laws would also increase. Furthermore, the improved governance would also contribute to more effective implementation of a traffic law.

DISCUSSION

This comprehensive review of 32 related studies on motorcycle helmet use offers crucial insights into the current landscape of helmet-related research in Malaysia. The articles were grouped into four thematic clusters: behavioural studies, clinical studies, helmet specification and technology, and enforcement and law. The classification into four clusters is to better understand the trends, issues, and challenges of past research on helmet use. The findings from this review reveal a strong interconnection between these clusters, with behaviour, helmet design, clinical implications, and enforcement efforts collectively shaping helmet-wearing practices and safety outcomes. Figure 7 illustrates the interrelation between these factors, emphasizing how weak enforcement, low helmet-wearing rates, and widespread use of uncertified helmets can ultimately contribute to an increase in head injuries. This underscores the need for comprehensive solutions that address all four dimensions simultaneously, rather than treating each as an isolated issue.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Figure 7
Interrelation between the Four Factors



For instance, behavioural studies have shown that individual perceptions significantly influence helmet-wearing habits. Kamaruddin et al. (2010, 2011, 2015) used behavioural theory to explore motorcyclists' intention to wear helmets and their actual behaviour in Johor and Klang Valley. One of the key findings was that perceived ease of use plays a crucial role in determining helmet use. If a helmet feels cumbersome or difficult to fasten, users may be less inclined to wear it properly, leaving them vulnerable to serious injury. This points to the need for innovative helmet design, especially in the strapping system, that simplifies fastening without compromising safety. Designers and manufacturers must rethink helmet ergonomics to strike a balance between comfort, convenience, and protection.

The relationship between helmet use and cervical spine injuries has also been a subject of intense debate. While helmets undeniably prevent fatal head injuries, some studies suggest that the weight of the helmet might increase the risk of cervical spine injuries, especially in non-frontal impacts such as rear-end or side collisions. Current helmet designs vary significantly in weight depending on the type (open-face, full-face, or modular) and the materials used—ranging from lighter polycarbonate to heavier fiberglass and carbon fibre composites. Given this diversity, further research should investigate how helmet weight interacts with a motorcyclist's body weight and build to determine whether certain riders are more susceptible to cervical injuries. A data-driven approach involving anthropometric analysis could offer valuable insights for creating safer, more personalized helmet designs.

Low helmet-wearing rates among child pillion riders highlight another pressing issue. This trend reflects not only a lack of parental awareness but also the broader failure of Malaysia's road safety education programs. Although a national road safety education program has been in place since 2007 for primary school students, the program seems to fall short of its goal to cultivate a deep-rooted culture of safety among young Malaysians. This raises several important questions: Is the curriculum engaging enough? Are there follow-up activities that reinforce the lessons learned? Are parents actively involved in promoting these safety messages at home? Future research should assess the program's effectiveness and explore innovative

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

ways to make road safety education more impactful. Perhaps incorporating interactive workshops, hands-on training, and collaborations with schools and community leaders could help instil stronger safety habits.

In addition to the identified behavioural and educational gaps, two significant research gaps stood out during this review. The first gap relates to the emergency response time following motorcycle crashes. According to Shaiffudin et al. (2021), the average ambulance response time in Malaysia ranges from 30 to 40 minutes, far exceeding the World Health Organization's standard of less than 8 minutes. For motorcyclists—the most vulnerable group on the road—such delays can mean the difference between life and death. A more detailed investigation into how response times affect crash outcomes could help prioritize improvements in Malaysia's emergency medical services. For example, what logistical challenges prevent faster response times? Could increase investment in emergency infrastructure or better coordination between hospitals and first responders make a difference? The second research gap lies in the understanding of motorcyclists' and guardians' decisions to use uncertified helmets or allow no helmets at all. While economic factors are often cited as a reason, the full picture remains unclear. Are these decisions driven by a lack of information about helmet standards, misperceptions about safety, or a general sense of invincibility? Exploring these motivations could lead to the development of targeted intervention programs that directly address these issues. For instance, policymakers could launch public awareness campaigns focusing on the risks of uncertified helmets or provide incentives for the purchase of certified helmets to reduce cost barriers.

Ultimately, this review underscores the need for a multi-faceted and integrated approach to improving helmet use in Malaysia. Strengthening enforcement and public education is essential, but these efforts must be complemented by advances in helmet design and technology, along with improved emergency response protocols. By addressing these interconnected factors holistically, policymakers and researchers can develop more effective strategies to protect motorcyclists and significantly reduce the staggering number of motorcycle-related injuries and fatalities.

To truly make a difference, we must rethink our approach and reimagine safety as a shared responsibility, one that involves everyone from policymakers and educators to parents, manufacturers, and the motorcyclists themselves. Only through collective action can we move closer to achieving safer roads and fewer tragedies.

CONCLUSION AND LIMITATIONS

As highlighted by the review, the lack of enforcement in terms of helmet wearing and the choice of uncertified helmet particularly among the child pillions are the major challenges in reducing motorcycles casualties. In alignment with global road safety plan, the Malaysian government strives to halve the traffic fatalities by 2030. A Road Safety Plan 2022- 2030 with 10 major thrusts was formulated to achieve the objectives. One of the key focuses is on the

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

motorcycle safety. It is encouraging to note that the issues identified in the past studies have been comprehensively addressed in the road safety plan but did not address the enforcement of regulations on the commercialization. Additionally, past experiences highlighted in this review demonstrate that enforcement remains the primary determinant for the success of all strategies. The enforcement should not only on the helmet wearing but should also strengthen the regulation on commercialisation of uncertified helmets. Therefore, a great deal of work remains to be done to ensure the motorcycle safety strategies be successfully implemented. This study is not without limitations. The use of single database in this study, focusing only examines the research work published in google scholar. Other database such as WOS, Scopus and other databases were not included in this study. The evaluation of this study can be further enhanced by using more robust measures such as the bibliometric approach and the meta-analysis approach.

ACKNOWLEDGEMENT

This study was supported by a grant (RE2024-01) from the Malaysian Institute of Road Safety Research (MIROS). Gratitude was expressed to all stakeholders, including all government agencies, who contributed directly or indirectly to the completion of the project.

REFERENCES

Ambak, K., Ismail, R., Abdullah, R. A., & Borhan, M. N. (2010). Prediction of helmet use among Malaysian motorcyclist using structural equation modeling. *Australian Journal of Basic and Applied Sciences*, *4*(10), 5263-5270.

Ambak, K., Ismail, R., Abdullah, R. A., & Borhan, M. N. (2010, December). Using the behavioral sciences theory and Structural Equation Model (SEM) in behavioral intervention: Helmet use. In *Proceeding of Malaysian Universities Transportation Research Forum and Conferences* (pp. 67-78).

Ambak, K., Rosli, N., Daniel, B. D., & Prasetijo, J. (2015). Behavioral intention to use safety helmet reminder system using the Extended Technology Acceptance Model. In *The 3rd Annual Int. Conference on Architecture and Civil Engineering*.

Ariffin, S. M., & Setapani, M. N. A. (2018). Knowledge, attitude and practice regarding motorcycle helmet usage among secondary school students in Kuantan, Malaysia. *Journal of Occupational Safety and Health*, *15*(1), 27-34.

Azhar, H., Ariffin, A. H., Syazwan, S. M., & Wong, S. V. (2014a). Estimating energy absorbing performance of motorcycle safety helmet. *Applied Mechanics and Materials*, *663*, 574-578.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Azhar, H., Ariffin, A. H., Syazwan, S. M., Md Isa, M. H., Ahmad, Y. A. H. A. Y. A., & Voon, W. S. (2014b). Comparative study of motorcycle helmets impact performance. *Applied Mechanics and Materials*, *575*, 306-310.

Azland, N. H. M., Ng, C. P., & Mohammed Alias, Y. U. S. O. F. (2013). The prevalence of helmet wearing among young motorcyclists in Klang Valley. In *Proceedings of the Eastern Asia Society for Transportation Studies* (Vol. 9).

DOSM, 2023. Statistics on Causes of Death, Malaysia. https://www.dosm.gov.my/portal-main/release-content/statistics-on-causes-of-death-malaysia-2024

Eastridge B, Shafi S, Minei J. (2006). Economic impact of motorcycle helmets: From impact to discharge. *Journal of Trauma* ,60, 978-84.

Faradila, P. N., Hafzi, M. M., Syazwan, S. M., Hafeez, A. A., Khairudin, R., Zulhaidi, M. J., & Azhar, H. (2011). Prevalence of helmet use among child pillion riders on route to school. *Malaysian Journal of Ergonomics*, *Special*, 30-38.

Hamzah, A., Syamza, M. H., Ahmad, M. A., Ariffin, A. H., Solah, M. S., & Paiman, N. F. (2019). Assessing motorcycle safety helmet standards compliance. *Journal of the Society of Automotive Engineers Malaysia*, *3*(4), 48-56.

Keng S.H. 2005. Helmet use and motorcycle fatalities in Taiwan. *Accident Analysis and Prevention*, 37,349-55.

Kulanthayan, S., Umar, R. R., Hariza, H. A., Nasir, M. M., & Harwant, S. (2000). Compliance of proper safety helmet usage in motorcyclists. *Medical Journal of Malaysia*, *55*(1), 40-44.

Kulanthayan, S., Radin Umar, R. S., Ahmad Hariza, H., & Mohd Nasir, M. T. (2001). Modeling of compliance behavior of motorcyclists to proper usage of safety helmets in Malaysia. *Traffic Injury Prevention*, *2*(3), 239-246.

Law, T. H., Noland, R. B., & Evans, A. W. (2013). Factors associated with the enactment of safety belt and motorcycle helmet laws. *Risk analysis*, *33*(7), 1367-1378.

Liu, B. C., Ivers, R., Norton, R., Boufous, S., Blows, S., & Lo, S. K. (2008). Helmets for preventing injury in motorcycle riders. *Cochrane database of systematic reviews*, (1).

Mutalib, M. H. B. A., & Seok, Y. B. (2021). Safety Helmets for Motorcycle Rider with Hearing Impairment.

Ooi, S. S., Wong, S. V., Yeap, J. S., & Umar, R. (2011). Relationship between cervical spine injury and helmet use in motorcycle road crashes. *Asia Pacific Journal of Public Health*, *23*(4), 608-619.

Oxley, J., O'Hern, S., & Jamaludin, A. (2018). An observational study of restraint and helmet wearing behaviour in Malaysia. *Transportation research part F: traffic psychology and behaviour*, *56*, 176-184.

Paul, T. (2008). Malaysia to ban half-shell helmets in January 2009. https://paultan.org/2008/12/16/malaysia-to-ban-half-shell-helmets-in-january-2009/

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

PDRM (2024). Laporan Perangkaan Kemalangan Jalan Raya Malaysia 2024. Polis Diraja Malaysia.

Rabihah, I., Azli, A. Z., Abdullah, S., & Nurulhana, B. (2013, March). Enforcement and helmet use compliance: an observation in selected areas in selangor. In *4th International Conference for Road Safety 4th–6th March* (pp. 1-12).

Radzuan, N. Q., Hassan, M. H. A., Omar, M. N., Othman, N. A., Radzi, M. A. M., & Kassim, K. A. A. (2023). The effect of motorcycle helmet type on head response in oblique impact. *International Journal of Automotive and Mechanical Engineering*, *20*(3), 10786-10797.

Radzuan, N. Q., Hassan, M. H. A., Omar, M. N., & Kassim, K. A. A. (2024). The influence of helmet certification in motorcycle helmets protective performance. *Journal of Mechanical Engineering and Sciences*, 9811-9823.

Ramli, R., & Oxley, J. A. (2019). Motorcycle helmet visor–related facial injury and its potential mechanism of injury: Evidence-based case study. *Traffic injury prevention*, *20*(3), 332-335.

Ramli, R., & Oxley, J. (2016). Motorcycle helmet fixation status is more crucial than helmet type in providing protection to the head. *Injury*, *47*(11), 2442-2449.

Ramli, R., Oxley, J., Hillard, P., Mohd Sadullah, A. F., & McClure, R. (2014). The effect of motorcycle helmet type, components and fixation status on facial injury in Klang Valley, Malaysia: A case control study. *BMC Emergency Medicine*, *14*, 1-11.

Rosli, N., Ambak, K., Daniel, B. D., & Sanik, M. E. (2016). Structural Equation Modelling in behavioral intention to use safety helmet reminder system. In *MATEC web of conferences* (Vol. 47, p. 03002). EDP Sciences.

Roszalina, R., Ng, L. S., Ng, F. C., Normastura, A. R., & Oxley, J. (2011). Helmet use amongst injured and non-injured motorcyclists in Malaysia. *Journal of the Australasian College of Road Safety*, *22*(2), 71-76.

Sambasivam, S., Aziz, A. A., Karuppiah, K., Abidin, E. Z., Tamrin, S. B. M., Naeini, H. S., & Alias, A. N. (2019). Prevalence of safety equipment and helmet use among school students commuting to school in South Selangor, Malaysia.

Setty, N. K. H., Sukumar, G. M., Majgi, S. M., Goel, A. D., Sharma, P. P., & Anand, M. B. (2020). Prevalence and factors associated with effective helmet use among motorcyclists in Mysuru City of Southern India. *Environmental Health and Preventive Medicine*, *25*, 1-9.

Shuaeib, F. M., Hamouda, A. M. S., Wong, S. V., Umar, R. R., & Ahmed, M. M. (2007). A new motorcycle helmet liner material: The finite element simulation and design of experiment optimization. *Materials & Design*, *28*(1), 182-195.

Supramaniam, V., van Belle, G., & Sung, J. F. (1984). Fatal motorcycle accidents and helmet laws in Peninsular Malaysia. *Accident Analysis & Prevention*, *16*(3), 157-162.

Evaluation Studies in Social Sciences (ESSS)
eISSN 0128-0473Vol 6(1)/2025(54-70)
https://ejournal.upsi.edu.my/index.php/ESSS/index
DOI: https://doi.org/10.37134/esss.vol6.1.4.2025

Tarigan, A. K., & Sukor, N. S. A. (2018). Consistent versus inconsistent behaviour of helmet use among urban motorcyclists in Malaysia. *Safety Science*, *109*, 324-332.

WHO, 2023. Road traffic injuries. Retrieved from https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries.

Xuequn, Y., Ke, L., Ivers, R., Du, W., & Senserrick, T. (2011). Prevalence rates of helmet use among motorcycle riders in a developed region in China. *Accident Analysis & Prevention*, *43*(1), 214-219.

Yellappan, K., Mani, K. K., & Tamrin, S. B. M. (2019a). Determinants of certified motorcycle helmet use among postal delivery riders at rural areas in Peninsular Malaysia. *IATSS Research*, *43*(3), 153-160.

Yellappan, K., KC Mani, K., & Md. Tamrin, S. B. (2019b). How safe are standard certified motorcycle safety helmets? Malaysian postal delivery riders scenario. *Traffic Injury Prevention*, *20*(6), 624-629.

Yusuf, M. B. O., & Oluwatoyin, O. A. S. (2019). User acceptance of crash helmet by motorcyclists in Malaysia: An Empirical Analysis. *Studia Universitatis Vasile Goldiș Arad, Seria Științe Economice*, *29*(1), 40-57.

Zi, Y. W., San, L. Y., & Abdulla, R. (2023). Motorcyclist helmet add-on proximity monitor. *Journal of Applied Technology and Innovation)*, *7*(3), 57-62.

Zohari, M. H., Elias, M. L. M., & Al-Fadhali, N. M. A. (2024). Safety helmet with Collision Detection System. *Journal of Advanced Industrial Technology and Application*, *5*(1), 76-82.