A Parametric Model for Accident Prediction Along Ado Ekiti – Ikole Ekiti Road, Ekiti State, Nigeria

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Abstract—Road Accident Prediction Models have been used in different countries as a useful tool by road engineers and planners to predict the safety levels of roads, given their potential for determining both the crash frequency occurrence and the degree severity of crashes. The research looked into developing a parametric model for predicting accidents at specific locations along Ado-Ekiti to Ikole-Ekiti road. The reconnaissance survey of the road and the identified accident vulnerable points along the road was carried out and the factors aiding the occurrence of accidents were isolated as Spot speed [S], Pavement condition [P], Condition of shoulder [C], Width of the road [W], Elevation(super/cambering) [E], Gradient [G] and Accident Vulnerability [AV] which form an acronym SPCWEG-AV. The spot speed in each of the locations was gotten by measuring a 60m length and noting the time vehicles covered the distance. The pavement and shoulder conditions were evaluated to determine their conditions. The width of the road, the elevation (super/cambering and the gradient (horizontal)) were measured using tape, twine and plumb. When the analyzed data from the investigated factors from the field were imputed into SPCWEG-AV Rating system and Weights, the index (which is a multiplication of the rating and weight) of each of the parameters was got and the addition of these indices produced what is called Total SPCWEG-AV Index (T.SPCWEG-AV.I) which defines the degree of accident vulnerability of the point in question. The higher the T.SPCWEG-AV.I is, the more vulnerable the location is. The results showed ten accident prone areas. They are Federal Government College, Ikole-Ekiti (Ch 0+000), NNPC, Ikole-Ekiti (Ch 3+200), Olokola, Ikole-Ekiti (Ch 7+000), The Nigeria Police station, Oye-Ekiti (Ch 23+2000), Federal University, Oye-Ekiti (Ch 25+600), Ifakiki-Ekiti (Ch 35+400), Iworoko-Ekiti (Ch 52+100), Iworoko market (Ch 53+100), Ekiti State University, Iworoko-Ekiti (Ch 62+750), Ilasa-Ekiti (Ch 64+800), Federal University, Oye Ekiti, Oye Ekiti (Ch 25+600) and Ilasa-Ekiti (Ch 64+800) have the highest number of accidents each having 24 and 22 and also has highest T.SPCWEG—AV.I of 71 and 70 respectively and other points show similar pattern. It is therefore, reasonable to conclude that the parametric model can replicate and predict the occurrence of accidents along Ado-Ekiti to Ikole-Ekiti road and other roads with similar features. It is recommended that the results of researches should be put to use and that agencies in charge of roads should ensure proper design, supervision and construction and to make sure the roads are properly maintained.

Index Terms—Parametric Model, Ado-Ekiti to Ikole-Ekiti Road, Road Accident, Total SPCWEG-AV Index.

I. INTRODUCTION

Road traffic accidents occur when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole. Worldwide, road traffic accidents lead to death and disability as well as financial cost to both society and the individual involved. Globally, millions of people are crippled or injured each year, 65% of deaths involved pedestrians and 35% pedestrians are children. It has been estimated that millions more will die and 60% million will be injured during the next ten years in developing countries unless urgent actions are taken [1-3]. A publication also reported that one person died in roadway during crashes nearly every twelve minutes and of that number, 25,136 die in roadway departure crashes, 9,213 in intersection crashes and 4,749 in pedestrian crashes. The World Health Organization (WHO) has estimated that nearly 25% of fatal injuries worldwide are a result of RTCs, with 90% of the fatalities occurring in low and middle income countries [4].

In developing countries (like in Nigeria), growth in urbanization and in the number of vehicles has led to increased traffic congestion in urban centers and an increase in RTCs which were never designed for the volumes and types of traffic that they are now carrying [5]. In Nigeria, about 300,000 persons lost their lives in 1,000,000 road accidents between 1960 and 2005 – a period of forty-five years while over 900,000 persons suffered various degrees of injuries within the same period [6]. The accident situation is more serious in Nigeria because of the rapid growth of motor vehicles in the past few years and the inadequacy of many of our roads. Edeagha Ehikhamenor, coordinator of Save Accident Victims Association (SAVA) said that the nation loses 30,000 persons yearly to accidents. This is only part of what the faling roads bring to its users. In Nigeria, fatal road accidents were said to be on the rise and a major cause of death in adults less than 50 years old in the country [7-8].

Police shows that from 1955 to 1998, the number of people killed in road accidents increased from 489 in 1955 to 6500 in 1998. By the turn of 2004, the number was put at 5351 after falling from an all-time peak of 11,382 in 1982. Similarly, there has been a decline in the number of reported accident cases. It first rose from 1413 in 1960 to its highest value of 40,881 in 1976, before declining to 14,361 in 2004. Likewise, the number of persons injured rose continually from 10,216 in 1960 to 30,023 in 1978 and fell to 16,897 in 2004. These statistics are found to be much lower than the estimated values for Nigeria, especially by the WHO. This may not be unconnected with the poor recording habit in the nation [9-11]. According to WHO, almost 16,000 people die from injuries sustained in road mishaps in Nigeria yearly, while several thousands more end up with non-fatal injuries and permanent disabilities. In Nigeria, as in most developing countries, a large number of hospital beds are occupied by

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road accident casualties, representing high social security cost for often tiny budgets. The personal and social cost of those injuries is enormous and is aggravated by the poor financial status of the people affected by the problem.

II. BRIEF DESCRIPTION OF THE STUDY AREA

Ado-Ekiti is the state capital and headquarters of the Ekiti State with an expected population of 518,534 in 2020. The city lies between Latitude 7°34' and 7°44' North of the Equator and Longitude 5°11’ and 5°18’ East of the Greenwich Meridian. It is bounded to the North by Iworoko which is about 16 kilometers away; to the east are Are and Afao, about 16 kilometers; to the West are Iyin and Igede, about 20km and to the South is Ikere, about 18 km. Its roads lead to other parts of the state [12]. It is the home to Ekiti State University, Afe Babalola University, Federal Polytechnic, Ado-Ekiti, Federal University Oye, FUOYE, Crown polytechnic, Nigeria Television Authority, Ekiti State Television (BSES), Radio Ekiti, Progress FM, Voice FM and other various commercial enterprises. Ikole-Ekiti is a town in Ekiti State with an expected population of 281,697 in 2020 and lies between Latitude 7°47’ and 7°53’ North of the Equator and Longitude 5°31’ and 5°35’ East of the Greenwich Meridian. Ikole is also home to several educational institutions including a campus of the Federal University, Oye and a Federal Government College. It is located about 250 metres above the sea level and about 40 kilometres from Ado-Ekiti [13]. Ado-Ekiti to Ikole-Ekiti road is 74.9 km showing Ilasa-Ekiti which is a village close to Ikole-Ekiti. Fig. 1 depicts Ado-Ekiti to Ikole-Ekiti road showing neighbour towns and villages like Iworoko, Ifaki, Oye, Ilupeju, Itapa, Usin, Odo-Ayedun and Ilasa-Ekiti.

III. MATERIALS AND METHODS

Parameters needed to develop the model apart from the human factor, environmental factor and vehicle factor are spot speed, gradient of the road, elevation of the road, pavement condition, condition of the shoulder and width of the shoulder. The twine was used to determine the elevation(super)/cambering across the road and the gradient along the road; the stop watch was used to determine the time taken for a particular vehicle to cover a given distance within the road; plumb was used to determine the perpendicularity (horizontal accuracy) of the twine to determine the elevation (cross slope) or gradient along the road; and car was used to estimate the pavement and shoulder conditions.

Road Traffic Accident data was collected from Federal Road Safety Corps and the Nigeria Police Force, Ekiti State Command. The data includes frequency of accidents, date of accident, consequences of accident (death and injury), causes of accidents and location of accidents. A five-year accident period was used, starting from 2014 to 2019. The Road Traffic Accident records on Ado-Ikole highway for five years (2014-2019) that was acquired was used to identify accident prone locations [14]. Accident prone locations are areas where accidents have occurred more frequently. The data that was collected from Federal Road Safety Corps and the Nigeria Police Force, Ekiti State Command was analyzed to determine the accident pattern at the studied area.

The accident prone locations identified from the Road Traffic Accident data was investigated, the spot speed in each of the locations was gotten by measuring a 60m length and noting the time vehicles covered the distance. The pavement and shoulder conditions were evaluated to determine their conditions. The width of the road, the elevation (super)/cambering and the gradient (horizontal) were measured using tape, twine and plumb. The analyzed data from the investigated factors from the field were imputed into SPCWEG-AV Rating system and Weights, the index (which is a multiplication of the rating and weight) of each of the parameters was got and the addition of these indices produced what is called Total SPCWEG-AV Index (T.SPCWEG-AV.I) which defines the degree of accident vulnerability of the point in question. The rating and weight method that was concluded from the investigations of [15] was used to obtain the Total SPCWEG-AV Index computation for the ten locations, using a rating system of 1 to 5 for each variable and a weighting system of 1 to 6 in their order of significant contribution to road traffic crashes. The rating system is shown in table I below.
The accident vulnerability index of a situation where accident occurred twice or more. Federal University, Oye-Ekiti has the highest total number of accidents.

The ten accidents prone locations identified from the data were investigated and the results are as follows. Tables III to XIII show the SPCWEG-AV index computation as a result of imputing field data at different accident vulnerable locations into the parametric model. Table III shows the computation for location 1 (Federal Government College, Ikole-Ekiti). The Table shows the spot speed measured on site as is 48.39km/hr and this is classified as moderate. The width of the pavement is also rated normal according to the value measured., the condition of shoulder was eroded, the pavement showed heavy surface, its road width was normal, its gradient was good and its elevation was very bad. From Table III, the rating and weight of 48.39km/hr are 2 and 6 respectively. The multiplication of the two which is SPCWEG-AV index is 12. The index for the condition of shoulder and pavement condition using the same method are 4. The Total SPCWEG-AV Index (T.SPCWEG-AV.I) for this location therefore, is 69. The same analysis was performed for locations 2 (NNPC Aloka, Ikole-Ekiti), 3 (Olokonla, Ikole-Ekiti), 4 (Police Station, Oye-Ekiti), 5 (Fuoye junction, Oye-Ekiti), 6 (Ijapa-Ekiti), 7 (Ilori-Oke, Ilora), 8 (Ilori-Oke, Ilora), and 9 (Ilori-Oke, Ilora) to give the Total SPCWEG-AV Indices of 64, 68, 59, 71, 59, 42, 61, 67 and 70 respectively. Table XIV also shows the Total SPCWEG-AV Index of an ideal (control) situation as 21. This means that the accident vulnerability index of a situation where

SPCWEG-AV accident vulnerability evaluation model is mathematically expressed in (1) as:

\[ T \cdot SPCWEG - AVI = S_s S_w + P_s P_w + C_s C_w + W_s W_w + E_s E_w + G_s G_w \]

(1)

Where,

- \( S_s \) = Rating assigned to Spot speed
- \( S_w \) = Weight assigned to Spot speed
- \( P_s \) = Rating assigned to Pavement condition
- \( P_w \) = Weight assigned to Pavement condition
- \( C_s \) = Rating assigned to Condition of shoulder
- \( C_w \) = Weight assigned to Condition of shoulder
- \( W_s \) = Weight assigned to Width of the road and shoulder
- \( W_w \) = Weight assigned to Width of the road and shoulder
- \( E_s \) = Rating assigned to Elevation (super)/cambering
- \( E_w \) = Weight assigned to Elevation (super)/cambering
- \( G_s \) = Rating assigned to Gradient
- \( G_w \) = Weight assigned to Gradient
- \( AVI \) = Accident Vulnerability Index.

The computed Total SPCWEG-AV Index road traffic accident collected will be compared with the Computed Total SPCWEG-AV Index to check if they correlate and to ensure that the parametric model can replicate and predict the occurrence of accidents along Ado-Ekiti to Ikole-Ekiti road and other roads with similar features.

The ten accidents prone locations as shown in table II were identified. Ten accidents prone locations were highlighted from the data. These locations are places where accident occurred twice or more. Federal University, Oye-Ekiti has the highest total number of accidents.

TABLE I: SPCWEG-AV RATING SYSTEM AND WEIGHTS

| Para. | Cond. | Class. | \( R \) | \( Ra \) | \( Wt \) |
|-------|-------|--------|--------|--------|--------|
| Spot Speed \((S)\) | Slow | Very Good | 0 – 30 | 1 |
| Moderate | Good | 30 – 60 | 2 |
| Average | Fair | 60 – 90 | 3 |
| Fast | Poor | 90 – 120 | 4 |
| Very Fast | Very Poor | 120 – 150 | 5 |
| Pavement Condition \((P)\) | Structurally okay | Very Good | 0 – 20 | 1 |
| Crack / minor defect | Good | 20 – 40 | 2 |
| Isolated Pot holes | Fair | 40 – 60 | 3 |
| Wavy/ Heavy Surface | Poor | 60 – 80 | 4 |
| Sheep/Massive failure | Very Poor | 80 – 100 | 5 |
| Condition of Shoulder \((C)\) | Clean / Clear | Very Good | 0 – 10 | 1 |
| Bushy | Good | 10 – 20 | 2 |
| Small Width | Fair | 20 – 30 | 3 |
| Eroded | Poor | 30 – 40 | 4 |
| AbSENT | Very Poor | 40 – 50 | 5 |
| Width of Pavement / shoulder \((W)\) | Too small | Very Poor | 0.0 – 2.8 | 5 |
| Small | Poor | 2.8 – 5.6 | 4 |
| Normal | Fair | 5.6 – 8.4 | 3 |
| Wider | Good | 8.4 – 11.2 | 2 |
| Very Wider | Very Good | 11.2 – 14.0 | 1 |
| Elevation(s) / cambering \((E)\) | Very Bad | Very Poor | 0.00-0.75 | 5 |
| Bad | Poor | 0.75-1.50 | 4 |
| Fair | 1.50-2.25 | 3 |
| Good | 2.25-3.00 | 2 |
| Very Good | Very Good | 3.00-3.75 | 1 |
| Gradient of Pavement \((G)\) | Normal | Very Good | 0 – 3 | 1 |
| Moderate | Good | 3 – 6 | 2 |
| Fair | Poor | 6 – 9 | 3 |
| High | Very Poor | 9 – 12 | 4 |
| Very high | Very Poor | 12 – 15 | 5 |

N.B.: Para. is parameter, Cond. is Condition, Class. is Classification, \( R \) is Range, \( Ra \) is Rating, and \( Wt \) is Weight.

6 = weights of spot speed
5 = weights of pavement condition
4 = weights of condition of shoulder
3 = weights of width of the road
2 = weights of elevation (super)/cambering
1 = weights of gradient of the road
accident will rarely occur is 21.

### TABLE III: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 1 (FGC, IKOLE- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 48.39km/hr (Moderate) | 60 (Wavy/ Heavy Surface) | 30 (Eroded) | 6.8m (Normal) | 12% (Very Bad) | 5.83% (Good) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 2 | 6 | 12 | 4 | 5 | 20 | 4 | 4 | 16 | 3 | 3 | 9 | 5 | 2 | 10 | 2 | 1 | 2 | 69 |

### TABLE IV: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 2 (NNPC, IKOLE- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 36.09km/hr (Moderate) | 60 (Isolated Potholes) | 40 (Eroded) | 7.08m (Normal) | 9% (Very Bad) | 5% (Good) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 2 | 6 | 12 | 3 | 5 | 15 | 4 | 4 | 16 | 3 | 3 | 9 | 5 | 2 | 10 | 2 | 1 | 2 | 64 |

### TABLE V: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 3 (OLOKONLA, IKOLE- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 81.58km/hr (Average) | 60 (Isolated Potholes) | 50 (Absent) | 11.7m(Wider) | 10% (Very Bad) | 5.42% (Good) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 3 | 6 | 18 | 3 | 5 | 15 | 5 | 4 | 20 | 1 | 3 | 3 | 5 | 2 | 10 | 2 | 1 | 2 | 68 |

### TABLE VI: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 4 (POLICE STATION, OYE- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 54.54km/hr (Moderate) | 25 (Block Crack) | 40 (Eroded) | 7.5m (Normal) | 9% (Very Bad) | 5% (Good) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 2 | 6 | 12 | 2 | 5 | 10 | 4 | 4 | 16 | 3 | 3 | 9 | 5 | 2 | 10 | 2 | 1 | 2 | 59 |

### TABLE VII: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 5 (FLOUOE)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 16.22km/hr (Slow) | 90 (Shear Failure) | 40 (Eroded) | 7.40m (Normal) | 40% (Very Bad) | 12.83% (Very High) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 1 | 6 | 6 | 5 | 3 | 23 | 4 | 4 | 16 | 3 | 3 | 9 | 5 | 2 | 10 | 5 | 1 | 5 | 71 |

### TABLE VIII: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 6 (IFAKI- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 26.09km/hr (Slow) | 70 (Wavy Surface) | 40 (Eroded) | 8.2m (Wide) | 13% (Very Bad) | 6.3% (Fair) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 1 | 6 | 6 | 4 | 5 | 20 | 4 | 4 | 16 | 6 | 3 | 18 | 5 | 2 | 10 | 3 | 1 | 3 | 69 |

### TABLE IX: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 7 (IWOROKO- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 25.00km/hr (Slow) | 50 (Isolated potholes) | 50 (Bushy) | 7.40m (Normal) | 17% (Very Bad) | 7% (Fair) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 1 | 6 | 6 | 3 | 5 | 15 | 2 | 4 | 8 | 3 | 3 | 9 | 5 | 2 | 10 | 3 | 1 | 3 | 42 |

### TABLE X: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 8 (IWOROKO MARKET)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 44.44km/hr (Moderate) | 40 (Minor dent) | 50 (Absent) | 9.55m (Wide) | 15% (Very Bad) | 6.67% (Fair) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 2 | 6 | 12 | 2 | 5 | 10 | 5 | 4 | 20 | 2 | 3 | 6 | 5 | 2 | 10 | 3 | 1 | 3 | 61 |

### TABLE XI: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 9 (EKUSU, IWOROKO- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 13.10km/hr (Slow) | 60 (Wavy Surface) | 50 (Absent) | 7.2m (Normal) | 9% (Very Bad) | 5% (Fair) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 1 | 6 | 6 | 4 | 5 | 20 | 5 | 4 | 20 | 3 | 3 | 9 | 5 | 2 | 10 | 2 | 1 | 2 | 67 |

### TABLE XII: SPCWEG-AV. INDEX COMPUTATION OF LOCATION 10 (ILASSA- EKITI)

| Para. | Field Data | Ra  | Wt  | SPCWE GAV1 |
|-------|------------|-----|-----|------------|
| Spot Speed (S) | 13.10km/hr (Slow) | 60 (Wavy Surface) | 50 (Absent) | 7.2m (Normal) | 9% (Very Bad) | 5% (Fair) | T.SPCWEG-AV1 |
| Pavement condition (P) | Condition of Shoulder (C) | Width of pavement (W) | Elevation(super)/ cambering (E) | Gradient of Pavement (G) |
| 1 | 6 | 6 | 4 | 5 | 20 | 5 | 4 | 20 | 3 | 3 | 9 | 5 | 2 | 10 | 2 | 1 | 2 | 67 |
The six (6) categories of accident vulnerability are very low, low, moderate, high, very high and dangerously high which occur when the total SPCWEG-AV indices are between 0-21, 22-31, 32-41, 42-51, 52-61, and ≥ 62 respectively.

From the above categorization, it is seen that for Location 1. Federal Government College, Iikole-Ekiti, accident vulnerability is dangerously high because the total SPCWEG-AV Index is 69, it has very high possibility of accident and it has the third highest accident vulnerability index.

For location 2, NNPC, Iikole-Ekiti, the SPCWEG-AV Index calculated for the spot is 65 which means that accident vulnerability of that location is dangerously high, it has high possible occurrence of accident but it is less than that of location 1.

For location 3, Olokola, Iikole-Ekiti, the accident vulnerability is also dangerously high because total SPCWEG-AV Index is 68, which means that there is very high possible occurrence of accident on this location.

It is seen that the accident vulnerability of location 4, The Nigeria Police Force Oye-Ekiti Divisional Headquarters is also very high but not dangerously high because the total SPCWEG-AV Index is 60 but it still has high possible occurrence of accidents.

For location 5, Federal University Oye-Ekiti, Oye Campus Junction, the accident vulnerability is the highest because the total SPCWEG-AV Index is 71 and this means that this location has the highest possible occurrence of accidents.

For location 6, Ifaki-Ekiti Road, the SPCWEG-AV is calculated to be 69, accident vulnerability is considered dangerously high, and it has the same SPCWEG-AV index as that of location 1.

The SPCWEG-AV Index for location 7, Iworoko-Ekiti is 42, the accident vulnerability is considered high. Location has the least accident vulnerability on the Iikole-Ekiti to Ado-Ekiti road.

For location 8 (Iworoko-Ekiti Market), the SPCWEG-AV index is 61, the accident vulnerability is also considered very high.

Location 9 (EKSU, Iworoko-Ekiti) has a SPCWEG-AV index of 67, this signifies that the accident vulnerability is dangerously high.

For location 10 (Ilasa-Ekiti), the SPCWEG-AV is computed to be 70, the accident vulnerability is dangerously high, it ranks the second highest accident vulnerable spot on the Iikole-Ekiti to Ado-Ekiti road.

Table XIV below gives the comparison between Road Traffic Accident Data and computed total SPCWEG-AV Index, Federal University, Oye-Ekiti (Ch 25+600) recorded the highest occurrence of accident (24 times each) and also has the highest T.SPCWEG-AVI value (71). Ilasa-Ekiti (Ch 64+800) has accident occurring 22 times while its T.SPCWEG-AVI value is 70. Federal Government College (Ch 0+000) and Ifaki-Ekiti (Ch 35+400) have accident occurring 21 times while their T.SPCWEG-AVI values are 68. Similar pattern runs through all the investigated sections of the road. It is therefore, reasonable to conclude that the parametric model can replicate and predict the occurrence of accidents along Ado-Ekiti to Iikole-Ekiti road and other roads where similar conditions of the highway occur.

### Table XIV: Comparison between Road Traffic Accident Data and Computed Total SPCWEG-AV Index

| Locations                       | Total SPCWEG-AV Index | Total number of accidents | Remarks      |
|---------------------------------|-----------------------|---------------------------|--------------|
| FGEC, Iikole-Ekiti (CH 0+000)   | 69                    | 21                        | Dangerously high |
| NNPC, Iikole-Ekiti (CH 3+200)   | 64                    | 16                        | Dangerously high |
| Olokola, Iikole-Ekiti (CH 7+000) | 68                    | 20                        | Dangerously high |
| NPS, Oye-Ekiti (CH 23+200)      | 59                    | 12                        | Very high     |
| FUOYE, Oye-Ekiti (CH 25+600)    | 71                    | 24                        | Dangerously high |
| Ifaki-Ekiti (CH 35+400)         | 69                    | 21                        | Dangerously high |
| Iworoko-Ekiti (CH 52+100)       | 42                    | 10                        | High          |
| Iworoko market (CH 53+100)      | 61                    | 13                        | Dangerously high |
| EKSU, Iworoko-Ekiti (CH 62+750) | 67                    | 18                        | Dangerously high |
| Ilasa-Ekiti (CH 64+800)         | 70                    | 22                        | Dangerously high |

IV. CONCLUSION

From the Road Traffic Accidents data collected from the federal road safety corps (FRSC) and Nigeria Police Force, Ekiti State Command, ten accident prone locations were identified. The parameters considered were spot speed of vehicles, pavement condition, and condition of shoulder, width of the road, elevation (super) /cambering and gradient of the road in order of their weight of accident vulnerability. The analyses and results of these parameters led to the development of Total SPCWEG-AV Index which shows the degree of accident vulnerability. The higher the index, the more vulnerable a section of the road is and thus the parametric model was developed. This parametric model showed very good correlation between the indices of the The results of this research revealed that eight (8) out of the ten (10) locations have dangerously high accident vulnerability while one has very high accident vulnerability and another one has high accident vulnerability. Federal University, Oye-Ekiti (Ch 25+600) has the highest T.SPCWEG-AVI value of 71 and also has the highest total number accidents (24 times). Ilasa-Ekiti (Ch 64+800), Federal Government College (Ch 0+000) and Ifaki-Ekiti (Ch 35+400) also have the next highest T.SPCWEG-AVI values of 70, 69 and 68 and total number accidents as 22 and 21 times. Iworoko-Ekiti (Ch 52+100) has the least T.SPCWEG-AVI value of 42 and the lowest total number accidents of 13. The results of this research revealed that eight (8) out of the ten (10) locations have dangerously high accident vulnerability while one has very high accident vulnerability and another one has high accident vulnerability. Federal University, Oye-Ekiti (Ch 25+600) has the highest T.SPCWEG-AVI value of 71 and also has the highest total number accidents (24 times). Ilasa-Ekiti (Ch 64+800), Federal Government College (Ch 0+000) and Ifaki-Ekiti (Ch 35+400) also have the next highest T.SPCWEG-AVI values of 70, 69 and 68 and total number accidents as 22 and 21 times. Iworoko-Ekiti (Ch 52+100) has the least T.SPCWEG-AVI value of 42 and the lowest total number accidents of 13.
accidents (10 times). The other locations have their T.SPCWEG-AV.I correlating with the occurrence of accidents in their respective locations and the SPCWEG-AV parametric model can reasonably predict the occurrence of accidents at these locations and other locations with similar conditions.

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CONFLICT OF INTEREST STATEMENT

I, O. S. Aderinola, is hereby confirming that there is no conflict of interest.

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