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CONTENTS

1 | A study of the use of Non-Motorized transport in the University of Lagos —Ege, E. E. / Oni, S. I. / Longe, I. O. / Ohaegbue, F. R. / Mordi, G. N. / Balogun, G. 1

2 | Pedestrian Infrastructure and its Safety Awareness Level in Metropolitan Lagos: The Case of Ojota Footbridge —Olawepo, R.A., PhD / Usman, B.A., PhD / Asaju, J.A. 11

3 | Wealth Creation for the African Woman in the Context of the Blue Economy—Ogochukwu Ugboma 23

4 | Speed-Limiting Devices and the Control of Road Crashes —Osi S. Akpoghomeh, PhD / Gladys C. Emenike, PhD 32

5 | A Review of Resource Management and Control in the Maritime Industry —Osi S. Akpoghomeh, PhD / Gladys Emenike, PhD 42

6 | Assessment of Car Parks Adequacy and Provisions in Lagos State University, Ojo—Charles Asenime / Fatai Yakeen / Charles M. Oyakhilome. 50

7 | An Investigation into the Performance of Lagos State Drivers' Institute since its Inception in 2007—Ege, Enyeribe Emmanuel / Oni, Iyiola Samuel / Sowunmi, Waheed Opeyemi 59

| Spatio-Temporal Dynamics of Crashes in the Nigerian Airspace —Odewumi, S.G. / Adenekan, O. 83

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2

Pedestrian Infrastructure and its Safety Awareness Level in Metropolitan Lagos: The Case of Ojota Footbridge

Olaiwepo, R.A., PhD / Usman, B.A., PhD / Asaju, I.A.

ABSTRACT

Pedestrians are a highly diverse group and the most vulnerable road users. The group includes children, older people, teenagers, joggers, the disabled, mobility impaired, and people using wheeled toys or recreational devices such as skateboards, rollerblades, and foot scooters. Everyone is a pedestrian at some stage in their journey, so strong and consistent consideration must be given to them by other road users. Pedestrians account for the highest proportion of road fatalities in nearly all African countries, ranging between 31% in Zimbabwe and 51% in Ethiopia. In Lagos, between 2006 and 2014, there were 1,579 fatalities on the highways, which include pedestrian not using overhead bridges. Even with this, previous studies from Nigeria has emphasized passengers and drivers over pedestrians in terms of research. It is however important to study the pedestrian infrastructure and the level of its awareness. Primary data source was relied on to examine the extent of the awareness level of pedestrian towards pedestrian infrastructure. 216 pedestrians were randomly selected from the study area using Glen's formula. The paper calls for appropriate authorities to construct more pedestrian friendly roads, enlightening the populace on the importance of pedestrian infrastructure by increasing the awareness level, as well as enforcing the usage.

Keywords: Awareness, Fatalities, Highways, Infrastructure, Pedestrian.

INTRODUCTION

Pedestrians are a highly diverse group and the most vulnerable road users. The group includes children, older people, teenagers, joggers, the disabled and mobility impaired, and people using wheeled toys or recreational devices such as skateboards, rollerblades, and foot scooters. Pedestrians are most vulnerable in the road environment because of the greater differences in the speed ratios (i.e. Pedestrian vs. Vehicles) (Turner 2014). Most other road users are moving significantly faster than pedestrians are, and pedestrians

have little or no bodily protection in the event of a collision. Pedestrians are also often difficult to see and their behaviours may be unpredictable. This can make it challenging for other road users to successfully factor pedestrians into the decisions they are constantly making as drivers and riders. Everyone is a pedestrian at some stage in their journey, so strong and constant consideration must be given to them by other road users. Jeng (2003)

According to the New Zealand Transport Agency (2009), pedestrians have been grouped into three categories. These are those on foot, those on small wheels and Mobility impaired Persons.

Table 1: Sub-groups of pedestrian within each category

Types of Pedestrian	Sub-Groups
On foot	Able Pedestrians
	Runners/Joggers
	Young Pedestrians
	Adult Pedestrians
	Aged Pedestrians
	Impaired Pedestrians
On Small Wheels	In-Line Skaters
	Roller Skaters
	Kick Scooters
Mobility Impaired	Mobility Scooters
	Manual Wheel Chairs
	Electric Wheel Chairs
	Pedestrian With A Walking Frame

Source: Pedestrian planning and design guide, New Zealand

Some of the major Pedestrian Infrastructure includes pedestrian bridges, pedestrian islands, raised medians, kerb extensions, pedestrian crossings (aka Zebra crossing), and pedestrian walkways.

Globally, Nigeria ranks low in the quality of its infrastructure, which impacts the ease of doing business. Low investments in transportation have resulted in the current infrastructural deficit. Key challenges include inadequate investment and poor management of transport infrastructure, which have created a huge infrastructural deficit. An estimated $15b is required annually to adequately fund Nigeria's infrastructural deficits (Okonjo-Iweala 2014). The transportation system in urban centres of Nigeria is plaque with numerous challenges. Generally, the analysis of Nigeria's transport system revealed a sector suffering from warped or defective developmental approach (Badejo, 2011). There is evidence of skewed modal development tilted in favour of road transportation to the disadvantage of other means of transportation yet the aspect of pedestrian infrastructure are not given adequate attention.

In most Nigerian cities, streets and major routes have no provision for pedestrian infrastruc-

ture. The roads and streets are narrow and they are poorly maintained. In developing countries, pedestrians represent the most dominant users of road space but there is a huge deficit in the provision of pedestrian infrastructure (Daniel 2013). This often results in pedestrian accidents as it is established that annually pedestrian accidents accounted for over forty percent (40%) of the distribution of road traffic accidents by road user type (Afukaar, 2001). Globally, a pedestrian bridge is an important measure towards resolving traffic problems in any city or metropolitan area. The existence of such infrastructure can be utilised as a means not only to resolve traffic congestion on main roads, but also to enhance easy movement of people.

The city of Hague in Netherland for instance with approximately half a million (500,000) people in the city has a well-developed pedestrian infrastructure network and support services. The network and support services are the result of several years of action taken by different government, local organisations, and the public. In 2011, almost the entire old city was transformed to a pedestrian area. Presently, Hague has the largest free-car zone in the Netherlands. Generally, the number of pedestrians killed in Hague each year does not exceed ten (10) (WHO 2010). Amazingly, in some years, there has been only one pedestrian killed. This is largely due to the sustained implementation of pedestrian, transport, and urban development programme in the city (World Health Organisation 2010) and the World Bank (2011). This, however, can be seen as a model for Nigeria and metropolitan Lagos as well.

Lagos state is the smallest state in Nigeria by land mass with an area of 356,861 hectares of land, yet it has the highest population of 17million people which is over 5% of the national estimate of 150million (LAMATA 2015). With a vehicular density of 227 vehicles per kilometres while most states in Nigeria is just 11 vehicles (Badejo, 2008). With the rapid increase in the number of vehicles in metropolitan Lagos and high growth rate in the population, the number of pedestrian accidents and fatalities is likely to increase if proper pedestrian infrastructures such as footbridges, walkways, and zebra crossing are not available. As a matter of facts, pedestrians are been killed every day in metropolitan Lagos due to poor observation and failure to give way to pedestrians. These are the two most common factors in pedestrian injury cases (Akomolafe, 2014). Therefore, safety awareness should be created on the usage of these pedestrian infrastructure and adequate provision for an improved infrastructure for pedestrian on the highway. However, this research would assess pedestrian infrastructure on the highway and their safety awareness level in some major highways in metropolitan Lagos.

1.1 AIM OF THE RESEARCH

The aim of this research is to assess Pedestrian Infrastructure and Its Safety Awareness Level in Metropolitan Lagos: The Case of Ojota Footbridge

2. MATERIAL AND METHODS

2.1 Study Area

Lagos State is located in southwestern part of Nigeria. It is bounded in the north and east by

05-20-17.indd 13 5/20/2017 8

Ogun State, in the west by the Republic of Benin, and in the south by the Atlantic Ocean on the Bright of Benin. Lagos State is the fastest growing city in Nigeria and it is the second most populous and fastest growing city in Africa next to Cairo in Egypt. It has also been ranked as the seventh fastest growing city in the world. The population of Lagos State in 1991 was 3.8 million and by 1997, the population was estimated as 11.58 million. Lagos State attained the mega city status in 1995 when the population reached the 10 million mark (UN-Habitat, 2006). Presently, the State population is estimated at 17 million, a remarkable increase on the 2006 national census figure of 9.01 million. Lagos State is Nigeria's economic capital as well as its financial and commercial nerve centre. The State accounts for over 33.5 % of national industrial establishment, 65% of its commercial activities, and over 45% of the skilled manpower in the country. Collectively, the socio-economic advantage has implications for traffic generation and flow; and road infrastructural provision. However, road provision has not met the sharp rise in the number of vehicles plying the roads (Filani, 2011).

2.2 Scope of Study

The research is limited to Ojota footbridge along Lagos –Ikorodu express road in metropolitan Lagos. Ojota is located in latitude 6.58777778 (6^0 35') and longitude 3.38222222 (3^0 22') It is a place with a very small population in the state. Cities, towns, and places near Ojota include Opamore, Oshosun and Onikosi. Ojota is a very popular area in Lagos because of its nature of inter-state bus deports and it is a first bus stop for a visitor to Lagos state (Google satellite Map). Hence, the busy nature of the area necessitated the construction of a footbridge at the bus stop.

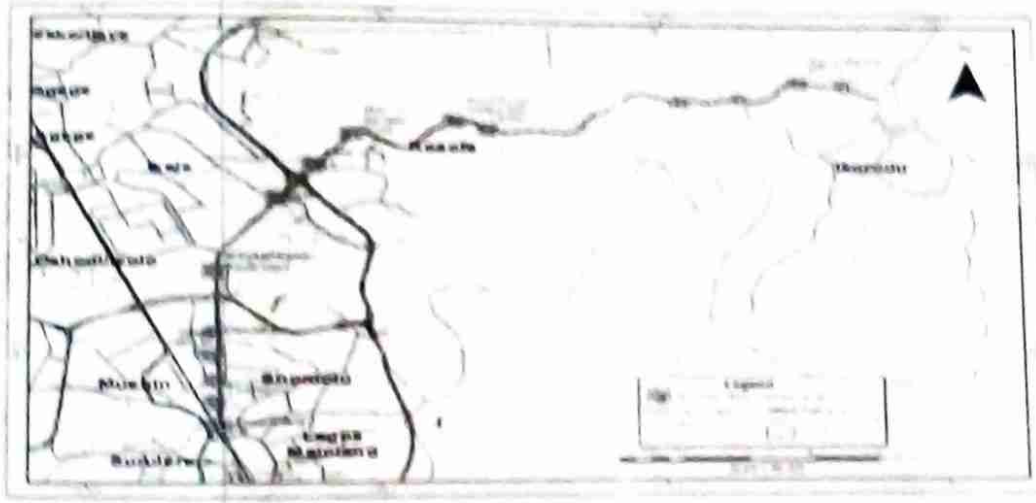


Figure 1: Pedestrian Bridges Along Lagos–Ikorodu Express Way

Source: Author 2015

Location	Present Status	Remark/Condition	GPS Reading

Ojota	Existing Concrete with roof top	Good	N 06.58788 E 003.37931

2.3 CONCEPTUAL FRAMEWORK

The Concept of CARS Index

This concept has been proposed by researchers and it was a modification of the concept of P-Index propounded by Mohammed Z (2010). The concept of P-index is based on four indicators namely: Mobility, Safety, Facility, and Accessibility, which collectively define what an ideal pedestrian infrastructure should be. The P-index comes together with star ratings that summarise the qualitative value of pedestrian infrastructure, similar to how hotels and Airlines are rated. The star rating provides a nonprofessional explanation on how good (or how bad) pedestrian infrastructure is. The numerical value of P-Index is determined from the four criteria that define an ideal pedestrian facility, namely: Mobility (M) Safety (S) Facility (F) Accessibility (A) .

Mathematically, the P-Index (P) is a function of the four criteria above. The functional relationship between P-Index (P) and the criteria is given below:

$P = f(M, S, F, A)$.

On the other hand, the CARS Index tries to look into the attitude of pedestrian towards the usage of pedestrian infrastructures on the highway. CARS are acronyms for Convenience, Availability/Attractiveness, Reliability, and Safety. These are parameters in the performance measure of pedestrian with pedestrian infrastructure on the highway.

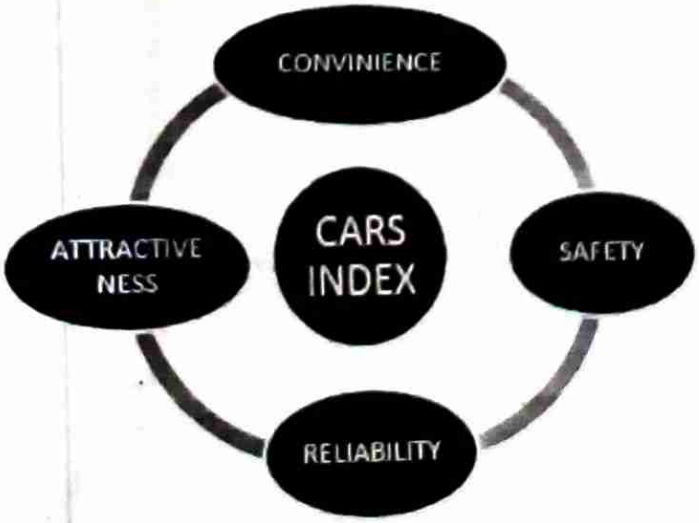


Figure 2: Concept of CARS Index

Author: Adapted by the Researchers

Convenience

The research shows that most pedestrians are of the opinion that these pedestrian infrastructures especially foot bridges are too difficult to climb especially for pregnant women, aged and people with disability.

Availability/Attractiveness

Pedestrian bridges are supposed to be found where the volume of pedestrians is high but sometimes, the reverse is the case. Most of the areas where these infrastructures are needed do not have them and vice versa. Attractiveness of the bridges has a greater influence also on the users. If the footbridges were attractive many pedestrian would make use of it. Abeokuta footbridges with an air condition is a good example

Reliability

Many pedestrians do not trust the footbridges because of the dilapidated nature of some of the bridges. Some are just a dead trap about to collapse. Many prefers to cross the highway and be careful than to climb the bridge and fall in front of an oncoming vehicle

Safety/Security

A pedestrian wants to be safe from miscreants who have turned the bridges to their abode, trying to rob people off their belongings or even rape whoever fall victim. Pedestrian bridges therefore need to be lit up in the night and adequate security should be put in place to enhance pedestrian safety.

2.4 Study Population and Sampling techniques

The source of data for this study is primary data with a well-structured questionnaires as well as observatory method (through pedestrian count). The research was carried out under the footbridge in Ojota. Two hundred and sixteen questionnaires were administered to pedestrians after a careful pedestrian count in the study area. Since the study area is a major point of reference for visitors who are coming to Lagos for the first time, it was discovered that there were 5,664 pedestrians between the hour of 6am-6pm (both those who make use of the bridge and those who do not). This was however divided by 12hours to arrive at an average of 472 pedestrian per hour. The numbers of questionnaires that were administered were gotten through the Use of Glen's formula for determining the sample size of a population. However, of the 216 questionnaires administered, only six were damaged and 210 were analyzed.

$$\text{i.e.: } n = \frac{N}{1 + N(e)^2}$$

Where

n = sample size
N = total population
e = percentage error or level of significant (which would be 0.05)
1 = constant

Location	Daily pedestrian count	Average pedestrian movement per hour	No. of questionnaires
Ojota	5,664	472	216

Average pedestrian count per hour = 472, i.e

$$\frac{472}{1 + 472\,(0.05)^2}$$

$$\frac{472}{1 + 472\,(0.025)}$$

$$\frac{472}{1 + 1.18} = \frac{472}{2.18} = 216$$

2.5 Data Analysis

Descriptive analysis were used to interpret the data generated from the field for a more convenient and easy interpretation. This includes the use of simple percentages, graphs and various charts.

3. RESULTS AND DISCUSSION

3.1 Demographic characteristic of respondents

Socio-Demographic Characteristics	Number of Respondents	Percentages
Sex		
Male	128	61%
Female	82	39%
Age		
<20	36	17%
21-40	94	45%
41-60	50	24%
>60	30	14%
Qualification		
Primary	44	21
Secondary	62	30
Tertiary	90	43
Others	14	6
Marital Status		
Married	112	53%
Single	85	41%
Others	13	6%
Occupation		
Students	60	28%
Civil servant	55	27%
Business	67	32%
Unemployed	28	13%

The above table shows that the vast majority of 61% of the respondents are male which means that there are more males on the move either to fend for the family or looking for daily sur-

vival of which about 69% falls between the economically active age of between 20-60 years. Majority of the respondents are also educated, as 43% had gone through one form of tertiary education or the other, 30% secondary, 21% primary while 6% had other forms of education. The result also shows that 53% of the respondents are married while 41% are not. 32% of these respondents are businessmen and women, 28%, 27%, and 13% are students, civil servants, and unemployed respectively.

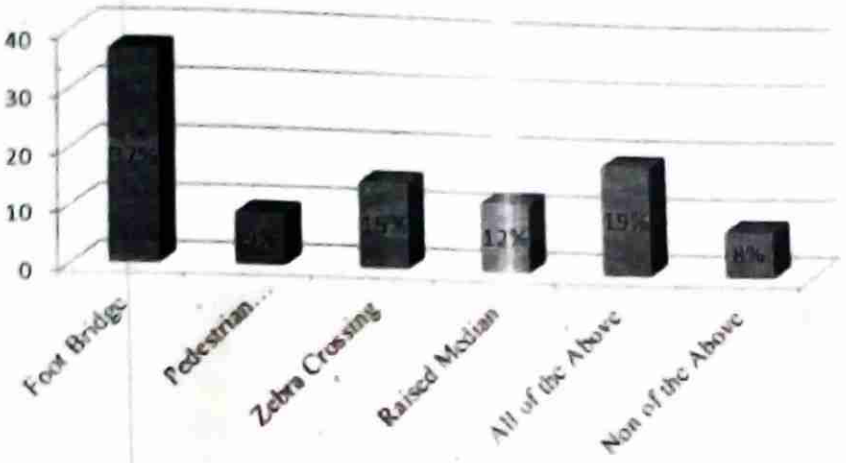


Figure 1: Pedestrians Infrastructure known to the respondents

Figure 1 shows that footbridge is the major pedestrian infrastructure a pedestrian is familiar with followed by zebra crossing, raised median, and walkway respectively. Only 19% of the respondents are familiar with the entire pedestrian infrastructure and 8% do not know these infrastructure.

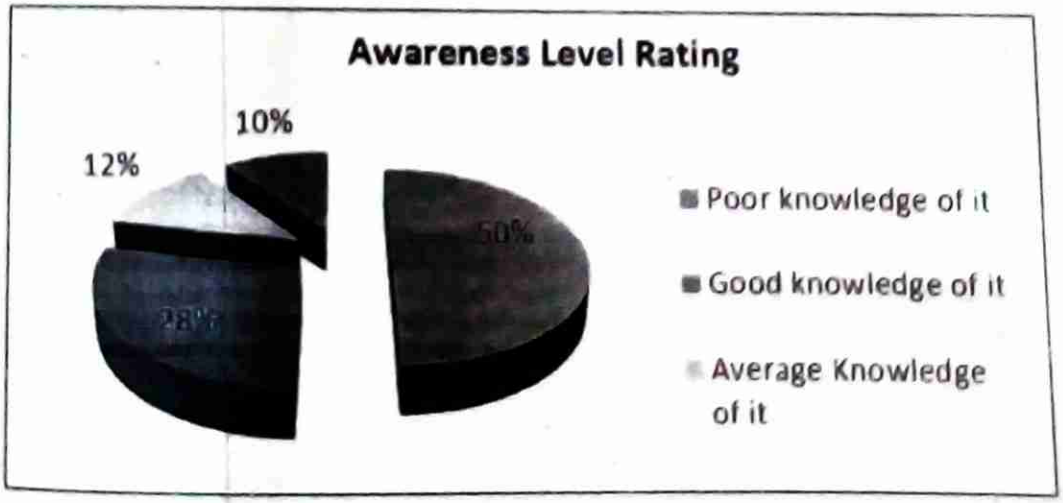


Figure 2: Level of pedestrian awareness to pedestrian infrastructure

Figure 2 shows the level of awareness of pedestrian in the study area. From findings, about 50% of the respondents have a little or no knowledge of pedestrian safety infrastructure and

only 28% had a good knowledge of it. This contributed to the high rate of defaulters in the usage of this infrastructure.

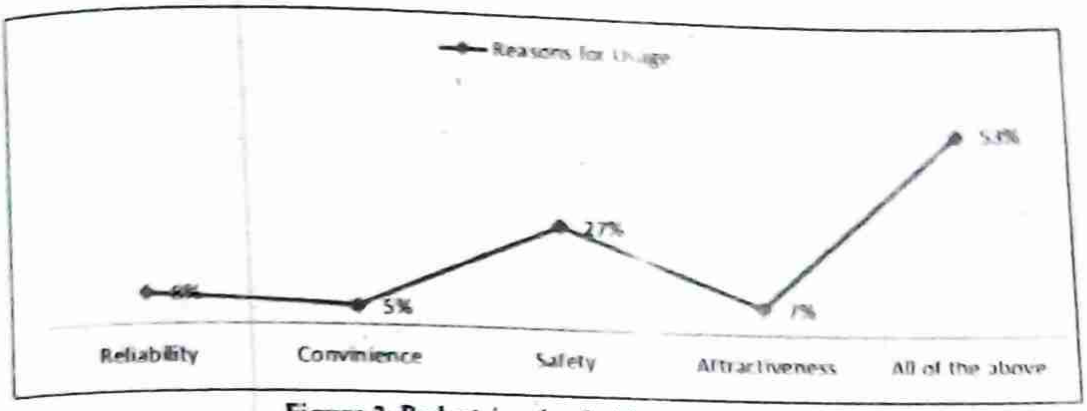


Figure 3: Pedestrian footbridge usage rating

Figure 3 shows that about 62% of the respondents sometimes, always, and frequently make use of the footbridge while 38% do not. This is due to various reasons ranging from height phobia, distance, and vices like beggars and traders that are occupying the footbridge or even being attacked in the night.

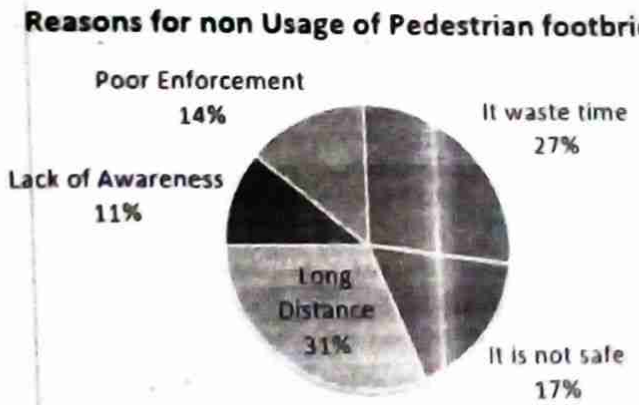


Figure 4: Reasons for the usage of pedestrian infrastructure

Figure 4 shows that the CARS concept is the parameter that the respondents consider before making use of any pedestrian infrastrueture as 53% of the respondents confirmed this.

Figure 5: reasons for non-usage of pedestrian infrastructure

The study also discovered that long distance to the base of the footbridge, time wastage; safety issues, poor enforcement, and lack of awareness are some of the reasons why many still ignore the usage of footbridges.

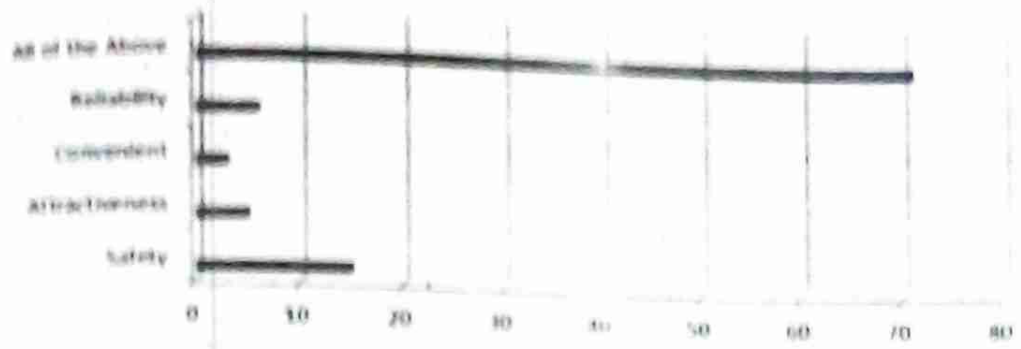


Figure 6: factors pedestrian consider before using pedestrian infrastructure

CONCLUSION

This research concludes that adequate awareness has not been created to sensitize the people on the importance of pedestrian infrastructure and the number of people who loses their lives to reckless drivers on daily basis. Also the enforcement level is very poor hence, the reason why many people still risk their precious lives by crossing the highway even where this infrastructure is provided.

The study also concludes that the concept of CARS has been proved to be the factors that pedestrians consider before they use pedestrian infrastructure. CARS is an acronyms for

Convenience
Availability/Attractiveness
Reliability And
Safety/Security

RECOMMENDATIONS

- The Lagos State authority should construct a friendlier pedestrian infrastructure in the study area (considering the aged, people with disability and pregnant women) as an addition to the present one due to the demand of it.
- Other pedestrian infrastructure such as walkways, raised median, speed bumps, zebra crossing and pedestrian signals should be provided in the study area
- More enlightenment programmes should be created through various campaign and jingles using radio and televisions. Also through a catch them young programme in both primary and secondary schools
- The usage of this infrastructure should be enforced by empowering the law enforcement agencies like KAI and Policemen to deal with defaulters especially the newly constructed median barrier

- A law that would ban displaying of goods and other items for sale on a footbridge should be enacted to enhance a free flow of pedestrian movement.
- Adequate security should be provided for users to avoid been harassed or even robbed by miscreant and footbridges should be lit up especially at night
- The state government should enact a law prohibiting indiscriminate parking at pedestrian walk way, increase child supervision and also enforce speed limit of not higher than 30kph



Plate 1: Study Area

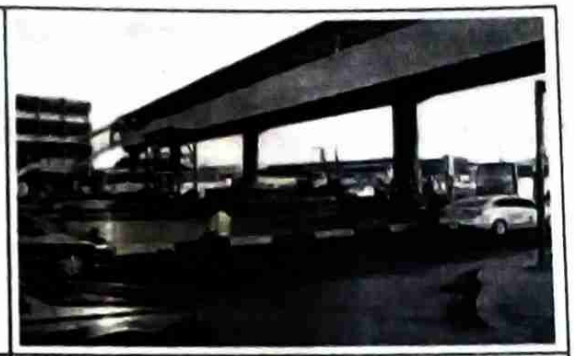


Plate 2: A man crossing directly under a pedestrian bridge at Ojota



Plate 3: A pedestrian that was almost knocked down at Ojota bus stop

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