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The Ember Months: A Dark Time for Road Safety in Nigeria?

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Abstract

Road Traffic Crashes (RTC) are known to exhibit various trends which are attributed to various factors such as the climatic seasonal changes and particular time periods, such as ember months (September, October, November, and December). This study explored the potential interaction between ember months and seasons concerning crash rates. Data on crash rates for 96 months (January 2014-December 2021) were extracted from the records at the Federal Road Safety Corps (FRSC), Headquarters Office, Abuja, and the dataset was organised based on the two independent variables: ember months and seasons (Wet/Dry). A two-way ANOVA was performed to analyse the main effects of both factors and examine whether there was an interaction effect between them. The results of the two-way ANOVA showed no significant interaction effect between ember months and seasons regarding traffic crash rates. However, significant main effects were observed for season (Wet/Dry) but with no significant main effect for specific months (Ember/non Ember). It was concluded that season has a statistically significant impact on crash rates, while ember months do not show a significant influence on crash rates. While the number of crashes does not appear to be significantly affected by the ember months, it is recommended that it is still important the Federal Road Safety Corps consistently enforce traffic laws and road safety measures all year long to maintain standards of safety.

Key findings

- Road Traffic Crashes (RTC) do not occur more in Ember than in non-Ember months
- The variation in RTC cases is more affected by the seasonal factor
- Data for more years disaggregated for the various climatic zones may be explored to firmly establish the effects of ember months and season

Introduction

The problem of road traffic Crashes (RTCs) has attracted considerable attention in the literature as it has reached epidemic proportions, responsible for 1.19 million deaths globally (WHO, 2023). Agbonkhese et al. (2013) and Reuben (2021) had earlier observed that Nigeria had the second-highest road crash rate of any country. In Nigeria, crashes in the third quarter of 2023 resulted in 1,323 deaths and caused injuries to 9,116 people (NBS, 2024).

"Ember months" are the final four months of the calendar year, from September to December that are noted for increased travel in Nigeria to visit relatives and friends to celebrate a number of religious and cultural festivals (e.g., Independence Day, Eid al-Mawlid, Christmas). The impact of ember months and weather conditions on road traffic crashes have been extensively studied with conflicting results. Some studies suggest that the risk of crashes is higher during the ember months while others argue that road traffic crashes increase during rainy or dry seasons. An earlier study by Jegede (1988) in Oyo State showed in Nigeria a consistently high RTC cases in four months of the year of which three were ember months, that is March, September, November and December. Later studies by Ukibe et al.

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(2011) at Owerri and Adamu and Elijah (2018) in Bauchi found that the highest peak of RTCs were all in the ember months of September to December.

On the other hand, a study in Rivers State by Owunari et al. (2019) using RTC data from January 2010 to December 2017 found that road crashes within the study area occurred any time of year and not only during specific seasons and concluded that the RTC data of Rivers State is non-seasonal contrary to the general belief that crashes are seasonal. Onyemaechi (2020) at the University of Nigeria Teaching Hospital, Enugu found that traffic crashes were more frequent in the months of January, April and December. From these studies, ideas began to emerge that the impact of ember months on RTC is ambiguous. It could not be concluded from these observations that higher crash rates occur more in the months of September to December. A further literature search beyond Nigeria tends to suggest that the ember month syndrome is peculiar to Nigeria. Findings by foreign researchers majorly link surge in RTCs to climatic conditions. In a study in the United States, Sivak (2009) observed a systematic seasonal variation in road fatality rates, with the highest rate in October and the lowest rate in March, and concluded that the observed seasonal variation in road fatality rates is likely the outcome a combined influence of several factors, which in turn show seasonal variations (e.g., duration of darkness, alcohol consumption, proportion of older drivers, frequency of leisure driving and bad weather). In a similar study, Edwards (1999) observed that in the UK, seasonal patterns of weather-related road crashes coincide with the occurrence of hazardous conditions, with regional variations in weather patterns evident in crash data.

On the impact of weather, the work of Mohammadian et al. (2015) in Iran highlights the relationship between weather-related traffic crashes and hazardous climatic conditions, with regional differences observed in crash data. Dangerous weather factors that predispose commuters to RTC include lower temperatures, more days with heavy fog, lower precipitation, and lower wind speeds (Zhao et al., 2019). Similarly, Sangkharat (2021) reported a significant increase in traffic crashes due to high levels of rainfall in both southern and northern provinces of Thailand.

Some studies on the impact of weather on RTCs in Nigeria have also been conducted. In a study by Nzoiwu and Ifeanyi (2017), it was discovered that the month of June consistently experiences a high number of recorded road crashes, indicating that wet periods are a significant risk factor for RTC. However, other studies show little or no correlation between the time of year and RTC. On the other hand, Osarumwense's (2013) study in Kogi State, which analysed data from January 1997 to December 2010, found no seasonal variations in traffic crashes. This suggests that there is no recurring pattern in the occurrence of road traffic crashes. However, other researchers have reached a different conclusion. Oyenuga et al. (2016) found that holiday months lead to higher crashes and fatalities due to the increased travel required for various festivities. This is due to the increased economic activity during these periods that prompted traders to travel more frequently to source and sell goods. Additionally, transport companies aim to make as much money as possible by transporting passengers (Kuye & Olufemi, 2022; Omobowale et al., 2011). Ember months are characterised by a lot of group travels, festivities, drinking, speeding, reckless driving resulting in increased road traffic crashes.

An added dimension to the causal factors of road crashes is the very disturbing observation of the strong belief in some cultures that road crashes are caused by evil people. As observed by Kayani et al. (2017), even when all precautionary measures are taken to prevent crashes, some people believe they will not work because of evil powers. Therefore, some people adopt their own "safety measures" like amulets perceived to be capable of neutralising the evil powers. Similarly, in Nigeria, the last four months of the years are associated with disasters. As noted by Omobowale et al. (2011) the perceived fear of these "ember" months has become a reality. The authors further observed that the last three letters of September, October, November and December i.e. "ber", which gives a linguistic sound of "ba" (damage or spoil) in the local Yoruba language in South-West Nigeria accentuates the meanings of destruction and calamities attached to ember months.

From the reviewed literature there are inconsistencies in the findings because most of the studies were limited to data from a particular hospital (Onyemaechi, 2020), a particular road section (J. U. Odinfono et al., 2020), or a particular region of a country (Olawole, 2016; Osarumwense, 2013). There is also a significant gap in understanding how the interaction of the two factors – ember months and climatic seasons – may impact the frequency and severity of RTCs. This study investigated this gap by examining the combined effects of the ember period (supposedly evil-laden months in some cultures) and seasonal variations on road safety and thus set out to test the hypothesis (H_O) that there is no statistically significant difference in RTC cases between Month Classification (Ember/non-Ember months) and season (Wet/Dry).

The Study Area

Nigeria is located in West Africa and occupies an area of about 924,000 km^2. The last official Census figure in 2006 put the population at 140,003,542 while current estimated population is 228,408,983 (Worldometer, 2024). The ICRC (2024) reported that the country has about 195,000 km road network out of which only about 60,000 km is paved. As at the fourth quarter of 2018, the estimated total vehicle population in Nigeria was 11,826,033 with vehicle per 2018 population ratio at 0.06.

Method

Data for this analysis was manually extracted from the various Annual Reports of the Federal Road Safety Corps' Office Headquarters, Abuja for the entire 36 States of the Federation and the Federal Capital Territory (FCT) for the period from January 2014 to December 2021 covering 96 months. Two other variables were then created from the

Figure 1. Nigeria in the context of Africa and West Africa

months by partitioning the months first into Ember (September, October, November and December) and non-Ember months (January to August) and labelled "Monthclass" and secondly into Wet (April to October) and Dry (November to March) seasons labelled "Season". Even though the length of wet and dry season varies across the country, April to October and November to March are regarded as the wet and dry season months respectively for the purpose of analysis (World Bank, 2021).

A two-way Analysis of Variance statistical method was adopted to test for difference of means in RTC cases as the dependent variable and two nominal variable – Monthclass and Season as the fixed factor variables. The RTC cases were checked for normality assumption and the histogram displayed with normal curve superimposed showed that the data approximates the normal curve. DATAtab online statistical package (DATAtab Team, 2023) was used to analyse the data.

Results

Annual variations in RTC cases

Despite all the road safety measures put in place including the annual road safety campaigns by the Federal Road Safety Corps, there still persists an upward trend in RTCs in Nigeria. Mean monthly RTC cases increased from 865 in 2014 to 923 in 2019, 990 in 2020 and 1077 in 2021 even though there was a decrease to 782 in 2017 as shown in Table 1.

Spatial variation of Road Traffic Crashes

Of the 2,717 RTC cases recorded in the fourth quarter of 2023 (NBS, 2024), the highest cases generally were recorded in the North-Central and the South-West while the lowest cases were recorded in the North-East, North-West and the South parts of Nigeria (Figure 2).

Temporal Pattern of RTC (2014-2018)

Figure 3 reveals a nearly stable RTC trend from Month 1 (January 2014) up to month 60 (December 2018) from where a general upward trend becomes visible.

Mean monthly and seasonal RTC variations

The behaviour of the RTC cases was examined during the Ember and non-Ember months and between the Wet and Dry seasons. From Table 2, the mean monthly RTC data shows that the highest cases occurred in December (Ember dry month, mean cases 1091.5), January, March (non-Em-

Table 1. Descriptive Statistics of Annual RTC Cases (2014 – 2021)

Year	Mean monthly RTC cases for Nigeria	Std Deviation	Minimum average recorded RTC in a month	Maximum average recorded in a month
2014	865	99.319	702 (July)	1059 (January)
2015	811	88.185	636 (November)	910 (January)
2016	803	64.832	715 (October)	903 (December)
2017	782	102.263	607 (September)	928 (January)
2018	812	122.153	668 (October)	1107 (December)
2019	923	134.633	716 (February)	1260 (December)
2020	990	229.113	584 (April)	1422 (December)
2021	1077	114.737	940 (September)	1355 (December)

Note: Mean values rounded to the nearest whole number.

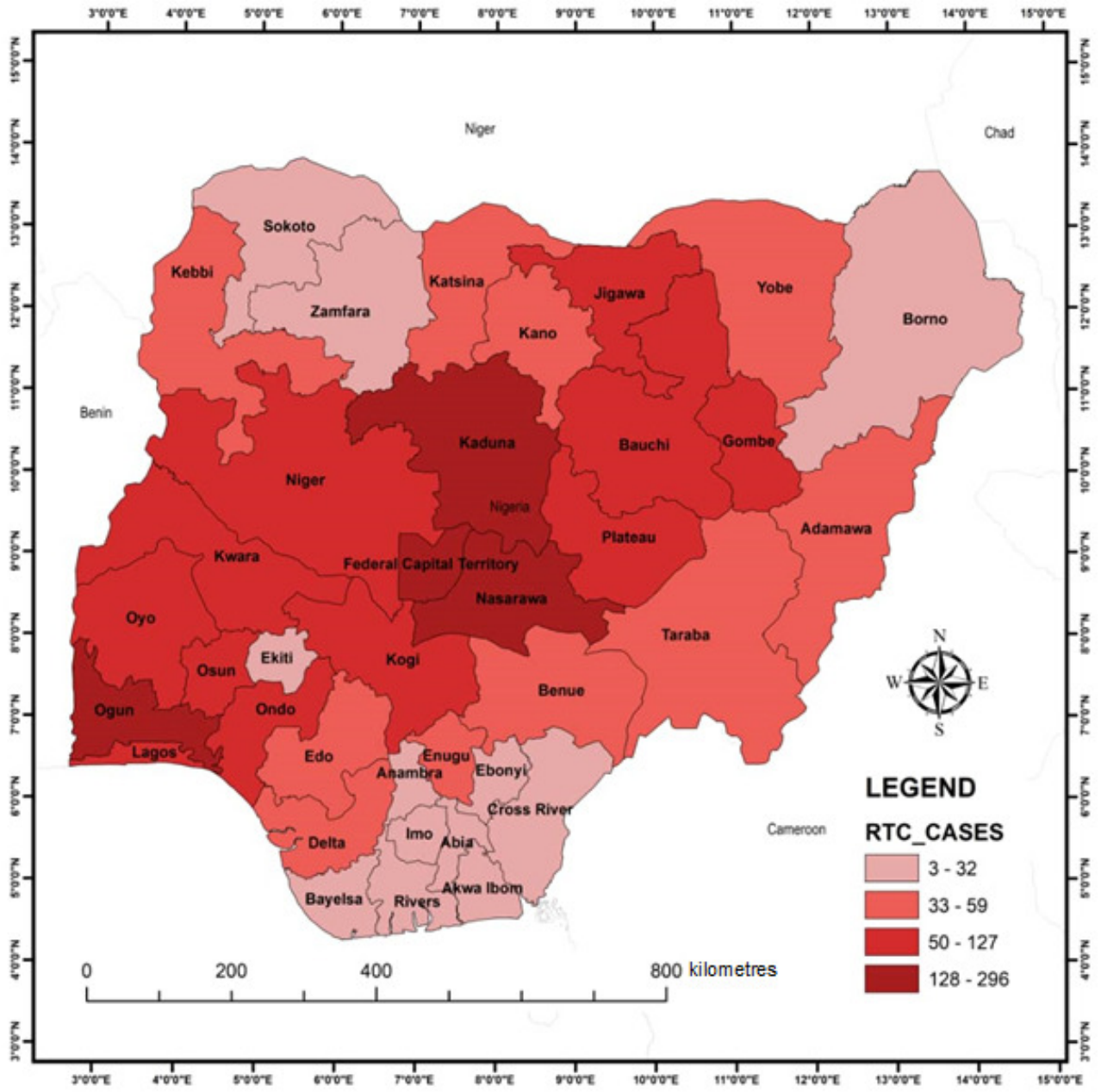

Figure 2. Spatial distribution of RTC cases in Nigeria

Source: Internally developed based on RTC data

ber 939, dry months 909.5 cases), April and August (non-Ember 879,888, wet months 878.38 cases). This observation shows that spikes in RTC cases are not limited to the Ember months alone.

Road Traffic Crashes in Ember/Non-Ember Months and Seasons

The Ember months recorded the highest mean RTC cases of 888 (Md = 873, SD = 200) compared to 880 (Md = 870, SD = 134) for non-Ember months with ember months showing the highest variability as indicated by the standard deviation value. However, the overall highest mean RTC cases (M = 931.19, MD = 909.5, SD = 177.2) occurred during the Dry season compared to the Wet season (M =834.35, MD = 822.5, SD = 119.81). A cursory look at the maximum monthly values column in Table 3 shows that the highest monthly value (1422) for RTC cases occurred in the Dry Ember month thus suggesting the influence of season of the year.

Hypothesis Testing

As shown in Table 3, in comparison to Non-Ember months and the Wet season, respectively, the Ember month that falls within the Dry season recorded a higher mean and me-

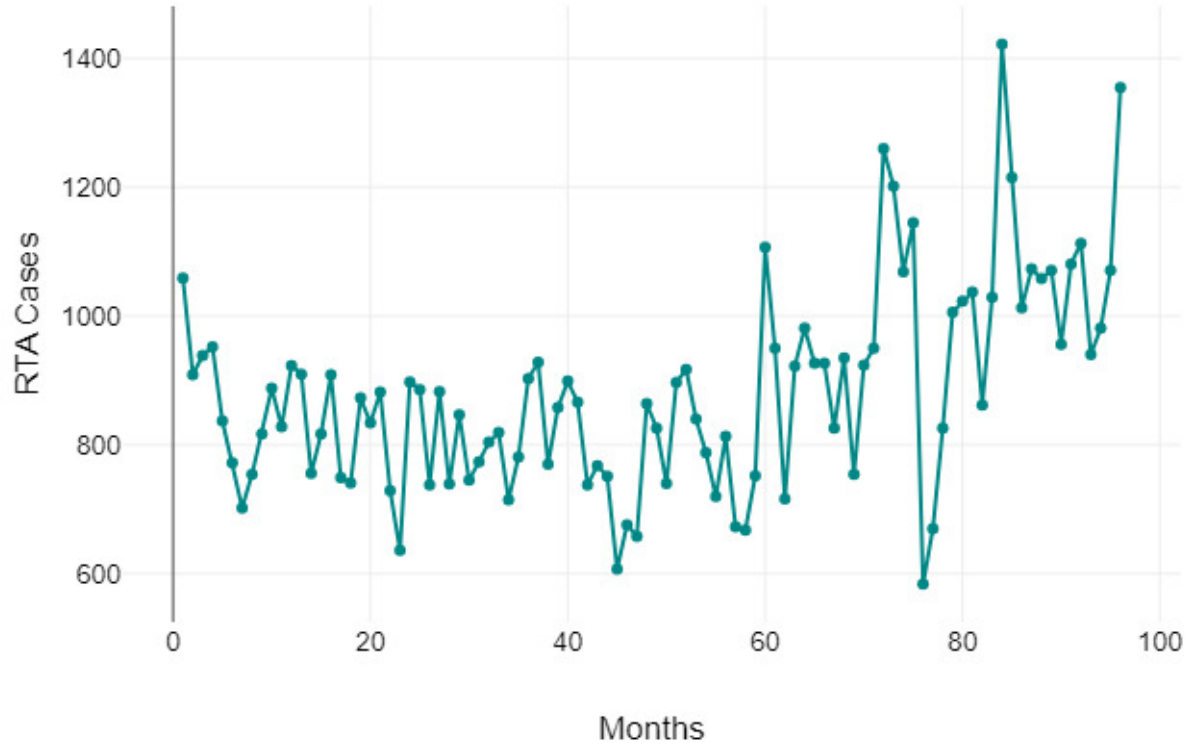

Figure 3. Trends in Monthly RTC Cases (Months 1-96)

Source: Internally developed based on RTC data

Table 2. Mean Monthly Road Traffic Crashes Cases (2014 -2021)

Month	Monthclass	Season	Mean	Median	Std. Deviation	Minimum	Maximum
January	Non-Ember	Dry	997.00	939	146.14	826	1215
February	Non-Ember	Dry	838.88	763	138.80	716	1069
March	Non-Ember	Dry	941.75	909.5	111.46	817	1145
April	Non-Ember	Wet	879.88	913	149.83	584	1058
May	Non-Ember	Wet	850.88	843.5	118.26	670	1071
June	Non-Ember	Wet	811.63	780	85.64	738	956
July	Non-Ember	Wet	843.75	800	136.17	702	1081
August	Non-Ember	Wet	878.38	823.5	132.36	751	1113
September	Ember	Wet	816.13	818	139.67	607	1037
October	Ember	Wet	805.38	795.5	122.22	668	981
November	Ember	Dry	838.13	804.5	163.56	636	1071
December	Ember	Dry	1091.50	1015	226.91	864	1422

dian annual cases. Generally, during the Ember months and the Dry season, RTC cases are more frequent and varied. This observation was subjected to a hypothesis testing. A two-way ANOVA was performed to evaluate the effects of Monthclass (Ember/non-Ember) and season (Wet/Dry)] on RTC cases at p = 0.05. The means and standard deviations for RTC cases are presented in Table 4.

A two-way ANOVA was conducted to examine the effect of Monthclass (Ember/Non-Ember months) and Season on the RTC cases. The results indicated no significant main effect of Monthclass, ($F(1,92)$ = 0.05, p =.819). There was a significant main effect of Season ($F(1,92)$ =10.32, p =.002). The interaction between Monthclass and Season was not significant ($F(1,92)$=1.47, p=.228). As a result, any changes in the RTC cases observed during the Ember or non-Ember months (Monthhtclass) also happen similarly during the Dry and Wet seasons. The descriptive plot is shown in Figure 4.

Table 3. Descriptive Statistics of RTC cases by Period and Season of the Year

Month	Frequency	Mean monthly RTC case	Median	Std. Deviation	Minimum monthly rate	Maximum monthly rate
Non-Ember	64	880.27	869.5	134.42	584	1215
Ember	32	887.78	873	199.67	607	1422
Dry	48	931.19	909.5	177.20	584	1422
Wet	48	834.35	822.5	119.81	607	1113

Note: Ember months: September-December; Non-Ember months: January-August. Dry months: November-March

Table 4. Two-Way ANOVA Output

	Type III Sum of Squares	df	Mean Square	F	p	η^2_p
Monthclass	1205.01	1	1205.01	0.05	.819	0
Season	236108.20	1	236108.20	10.32	.002	0.1
Monthclass x Season	33654.09	1	33654.09	1.47	.228	0.02
Error	2104561.66	92	22875.67			

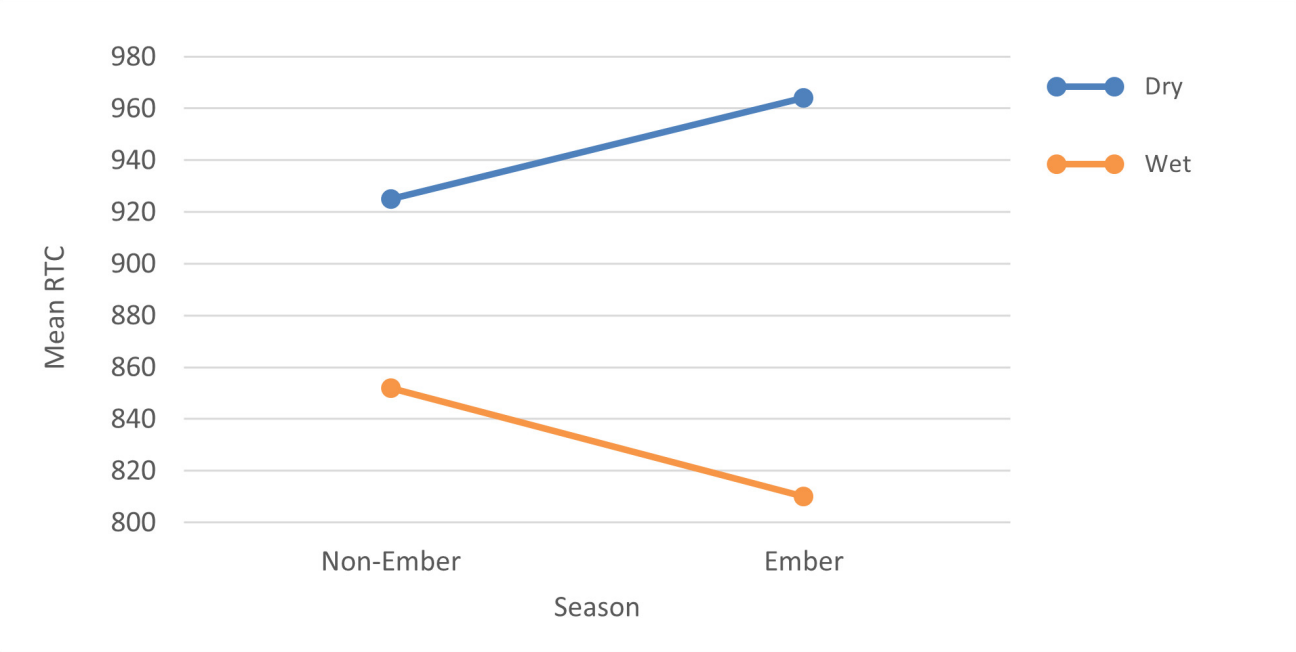

Figure 4. Interaction Plot of Monthclass and Season

Discussion

Even though the mean RTC cases during the Ember months (887.78) appears higher than recorded during the non-Ember months (880.27), the difference was not statistically significant indicating that RTCs do not occur more in Ember than in non-Ember months. This observation agrees with the findings of Onyemaechi (2020) which could not associate the Ember months with high incidence of RTCs, but in contrast with some other studies (Aganga & Umoh, 1983; Ukibe, 2011) who found that ember months are associated with a higher occurrence of road traffic crashes in Nigeria.

The effect of season on RTC was found to be significant with more cases (M = 931.19) occurring in the dry months compared to the wet season (M = 834.35). This finding is compatible with previous findings such as those of both Ayeni and Oni (2012) which found a notable rise in road traffic crashes during the harmattan (Dry) season and Odusola et al. (2023) who found that more road traffic ambulance-related operations (41.9%) took place during December and January combined (harmattan (i.e., dust storm), foggy) compared to (31.1%) during the months of April and May (Rainy season) in Lagos State mainly due to reduced visibility in Southern Nigeria. Folorunsho et al (2022) found that only 5.4 percent of the variation in traffic crashes can be explained by rainfall in Kogi State, North Central Nigeria. Lawal et al (2018) that observed a higher rate of RTCs in

the dry months of December and January in Kaduna, North Central Nigeria.

This study, however, differs from studies that found higher RTCs in the wet season (J. Odinfono et al., 2019) or found no seasonality in RTC cases (Osarumwense, 2013). The reason for the departure could be due to wide variation in the length of rainy and dry harmattan/dry season in Nigeria with rainy season ranging from eight to ten months in South and Coastal areas to three to five months in the North and far North. Furthermore, intensity of dust haze across Nigeria during the harmattan season varies widely.

Conclusions

The unique finding from this study on the interaction of Ember months and seasons on road traffic crashes in Nigeria is that spikes in RTC cases are not solely confined to the Ember months. The study, using the 96 month data, has revealed that, the mean highest number of RTC cases occurred more outside the Ember months, that is, only in one Ember dry month of December and then more in non-Ember dry months of January, March, April and in August which is non-Ember wet month, thus challenging the common belief that RTC spikes are predominantly associated with the Ember months and evil forces.

Given the prevailing belief that the Ember months are associated with a high incidence of road traffic crashes (RTC), the Federal Road Safety Corps (FRSC) has traditionally focused its safety campaigns during this period. However, based on current findings, while the number of crashes does not appear to be significantly affected by the ember months, it is still important to consistently enforce traffic laws and road safety measures all year long to maintain standards of safety. In addition, it is advised that the FRSC periodically examines traffic data to spot any modifications or new trends throughout the course of the year and modifies plans as necessary.

Difficulties in getting monthly data for longer number of years is a limitation identified in this study. For instance, ember months are just four out of the twelve months in the year, as such more years of data are required to get more ember months. For future studies, data for more years and the data disaggregated into different climatic zones may be explored to firmly establish the effects of ember months and season since different zones experience different lengths of seasons.

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Author contributions

Morenikeji Wole, Musa, H. D., Akande, S.O. and Owoeye, Lanke conceived this manuscript, collected, analysed, and wrote the manuscript while Balogun, Sikiru supplied and cleaned the data. They critically revised it for intellectual content and approved the published version.

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Human Research Ethics Review

This study did not require Human Research Ethics Review. This study is a secondary review of data that is publicly available from https://frsc.gov.ng/statistical-digest/

Data availability statement

The authors have included all relevant materials, and data associated with the publication in the text.

Conflicts of interest

The authors declare that there is no conflict of interest.

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