



## Original Article



## Investigating Motorcycle Accident Risk Factors among Educated Riders: Associations with Driver Behaviour, Road Conditions, and Vehicle Safety Concerns

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## ABSTRACT

Motorcycle accidents pose a significant threat to public health and often present as serious medicolegal challenges, particularly in developing countries. **Objectives:** To identify and analyze key risk factors, over speeding, poor driving sense, lighting defects, and mirror faults, associated with motorcycle accidents among an educated population comprising students and faculty. Also, to explore the association of these factors with demographic characteristics and varying road conditions. **Methods:** A cross-sectional study was conducted using a self-administered questionnaire to gather data on participants' demographics, motorcycle usage patterns, self-reported safety concerns, and perceived road hazards. Chi-square tests were used to assess associations between variables. **Results:** Over-speeding emerged as the most frequently reported safety concern, especially among younger riders and during peak traffic hours. Although notable trends were observed across different age groups, professions, and road conditions, none of the associations reached statistical significance ( $p > 0.05$ ). **Conclusions:** It was concluded that although over-speeding was consistently reported as the most frequent safety concern among students and faculty, statistical analysis revealed no significant associations between reported concerns and demographic or road condition variables. These findings suggest that motorcycle safety risks are broadly distributed across rider categories. Institutional interventions such as safety awareness programs, infrastructure improvements, and strict enforcement of traffic laws may still be beneficial in promoting safer riding practices within the academic community.

## INTRODUCTION

Motorcycle accidents represent a growing public health concern, particularly in developing countries where rapid urbanization and inadequate traffic infrastructure contribute to increased road risk [1]. These accidents account for a significant proportion of trauma-related injuries and deaths, especially among young, economically active males [2]. When such incidents are brought before legal authorities, they often involve complex medicolegal

consequences and prolonged court proceedings [3]. In countries like Pakistan, motorcycles are one of the most common modes of transport due to their affordability and convenience [4]. However, riders often operate in high-risk environments with limited protective measures, weak enforcement of traffic laws, and poor road conditions. This makes motorcyclists more vulnerable to accidents compared to users of other transportation modes [5, 6].



While various studies have explored factors such as helmet use, alcohol consumption, and collision mechanics in the general population, limited attention has been given to risk behaviours and perceptions among educated individuals, university students and academic staff who are assumed to have better awareness yet still engage in unsafe practices[7-9].

This study aims to address this gap by investigating the relationship between driver characteristics (age, gender, marital status, and literacy level) and specific problems encountered by students and faculty while riding motorcycles, including over-speeding, poor driving sense, and issues with lights or mirrors. It also explores the association between various road conditions (peak hours, traffic jams, routine hours, and low visibility) and the type of safety concerns reported by motorcyclists.

## METHODS

This cross-sectional study was conducted to investigate the factors contributing to motorcycle accidents among students and faculty members of Sahara Medical College, Narowal, from 6<sup>th</sup> June 2021 to 6<sup>th</sup> November 2021. The study aimed to explore the association between driver characteristics, road conditions, and reported motorcycle safety concerns within this academic population. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Sahara Medical College under reference number No. 83/FMT/SMC. The approved study period extended from 06 June 2021 to 06 November 2021. The study was conducted by ethical guidelines, ensuring informed consent, voluntary participation, and confidentiality of all participants. The target population included all male students and faculty members of Sahara Medical College. A convenience sampling technique was employed to recruit participants who were accessible and willing to participate. The inclusion criteria specified participants aged 18 years or older, who used motorcycles as their primary mode of commuting and voluntarily provided informed consent. Exclusion criteria included female individuals, minors (under 18 years), non-motorcycle users, and those unwilling to consent. The final sample comprised 250 participants, including 123 MBBS students, 80 Allied Health Sciences students (from disciplines such as Pharmacy, Medical Lab Technology, Information Technology, Microbiology, and Biotechnology), and 47 faculty members. The sample size was determined using a 95% confidence level and a 5% margin of error to ensure statistical representativeness. Data were collected using a self-administered questionnaire distributed in both print and digital formats. Printed copies were made available in classrooms, department offices, and faculty lounges. The questionnaire gathered information on four key areas: (1) demographic characteristics (age, marital status, profession), (2) motorcycle riding habits (frequency

of riding, safety practices), (3) driving experiences (problems encountered while riding), and (4) perceptions of road conditions (traffic congestion, visibility issues, infrastructure). To ensure anonymity, all responses were de-identified before analysis. Data were entered and analyzed using SPSS version 22. Descriptive statistics were used to summarize participant characteristics and response frequencies. Chi-square tests were applied to evaluate associations between driver characteristics, road conditions, and reported motorcycle safety concerns. A p-value of <0.05 was considered statistically significant.

## RESULTS

The majority of participants aged 18-25 and 26-32 years identified over-speeding as their primary concern (53.6% and 55.4%, respectively). Older age groups, particularly those above 46 years, showed a broader distribution across issues, including driving sense (32.4%), lighting problems (13.5%), and mirror faults (16.2%). Notably, the youngest group (18-25 years) reported the lowest concern for driving sense, reinforcing the idea that younger riders may underestimate behavioural factors. However, the chi-square test result ( $\chi^2=13.432$ , Degrees of Freedom (df)=12,  $p=0.338$ ) suggests no statistically significant relationship between age and safety concerns. Single participants more frequently reported over-speeding (52.1%) and driving sense (30.3%) issues compared to married individuals (48.2% and 24.7%, respectively). Interestingly, married riders expressed greater concern for mirror faults (11.8%), more than double the percentage among singles (4.2%). Despite these differences, the chi-square result ( $\chi^2=5.608$ ,  $df=3$ ,  $p=0.132$ ) indicates that the association is not statistically significant. The findings may still hint at subtle behavioural distinctions based on marital responsibility or maturity, even if not statistically proven (Table 1).

**Table 1:** Association Between Age Group, Marital Status, and Reported Motorcycle Safety Concerns (n=250)

Groups	Over Speeding	Driving Sense	Front/Back Lights	Side Mirror	Total	Pearson Chi-Square Value	df	p-value
<b>Age</b>								
18–25 Years	59 (53.6%)	27 (24.5%)	19 (17.3%)	5 (4.5%)	110	13.432	12	0.338
26–32 Years	36 (55.4%)	19 (29.2%)	6 (9.2%)	4 (6.2%)	65			
33–39 Years	2 (40.0%)	2 (40.0%)	0 (0.0%)	1 (20.0%)	5			
40–46 Years	16 (48.5%)	11 (33.3%)	5 (15.2%)	1 (3.0%)	33			
Above 46 Years	14 (37.8%)	12 (32.4%)	5 (13.5%)	6 (16.2%)	37			
Total	127 (50.8%)	71 (28.4%)	35 (14.0%)	17 (6.8%)	250			
<b>Marital Status</b>								
Single	86 (52.1%)	50 (30.3%)	22 (13.3%)	7 (4.2%)	165	5.608	3	0.132
Married	41 (48.2%)	21 (24.7%)	13 (15.3%)	10 (11.8%)	85			
Total	127 (50.8%)	71 (28.4%)	35 (14.0%)	17 (6.8%)	250			

Among MBBS students, over-speeding was the most reported issue (52.8%), while AHS students exhibited a comparatively higher concern for driving sense (36.3%), indicating more emphasis on behavioural risks. Faculty members displayed a similar trend to students, with over-speeding leading (51.1%), but also a noticeable concern for mirror and lighting issues. Despite visible distribution differences, the chi-square result ( $\chi^2=5.690$ ,  $df=6$ ,  $p=0.459$ ) implies no significant statistical relationship between profession and the type of safety concern reported (Table 2).

**Table 2:** Association Between Profession and Reported Motorcycle Safety Concerns (n=250)

Professions	Over Speeding	Driving Sense	Front/Back Lights	Side Mirror	Total	Pearson Chi-Square Value	df	p-value
MBBS Students	65 (52.8%)	28 (22.8%)	21 (17.1%)	9 (7.3%)	123	5.690	6	0.459
AHS Students	38 (47.5%)	29 (36.3%)	9 (11.3%)	4 (5.0%)	80			
Faculty Members	24 (51.1%)	14 (29.8%)	5 (10.6%)	4 (8.5%)	47			
Total	127 (50.8%)	71 (28.4%)	35 (14.0%)	17 (6.8%)	250			

Over-speeding was the most frequently cited issue across all road conditions, particularly under low visibility (67.9%) and peak hours (51.1%), highlighting the dangers of fast riding when visibility or traffic density is poor. Routine hours showed a relatively even concern for various issues. Although these patterns are meaningful from a public safety standpoint, the statistical analysis ( $\chi^2=11.125$ ,  $df=12$ ,  $p=0.518$ ) showed no significant association. However, the data still reinforces the importance of improving behaviour during high-risk road conditions like traffic congestion or smog (Table 3).

**Table 3:** Association Between Road Conditions and Reported Motorcycle Safety Concerns (n=250)

Road Condition	Over Speeding	Driving Sense	Front/Back Lights	Side Mirror	Total	Pearson Chi-Square Value	df	p-value
Peak Hours	67 (51.1%)	39 (29.8%)	16 (12.2%)	9 (6.9%)	131	11.125	12	0.518
Traffic Jams	21 (41.2%)	18 (35.3%)	10 (19.6%)	2 (3.9%)	51			
Routine Hours	4 (44.4%)	3 (33.3%)	2 (22.2%)	0 (0.0%)	9			
Low Visibility	19 (67.9%)	4 (14.3%)	2 (7.1%)	3 (10.7%)	28			
Other Causes	16 (51.6%)	7 (22.6%)	5 (16.1%)	3 (9.7%)	31			
Total	127 (50.8%)	71 (28.4%)	35 (14.0%)	17 (6.8%)	250			

The highest rate of over-speeding (73.3%) was reported in accidents caused by animal crossings, likely due to sudden, unpredictable road events. In contrast, collision-related accidents showed a more balanced distribution with concerns for lighting (15.6%) and mirrors (7.8%). Riders involved in slip/skid and overturn incidents also emphasized over-speeding and driving sense, but with varied percentages. Despite these variations, the chi-square value ( $\chi^2=7.658$ ,  $df=9$ ,  $p=0.569$ ) suggests that the type of accident does not significantly influence the specific safety concern identified (Table 4).

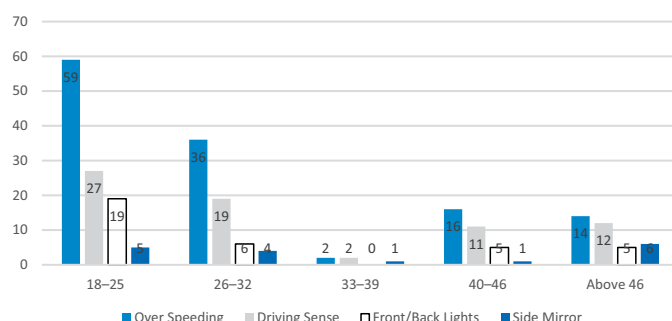
**Table 4:** Association Between Accident Type and Reported Motorcycle Safety Concerns (n=250)

Type of Accident	Over Speeding	Driving Sense	Lighting Issues	Mirror Fault	Total	Pearson Chi-Square Value	df	p-value
Collision	70 (49.6%)	38 (27.0%)	22 (15.6%)	11 (7.8%)	141	7.658	9	0.569
Slip/Skid	31 (47.0%)	21 (31.8%)	10 (15.2%)	4 (6.1%)	66			
Overturn	15 (53.6%)	10 (35.7%)	1 (3.6%)	2 (7.1%)	28			

Animal Crossing	11(73.3%)	2(13.3%)	2(13.3%)	0(0.0%)	15			
Total	127(50.8%)	71(28.4%)	35(14.0%)	17(6.8%)	250			

Over-speeding is the most dominant safety concern across all age groups, with the highest frequency reported among riders aged 18–25 years ( $n=59$ ) and 26–32 years ( $n=36$ ). This trend aligns with earlier findings that younger riders tend to exhibit more aggressive riding behaviour and risk-taking tendencies. As age increases, concern shifts gradually toward driving sense, particularly in the above 46 years' group, where 12 participants reported it as a primary issue. Equipment-related concerns lighting problems and mirror faults were less commonly reported but more prominent in older groups than younger ones, possibly due to increased attention to safety with age. Notably, mirror issues were least reported overall, except in the above 46 group, suggesting a general lack of emphasis on visual safety aids among younger riders. These patterns underscore the importance of age-specific road safety education, particularly targeting youth with behaviour-focused interventions to mitigate over-speeding risks (Figure 1).

Distribution of Reported Motorcycle Safety Concerns by Age Group



**Figure 1:** Distribution of Reported Motorcycle Safety Concerns by Age Group ( $n=250$ )

This bar chart presents the frequency of self-reported motorcycle safety concerns, such as over speeding, poor driving sense, front/backlighting issues, and side mirror faults, among different age groups of participants. The 18–25 and 26–32-year groups reported the highest rates of over speeding, while older age groups (40 and above) expressed relatively higher concern regarding driving sense and mirror-related issues.

## DISCUSSION

This study explored key risk factors contributing to motorcycle accidents among an educated population, specifically students and faculty members of Sahara Medical College. It focused on analyzing associations between rider characteristics, road conditions, and reported safety concerns such as speeding, poor driving sense, and vehicle issues. Consistent with global trends, over-speeding emerged as the predominant safety concern reported by participants, particularly among younger motorcyclists aged 18–32 years. Similar findings were observed by Kumar et al., who highlighted over-speeding as a major contributor to accidents among

younger riders due to their higher risk-taking tendencies and overconfidence on the road [7]. This behavioural pattern was also supported by Sumit et al., who reported that younger riders underestimate hazards, thereby increasing their vulnerability to accidents [10]. Interestingly, despite observable trends linking rider age to safety concerns, the statistical tests in our study showed no significant association ( $p=0.338$ ). A similar outcome was reported in a Malaysian study by Zaki et al., who identified distinct behavioural trends without statistically significant differences, suggesting widespread risky riding practices across various age groups [11]. Profession-wise analysis revealed MBBS students primarily reporting over-speeding, whereas Allied Health Sciences (AHS) students demonstrated higher concerns regarding driving sense. These findings align with previous research by Champahom et al., in Thailand, where variations in risk perception among university students were observed based on their educational background and exposure to safety training [12]. However, our findings did not show statistically significant differences ( $p=0.459$ ), similar to Nurain and Razelan's (2022) Malaysian study, which found no significant differences despite noticeable patterns [13]. The reported safety concerns varied slightly with road conditions, although again not significantly ( $p=0.518$ ). Peak hours and low visibility conditions were predominantly associated with over-speeding concerns. Similar findings were documented by Pervez et al., in Pakistan, who identified over-speeding as exacerbated by environmental factors such as dense traffic and low visibility, highlighting the importance of targeted safety measures during specific road conditions [14]. Equipment-related concerns, including issues with mirrors and lighting, were less frequently reported, especially among younger riders. Sunnud et al., investigating older Thai riders, noted that younger riders typically neglect routine maintenance and safety checks, reflecting their limited understanding of pre-ride safety protocols. This insight complements the observations from this current study [15]. Our findings support global research stressing the importance of educational programs targeted toward younger, educated populations. Rankin et al., observed positive outcomes from structured educational interventions aimed at improving riding behaviours among young adults in developed settings [16]. Such educational initiatives could be adapted effectively within academic environments like Sahara Medical College. This study had certain limitations, notably the reliance on self-reported data, which potentially led to recall bias. Similar methodological limitations were identified in recent studies conducted by Beyera et al., and McCarty and Kim emphasizing the need for observational methods or mixed-method approaches



to validate findings further [5, 17]. Additionally, the lack of gender diversity in our sample limits the generalizability of results, an issue similarly discussed by Setyowati et al., in their review of African motorcycle studies [18]. Given the global relevance of motorcycle safety and the consistency in risk factors identified across studies, educational institutions must proactively implement comprehensive safety training programs. Such interventions have proven beneficial, as demonstrated by Hussain et al., and Amodu et al., who reported reduced risky riding behaviours following targeted awareness programs in university settings [19, 20].

## CONCLUSIONS

This study identified over-speeding as the most frequently reported motorcycle safety concern among educated riders (students and faculty members). While younger age groups and certain road conditions, such as peak hours and low visibility, were associated with higher frequencies of safety concerns, no statistically significant associations were found across demographic factors, professional categories, or road conditions. These findings highlight a broad prevalence of risky riding behaviours, indicating a critical need for targeted educational interventions, improved road infrastructure, and stricter enforcement of motorcycle safety regulations within educational communities.

## Authors Contribution

Conceptualization: MH, MAS

Methodology: SK, RA, DZ, ZAB, MAS

Formal analysis: RA, DZ, ZAB, MAS

Writing review and editing: MH, SK, RA, DZ, ZAB

All authors have read and agreed to the published version of the manuscript

## Conflicts of Interest

All the authors declare no conflict of interest.

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