

## Temporal Presentation of RTA Frequencies along Kaduna- Zaria Expressway, Nigeria

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### ABSTRACT

Effort is here made to observe and note the spread of RTA frequencies based on the period of occurrences. The classification was based on two distinctive seasons of wet and dry. Effects of religious festive seasons on road traffic accident occurrence were also considered in the paper. A record on Road Traffic Accidents (RTAs) frequency on the study route was analysed under temporal variable of festivals and seasons against the total cases of accidents covered by the study. To estimate the effects of each of the temporal variables on accidents, one way analysis of variance ANOVA was used at 0.05 level of significance at 95% confident intervals, from which a decision to accept or reject the result was made. It was revealed amongst others that road traffic accidents is high during wet season throughout the four years of study spanning 2007 to 2010. It is recommended that vegetation growth and agricultural activities, which are fully alive during the rainy season along the main road, should be prohibited, because they obstruct motorists from clear visibility.

**Key words:** Spanning, Impair, Ed- Fitr, Ed- Kabir, Confident Interval, Yuletide, EMBER

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### I. INTRODUCTION

The word temporal is derived from Latin-Greek word Tempus (meaning time). Temporal has to do with time as opposed to entity, earthly life as opposed to heavenly existence and time as opposed to space. (Richard, 1986). He further defined time as a period during which event or a data based on fact was or will be valid in modeled reality. For instance, according to him, as of December, 2011, ISO/IEC 9075 Data Base Language was launched.

Spatio-temporal relates to space and time together. It has both the spatial extension and temporal duration. In the same vein, space-time is a four dimensional frame, consisting of three dimensions in space and one dimension in time used especially in relativity theory as a basis for coordinates system for identifying the location and timing of objects and events (Encarta,2009). This paper however, focuses on identifying the temporal elements that cause road traffic accidents along Kaduna – Zaria Expressway in Kaduna State, Nigeria. This is with a view to provide reliable empirical data for government agencies, which will not only update what already exist but would also facilitate more efficient management, rehabilitation and administration of the study route

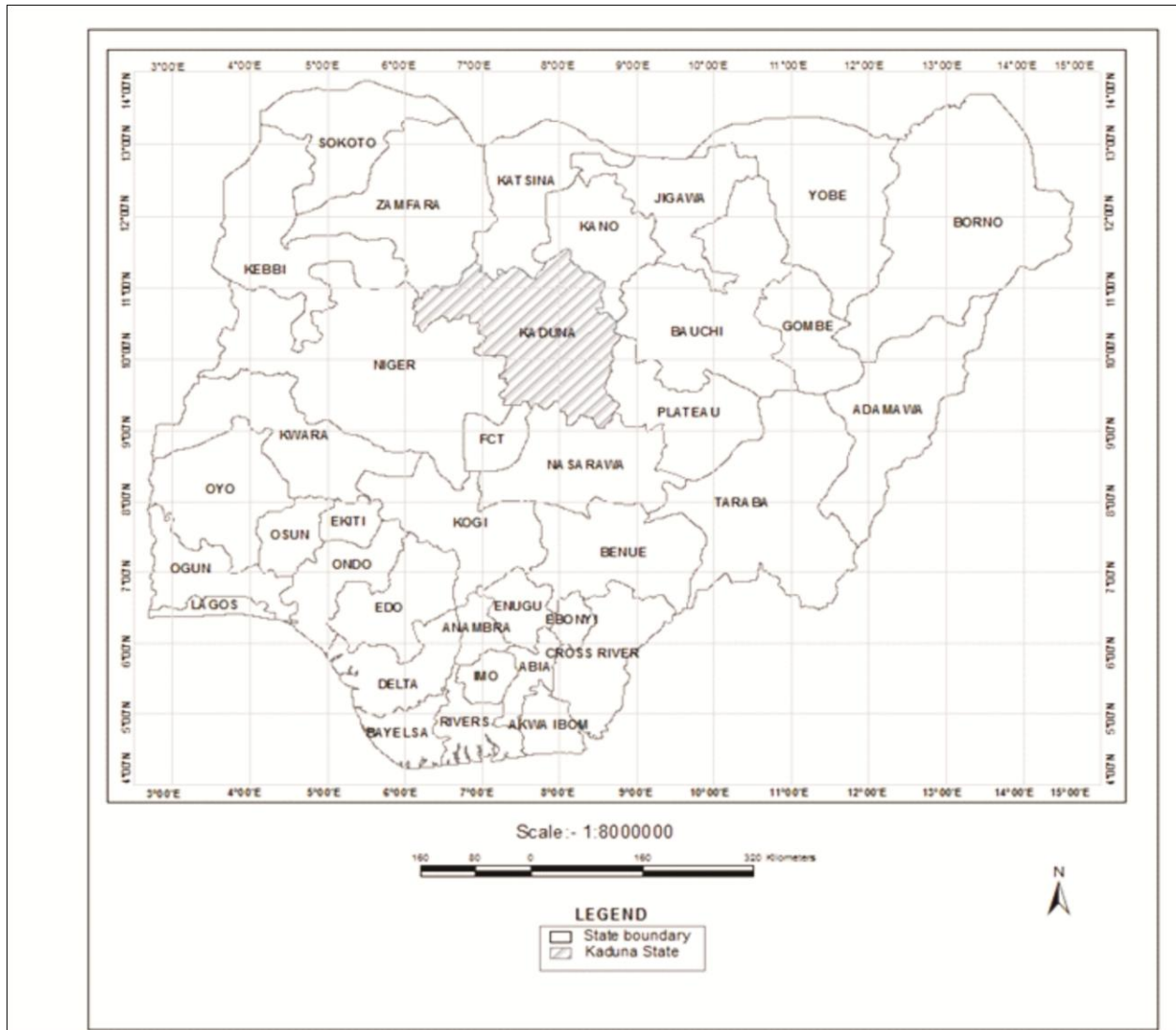
The spread of RTA frequencies is based in this paper on the periods of occurrences. The classification was based on two distinctive seasons of wet (Mar/April through Sept/Oct and dry seasons (Nov to Feb) of every year, religious festive periods especially during Easter (15<sup>th</sup> Mar-15<sup>th</sup> April), Ed-Fitr (20<sup>th</sup> Aug-15<sup>th</sup> Sept), Ed-Kabir (15<sup>th</sup> Oct-15<sup>th</sup> Nov), and Christmas (15<sup>th</sup> Dec-10<sup>th</sup> Jan) of every year, days of week and months of year spanning 2007 and 2010.

The Sector Commander of Federal Road Safety Corps (FRSC) Kaduna State Sector Command, Mr. Chidoka had in October, 2009, pointed out to some media organizations such as; Nigeria Television Authority (NTA), Desmimms Independent Television (DITV), African Independent Television (AIT), and Capital TV during EMBER Months (Last quarter of the year) campaign against road traffic accidents that amongst the major causes of road accidents along Kaduna-Zaria expressway are; road obstruction by trailers, U-Turns, feeder roads and the general attitudes of road users. Kaduna – Zaria expressway is among the busiest routes in Nigeria, most especially, during yuletide periods of Easter, Ed-Fitr, Ed-Kabir and Christmas and also, the periods of dry and rainy seasons. These results into traffic congestions thereby, causing road traffic accidents on frequent basis, a situation that needs to be arrested because of its negative effects. Though, there could be many ways and methods of checking and reducing road crashes, remote sensing and Geographic Information System

(GIS) are the most viable methods as they can be used to identify and at the same time analyse different variables that cause road mishaps. The synoptic view of remote sensing is also an added advantage in this direction. Against this background, SPOT 5 imagery of 2005 with the aid of GIS techniques was employed to generate the required data for this paper.

## II. LOCATION OF THE STUDY AREA

The study route is in Kaduna State of Nigeria and passes through three local government areas of the state: Kaduna North, Igabi and Zaria. It cuts across latitudes  $10^{\circ}30'N$  and  $11^{\circ}10'N$ , and longitudes  $7^{\circ}20'E$  and  $7^{\circ}50'E$ . The whole area through which the expressway passes is in the northern part of Kaduna state, Nigeria and equally shares boundaries with Kaduna South, Chikun, Soba, Kajuru, Giwa and Birnin Gwari local government areas of the state. ((Figs 1 and 2)



**Figure 1: Nigeria Showing Kaduna State**

**Source: KEPA 2006**

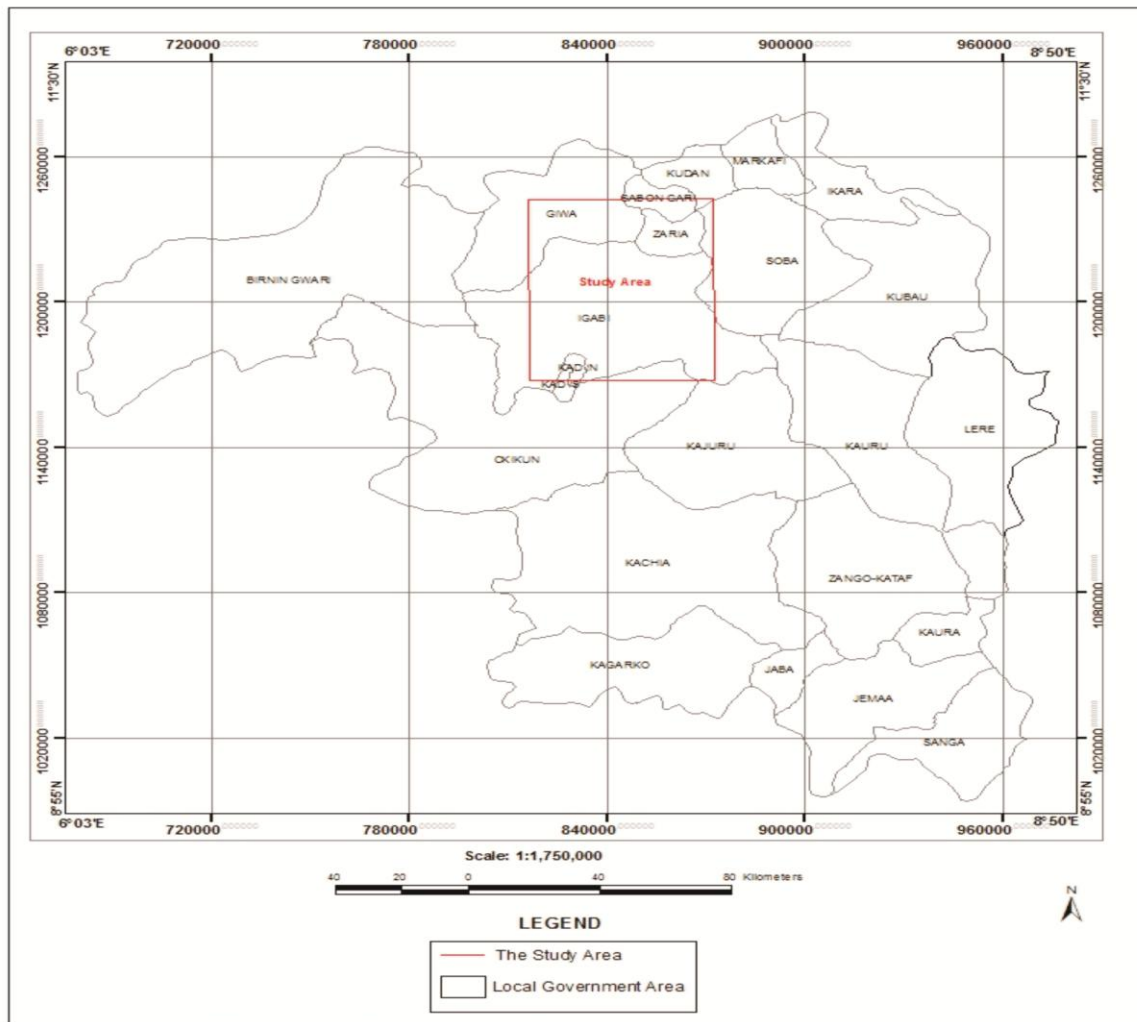


Figure 2: Kaduna State Showing the Study Area Source: KEPA, 2006

The study route experiences the tropical continental climate. It is characterized by two distinct alternating wet and dry seasons. The rainy season usually begins from March/April and runs through September/October. The rainfall amounts falls between 1100 - 1300 mm. The rainfall type is convectional with a single regime of maximum peak, which usually occurs in August/September at a stretch (Parkman International Studies, 1997). At the period of peak rainfall, water wash away the protection by the edges of the road and improper or absence of bracing or embankment leads to the breakage of the road edges. Also, water seepage beneath the road soil leads to softening and losing the soil compaction. This leads to road depression and undulating surfaces due to pressures exerted by vehicles. Thus, creating opening (cracks, potholes and breakages), which eventually results into road traffic crashes.

### III. ROAD NETWORK OF THE STUDY AREA

The road network of the study area is classified as major road. It was duallized between 1988 and 1992 by the president Gen. Ibrahim Badamasi Babangida led military government with several feeder roads linking the expressway at various locations. Notable amongst these feeder roads are the Zangon Aya road, Kangimi links at Sabowa and Sabon Birni road. The study route which extends up to 73.96km long has several characteristics such as sharp bends, bridges, undulation and U-turns. The study route is depicted in fig 3 below.

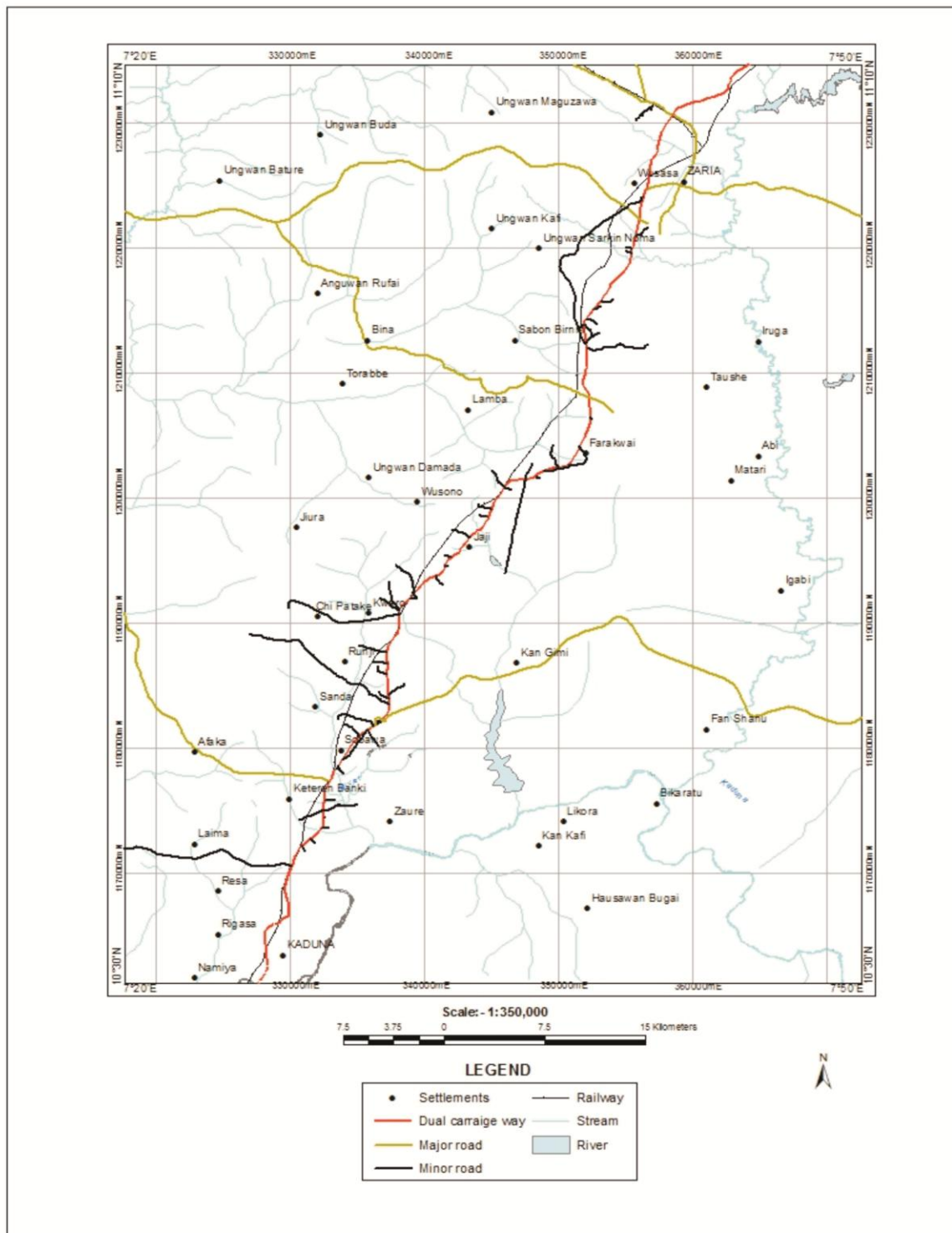


Figure 3: The Study Route  
Source: SPOT 5 Imagery, 2005

#### IV. METHODOLOGY

The record on RTAs frequencies on the study route was analyzed under temporal variable of festivals and the seasons against the total cases of accidents covered by the study. The result of analysis from ANOVA at 0.05 level of significance and 95% confident intervals provided an impetus from which decisions were made.

#### V. RESULTS

##### EFFECTS OF SEASONAL CHANGES ON ROAD TRAFFIC ACCIDENT OCCURRENCES.

A brief background of the weather and climatic characteristics of the study area is reflected in section II. The relationship between the total cases of road accidents and the frequencies recorded against each of the variables of wet and dry seasons was established as shown in Table 1. The graphical presentation is also shown in figure 1

TABLE 1: Distribution of RTAs Over Wet And Dry Seasons

YEAR	WET	DRY	TOTAL
2007	19	16	35
2008	107	38	145
2009	76	39	115
2010	125	70	195
TOTAL	327	163	490

Source: Field Analysis

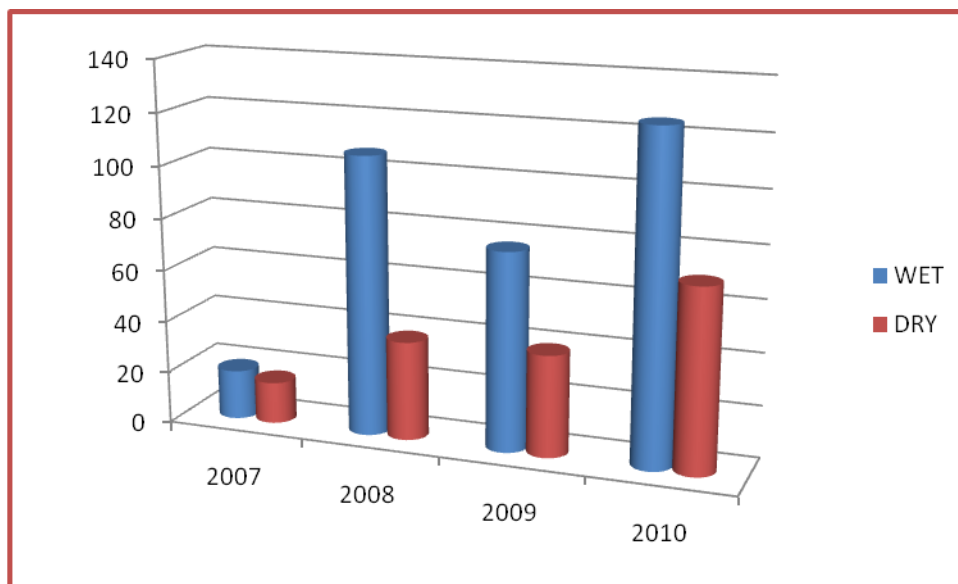


Figure 4: Distribution of Road Traffic Accident Frequencies over Wet and Dry Seasons along Kaduna-Zaria Expressway

Figure 4 indicates that road traffic accidents is high during wet season through out the four years of study spanning 2007 to 2010. Also, the occurrences of RTAs increased in 2008 and decreased in 2009, while in 2010, it rose again due to seasonal variations of climatic elements in the region.

To test the level of significance of wet and dry seasons and the frequency of RTAs occurrence over the period of study, one way analysis of variance was applied at 0.05level of significance at 95% confident intervals. The result revealed that the calculated value given is 0.263 as against acceptance value of 0.05. Therefore, there is no significant difference between both wet and dry seasons with the frequency of occurrence of road traffic accidents along Kaduna-Zaria expressway.

Also, despite the insignificant nature of seasonal variations in accident causations, the range values fall between minimum and maximum of 48 and 93 for wet season and, 36 and 70 for dry season respectively. In the same vein, the test result indicated the mean value of 68.75 and 53.75 in wet and dry season respectively. The result is presented in Table 2.

**Table 2: Test Results of Seasonal Distribution of Road Traffic Accident Frequencies along the Study Route**

FACTOR	VARIABLES	RANGE		MEAN	P value
		Min	Max		
SEASONS	WET	48	93	68.75	0.263
	DRY	36	70	53.75	

Sig level is 0.05 at 95% confident interval.

**Effects of Religious Festive Seasons on Road Traffic Accidents Occurrence.**

The study revealed that religious festivity is among the period, under which road accident frequencies record used to be high due to the fact that the rate of travels used to be intensified. Four major different periods have been identified under this factor and they usually occur at different times of the year, even though, some remain fixed to particular dates, others are not (fixed) but usually within the ranges given below. The periods identified in this paper are:

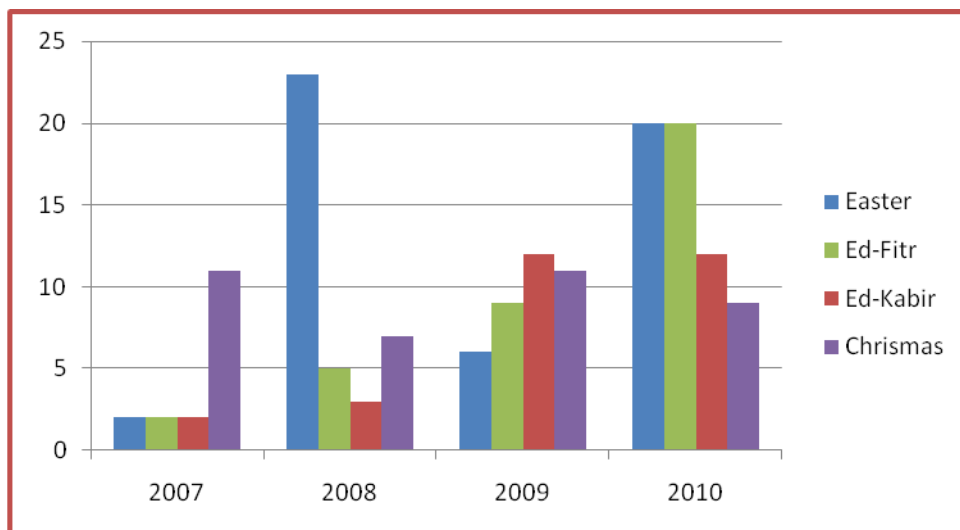
- i. Easter (15<sup>th</sup> Mar-15<sup>th</sup> April)
- ii. Ed- Fitr (20<sup>th</sup> Aug-15<sup>th</sup>Sept)
- iii. Ed- Kabir (15<sup>th</sup> Oct-15<sup>th</sup> Nov)
- iv. Christmas (15<sup>th</sup> Dec-10<sup>th</sup> Jan)

From the variables captured above, the total number of RTAs against each period was analysed within the period of study, 2007 to 2010. The data is depicted in Table 3 and figure 2 below.

**TABLE 3:** Distribution of RTAs over Festive Periods,

Year,	Easter	Ed-Fitr	Ed-Kabir	Christmas	Total
2007	2	2	11	11	24
2008	23	3	5	7	38
2009	6	12	9	11	38
2010	20	12	20	9	61
<b>TOTAL</b>	<b>51</b>	<b>29</b>	<b>45</b>	<b>38</b>	

Source: Field Work



**Figure 5:** Distribution of Road Traffic Accident Frequencies over the Period of Religious Festivity

Figure 5 above presents the temporal distribution of RTA frequencies of religious festive seasons. It shows that in 2007, RTA was high during Christmas periods while the other three periods recorded the same range. Also, in 2008, Easter was highest followed by Christmas season. Ed-kabir recorded the least RTA



frequencies in the year. In 2009, Ed-Kabir tends to be slightly higher than Christmas and Ed-fitr was also slightly higher than Easter period. From the forgoing, therefore, it is clear that most of the RTAs recorded along the study route in the four years under review took place during Easter and Ed- Kabir periods. This was then followed by Christmas and Ed- Fitr periods.

In order to estimate the significant difference between the temporal variables and the festive period of religious activities such as Easter, Ed-Fitr, Ed-Kabir and Christmas with corresponding frequency of road traffic accidents spanning the period 2007-2010, a bi-variant statistical testing was used via statistical software for social sciences (SPSS) in which one way ANOVA applied. Findings from the test revealed that festival as a factor with four set of identified variables is not statistically significant at 0.817. Hence, there is no relationship between the frequency of occurrence of road traffic accidents and each of the variables of religious periods of celebration. The test result is presented in Table 4.

**Table 4: Test Result of Frequency of Road Traffic Accidents and Period of Religious Festivities**

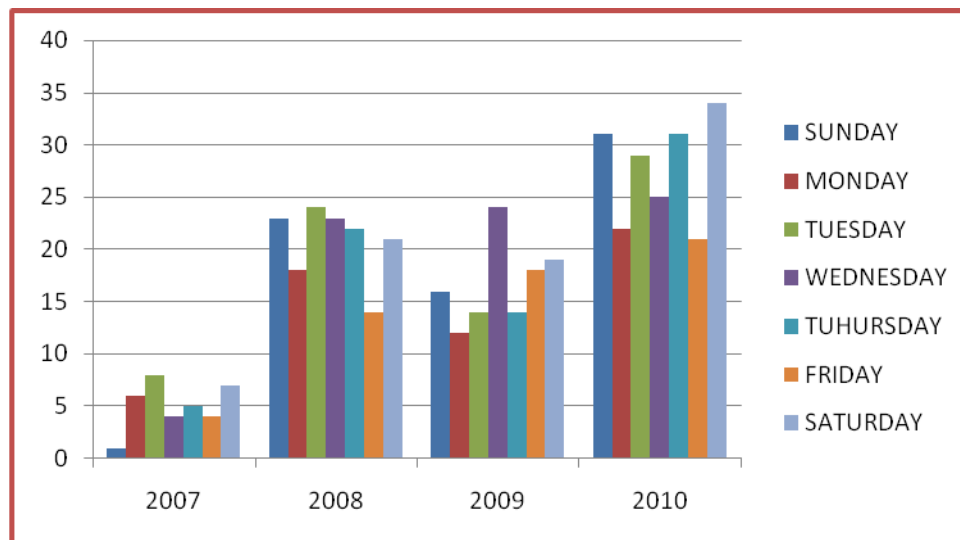
FACTOR	VARIABLES	RANGE		MEAN	P Value	REMARK S
		MIN	MAX			
FESTIVAL S	Easter(15 <sup>th</sup> Mar-15 <sup>th</sup> Apr)	8	19	13.50	0.817	NOT Significant
	Ed-Fitr(20 <sup>th</sup> Aug-15 <sup>th</sup> Sept)	3	23	10.50		
	Ed-Kabi(15 <sup>th</sup> Oct- <sup>th</sup> Nov)	4	24	13.75		
	Christ(15 <sup>th</sup> Dec-10 <sup>th</sup> Jan)	3	15	9.50		

LOS (P): NS>0.05\*, ≤0.05\*\*, ≤ 0.01

Also, road traffic accidents were analyzed based on days of week. The data used were extracted from the road traffic accident data obtained from relevant authorities and presented in Table 5. The analysed data were then plotted in figure 6.

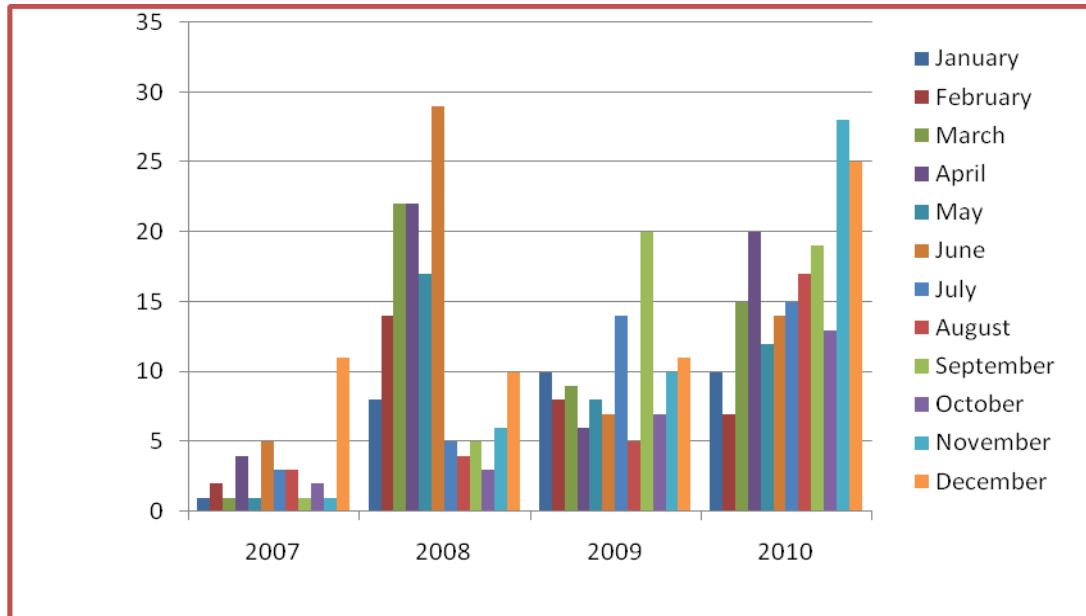
**TABLE 5: DISTRIBUTION OF RTA BY DAYS OF A WEEK**

DAYS OF A WEEK	2007	2008	2009	2010
SUNDAY	1	23	16	31
MONDAY	6	18	12	22
TUESDAY	8	24	14	29
WEDNESDAY	4	23	24	25
THURSDAY	5	22	14	31
FRIDAY	4	14	18	21
SATURDAY	7	21	19	34
<b>TOTAL</b>	<b>35</b>	<b>145</b>	<b>117</b>	<b>193</b>



**Figure 6: Analysis of Road Traffic Accidents by Days of Week over the Period of Four Years.**

Figure 6 presents the analysis of RTAs by days of week over the period of four years and it revealed that in 2007, the occurrence rate was generally lower than the preceding three years. In 2008, RTA rose and dropped a little bit in 2009 and rose again in 2010. Daily analysis revealed that, RTAs are more on Saturdays, Sundays, Tuesdays, Thursdays, and Wednesdays. This coincides with market days of the settlements along the route such as Katabu– Saturdays, Lamban Zango –Mondays, Kawo-Tuesdays, Birnin Yero-Thursdays, and Jaji-Fridays. Following from the above, road traffic accidents occurrence is fluctuating along the route with high frequencies during week end periods.



**Figure 7: Analysis of Road Traffic Accidents by Month over the Period of Four Year.**

Fig 7 revealed that RTAs were low in 2007 due to the inadequate record from the relevant authorities with highest range of increases in the month of December. In 2008, it rose in the months of February through June and dropped in October and rose again in December. In 2009, the highest range was recorded in the month of September, followed by July and December. Also, in 2010, the occurrence rate rose from the months of March to April, June, July, August, September, November and December with the highest rate of increase in the months of April, December and November respectively. The data from which the graph was plotted is shown in Table 6.

**TABLE 6: DISTRIBUTION OF RTA BY MONTHS OVER FOUR YEARS**

MONTHS	2007	2008	2009	2010
January	1	8	10	10
February	2	14	8	7
March	1	22	9	15
April	4	22	6	20
May	1	17	8	12
June	5	29	7	14
July	3	5	14	15
August	3	4	5	17
September	1	5	20	19
October	2	3	7	13
November	1	6	10	28
December	11	10	11	25
<b>TOTAL</b>	<b>35</b>	<b>145</b>	<b>117</b>	<b>193</b>



## VI. QUESTIONNAIRE ADMINISTRATION

Results of structured questionnaire revealed that 255 respondents opined that 57.7% of road traffic accidents occur during festivity periods on yearly basis. 136 respondents were with the view that 29.1% of the road accidents were influenced by heavy rainfall. (Table 7). In such a situation, motorists find it difficult to drive properly as a result of invisibility and running water may cover certain areas of road surface. The road could therefore, be slippery. Another important effect of rains on the route is the appearance of luxuriant vegetation on both sides of the express. The road sides are also busy with farming activities and these obstruct visibility of motorists along the route especially at the curves. Against this backdrop, it is here recommended that vegetation growth and other agricultural activities along the study route especially at the bends should be prohibited in order not to create road accidents blind spots and impaired motorists from clear visibility from at least 100 metres. This vegetation clearance should be done by the department of forestry and livestock under the Federal Ministry of Agriculture.

**Table 7: Period of Frequent Occurrence of Road Traffic Accident**

CATEGORY	NO.OF RESP.	PERCENTAGE (%)
Rainy season	136	29.1
Dry season	69	14.8
Festive Season	255	54.7
<b>Total</b>	<b>466</b>	<b>100</b>

On the other hand, 316 respondents argued that 67.8% of RTAs occurred during the day especially the rushing hours of between 0700 hrs- 0900 hrs in the morning and 1500 hrs- 1700 hrs in the afternoon. RTA frequencies in the night are lower compared to that of the day (Table 8).

**Table 8: Time of Occurrences of Road Traffic Crash on Kaduna-Zaria Road.**

CATEGORY	NO OF RESP	PERCENTAGE (%)
DAY	316	67.8
NIGHT	150	32.2
<b>TOTAL</b>	<b>466</b>	<b>100</b>

Source: Field Analysis, 2010.

## VII. CONCLUSION

Effort has been made to observe the spread of RTA frequencies based on the periods of occurrences. The classification was based on the two distinctive seasons of wet and dry periods and religious festive seasons especially during Easter, Ed-Fitr, Ed-Kabir, Christmas of every year, days of a week and months of the year spanning 2007 and 2010. The result of this paper amongst others revealed that road traffic accidents is high during wet season throughout the four years of study.

The prone accident religious festive seasons have been identified to be Easter, Ed- Kabir, Christmas and Ed- Fitr. This has been attributed to the fact that rate of travels used to be high. People tend to go to their father homes to celebrate these festivals. Wet season also do record high rate of accidents on yearly basis. This is partly due to road floods and slippery nature of tare during rains. As earlier pointed out, vegetation growth and agricultural activities along the study route should be prohibited.

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