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Research Article

Risky-Riding Behaviors of Commercial Motorcycle Riders in Benue State, Nigeria

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Abstract-Commercial motorcycle riders' involvement in road traffic accidents has increasingly become a public health concern. The study aimed to unveil the prevalence, causes, and socio-demographic characteristics of commercial motorcyclists capable of influencing motorcycle-related accidents. The study population was 38,128 commercial motorcycle riders in Benue State involving six (6) Local Government Areas of the State. The study utilized a descriptive survey design and 412 commercial motorcycle riders (CMRs) were recruited as respondents. A self-constructed and validated questionnaire tagged - Commercial Motorcyclists' Behavioral Indexes Questionnaire (CMBIQ) was utilized for data collection. The cluster sampling technique was adopted using a multi-stage approach. Descriptive statistics, Student independent t-tests, and ANOVA statistical tools were used for data analysis. Significant influence was declared when the p-value was <0.05. Key findings of the study were: Prevalence of motorcycle-related road traffic accidents (RTAs) among CMRs in Benue State was 75.2% and the commonest cause (category) of the accidents was 37.1% due to individual human error. CMRs below the age of 30 years (<20 years - $\bar{x}$ = 3.51,σ = 0.56, p<0.05; 20 - 29 years - $\bar{x}$ = 2.61,σ = 0.86, p<0.05), no formal education ($\bar{x}$ = 3.69,σ = 0.47, p<0.05) and only Primary education ($\bar{x}$ = 2.97,σ = 0.78, p<0.05) as the highest level of educational attainment, daily income of less than ₦7,000 (<₦4,000 - $\bar{x}$ = 3.24,σ = 0.72, p<0.05; ₦4,000 - ₦7,000 - $\bar{x}$ = 2.81,σ = 0.88, p<0.05) and CMRs without alternative employment ($\bar{x}$ = 3.22,σ = 0.73, p<0.05) were observed to have significant influence on RTAs in Benue State. None (0%) of the 412 (100%) CMRs studied, received any formal counseling geared towards RTAs prevention. In conclusion, the socio-demographic characteristics of CMRs studied had a high influence on RTAs, and CMRs were not exposed to accident-prevention targeted counseling. An active public health policy ensuring persona-socio counseling might be a panacea in reducing the scourge. Being the first study in Benue State to unveil the prevalence of RTAs among CMRs and the necessity for persona-socio counseling for prevention reveals its novelty.

Article Key Information

Keywords: Motorcycle accidents, public health, Rider demographics, Road safety interventions

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1. Introduction

The use of motorcycles for commercial purposes in developing countries has significantly transformed the transportation sector, bridging socio-economic divisions. This transformation is undesirably linked with accidents that pose a growing threat to public health in those countries. Transportation of goods and services being the bedrock of rapid and modern economic, agricultural, industrial, and cultural growth and development of many countries has five identified modes: road, rail, water, air, and pipeline. Road transportation is the most common mode of transport that uses the land utilizing earth-moving articulated machines, trucks, buses, cars, motorbikes, tricycles, motorcycles, and bicycles as vehicles. According to Isa and Siyan (2016), all modes of transportation only effectively complement each other in the delivery of goods and services. Motorcycles' portability allows them to navigate poor road conditions in urban, rural, and hard-to-reach areas to be able to deliver on their mandate.

Historically, following the invention of the motorcycle in 1885 by the German engineer Karl Benz (Ridejunky; 2024), the first motorcycle accident occurred in a small town of the Irish Midlands in the year 1896 with collateral damages (Fallon & O'Neill, 2005 and Gopalakrishnan, 2012). Subsequently, motorcycle-related traffic accidents became more frequent and were observed by Nzuchi et al (2022) and WHO (2014) to be a major contributor to road traffic accidents (RTAs).

In Bangladesh South Asia, the prevalence of motorcycle-related road traffic accidents (MRRTAs) was found to be 68.66% by Miah et al (2024). In Ghana, the prevalence of MRRTAs was 74.0% (Kolan et al, 2020) while that of Cameroon was 77.4% (Wankie et al, 2021) in the years 2020 and 2021 respectively. It is worth noting that Ghana and Cameroon are countries in Nigeria's geographical neighborhood with similar socio-demographic characteristics. In Nigeria however, the national prevalence according to Adebayo et al (2023) was found to be 68.0%. The picture within the country and across the States is also varying. Ajayi et al (2017), reported 54% in Ilorin, Kwara State while Olasinde et al, (2022) recounted the prevalence of 56.6% in Owo South Western Nigeria. The prevalence of MRRTAs in Nnewi South Eastern Nigeria according to Anigwe et al (2024) 2024 was 65.2% while Lawal et al (2019) reported 63.2% in Sokoto in the year 2014. It is important to note that, the states and the national prevalence of commercial motorcycle accidents is as high as the prevalence of the neighboring countries. However, the prevalence in Benue State is not known despite few local studies in this area of public health.

Generally, the study considered human error, mechanical faults on the motorcycle, poor environmental and road infrastructure, or even the behavior of other road users as categories of causes of MRRTAs which could be solitary or composite.

Human errors such as reckless riding, high-speeding, riding under the influence of psychoactive substances, fatigue, stress, use of mobile phones while riding, and breaking of traffic rules are momentous contributors to motorcycle-related road traffic accidents especially among commercial motorcycle riders. These are reported to account for 90% of road traffic accidents the world over (WHO, 2018) and 73% in Nigeria (FRSC, 2020). Konlan et al (2022), therefore recommended a multi-sectorial measure that targets riders' behavioral change to curb the rising scourge. Mechanical faults resulting from malfunctioning chain and sprocket, worn-out tires, and failed brake systems compounded with the carrying of heavy loads and passengers could lead to loss of control, collisions, and varying degrees of physical injuries and even deaths. Konlan et al (2022), further reported that most MRRTAs were associated with mechanical faults while brake failure was observed to be the commonest fault leading to loss of control and increased risk of accidents (NHTSA, 2021).

Poor environmental conditions and poor road infrastructure are associated with MRRTAs. In Nigeria, Oluwadiya et al (2016) reported that poor road infrastructure was responsible for 35.7% of motorcycle-related accidents. Other road users such as moving or stationary vehicles, and animate objects, could be potential causes of RTAs among commercial motorcyclists. Additionally, lane splitting, reckless riding and over-taking, failure to correctly interpret road signs and riding/driving inexperience can be responsible for the accidents recorded against commercial motorcycle riders (Oluwadiya, 2016; WHO, 2018 & NHTSA, 2021).

The extreme age of riders is an important factor contributing to the increased prevalence of motorcycle-related accidents. Tumwesigye et al (2016), in their study, concluded that young riders were at great risk of being involved in motorcycle-related accidents while Olumide and Owoaje (2015), independently identified ages less than 25 years to have poor road safety practices capable of resulting in accidents. This vulnerability according to Mustapha and Faisal (2016) may have resulted from the youthful exuberance and involvement in risky-riding that easily distract them. Again, youthful exuberance and abuse of psychoactive substances by CMRs is known to contribute

to MRRTAs (Ogunmodede, 2013; Olumide & Owoaje, 2015; Tumwesigye et al, 2016; Yousif et al, 2016; Stevelee, 2017; and Borhan et al, 2018). The use of mobile phones among the CMRs is becoming an emerging safety concern that could be a determinant of RTAs (Truong & Nguyen, 2019; Widyanti et al, 2020). On the other hand, the old-aged riders may be frail in stature, and slow in coordination at critical moments of decision-making while riding. Very often, this aged population have co-morbid clinical conditions like gradual hearing and visual losses and even degenerative brain disorders that might eventually result to RTAs.

Basic education of the CMRs may be important for their operations within the safety margin to prevent unnecessary RTAs. Oyeleke and Bada (2015), observed a significant relationship between the level of education and proneness to risky-riding and road traffic accidents among CMRs. This observation was based on the fact that when riders are not educated, reading and interpreting road signs becomes a herculean task and also adversely affects their life-saving decisions while riding. This was likewise alluded to by Borhan et al (2018) and Babafemi et al (2019), that educational background influences the risky-riding behavior of motorcyclists.

The meager daily income generated by the CMRs may contribute to the growing prevalence of MRRTAs. Oyedepo et al (2016) and Gumel et al (2017), established that the daily earnings of commercial motorcycle riders are relatively meager. The unfavorable socio-economic dynamics of the riders and the task of meeting up with daily financial obligations often makes them psychologically and emotionally unbalanced predisposing them to motorcycle-related accidents. Additionally, many of the CMRs have various alternative means of livelihood which they combine to enhance their daily or monthly income earnings from the cycling business (Ayanwuyi, 2013; Adebo & Adesina, 2017). While carrying out this task of riding to meet up with unending and sometimes overwhelming financial and economic challenges, several unhealthy practices on the road are taken-up by the riders to maximize their daily earnings. Some of these unhealthy practices like high-speeding, overloading, and use of psychoactive substances may become counter-productive and may eventually result in road traffic accidents.

Road safety regulatory institutions like FRSC and Vehicle Inspection Service (VIS) in Nigeria have tried to reduce the prevalence of this menace however, the rate of MRRTAs continues to rise. Similarly, Igbudu et al (2022) observed that the CMRs business space lacks counseling facilities which have potential benefits in curbing the nuisance. A reduction in the prevalence of CMRRTAs can also be achieved when the risk factors are identified and adequately put into check (Arauja et al, 2017). It is therefore clearer, that an active public health-based multi-factorial and multidisciplinary approach in Nigeria and the West Africa sub-region, may be the panacea to the control of the scourge.

The scope of this paper therefore is limited to unveiling the prevalence, causes, and socio-demographic characteristics of the commercial motorcyclists capable of influencing motorcycle-related accidents and profiling workable solutions that will curb the scourge in Benue State and beyond.

2. Methodology

2.1 Study Area: The study was in 6 Local Government Areas (Konshisha, Vande-ikya, Makurdi, Gboko, Otukpo, and Oju) of the three Senatorial Zones (A, B, and C) of Benue State, Nigeria

2.2 Study Population: The population for the study was 38,128 registered commercial motorcyclists in Benue State (Adejoh & Uveryol, 2021). The population comprised 11,121 commercial motorcyclists from Senatorial Zone A, 16,784 commercial motorcyclists from Senatorial Zone B, and 10,223 commercial motorcyclists from Senatorial Zone C of Benue State.

2.3 Research Design: The research design for the study was a descriptive survey design.

2.4 Sample and Sampling: The sample size was 436 commercial motorcyclists which was determined using Taro Yamane's formula. A total number of 436 questionnaires were administered but only 412 were retrieved from the Commercial Motorcycle Riders for analysis. The formula for sample size estimation is as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where: N = given population (total population = 38,128), e = margin of error, 1 = constant, n = sample size. To determine the sample size (n) use this formula:

$$n = \frac{38{,}128}{1+38{,}128(5\%)^2} = 396$$

An attrition rate of 10% (40) was added to the calculated minimum sample size which became 436. However, of the 436 questionnaires administered to the duly consented (verbal and written) motorcyclists, only 412 were retrieved and analyzed for this work. A multi-stage sampling was done using the already existing three (3) Senatorial Zones as clusters. In the first stage, the three (3) Zones were all selected by purposive sampling technique. In the second stage, six (6) Local Government Areas (LGAs) of study from the three Zones were selected as subgroups using a random sampling method of lucky dip with replacement. In the third stage, the respondents were then selected from the LGAs proportionately to complete the estimated sample size based on their relative number per LGA.

2.5 Instrument of Data Collection: This was a self-structured questionnaire titled "Commercial Motorcyclists' Behavioral Indexes Questionnaire" (CMBIQ). The two (2) sections of the instrument were self-constructed and were designated as A and B. Section A included respondents' socio-demographic characteristics of the commercial motorcyclists while section B had twenty-five (25) items and sought to elicit information from the commercial motorcyclists (respondents) on how their behavior or status could influence road traffic accidents. The respondents were required to show their level of agreement as "very true of me" and "true of me" or disagreement as "untrue of me" and "very untrue of me" with the statement items in the questionnaire as they related to their personal cycling experience. The statements were close-ended with a response patterned on a four-point modified Likert Scale with: Very true of me (VT) - 1, True of me (T) - 2, Untrue of me (U) - 3 and very untrue of me (VU) - 4 which sought to elicit information from the respondents on how the individual behavior of the CMRs influence road traffic accidents. The questionnaire grossly unveiled the presence or absence as "present" or "absent" of the likely causes of accidents among the CMRs. The level of influence of CMRs to be involved in RTAs was categorized as Very High, High, Moderate, and Low influence depending on the estimated Mean scores (accident risk) from the riders' responses which was determined by the formula: Mean score = (sum of scores)/(number of items). Mean scores ($\bar{x}$) of 4.00 - 3.25 are considered Very High Influence, $\bar{x}$ of 3.24 - 2.50 as High Influence, $\bar{x}$ of 2.49 - 1.75 as Moderate Influence, and $\bar{x}$ of 1.74 - 1.00 as Low Influence (Guimba & Alico; 2015).

2.6 Instrument Validation and Reliability: The questionnaire (CMBIQ) underwent facial, content, and construct validation by experts with a reliability Cronbach's alpha value of 0.891. The experts for validation were drawn from different fields/departments including measurements and evaluation, educational foundations, and surgery departments of Benue State University, Makurdi.

2.7 Method of Data Analysis: Descriptive and inferential statistics of independent t-test and ANOVA were used as statistical tools for data analysis using Statistical Package for Social Sciences (SPSS) version 26. The decision criterion was p-value set at 0.05.

2.8 Ethical Considerations: The Benue State University, Makurdi approved of the work and the individual motorcyclists consented (verbal and written) before questionnaires were administered to them for data collection. The used data is available.

3. Results and Interpretation

3.1 Results

Self-reported Motorcycle Road Traffic Accidents among CMRs in Benue State were 310 (75.2%) while 102 (24.8%) had no accidents. All (412; 100%) of the CMRs studied did not receive any formal counseling geared towards RTA prevention.

Table 1: Frequencies and Percentages of Road Traffic Accident Causes (Categories) among Commercial Motorcyclists

Causes of Accidents (Categories)	n*=310	Percent. (%)
Individual human error	115	37.1
A mechanical fault on the motorcycle	71	22.9

Poor environmental/Road infrastructure	36	11.6
The fault of another road user	88	28.4

n* *is the total number of CMRs who had accidents. N =412*

The commonest cause of RTAs among CMRs was due to *"Individual human error"*.

Table 2: Mean Analysis of Causes (Risky-Riding Behavior Assessment) of RTA among Commercial Motorcyclists

Item	Mean ($\bar{x}$)	SD (σ)	Remark
Pick more than one passenger on the bike	2.89	1.17	Present
Usually beat traffic when in haste	2.95	1.17	Present
Overtake vehicles and other motorcycles at road bends	2.92	1.16	Present
Ride at high speed (usually more than 50Km/hr)	2.95	1.14	Present
Rarely check the left and right sides before crossing roads	2.47	0.99	Absent
Carry heavy loads at the front of my motorcycle	2.54	0.92	Present
Rarely clear off the road to the parking space before picking up a passenger	2.61	0.87	Present
Hardly indicate the intended direction of turn (using the motorcycle traffic indicator) before stopping by the roadside	2.56	0.96	Present
Rarely indicate the intended direction of the road to follow	2.60	1.01	Present
Take psychoactive substances/drugs before setting out to ride	2.57	0.93	Present
Make use of my cellular phone while riding	2.98	1.13	Present
Ride to make up for the daily financial target even when tired	2.30	0.94	Absent
Ride at top speed on smooth roads	2.38	0.95	Absent
Speed breakers on the roads do not necessarily reduce motorcycle speed	2.48	1.01	Absent
Potholes on the roads are navigated without necessarily reducing the speed	2.48	1.02	Absent
Wet clay-graded roads are navigated successfully without necessarily reducing the speed	2.62	0.90	Present
Even dusty un tarred roads are successfully navigated without necessarily reducing the speed	2.59	0.95	Present
Hardly observe road signs while riding	2.48	1.03	Absent
Ride sometimes at night with poor lighting	2.37	0.99	Absent
Ride sometimes despite suboptimal brake system function	2.26	0.94	Absent
Sometimes copes with a malfunctioned sprocket on the motorcycle to meet the daily financial target	2.35	0.93	Absent
Hardly look through the side mirrors when riding	2.95	1.17	Present
Hardly blow a horn before overtaking vehicles	2.93	1.16	Present
Hardly change the tires of the motorcycle until they are completely worn out	2.94	1.16	Present
Sometimes ride on roads encroached by street hawkers who further make them narrow	2.92	1.14	Present

Mean ($\bar{x}$); SD (σ)= Standard Deviation

Overloading, beating of traffic regulations, high-speed riding, and indiscriminate turning, stopping, and parking were the commonest causes of RTA.

Table 3: Detailed Analysis of Socio-demographic Characteristics of Risky-Riding Behaviors (causes of RTA) among Commercial Motorcyclists

Socio-demographics	n=412 (%)	Mean	F(3,408) t (410)**	p-value	Remark
*Age (years):					
< 20	98 (23.8)	3.51	104.81*	p<0.001	Very High Influence
20 - 29	144 (35.0)	2.61			High Influence
30 - 39	95 (23.0)	1.79			Moderate Influence
>40	75 (18.2)	1.71			Low Influence
*Level of Education:					
No formal education	65 (15.8)	3.70	149.82*	p<0.001	Very High Influence
Primary	143 (34.7)	2.97			High Influence
Secondary	118 (28.6)	1.80			Moderate Influence
Tertiary	86 (20.9)	1.69			Low Influence
*Daily Income (₦)					
< 4,000	131 (31.8)	3.24	105.88*	p<0.001	High Influence
4,000 - 6,900	113 (27.5)	2.81			High Influence
7,000 - 9,900	160 (38.8)	1.66			Low Influence
> 10,000	8 (1,9)	1.88			Moderate Influence
*Alternative Employment Status:					
No	198 (48.1)	3.22	18.65**	p<0.001	High Influence
Yes	214 (51.9)	1.79			Low Influence

** Analysis with ANOVA; ** Analysis with student independent t-test; Naira (₦)*

All the socio-demographic variables of the CMRs were potential influencers of being involved in RTAs.

3.2 The Influence of age on road traffic accidents among the CMRs

Table 3 shows CMRs (respondents) below 30 years (242; 58.8%) had high influence on risky-riding behavior that may result to RTA (Figure 1). One-way ANOVA revealed significant influence of age on risky-riding behavior of commercial motorcyclists and involvement in RTA: $F(3,408) = 104.81$, $p < 0.001$. Tukey's HSD post hoc test (Appendix A) showed that CMRs below 30 years had significant influence on risky-riding behavior and involvement in RTA.

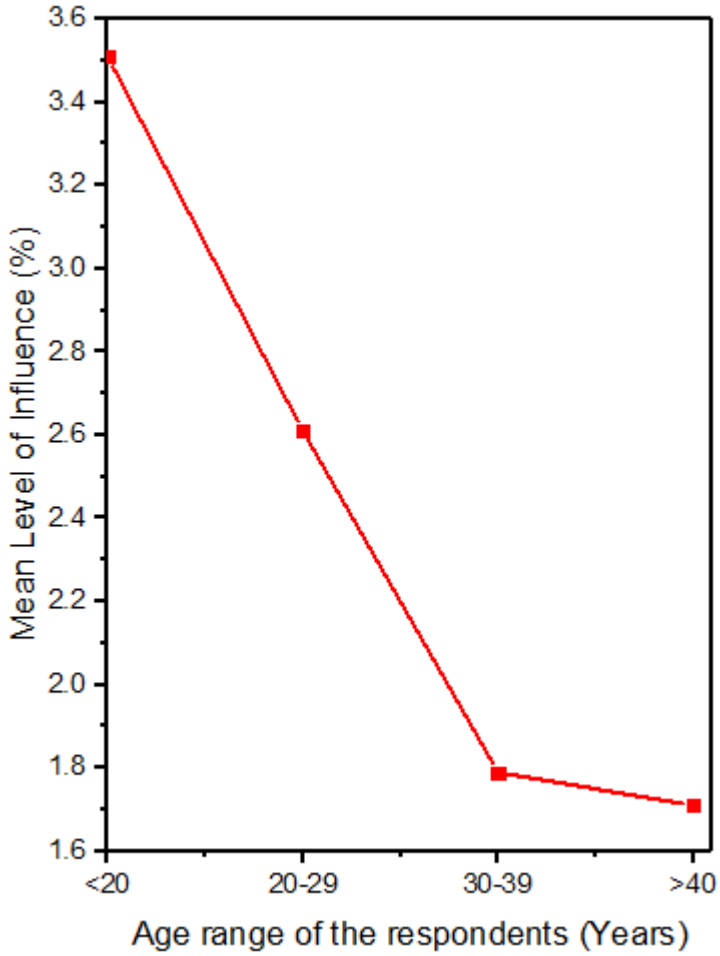

Figure 1. Age Ranges of Respondents vs Mean Level of Influence

3.3 The influence of level of education on road traffic accidents among the CMRs

Table 3 showed that more than half (208; 50.5%) of the CMRs' highest educational attainment was either 'no formal education' or 'primary education'. Table 3 and Figure 2 also revealed that the higher the level of educational attainment of a CMR, the less likely his riding behavior will be risky. One-way ANOVA revealed a significant influence of age on RTAs among the CMRs, $F(3,408) = 149.82$, $p < 0.001$. Tukey's HSD post hoc test (Appendix B) showed that only CMRs who had 'no formal education' and those with 'primary education' had significant influence on risky-riding behavior and involvement in RTA.

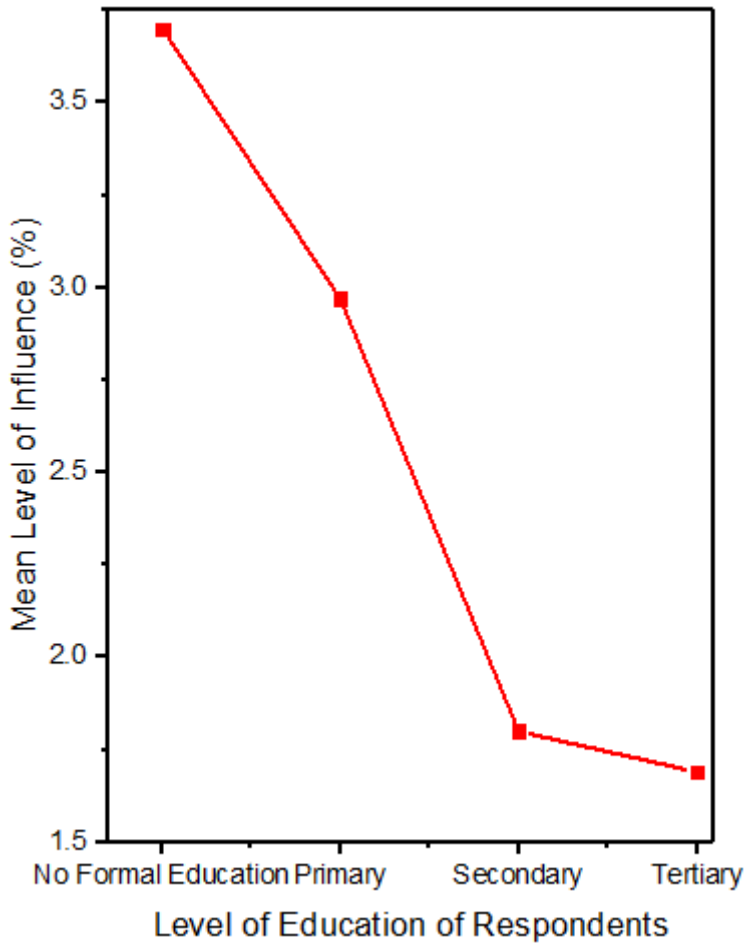

Fig 2. Level of Education of Respondents vs Mean Level of Influence

3.4 The influence of daily income on road traffic accidents among the CMRs

Table 3 showed that more than half (244; 59.3%) of the CMRs had a daily income of less than ₦7,000. Table 3 and Figure 3 revealed that CMRs whose daily income was less than ₦7,000 had higher influence on risky-riding behavior that may result to RTA than CMRs whose daily income was above ₦7,000. From Tukey's HSD post hoc test analysis (Appendix C), only CMRs with daily income <₦7,000 had significant influence on risky-riding behavior and involvement in RTA.

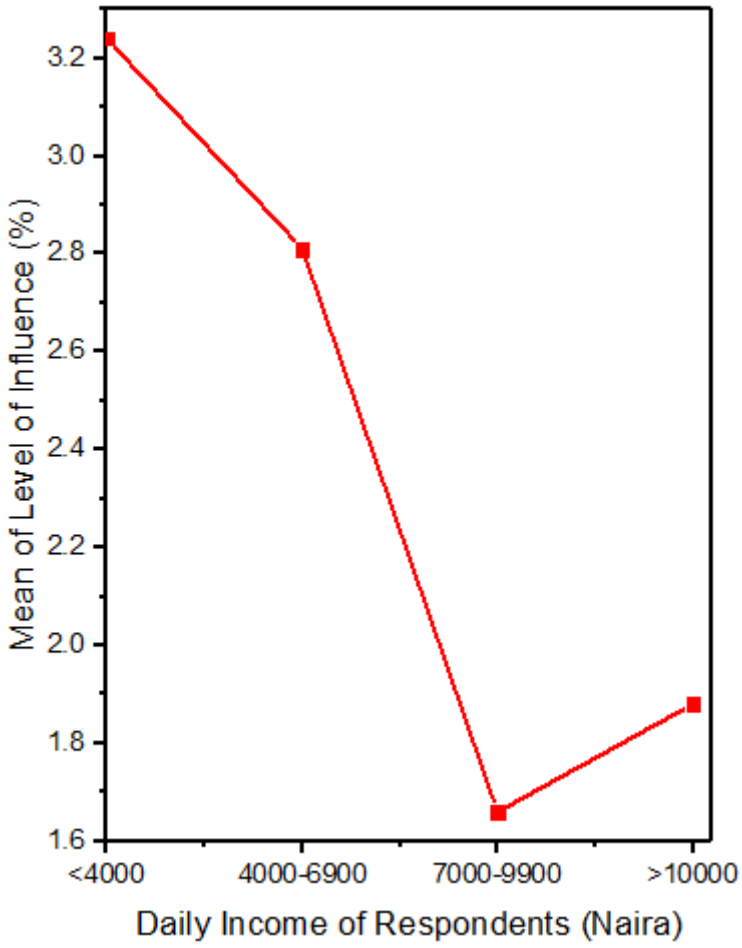

Figure 3. Daily Income of Respondents vs Mean of Influence

3.5 Influence of alternative employment status on road traffic accidents among the CMRs

Table 3 revealed more than half (214; 51.9%) of CMRs had other jobs (alternative) aside from commercial cycling. The Table also showed that CMRs without an alternative job coupled with the motorcycling business were very likely to have a risky-riding behavior that may result to RTA. The student independent t-test analysis (Table 3) revealed a significant ($p<0.05$) influence of alternative employment status on RTA. However, CMRs with no alternative employment scored significantly higher on risky-riding of motorcycles ($\bar{x}$ = 3.22) and were more predisposed to motorcycle-related accidents than those with alternative employment ($\bar{x}$ = 1.79).

4. Discussion of Findings

General findings from this study revealed the prevalence of road traffic accidents (self-reported) among the CMRs to be 75.2%. The study also revealed that most 115 (37.1%) of the self-reported accidents were due to individual human errors and less likely due to 'fault of another road user', 'mechanical fault on the motorcycle', and 'poor environmental/road infrastructure'. Self-reported data and exclusion of some CMRs doing business in crises prone areas would have influenced the reported prevalence. The high prevalence of MRRTAs from this study corroborated with studies done by Wankie et al (2021) and Konlan et al (2020) who independently reported high prevalence rates of commercial motorcyclists in Cameroon and Ghana respectively. The reported prevalence in this study was observed to be higher than the national prevalence as reported by Adebayo et al (2023) in their study among CMRs in Nigeria. Within Nigeria, this prevalence was marginally higher than that in the South-East, North-West, and South-West as reported by Anigwe et al (2024), Lawal et al (2014), and Olasinde et al (2022) respectively. The high population of young commercial motorcycles less than 30 years old, and the large number of CMRs with low levels of education and poor daily income may explain the high prevalence rate of accidents found in the study (Table 3).

The study revealed "individual human error" as the commonest cause (category) of RTAs among CMRs (Table 1). Overloading, beating traffic regulations and high-speed riding were some of the risky-riding behaviors that constituted "individual human error" (Table 2). This finding agreed with those of WHO (2018) and FRSC (2020) that human error was a momentous contributor to motorcycle-related road traffic accidents among CMR accounting for most road traffic accidents in Nigeria and the world over. The high population of CMRs who were less than 30 years old (Table 3) are generally known to be risk-takers even while riding and are likely to indulge in activities (Table 2) that could lead to road traffic accidents thereby justifying the high prevalence rate reported by this study. The study further revealed that the commonest risky-riding behavior (as causes) of commercial motorcyclists associated with road traffic accidents were: the use of a cellular phone while riding, riding at high speed, and beating traffic signs and regulations when in haste (Table 2). These study findings agreed with those of many independent studies by Tumwesigye et al (2016), Borhan et al (2018), Widyanti et al (2020), and FRSC (2020) that high speeding and the use of mobile phones by CMRs could result to RTAs. The beating of traffic signs and regulations by commercial motorcyclists as causes of RTA were also upheld by Babafemi et al (2019).

Commercial motorcyclists less than 30 years of age accounted for more than half of the population studied (Table 3) and were observed to have a high influence of being involved in risky-riding behaviors that could result to RTA. Table 3 and Figure 1 showed that the population of the CMRs who were less than 30 years old were more prone to risky-riding behaviors that could result to RTA and the population thinned out as their ages increased. The above findings agreed with the independent study findings of Olumide et al (2015) and those of Tumwesigye et al (2016) that young commercial motorcycle riders were more at risk of being involved in risky-riding behaviors that could result to RTA than the older CMRs. The findings of this study further corroborated those of Ogunmodede et al (2013) and Lawal et al (2019) that young CMRs were also prone to MRRTAs and with a high prevalence rate similar to the prevalence reported in the index study. The reason for this age group's predilection and vulnerability may be that young people are usually adventurous and may be involved in risky-riding behaviors and are easily distracted when riding.

The level of education of commercial motorcyclists was found to have significant influence on road traffic accidents (Table 3). Additionally, Table 3 and Figure 2 revealed that CMRs with 'no formal education' or only 'primary education' as the highest level of educational attainment were likely to be involved in risky-riding behaviors that could result to RTA. The implication is that CMRs with at least secondary education were less likely to be involved in in risky-riding behaviors that could result to RTA. These findings were also consistent with those of Borhan et al (2018) and Babafemi et al (2019), who reported that the more educationally disadvantaged a CMR is, the more prone such a rider is to being involved in motorcycle-related road traffic accidents. It was observed that the age range (20 - 29 years) with the highest population (Table 3) was the learning (schooling) population expected to be in the tertiary institutions of learning but unfortunately, this is not so.

The daily income of commercial motorcyclists was shown to significantly influence risky-riding behaviors of CMRs that could result to road traffic accidents (Table 3). Furthermore, Table 3 and Figure 3 showed that CMRs with daily income of less than ₦4,000 and between ₦4,000 - ₦6,900 had the likelihood of being involved in risky-riding behaviors that could result to RTAs. The implication here is that CMRs whose daily income is less than ₦7,000 are likely to be involved in RTAs. These findings were consistent with those of Gumel et al (2017) who concluded in their study that CMRs' meager daily incomes predisposed them to be involved in road traffic accidents. This meager daily income from CMRs had been corroborated by the findings of Oyedepo et al (2016) who also established that the daily income was observed to be dependent on the resilience of an individual rider. The required resilience may be the reason why most of the riders were young people below the age of 30 years (Table 3) to be able to cope with the adjoining stress of the job. It is important to note however that in the face of the current economic and financial realities with associated inflation where there may be obvious changes in motorcycle transport fares, conducting another study will be important to explain the variations.

The study also revealed that the alternative employment status of commercial motorcyclists had a significant influence on being involved in road traffic accidents. It further observed that more than half of the CMRs had alternative employment (Table 3) which was expected to complement their daily income from their motorcycle business. The finding was also consistent with the findings of a study done by Olumide and Owoaje (2015), who reported that the majority of the CMRs studied had alternative jobs they were doing aside from the motorcycle business. The meager daily returns from the business may be the reason why most of the CMRs have alternative jobs as alluded to by Gumel et al (2017).

An active public health policy from the Government of Benue State through regulatory institutions like FRSC and VIS by ensuring adequate counseling is a necessity for CMRs as this might be a panacea in reducing the scourge.

The novelty of the study is in being the first to unveil the prevalence of RTAs among CMRs in Benue State and the necessity for counseling for accident prevention.

5. Conclusion and Recommendations

5.1 Conclusion

The self-reported prevalence of commercial motorcycle-related road traffic accidents in Benue State was 75.2 %. The commonest cause (category) of the accidents was due to 'individual human error' and the use of cellular phones, high speeding and beating of traffic signs and regulations were the commonest risky-riding behaviors associated with road traffic accidents among commercial motorcyclists. CMRs below the age of 30 years, with 'no formal education' and only 'primary education' as the highest level of educational attainment, daily income of less than ₦7,000, and those without alternative employment were observed to have a high influence on risky-riding behaviors that could result to road traffic accidents in Benue State. Despite the revealing high burden of accidents reported in this study, none of the CMRs studied, received any formal counseling geared towards RTA prevention during their riding career. Integration and enforcement of periodic FRSC and VIS-facilitated counseling among the CMRs by the Benue State government might be the panacea to curb this public health menace and enhance road safety in the transportation section.

5.2 Limitations

The study relied on self-reported data from the individual CMRs.

5.3 Recommendations

Based on the findings of the Study, the following recommendations were made:

i. The government through the Ministry of Transport should engage the road safety regulatory institutions like FRSC and Vehicle Inspection Service (VIS) to ensure traffic rules are duly observed by all road users including CMRs. They should also ensure offenders are corrected, appropriately fined, and/or have their licenses temporarily revoked. The revoked license should then be given back after providing evidence of having received appropriate counseling. Installation of CCTV cameras at strategic roads and road junctions could help with monitoring.

ii. The government through regulatory institutions like FRSC should raise the minimum riding age and license from 18 years to 20 years. The requirement of a birth certificate or declaration of age for licensing will facilitate the implementation.

iii. The government through road safety regulatory institutions like FRSC in conjunction with the Commercial motorcycle rider's Association should ensure that the minimum educational attainment of prospective commercial riders as a prerequisite to licensing be secondary education. They should also encourage as many members to be enrolled in learning institutions (as appropriate) to have formal education and to ensure compulsory periodic refresher training on basic road safety education. The government should have designated driving schools in each Local Government area to support this application.

iv. Commercial motorcycle rider's association in Benue State should periodically encourage their members to start small and medium-scale businesses to support them and their dependents. The Government can facilitate the issuance of small and medium-scale loans for the riders.

v. The government through the road safety regulatory institutions should partner with counseling institutions in the State University and professional counseling bodies to ensure periodic persona-socio counseling (also as a prerequisite for licensing) to all members of commercial motorcycle rider's association in the State. The counseling unit or department of the university can create counseling offices either in the proposed driving schools or integrated into the association's branch offices across the state.

vi. The government through road safety regulatory agencies can make provision for periodic CMR-training programs targeting road traffic accident prevention by partnering with Non-Governmental Organizations. Radio/television and social media can be used as platforms for information dissemination in the prevention of road accidents.

vii. The findings above can also be used for road traffic accident prevention among CMRs in other States and countries with similar socio-economic characteristics thereby improving public health and safety on their roads.

Declarations

Ethical Approval and Consent to Participate:

This study was approved by the Department of Human Kinetics and Health Education, Benue State University Makurdi. Verbal and written informed consent were obtained from all participants before data collection. The study was done transparently.

Consent for Publication:

All authors consent to the publication of this manuscript and confirm that the work is original, has not been published elsewhere, and is not under consideration for publication elsewhere.

Competing Interests:

The authors declare no competing interests related to this study.

Funding:

This study did not receive any specific funding.

Data Availability:

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' Contributions:

Igbudu TJ, Iorvaa T, Ityodugh IJ: Conceptualization, methodology, and manuscript drafting.
Zwawua OS, Igbudu TJ: Data collection, analysis, and figure preparation.
Igbudu TJ, Egwuda L, Igbudu EJ, Akpehe AG, Rimamnura NG, Omolabake BI, Ervihi-Uva L: Literature review and critical manuscript revision.
All authors read and approved the final manuscript

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Appendices:

Table A

Tukey's HSD post hoc test (Age Ranges);n=412

Age range of Respondents (years)	Age range of Respondents (years)	Mean Difference	Std. Error	p-value	95% Confidence Interval	
					Lower boundary	Upper boundary
< 20	20 – 29	0.87132	0.10413	0.000	0.5952	1.1474
	30 - 39	1.67863	0.11450	0.000	1.3751	1.9822
	> 40	1.85687	0.12200	0.000	1.5334	2.1803
20 – 29	< 20	-0.87132	0.10413	0.000	-1.1474	-0.5952
	30 - 39	0.80731	0.10511	0.000	0.5286	1.0860
	> 40	0.98556	0.11324	0.000	0.6853	1.2858
30 – 39	< 20	-1.67863	0.11450	0.000	-1.9822	-1.3751
	20 - 29	-0.80731	0.10511	0.000	-1.0860	-0.5286
	> 40	0.17825	0.12283	0.885	-0.1474	0.5039
> 40	< 20	-1.85687	0.12200	0.000	-2.1803	-1.5334
	20 - 29	-0.98556	0.11324	0.000	-1.2858	-0.6853
	30 – 39	-1.17825	0.12283	0.885	-0.5039	0.1474

Table B

Tukey's HSD post hoc test (Level of Education); n=412

Level of Education of the Respondents	Level of Education of the Respondents	Mean Difference	Std. Error	p-value	95% Confidence Interval	
					Lower Boundary	Upper Boundary
No formal education	Primary	0.72028	0.10919	0.000	0.4308	1.0098
	Secondary	1.89570	0.11275	0.000	1.5968	2.1946
	Tertiary	2.00626	0.11997	0.000	1.6882	2.3243
Primary	No formal education	-0.72028	0.10919	0.000	-1.0098	-0.4308
		-1.17542	0.09078	0.000	-0.9347	1.4161

	Secondary	1.28598	0.09960	0.000	1.0219	1.5500
	Tertiary					
Secondary	No Formal Education	-1.89570	0.11275	0.000	-2.1946	-1.5968
	Primary	-1.17542	0.09078	0.000	-1.4161	0.9347
	Tertiary	0.11056	0.10349	1.000	-0.1638	0.3849
Tertiary	No Formal Education	-2.00626	0.11997	0.000	-2.3243	-1.6882
	Primary	-1.28598	0.09960	0.000	-1.5500	-1.0219
	Secondary	-0.11056	0.10349	1.000	-0.3849	-0.1638

Table C

Tukey's HSD post hoc test (Daily Income);n=412

Level of Daily Income of Respondents (₦)	**Level of Daily Income of Respondents (₦)**	**Mean Difference**	**Std. Error**	**p-value**	**95% Conf. Interval**	
					Lower Boundary	**Upper Boundary**
< 4,000	4,000 - 6,900	0.43897	0.10187	0.000	0.1689	0.7090
	7,000 - 9,900	1.58802	0.09349	0.000	1.3402	1.8359
	> 10,000	1.36927	0.28897	0.000	0.6032	2.1354
4,000 - 6,900	< 4,000	-0.43897	0.10187	0.000	-0.7090	-0.1689
	7,000 - 9,900	-1.14906	0.09750	0.000	0.8906	1.4076
	> 10,000	0.93031	0.29029	0.009	0.1607	1.6999
7,000 - 9,900	< 4,000	-1.5 8802	0.09349	0.000	-1.8359	-1.3402
	4,000 - 6,900	-1.14906	0.09750	0.000	-1.4076	-0.8906
	> 10.000	-0.21875	0.28746	1.000	-0.9809	0.5434
> 10,000	< 4,000	-1.36927	0.28897	0.000	-2.1354	-0.6032
	4,000 - 6,900	-0.93031	0.29029	0.009	-1.6999	-0.1607
	7,000 - 9,900	-0.21875	0.28746	1.000	-0.5434	0.9809