Adequacy and usage of Pedestrian Traffic Infrastructure and Facilities in Nigerian Cities: Case Study of Minna, Niger State

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ABSTRACT

One of the major challenges of managing traffic in Nigerian cities is high rate of road crashes involved vehicular- pedestrian traffic. The underlying factors of vehicular-pedestrian crashes have remained largely speculative in Nigeria. This paper therefore attempts to assess the level of adequacy of infrastructure and facilities provided for controlling vehicular- pedestrian traffic conflict and the level of pedestrians' usage of these infrastructures and facilities. Questionnaire and observatory surveys of pedestrians perceptions, inventory of pedestrian facilities, and traffic flow/ volumetric count along the major traffic corridors and intersections in the city were carried out. The findings revealed that pedestrian infrastructure and facilities are grossly inadequate and the level of compliance with the usage of the existing infrastructure and facilities is very low. Furthermore, the level of risk of pedestrians to vehicular traffic conflicts and collisions at pedestrian crossings in the city is very high. For the whole city, an average pedestrian risk level of 0.23 per road crossing is recorded. In view of this, some recommendations which involve repair and regular maintenance of damaged pedestrian infrastructure and facilities as well as improved enforcement were made. In addition, a system approach to planning of city traffic and transportation is also recommended to Agencies of Niger State Government who are in charge of transportation and traffic planning in the City.

1 INTRODUCTION

Over the years, there have been increased preferences for roadways design, construction of roads with wider lanes, longer sight distances and other high-speed design elements to promote safety. While high design speeds are viewed as desirable for motorist safety, they are not safe for pedestrians and cyclists. Higher vehicle speed result in an increase in both the frequency and severity of road crashes involving pedestrians (Anderson, et al, 1997; Garber, 2001; 2004). With increased vehicular traffic and widening of city roads and highways, vehicular-pedestrian conflicts have also been on the increase.

Traffic conflict is an event involving two or more road users, in which the action of one user causes the other user to make an evasive maneuver to avoid a collision" (Hyden 1987). Traffic conflict, in transportation engineering refers to an event involving two or more moving vehicles, or pedestrian-motorist approaching each other in a traffic flow situation in such a way that a traffic collision would ensue unless at least one of the user performs an emergency stop or maneuver. Transportation engineers and metropolitan managers continuously try to gather necessary safety data to characterize traffic safety problems. By pedestrian-vehicular conflict we mean a situation in which because of violation of one or more users, other users must do a runaway maneuver to prevent a conflict. This runaway maneuver can be a sudden brake or sudden lane change (Mallah, 2009).

In kpakungu intersection, there is no pedestrian or vehicular infrastructure such as the zebra crossing, traffic light or overhead bridges. The only infrastructure found at the time of carrying out the survey was the speed breakers which are not in good condition also. The same situation was found at Ogbomoso intersection which has 4 traffic lights out of which only one of them was functioning and the zebra crossing line in the intersection was no longer visible. The last column in Table 5 shows the level of risk that pedestrians are exposed to while trying to cross the roads at 5 selected intersections in the city. In Kpakungu intersection, the risk level of pedestrians being involved in traffic collision is 0.028 while crossing the road. In Tunga Intersection, the chances that a pedestrian will get involved in collision is a bit lower than any other intersections, the average risk level calculated is 0.018. Ogbomoso Intersection seems to have highest pedestrian risk level with an average risk level of 0.034. Kure Market records the lowest pedestrian risk in the whole city with an average of 0.010. For the whole city, an average pedestrian risk level of 0.23 per road crossing is recorded.

Pedestrian-Vehicular Accident Record From 2008-2015

The records of road traffic accidents related to pedestrian-vehicle collision between 2008 and 2015 obtained from Nigerian Police Divisional Offices in Minna reveal that an average of one pedestrian is knocked by vehicles every month. The yearly figures of pedestrian- vehicle crashes victims are not stable. The figures fluctuate from year to year. Figure 3 shows the trend in the number of pedestrian victim involved pedestrian-vehicular crashes between 2008 and 2015. From the Figure, the highest number of pedestrian road accident was recorded in 2013 while the least number was in 2011.

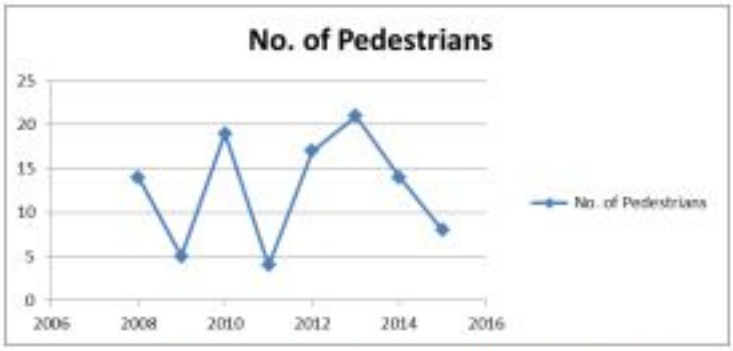

Figure 3 Trend of Pedestrian-Vehicular Accident in Minna From the Year 2008 - 2015.

Source: Motor Traffic Division (MTDRTR) Minna.

Assessing Adequacy of Pedestrian-Vehicular Infrastructure in Minna

A digitized map showing the location of pedestrian-vehicular infrastructure in Minna was produced (see figure 4). Figure 4 shows that there are about 8 intersections with zebra crossing these are, College of

Education, Top Medical, Ogbomoso Intersection, CBN intersection, Emir Road intersection, Federal University of Technology, Police Secondary School, and Mawo School. Only about 6 Intersections have Traffic light installed to control traffic. In many intersections, Traffic Wardens are usually deployed to control traffic in many intersections. Furthermore, only 7 locations are found to have pedestrian overhead bridges, the locations are College of Education, St. Michael/Niger Baptist road, Government Day Secondary School, Bah ago Roundabout, Bosso market and Kure market.

In the whole city, only 34 the numbers of pedestrian-vehicular infrastructure and facilities are found along major routes in Minna, comprising of 7 pedestrian overhead bridges, 8 zebra crossings, and 19 traffic lights. Also, about 6 zebra crossing lines are no more visible to motorists and pedestrians while 5 out of 7 pedestrian overhead bridges are older once with 2 newly constructed in 2016 and finally 9 out of the 19 traffic light are not functioning at all while 5 are partially functioning.

Despite high volume of pedestrians and vehicles often experienced on the major route on daily basis, as shown from Table 4, the distance from where one infrastructure is located to the other is quiet far from each other. For instance, only one the zebra crossing is found between the Top Medical and Niger State College of Education (NSCOE), a distance of about 1 km with not less than 8 pedestrian-vehicular conflict points. This is quite inadequate! Looking at those locations it will be very important to make additional provision for pedestrian-vehicular infrastructure along the route. With the limited number of infrastructure in the town, the implication of this is that pedestrian conflict or accident will continue to rise if appropriate measures are not properly taken.

Figure 4: Locations of Pedestrian-Vehicular Infrastructure/Facilities in Minna.

Source: Author analysis

Pedestrian Overhead Bridges in Minna

Plate 1 shows the image of different pedestrian overhead bridges available for pedestrians use. They are of two colours, one in blue which is the newly constructed pedestrian overhead bridges and presently situated at C.O.E (College of education) and the other is situated along Padikwe-Kure Market road while the other pedestrian overhead bridge in brown colour are the older ones but the problem is that they were more or less situated in non-conflict and a very low traffic environment, hardly do they find pedestrian using them. Because the essence of this infrastructure is to help reduce conflict and traffic of pedestrian crossing on road therefore there is need for this pedestrian infrastructure to be located in high traffic and conflict areas.

Plate 1a & b: Pedestrian overhead bridges in Minna
Source: Author's Analysis 2016

Traffic Light in Minna

Plate 2 which try to show the present condition of traffic light in Minna. It will be observed that the present condition of traffic light could also be one among reason for pedestrian-vehicular conflict because presently in Minna, most of the vehicular traffic light are no longer functional and it is so obvious that most traffic light not functional are those located in the major conflict area therefore, there will be need to ensure that this infrastructure are always fixed when faulty because the implication will be more on vulnerable road users.

Plate 2a & b: Present condition of traffic light in Minna

Source: Author's survey 2016

5 CONCLUSIONS AND RECOMMENDATIONS

The paper has attempted to assess the adequacy and the level of the usage of existing vehicular-pedestrian traffic control infrastructure and facilities in Minna City. The findings so far have shown that the existing

infrastructure and facilities are grossly inadequate to meet the level of demand. Apart from this, the users' compliance to the usage of these infrastructures is very low, this increases the risk level of the pedestrians and it is therefore important that measures recommended in this paper should be taken by the Niger State Government and its relevant agencies in order to guarantee a safe traffic environment in the city.

The study recommends systems approach which may help in the coordination of traffic in Minna metropolis. This means that the sustainable pedestrian mobility will be achieved if the effective regulations, planning and urban design process are initiated. Practically the large numbers of the components that can influence safety are the environment, vehicles and the behavior of man.

Pedestrian mobility such as (designing of road with zebra crossing and pedestrian overhead bridge and pedestrian traffic light) should be one of the key focuses in planning to help ensure pedestrians safety.

Government should ensure that funds are provided to help in regular maintenance designing or re-designing, construction, and rehabilitations of new and existing infrastructure.

Traffic wardens and other road traffic law enforcement agencies such as the FRSC and V.I.O should be assigned to locations where there is high pedestrians-vehicular conflict in order to ensure that users adhere to traffic rules and to assist control of traffic during the peak hours.

Speed breakers either bumps or humps should be part of the design measures as well as be constructed in high vehicular-pedestrian traffic areas. It should also be constructed meters away from where zebra crossings are located so as to help break vehicle speed while approaching pedestrian foot path.

From the research it was discovered that more students and traders are involved in traffic flow in the conflict locations, there is therefore need to ensure that pedestrian infrastructure such as pedestrian overhead bridge, pedestrian side-walks, pedestrians traffic light are provided and designed for the safety of students and traders.

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A pedestrian on the other hands, can be described as any person who is travelling by walking for at least part of his or her journey. In addition to the ordinary form of walking, a pedestrian may be using various modifications and aids to walking such as wheelchairs, motorized scooters, walkers, canes, skateboards, and roller blades. Most pedestrian-vehicular conflicts in traffic environment occur at either non-signalized or signalized intersections which might be due to left turn, right turn of vehicle on highways or even residential area. Left turn in non-signalized intersections, especially from minor street to major Street creates many problems and increases conflicts, which is a great factor for accidents (Liu, 2006).

For many years pedestrian-vehicular traffic accidents have been used as a direct measure of highway safety. If an unusually high number of accidents occur at any location and intersection, it is probably that something associated with the roadway design or traffic system is unsafe. It is therefore, important that safety measures are ensured and taken to curb this accident on highways and at intersection areas. With the declining trends in pedestrian fatalities (most notably declines among children and older adults), pedestrian crash injuries remain a serious public safety problem. In Canada between 2003 and 2007, serious pedestrian injury increased each year as a proportion of total road-traffic injuries rose from 9.8% to 12.2% over the 5 year span. The worst hit are middle-income countries, According to (WHO 2009) about 1.2 million die yearly from road traffic accidents especially in low- to middle-income countries.

Most African countries fall within the middle income category and thus are worst hit by fatal road accidents. In spite of the lower vehicle ownership, the traffic fatality rate in African countries is far greater than what is obtainable in the United States (Jacobs, Aeron and Thomas, 2000).

Pedestrians are vulnerable road users and the consequences of traffic accidents with pedestrians tend to be severe, even at relatively low impact speeds. Road Traffic Accidents results in the deaths of 1.2 million people worldwide each year and injures about 4 times this number (WHO, 2009). Although death and injury due to road-traffic collisions have decreased in recent years in many high-income countries due to adoption of pedestrianization, but their burden remains a large contributor to overall mortality and morbidity. Far more people get injured and the societal cost of traffic accidents is huge (Elvik et al, 2008).

Nigeria cities traffic environment is getting more and more complex, because of increase in automobile. Wider roads and better technology also mean higher speeds. Motorists want short travel times, at the same time, vulnerable road users such as bicyclists, pedestrians, and elderly drivers, demand increased safety as well as less obstruction. In Nigeria, pedestrian-vehicular conflict has also become one of the leading causes of death in older children and economically active adults between the ages of 30 and 49 years (Jacobs et al., 2000).

Addressing this road safety problem particularly pedestrian-vehicular conflict requires three Es of Engineering, Education and Enforcement. One noticeable factor responsible for high pedestrian-vehicular conflict is Nigerian cities is poor engineering, maintenance and poor planning of road system. Also the infrastructure needed to ensure a well-coordinated system such as traffic light, zebra crossing, speed breaker (either bumps or humps), overhead pedestrian bridges and pedestrian traffic light are also very

few in Nigerian cities. Where these infrastructure and facilities are found their conditions are deplorable and in many cases they are not functioning well.

One other social problem of pedestrian- vehicular traffic that has been observed is the poor usage of the infrastructure and facilities provided for traffic regulations and control. The pedestrians have the habits of not using the facilities provided thereby increase their vulnerability level to traffic accidents. It is necessary to find out how adequate are pedestrian traffic control infrastructure and facilities in Nigerian cities? What is the pedestrian response to the use of these infrastructure and the underlying factors responsible for low or high usage of these infrastructure and facilities in Nigerian cities? To answer these questions, the paper therefore tries to assess the level of adequacy and usage of pedestrian traffic infrastructure and facilities in Nigerian cities using Minna, the capital of Niger State as a case study.

2 LITERATURE REVIEW

One of the most popular theories used in transportation studies for explaining complex nature of interactions of transport system is the System Theory. According to Skyttner (2005), there are many different definitions of system depending on which scientific school one represents. He refers to an often used common sense definition in which a system is defined "as a set of interacting units or elements that form an integrated whole intended to perform some function". From this definition it is possible to draw the conclusion that the road transport system really is a system since it consists of road-users, vehicles and road components that interact with each other in order to "produce" transportation of people and cargo.
The traditional scientific approach to systems had been largely reductionistic before 1940s. The reductionistic approach argues that from scientific theories which explain phenomena on one level, explanations for a higher level can be deduced (Skyttner 2005).
Skyttner (2005) further states that emergence is an important concept of systems theory and that it "results from the interaction of independent parts when they stop being independent and start to influence each other". He argues that it is the relationships between the components of a system and not the nature of the components themselves that determines the properties and behaviour of it. This is in line with both Leveson (2002) and Hollnagel (2004) who mean that accidents can be seen as emergent phenomena. Accidents occur when components of a system interact with each other and these interactions are not possibly foreseen because of their complexity (Hollnagel, 2004).

Particularly, in the field of geography the systems theory explanations were based on the concept of risks and man-environment adjustments and maladjustments. The components of the theory are the environment, the means of transport and the behavior of man. In furtherance of this theory, a model for traffic accident as inspired by the ecological model of a disease was developed. The model is characterized by three main components. These are the vehicle, the environment and the behavior of the population. Blumenthal (1968) adopted a General Systems Theory approach as a tool for scientific study, traffic safety which can be regarded as an "open system". In addition, the traffic system can be explained by the interactions and relationships among road users, vehicles and roadway elements at a certain level of abstraction. These theories and concepts are very useful in explaining the nature of relationship that exists among different elements of transport system.

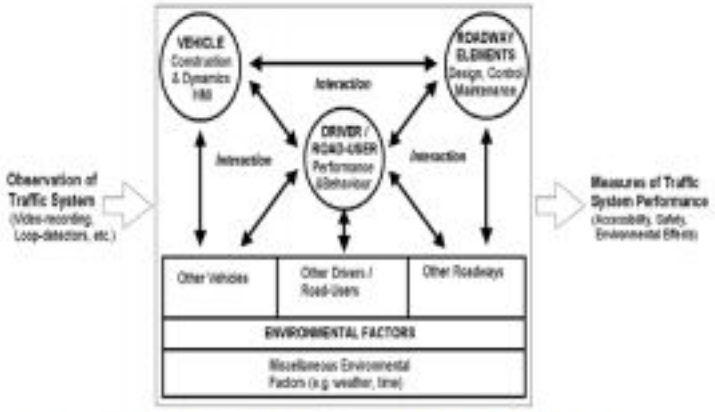

Figure 1 Conceptual model of the main elements of the traffic system
Source: Archer 2015

Crash Risk Theories

The interaction between vehicles, road infrastructure and road users plays a role in crash risk, which can be explained using theories from physics and social sciences. The interaction between road users and roads is often called 'human factors'; while the interaction between road users and vehicles is labeled as 'man–machine factors' (Birth et al., 2009). Four types of so called 'functional driver behavior models' have the ability to describe how the road environment and vehicles can be adapted to fit road users' capabilities in order to reduce crash risk: The four models are, perception models, cognitive models, workload models, and motivational models (Michon, 1985;Ranney, 1994; Weller and Schlag, 2007). The first three describe what road users are able to handle; motivational models explain what drivers are motivated to do. Physical factors based on physics help to explain the interaction between vehicles and infrastructure, e.g. friction between tyres and the road surface to enable steering and braking (Elvik, 2006) and super elevation to negotiate a curve (Aram, 2010).

Empirical studies have shown that Pedestrian collisions associated with motor vehicles are a serious problem globally. However, the seriousness of pedestrian collisions has not been fully realized until recently. For instance, in the United States, 68,881 crashes involving motor vehicles and pedestrians were reported in 2005. Specifically, 4881 pedestrians were killed in motor vehicle crashes in the United States in 2005 and this number accounted for 11.2% of total motor vehicle deaths that year. Previous studies have established clear socio-demographic correlates of pedestrian collision risk and frequency. They show that rates of pedestrian collisions are usually high among young age groups and among males. More than 35% of total pedestrian fatalities and injuries were children victims under the age of 15 in the United States in 1996 (National Highway Traffic Safety Administration. 2012.)

More often conflicts between pedestrian and vehicles arise from vehicle speed. The action of the motorists includes a variety of maneuvers such as turning left or right across the route at intersection area posting dangers to pedestrian. Two studies, each conducted by (Habib, 1980 and 1973), have examined pedestrian accidents at signalized intersections on a one way grid system. They discovered that vehicle left turns were approximately four times more dangerous to pedestrians than through movements. Left-turning vehicles are often involved in pedestrian accident than right-turn vehicles, partly because drivers are not able to see pedestrians to the left as well. (Weicheng et al., 2014).

According to Hyden (1987) who found that in pedestrian-vehicle conflicts 93.1% of actions taken by drivers included braking (79.1% of them were braking only and 14.0 per cent were a combination of swerving and braking). Hyden (1987) also found that there was similarity between the actions taken by drivers involved in conflicts and by those involved in accidents.
Robertson and Carter (1984) used existing data bases from different states for their study. They found that approximately one out of every five vehicles involved in an accident was a turning vehicle, with left-turning vehicles being more predominant. Also, they found that the young and the elderly are more susceptible to accidents. Witkowski (1988) studied the relationship between land-use type and accident rates. He concluded that intersection-related accidents more often occur in areas of commercial or financial land-use, and that residential land use is associated more with mid-block accidents.
Above review clearly shows the importance of traffic control infrastructure and road complementary facilities in enhancing the safety of the pedestrians in cities.

3 METHODOLOGY

The study mainly used questionnaire and observatory surveys for collection of data required. The questionnaire was used to collect data on pedestrian perception on the usage of pedestrian traffic control facilities provided in the city, while the observatory survey was employed for collecting data on vehicular and pedestrian flow data and the number of pedestrian-vehicular conflicts that daily occur in the city of Minna. Five major pedestrian traffic hubs were identified and chosen as survey points for both questionnaire and observatory surveys. These locations are Dutsenkura, Kpakungu, Tunga, Kure market and Ogbomoso intersection (see figure 1). For questionnaire survey, a structured questionnaire was designed to find out how often do pedestrians use those pedestrian traffic control and regulatory facilities provided along the major traffic corridors and their perceptions about the adequacy of these infrastructure and facilities and the traffic environment generally in Minna. A systematic random sampling of one out of every twenty pedestrians that cross road at these locations were chosen for questionnaire administration interviewed between 7.00am – 9.00am, 12.00pm – 2.00pm, and 4.00pm – 6.00pm. These hours are considered as traffic peak periods in the city. Within this period, a total number of 140 pedestrians were interviewed after removing defective ones; only 135 were used for the analysis.

In addition, a traffic count of pedestrians crossing the roads at the 5 survey points within the same hours mentioned above was carried out, and the number of conflicts observed was also recorded to determine the risk and vulnerability level of pedestrians at the major intersections. Furthermore, an inventory survey

of the pedestrian infrastructure and facilities was carried out to ascertain the adequacy, their physical conditions and functionality.

4 DISCUSSION OF FINDINGS

Social-economic Characteristics of Pedestrians surveyed.
As earlier stated, a total number of 135 questionnaires were successfully administered at 5 different locations in Minna. Table 1 shows the number of questionnaires successfully administered in each survey location.

Table 1: Questionnaire Distribution at Survey Locations

	No.of respondent	Percent
Kpakungu	30	22.2
Tunga	26	19.3
Dutsen Kura	27	20.0
Ogbomoso road	28	20.7
Kure market	24	17.8
Total	135	100.0

Source: Field survey 2016

In terms of their socio-economic characteristics, Table 2 shows that 60% of the respondents interviewed were males while 40% were females. It is further shown that majority of pedestrians in the city are between ages of 16- 30, they represent 53.3% of the total pedestrians interviewed. This age group is young people who are either in schools or have just started their life professional career; they constitute the most productive part of the population. This is followed by people between ages 31 and 45 years who constitute 28.9% of the people interviewed. They are also the part of the most active group of the city population. A close look at the table also shows the occupational types of the pedestrians, students constitute 44.4% of the pedestrians in the city, while traders constitute 22.2%. The least occupational group is self-employed other than traders. The pedestrians are those segments of the population that mainly depend on public transport for their mobility.

Table 2: Socio-Economic Characteristics of Pedestrians

	Distribution by Gender		Distribution by Age					Distribution by Occupation			
	Male	Female	1-15	16-30	31-45	46-60	61+	Student	Traders	Self-Employed	Govt. Employed
No. of Respondent	81	54	6	72	39	12	6	60	30	21	24
Percent	60	40	4.4	53.3	28.9	8.9	4.4	44.4	22.2	15.6	17.8

Source: Field survey, 2016

Assessing Pedestrians' Knowledge and Usage Traffic Calming Infrastructure in Minna

Pedestrian Knowledge on Zebra Crossing

Zebra Crossing is used globally to calm vehicular traffic and promote pedestrian safety in traffic environment in cities. However, it has been observed that the low usage of these road complementary facilities may be due to ignorance of their uses by the pedestrians. This is why attempt was made to find out the level of awareness of pedestrians on the use of zebra crossing. The results shown in the Table 3 reveals that only 62.2 % of the respondents are very much aware of what the zebra crossing signifies and how it is used. While about 37.8% of the respondent are still unaware of the sign and how it is used.

Table 3 Pedestrian Knowledge on Zebra Crossing

	No.of Respondent	Percent
Yes	84	62.2
No	51	37.8
Total	135	100.0

Source: Field survey 2016.

Regarding their usage, Figure 1 shows that 48.9% the pedestrians do not at all use zebra crossing while crossing roads, 24.4% of them seldom use it, only 6.6% of pedestrians claimed that they frequently use zebra crossing anytime they cross roads in the city. The remaining respondents did not answer the question.

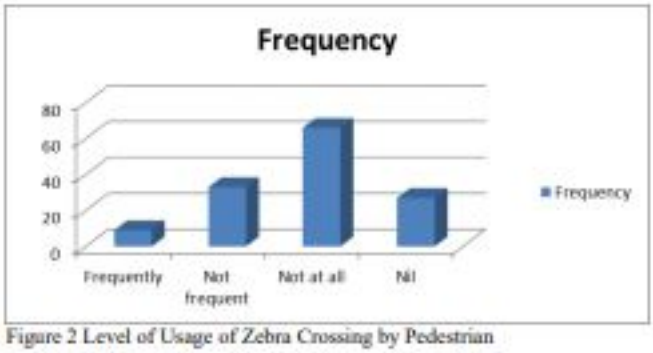

Figure 2 Level of Usage of Zebra Crossing by Pedestrian

Source: Field survey 2016

Analyzing Pedestrian - Vehicular Conflicts in Minna

To objectively determine the level of risk pedestrians are exposed to while crossing roads at different locations without zebra crossing or overhead bridges, an observatory survey of road crossings by the pedestrians was undertaken. The results of the findings are presented in Table 5 below. The table shows the volume of vehicles that passed through each conflict point at different periods of the day, the number of road crossings made by pedestrians, the number of near collisions (conflicts) observed and average conflicts per crossing.

Table 4: Pedestrian- Vehicular Conflicts in Minna.

KPAKUNGU	Time	Volume of Vehicle	No. of Pedestrian	No.Near Collision	No.of Crossing	conflict per crossing
Morning	7:00-8:00	691	201	5	131	0.038
	8:00-9:00	753	278	7	195	0.036
Afternoon	12:00-1:00	592	153	1	87	0.011
	1:00-2:00	741	294	4	215	0.019
Evening	4:00-5:00	625	183	5	112	0.041
	5:00-6:00	619	210	2	128	0.016
	Average	670	219	4	144	0.028
TUNGA						
Morning	7:00-8:00	484	114	0	71	0
	8:00-9:00	519	189	1	111	0.009
Afternoon	12:00-1:00	542	174	3	107	0.028
	1:00-2:00	570	201	1	119	0.008
Evening	4:00-5:00	532	235	4	140	0.029
	5:00-6:00	514	181	1	121	0.008
	Average	526	182	2	111	0.018

D. KURA						
Morning	7:00-8:00	634	218	3	132	0.023
	8:00-9:00	589	167	4	94	0.043
Afternoon	12:00-1:00	501	181	1	119	0.008
	1:00-2:00	583	198	0	103	0
Evening	4:00-5:00	526	207	3	120	0.025
	5:00-6:00	491	185	7	109	0.064
	Average	554	192	3	112	0.027
OGBOMOSO						
Morning	7:00-8:00	591	173	0	102	0
	8:00-9:00	732	218	11	228	0.048
Afternoon	12:00-1:00	690	210	2	182	0.011
	1:00-2:00	738	227	8	219	0.037
Evening	4:00-5:00	674	194	12	185	0.065
	5:00-6:00	703	229	5	143	0.035
	Average	688	208	6	176	0.034
KURE MARKET						
Morning	7:00-8:00	473	121	1	73	0.014
	8:00-9:00	503	201	1	141	0.007
Afternoon	12:00-1:00	438	165	2	82	0.024
	1:00-2:00	527	216	0	137	0
Evening	4:00-5:00	541	175	3	105	0.029
	5:00-6:00	468	149	2	72	0.028
	Average	491	171	1	101	0.010

Source: Field Survey 2016

From Table 5 above, Ogbomoso Intersection records the highest average hourly flow of vehicular traffic of 688, closely followed by Kpakungu intersection with an average hourly vehicular volume of 670. The least vehicular traffic was recorded by Kure Market conflict point with an average of 491 vehicles. On the other hand, Kpakungu generates the highest numbers of daily pedestrian traffic and the numbers of road-crossings of 219 and 144 respectively. The next highest pedestrians traffic volume and number of crossings was generated by Ogbomoso intersection recording 208 and 176. The main reason for the high volume of traffic flow is due to the type, the nature and volume of business and socio-economic activities taking place in and around these locations. Land use activities such as shopping complexes, motor parks/Bus stops, hawking, restaurants, Mechanic workshops, fuel stations and religious centres such as mosques are found clustered in these locations. All these activities are situated along those routes therefore causing a lot of movement of traders, motorists and pedestrians are moving and crossing the roads in different directions especially in peak hours. Apart from these traffic generating activities, other challenges observed in these intersections resulting to traffic conflicts, are poor condition of the road infrastructure available for controlling traffic at the intersection causing a high number of near collision.