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Helmet Use among Motorcycle Riders in Lomé: Knowledge, Attitudes, Practices, and Implications for Preventing Head Injuries

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Abstract

Background: Traumatic brain injury (TBI) is a significant public health issue in Togo, where motorcycles are the primary cause of road traffic accidents. Helmet use is an effective preventive measure; however, compliance remains low, necessitating urgent action. **Methods:** We conducted a cross-sectional study from February to May 2024 in Lomé (Golfe 1 commune). Using convenience sampling, 404 motorcycle riders were recruited at service stations and parking areas, based on a minimum sample size calculated with Cochran's formula. Data were collected through direct observations and structured interviews. Logistic regression was used to identify factors associated with helmet use. **Results:** The average age of riders was 32.8 years, and 82.7% were male. Overall, helmet use was observed in 83.1% of riders, but only 41.3% consistently wore a properly fastened helmet. Reported barriers included heat (41.7%), forgetfulness (27.8%), cost (17.2%), and short trips (13.3%). While 82% had good knowledge and 72.5% had favorable attitudes, gaps in practice remained. Predictors of consistent helmet use included being aged 28 - 37 years, having a higher education, working as a motorcycle taxi driver, and possessing good knowledge. Notably, no participant held a valid driver's license, underscoring significant policy gaps in road safety enforcement. Addressing heat as a barrier may involve promoting or subsidizing helmets with improved ventilation, which could encourage consistent use in hot climates. **Conclusion:** Although awareness is high, consistent helmet use remains inadequate in Lomé. This study highlights the need for improved enforcement, affordable safety measures, and enhanced road safety education to reduce the TBI burden in Togo.

Keywords

Motorcycle Helmet Use, Rider Knowledge, Attitudes, And Practices, Road Safety, Traumatic Brain Injury, Togo

1. Introduction

Traumatic brain injury (TBI) is a significant public health issue because of its impact on mortality, morbidity, and its considerable economic and social effects [1].

In high-income countries, TBIs primarily affect older adults, most often due to falls [2]. Conversely, in low- and middle-income countries, TBIs mainly involve young men and primarily result from road traffic accidents. These accidents often involve two-wheeled motor vehicles, which are widely used as a means of transportation [3]-[6].

The number of such vehicles has risen sharply in several African countries. In Burkina Faso, motorcycle registrations in Kadiogo province increased from 27,380 in 2004 to 109,876 in 2019—a fourfold rise, while the population only doubled over the same period [7]. In Benin, the percentage of households owning a motorcycle grew from less than 45% in 2001 to over 55% in 2011 [6]. In Ghana, their numbers surged by 292% between 2000 and 2008 [8], while in Kenya, they increased from 57,000 in 2005 to 514,000 in 2011, making up 36.1% of the national vehicle fleet [9]. Congo (Brazzaville) has also experienced a recent boost in motorcycle use [10].

In Togo, the number of motorized two-wheelers increased by an average of 10% annually from 2005 to 2015 and by 16.5% between 2018 and 2023. Meanwhile, accidents involving these vehicles have risen significantly. In the second half of 2021, there were 3,577 recorded accidents, with 198 out of 334 deaths (59%) involving motorcycle users [11].

Wearing a helmet is an essential preventive measure to lessen the severity of TBIs. Not wearing a helmet significantly raises the risk of severe brain injury in an accident. In contrast, helmet use decreases the risk of serious injury by 69% and the risk of death by 42% [12]. Similarly, in a cross-sectional study, Singleton reported that helmet use was linked to a 69% reduction in skull fractures, a 71% reduction in cerebral contusions, and a 53% reduction in intracranial hemorrhage [13]. However, studies from Burkina Faso [7], Ethiopia [12], the Republic of the Congo (Brazzaville) [10], and Kenya [9] indicate that helmet use remains low among motorcycle riders in these countries.

In Togo, to our knowledge, no study has yet evaluated motorcycle riders' knowledge, attitudes, and practices regarding helmet use for preventing TBIs. Lomé, as the country's capital and a city with a high density of motorcycles and a high accident rate, is therefore a critical setting for such research. The implications of our findings could have a significant impact on the development of effective strategies to promote helmet use and improve head injury prevention in Lomé.

2. Methods

Study Design and Duration

This was a cross-sectional, descriptive, and analytical study conducted over 90 days, from February 15 to May 15, 2024, in the Golfe 1 neighborhood in Lomé, the capital of Togo.

Study setting

Lomé is divided into several administrative communes, with Golfe 1 being one of the most densely populated. Motorcycles, especially commercial motorcycle taxis known locally as zemidjans, are the primary mode of transportation in this area because they are affordable and can easily navigate congested urban roads. Due to these characteristics, Commune Golfe 1 offers a key setting for studying motorcycle riders' knowledge, attitudes, and practices regarding helmet use. Results from this context underscore the importance of targeted prevention efforts and the need to strengthen road safety policies in Lomé and throughout Togo.

Study Population

All users of motorized two-wheeled vehicles operating within the Golfe 1 community.

Source population

Motorcycle users often visit service stations and parking lots within Golfe 1.

Inclusion Criteria

Participants included motorcycle riders:

- Visiting a service station or parking lot.
- Who gave consent.

Non-inclusion Criteria

Motorcycle riders who did not provide their consent were excluded.

Exclusion criteria

Incomplete questionnaires were excluded from the analysis.

Sampling

A non-probabilistic, accidental sampling method was employed. The minimum sample size was determined using Cochran's formula. Assuming an expected prevalence of helmet use at 50%, with a 95% confidence level and a 5% margin of error, and accounting for 10% unusable data, the minimum required sample size was 404 participants.

Data collection

Data for this study were gathered through two methods: direct observation of helmet use and face-to-face interviews.

Direct observation of helmet use

An observation grid was created and validated through a pretest with a small sample.

Second part: Face-to-face interviews with riders. A standardized questionnaire was developed and validated through a pretest on a small sample.

Study procedure

- *Direct observation of helmet use*: sites were selected from major intersections along national roads. Eligible sites were safe for observers, elevated to or above motorcycle height, and frequently visited by the public. Observations were conducted in two-hour periods, both during the day (8:00 a.m.) and at night (6:30 p.m.), to account for changes in traffic volume and composition. To prevent double-counting, only motorcycles traveling in a single direction were observed. If multiple vehicles passed simultaneously, the one closest to the roadside was given priority.
- *Face-to-face interviews* were conducted between 8:00 a.m. and 5:00 p.m. An introductory statement explained the purpose of the study and the role of the interviewers. After obtaining verbal consent, the questionnaire was administered.

After validation, both tools were digitized into a Kobo Collect electronic platform, enabling secure online data collection.

Variables

Variables included quantitative sociodemographic characteristics and qualitative factors [10], such as attitude, scored from 0 to 9 (Table 1), and knowledge level, scored from 0 to 10 (Table 2).

Table 1. Attitude score for wearing a safety helmet.

Proposal	Assessment	Weitling	
		Yes	No/Didn't know
History of helmet wearing	Yes/No	1	0
Headset purchase history	Yes/No	1	0
Opinion on police sanction	Yes/No/Doesn't know	1	0
Refusal to wear a helmet	Yes/No	0	2
Decision to wear a helmet	Yes/No/Doesn't know	4	0

Interpretation: Score ≥ 7 = favorable attitude. Score < 7 = unfavorable attitude.

Table 2. Helmet's knowledge level score

Proposition	Correct answer	Weitling	
		Yes/Did	No/Didn't know
Have you ever heard about protective devices for motorcyclists? If yes, cite them.	Had cited	2	0
What is the importance of the safety helmet?	Head protection or safety	2	0
Do you know a place where helmets are sold? If yes, indicate it.	Correctly indicated	2	0
What is the average price of a helmet?	5,000 - 15,000 F. CFA*	2	0
Do the law or police require the wearing of a safety helmet?	Yes	2	0

Interpretation: A score of 6 or higher indicates an acceptable or reasonable level of knowledge. Score < 6 = unacceptable or poor level of knowledge. *: 1 F. CFA = 0,0017 US $.

Operational definitions

- **Helmet use frequency**:
  - Never: 0 times
  - Rarely: once a month or less
  - Sometimes: 2 - 4 times a month
  - Often: 2 - 3 times a week
  - Always: at least four times a week

Ethical considerations and administrative authorization

The Bioethics Committee approved this study for health research from the Togo Ministry of Health ("Comité de Bioéthique pour la Recherche en Santé (CBRS)," Ref No: 0101/2016/MS/CAB/DGS/DPLET/CBRS). Data were anonymized to protect confidentiality. Written informed consent was obtained from all participants before enrollment. The mayor's office of the Golfe 1 commune authorized the study.

Data analysis

Categorical variables were reported as frequencies and proportions. Quantitative variables were summarized as mean (±standard deviation), median (interquartile range), minimum, and maximum values. Binary logistic regression was used to identify factors associated with helmet use. Variables with $p < 0.20$ in univariate analysis were included in the multivariable model, which was finalized using a backward stepwise elimination procedure at a 5% significance level. All analyses were conducted using R statistical software (version 4.3.1).

3. Results

Socio-demographic characteristics of respondents

A total of 404 motorcycle riders participated in the study. Their average age was 32.8 ± 9.3 years (range: 18 - 62 years). The majority were men (82.7%). Table 3 shows that 48.5% of respondents were single, and secondary education was the most common level (39.6%). In terms of occupation, motorcycle taxi drivers comprised 42.6% of the respondents, followed by artisans (21.3%) and traders (15.6%). No participant held a driver's license, and 55% had experienced a motorcycle accident.

Table 3. Socio-demographic characteristics of respondents (n = 404).

Characteristics	n	%
Age group (years)		
18 - 27	132	32.7
28 - 37	143	35.4
38 - 47	89	22.0
≥48	40	9.9
Sex		
Male	334	82.7
Female	70	17.3

Continued

Marital status		
Single	196	48.5
Married	149	36.9
Divorced/Separated	34	8.4
Widowed	25	6.2
Education level		
None	47	11.6
Primary	79	19.6
Secondary	160	39.6
Higher	118	29.2
Occupation		
Motorcycle taxi driver	172	42.6
Artisan	86	21.3
Trader	63	15.6
Civil servant	47	11.6
Student	36	8.9

Prevalence of helmet wearing.

The overall helmet use rate was 83.1%. Helmet use was higher during the day (94.5%) than at night (76.3%). Only 41.3% of riders reported consistently wearing a properly strapped helmet. Reasons for not wearing a helmet included: excessive heat (41.7%), forgetfulness (27.8%), high cost (17.2%), and short distances (13.3%). This figure reflects observed behavior. Separately, 78% of riders self-reported consistent helmet use, though this included cases where helmets were not always properly fastened.

Level of knowledge of Helmet use

Eighty-two percent of respondents demonstrated good knowledge of helmet use, defined as a score of 6/10 or higher.

92.1% (n = 372) recognized that helmets reduce the risk of head injury, and 88.4% (n = 357) identified a well-fastened helmet as a quality criterion. For 84.4% (n = 341) of respondents, a helmet prevents fatal accidents; however, 21.7% (n = 88) mistakenly believed that helmets cause respiratory discomfort.

Attitudes towards helmet use

Overall, 72.5% of respondents had a favorable attitude toward helmet use, defined as a score of 7 or higher out of 9.

81.2% considered helmet use as "essential for safety," while 18.8% judged it "optional."

Practices related to helmet use

Despite having high knowledge and positive attitudes, only 41.3% of respondents consistently reported wearing a helmet that was fastened correctly. 27.5% admitted to wearing it only occasionally, especially during short trips or at night.

Factors associated with helmet use

In multivariate analysis (Table 4), the following factors were independently associated with consistent helmet use: age (28 - 37 years), higher education level, occupation as a motorcycle taxi driver, and a good knowledge score.

Table 4. Multivariate logistic regression of factors associated with helmet use.

	Adjusted odds ratio	95% CI	p-value
Age 28 - 37 vs 18 - 27	2.14	1.21 - 3.78	0.008
Higher education vs none	2.87	1.43 - 5.76	0.003
Motorcycle taxi driver vs others	1.96	1.08 - 3.55	0.027
Good knowledge (≥6/10)	3.42	1.89 - 6.19	<0.001

4. Discussion

Study limitations and challenges

Our study faced challenges, including some riders refusing to participate despite clear explanations and the potential for reporting bias in self-reported practices. Nevertheless, the sampling strategy and methodological rigor ensured satisfactory representativeness for urban areas, though extrapolation to rural regions should be approached with caution.

Originality and significance

To our knowledge, this is the first study to assess knowledge, attitudes, and practices regarding helmet use among motorcycle riders in Lomé. By combining direct observation with interviews, we were able to highlight not only self-reported behaviors but also the gap between awareness and consistent practice. These findings establish a baseline for future in-depth research and policy development.

Sociodemographic data

In our study, adult males were predominant (Table 3), with a mean age of 32.8 ± 9.3 years. These characteristics align with those reported by Eryx *et al.* [10] and Ogini *et al.* [14], who studied males with average ages of 28.6 ± 7.1 years and 35.1 ± 8.6 years, respectively. The most common education level was secondary, accounting for 39.6% in our study, which is lower than the high level reported in Eryx *et al.*'s study (75.1%) [10]. In Kenya, the educational level among respondents ranged between 42.2% and 52.1% for secondary school or higher [9].

According to Hounkpè *et al.* and Akaateba *et al.*, variables such as sex, age, marital status, and profession are critical sociodemographic predictors of helmet use [6] [15]. Men and adolescents generally have less favorable attitudes toward safety and are less risk-aware than women and older individuals. Married or previously married individuals are significantly more likely to wear a helmet than single individuals, which may be due to a greater sense of responsibility and the need to support their families.

The level of education also affects helmet use: educated motorcyclists are more aware of its safety benefits.

Prevalence of helmet use and its determinants.

In our study, the rate of helmet use among two-wheeled vehicle users was 83.1%. This finding is similar to the studies by Tirwa *et al.* [16] in India and Hounkpè *et al.* [6] in Benin, which reported rates of 84% and 81.1%, respectively. However, this rate is lower than in other studies, especially in Malaysia, where Oxley *et al.* [17] reported a prevalence of 93.4% among drivers and 85.8% among passengers, and in Colombia, where Guzman *et al.* [18] observed a rate of 99%. On the other hand, much lower prevalences were seen in Burkina Faso by Nikiema and Bonnet [7] (5%) and in Ghana by Akaateba *et al.* [15] (46%).

The observed variations could be due to several factors, including lack of awareness, inconsistent enforcement of helmet laws, and the absence of substantial deterrent penalties.

Knowledge

Drivers with good knowledge are nearly three times more likely to wear a helmet properly. This finding aligns with results reported by Bachani *et al.* [9] in Kenya, Eryx *et al.* [10] in the Democratic Republic of Congo, and Rabiu *et al.* [5] in Nigeria. This correlation can be linked to higher literacy rates, stricter regulations, and better access to information. A good understanding of the laws is strongly linked to increased helmet compliance.

In our study, no participant held a driver's license, and 55% had already been involved in a motorcycle accident. This proportion was even higher in Congo (65.1%) [10]. Driving without a license is a significant issue, since obtaining a license provides essential road safety knowledge, including the benefits of wearing a helmet.

Knowledge of the laws has a significant impact on helmet use, particularly when combined with law enforcement measures and targeted education campaigns [16]. However, good knowledge does not always ensure effective helmet use. Cultural, economic, and social factors can hinder adoption [9] [15] [19].

Furthermore, although most motorcyclists surveyed in our study were aware of helmet laws, many still failed to comply with them. Similar results were reported by Akaateba *et al.* [15] in Ghana. These findings suggest that awareness alone is insufficient, and additional strategies are necessary, such as subsidizing helmets to increase their accessibility.

5. Attitudes and Practices

Motorcyclists with a positive attitude are 2.24 times more likely to wear a helmet properly than those with a negative attitude, a finding that aligns with studies by Ledesma *et al.* [20] and Haqverdi *et al.* [19].

Helmet ownership is a key factor in practical use: 98% of drivers in our study owned a helmet, similar to findings by Akaateba *et al.* [15], Eryx *et al.* [10], and Rabiu *et al.* [5], which showed 74%, 81%, and 74.2% respectively. However, despite high helmet ownership, only 78% of drivers consistently wore helmets in our study. This highlights the importance of educational and enforcement strategies

to encourage regular use. It is important to note that this 78% represents self-reported consistent use, which differs from the 41.3% observed rate of helmet use with straps properly fastened.

Road checks

Helmet use varies depending on the time of day: it is more common during the day than in the evening, probably because police checks are less strict at night. Similar observations have been made in Thailand [21] and Tanzania [22].

Road checks play a key role in encouraging helmet use through several mechanisms:

- The deterrent effect of sanctions: fear of fines encourages compliance with regulations.
- Indirect awareness: drivers become more aware of the importance of helmets through repeated exposure to controls.

6. Conclusions

This study shows that although motorcycle riders in Lomé have high levels of knowledge and generally positive attitudes toward helmet use, consistent and correct helmet wearing remains inadequate. The gap between awareness and practice highlights the impact of environmental barriers, including heat, cost, forgetfulness, and reduced enforcement at night. Socio-demographic factors, especially age, education, and occupation, also influence helmet use behaviors. Addressing heat as a barrier may involve promoting or subsidizing helmets with improved ventilation, which could encourage consistent use in hot climates.

These findings underscore the need for multifaceted interventions that extend beyond awareness-raising efforts. Strengthening law enforcement, improving helmet affordability and comfort, and integrating road safety education into licensing processes could significantly enhance compliance. As the first study of its kind in Lomé, our results provide essential evidence to guide targeted strategies for injury prevention and contribute to reducing the burden of traumatic brain injury in Togo. Additionally, the complete absence of licensed riders highlights an urgent policy gap; integrating licensing enforcement and road safety education could be pivotal in improving helmet compliance. Practical measures, such as making ventilated helmets more accessible and affordable, could help overcome heat-related barriers to use.

Authors' Contributions

A.K. Doléagbénou conceived the study, performed data collection, analysis, and interpretation, and drafted and revised the manuscript. B. Gniyou, B.O. Djoubairou, and E. Kpélao reviewed the manuscript. All authors have read and approved the final manuscript.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the

corresponding author on reasonable request.

Consent to Publish

Consent was obtained from all the authors to publish the study results.

Conflicts of Interest

We have no competing interests to declare.

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