ALKÜ Fen Bilimleri Dergisi 2019, Sayı 1(1): 33-39

Pedestrian's Utilizations of Footbridge In Kano-Nigeria

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Abstract

Pedestrian crossing facilities such as crosswalk, pedestrian footbridges overpass, and under-pass at intersection or midblock with crossing facilities are designed to separate pedestrians from the moving vehicles hence improving safety of the pedestrians. Questionnaire survey was used to determine the factors influencing the use and utilization of footbridge by pedestrians in Kano city, Nigeria. The survey results show that 70% of the respondents were frequent users of the bridge while 30% were found not be using it. Analysis of the survey result shows that age and gender were statistically significant in the utilization of the bridge with a p-value of 0.041 and 0.002 respectively while education level was found to be statistically insignificant p-value = 0.688. The major reasons influencing pedestrian to use the bridge were safety (66%), barricades (25%), then traffic flow (9%). For the pedestrians that do not use the bridge, they describe the bridge height (38.5%) as the major reason for not using the bridge followed by poor design of the ramps (26.5%). Improving the design of the bridges and using escalators will surely enhance use of the footbridges by the pedestrians in Kano city.

Keywords: Pedestrians, Foot Bridge, Kano.

1. INTRODUCTION

Traffic accidents involving the vulnerable road users, that is pedestrians and cyclist is a critical safety threat around the globe [1]. An estimated 275,000 pedestrians die every year globally as a result of traffic collisions [2]. Amoako et al had limited insight into the relationship between pedestrian infrastructure and pedestrian safety in urban areas in developing countries [3]. The high population and inadequacy of traffic infrastructure in developing countries have resulted in road traffic crashes and traffic congestions. Pedestrian crossing facilities such as crosswalk signalized and un-signalized, pedestrian bridges overpass underpass at an intersection or midblock with crossing facilities are designed to separate pedestrians from the moving vehicles hence improving the safety of the pedestrians. Unfortunately, the pedestrians prepare to cross illegally despite the fact that the facilities are for their safety [4].

Pedestrian crossing speed was evaluated in Jordan and the results show that age, gender, and distance crossed have some effect [5]. Pedestrian behavior is very complex and easily influenced by environmental designs and urban forms. A proper design of facilities can encourage walking without compromising safety and convenience [6].

Safety, time-saving, and convenience were found to be the most influential factors influencing pedestrian's decision to cross at designated crossing locations [4]. Environment plays a vital role in pedestrian decision-making to cross at appropriate locations. Use of escalators was found to be a good way of encouraging people to use the footbridge, whereas the presence of crossing light signals encouraged pedestrians to walk across the road instead. It is interesting to note that there was a benefit to be derived from each alternative, but that it was probably not the same type of benefit [7]. A qualitative study among residents in three areas in London, Birmingham, and Southend found that pedestrian's perceptions about crossing facilities are influenced by accessibility, safety, crossing time, convenience, and security [8]. Modeling pedestrian crossing behavior in the Athens city center in Greece, showed that pedestrian crossing choices are influenced significantly by road type, traffic flow and traffic control [9].

According to [10], some elements of the existing pedestrian facilities are not preferred by pedestrians, thus affecting the use of the mode. In order to increase their use and safety, it is important to appreciate pedestrians' preferences to ensure that their desires and aspirations are reflected in the planning and design of pedestrian facilities.

The traditional methods used to observe pedestrian's behavior on train platforms, junction areas, location of footbridge, etc. include video recordings of local level behavior [11], following pedestrians and recording their path by means of a GPS or similar device [12], combination of following pedestrians and using a video camera for capturing the environment [13]. Video camera recording is the most common data collection method used and its main limitation rises from the obvious difficulty to capture more than the local level behavior of pedestrians, beyond the video camera range [11]. In some studies, the local level behavior observations were combined with a questionnaire survey to improve the data [14].

The aim of this research is to identify factors influencing pedestrian's decisions for using footbridge and also to assess the utilization level of the foot brides by pedestrians.

2. METHODOLOGY

The study was conducted in Kano State Nigeria in April 2018. A total of 400 people within a 50m distance of the four pedestrian footbridges in the state were interviewed to collect information regarding the pedestrians use of bridges. Three of the Pedestrian bridges were located near schools, that is Saadatu Rimi college of education along Zaria road, Bayero University, Kano, Aminu Kano College of Islamic Legal and Studies on BUK road and the fourth is that of Kurna Babban Layi along Katsina Road. The information gathered include age, gender, education level and the respondent's use of the footbridge. The respondents were further asked on the reasons motivating them to use the bridge or otherwise in case of non-use of the footbridge. Regression analysis using Minitab was performed to determine the significance of the variables. All the sites surveyed have high traffic volume at peak hour and the locations were black spots with a record of fatal accidents before the installation of the bridges. There are bus stops at the location of all the pedestrian bridges. In all the locations, a barricade was constructed to a length of 100m to force the pedestrians to use the bridge. The footbridges are 6m high spanning over a six-lane divided road. Table 1 summarizes the description of information collected.

Table 1: Descriptions of Variables

Variables	Notations	Description
Gender	X_1	1 = Male, 2= Female
Age	X_2	1= <20, 2=20 To 30, 3=31 To 40, 4=41 To 60, 5= 50-60, 6= >60
Education	X_3	1=Primary, 2=Secondary, 3=Diploma, 4=Degree, Post graduate = 5, 6=Informal Education
Reasons for not using pedestrian bridge	Y_1	1= Height, 2=Insecurity, 3= Untidy, 4= Beggars, 5=Disability/ illness, 6=poor ramp design
Reasons for Using Footbridge	Y_2	1= Barricade, 2= safety, 3= heavy traffic

3. RESULTS AND DISCUSSIONS

3.1 Respondents Characteristics and Use of Footbridge

The description of the respondent's demographic characteristics and their usage of the footbridge was analyzed and presented in Table 2. The percentage of those using the bridge is 70% and 30% were not using the bridge. This is a high number when compared with other studies in Malaysia where only 18.9% of the respondents voted for crossing bridge [15] in preference of other pedestrian crossing facilities. The installation of the barricade had influenced the choice of using the footbridge over non-use of the facility. Since three of the facilities are situated near schools, 67.5% of the respondents are between the ages of 20-40 years and constitute 74.3% and 60% of the facility usage and non-usage respectively. 76.5% of the respondents had at least diploma which is as a result of the location of the bridges. The result of the regression analysis presented in Table 3 has shown that age and gender are statistically significant for bridge use with a p-value of 0.002 and 0.041 respectively. The education level of the respondents has no effect on the pedestrian's choice in using the footbridge.

Table 2: Survey Summary Result

Variables	Label	Respondent		Using Foot Bridge		Not Using Foot Bridge	
		No.	%	No.	%	No.	%
Bridge Use	Using	280	70.0	-	-	-	-
	Not using	120	30.0	-	-	-	-
Gender	Male	252	63.0	196	70.0	56	46.7
	Female	148	37.0	84	30.0	64	53.3
Age	<20	68	17.0	46	16.4	22	18.3
	20/30	218	54.5	168	60.0	50	41.7
	30/40	52	13.0	40	14.3	12	10.0
	40/50	42	10.5	16	5.7	26	21.7
	50/60	14	3.5	8	2.9	6	5.0
	60>	6	1.5	2	0.7	4	3.3
Education level	primary	16	4.0	16	5.7	0	0.0
	SSCE	44	11.5	28	10.0	16	13.3
	Diploma	154	38.5	104	37.1	50	41.7
	Degree	136	34.0	102	36.4	34	28.3
	Graduate	16	4.0	12	4.3	4	3.3
	Informal	34	8.5	18	6.4	16	13.3

Table 3: Result of the Regression Analysis

	coefficient	t stat	p-value
Intercept	1.17255	8.28438	0.000
Gender	-0.20211	-3.07823	0.002
Age	-0.06566	-2.05970	0.041
Level of Education	-0.01215	-0.40278	0.688

3.2 Respondents Reasons for Using the Bridge

The respondents that were frequent users of the pedestrian bridge were further asked on the factors motivating them to use the bridge and the reasons were found to be the barricade (fence) provided personal safety and those that consider heavy traffic as their reason. The analysis based on the respondents' demographic characteristics revealed that in all the classes safety has been the major reason behind their choice for using the footbridge the with the exception of elderly those of age greater 60 having barricade as their major reason for using the bridge. The second major reason for using the pedestrian bridge is the Barricades and lastly the traffic flow.

Table 4: Reasons for Using Pedestrian Bridge

Variables	Label	Reasons for using Pedestrian Bridge (% Group)		
		1	2	3
Gender	Male	29.59	61.22	9.18
	Female	14.63	80.49	4.88
Age	<20	26.09	69.57	4.35
	20/30	24.10	66.27	9.64
	30/40	30.00	65.00	5.00
	40/50	12.50	75.00	12.50
	50/60	25.00	75.00	0.00
	60>	100.00	0.00	0.00
Education level	Primary	50.00	50.00	0.00
	SSCE	33.33	33.33	33.33
	Diploma	17.65	70.59	11.76
	Degree	29.41	64.71	5.88
	Post Graduate	0.00	83.33	16.67
	Informal	22.22	77.78	0.00

Figure 1 shows the percentage of the pedestrian's reasons for using the pedestrian bridge. Personal safety was considered to be the major reason (66%) for choosing the bridge which corroborates with research by [4], followed by barricades (25%) and finally due to heavy traffic (9%).

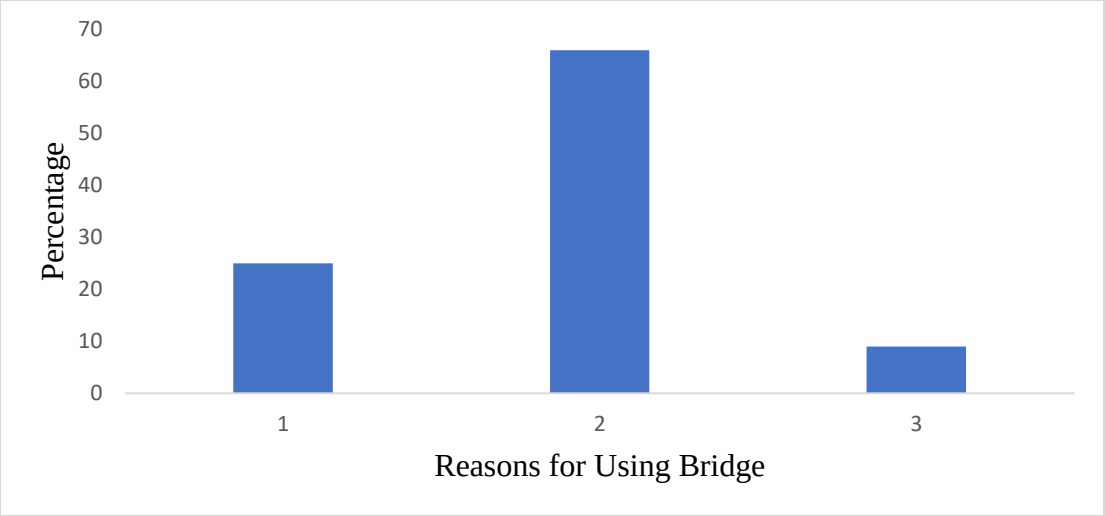

Figure 1: Factors Motivating Use of Bridge

3.3 Respondents reasons for not using the bridge

The pedestrians' reasons for not using the footbridge despite been situated near a bus stop and risk for crossing heavy traffic roads with six-lane road and choosing to walk extra distance were collected and analyzed. Both males and females ranked height of the bridge as the major reason influencing their decision for not using the bridge followed by poor ramp design of the bridge as that makes them tired and uncomfortable. All the age groups with exception of those between 30-40 years mention height as the major reason preventing them from using the bridge. The major contributing factors for those between 30-40 years are a disability and poor design. For the education level also, height and poor ramp design seem to be the major factors discouraging them from using the facility.

Table 5: Reasons for not Using Foot Bridge

Variables	Label	Reasons for NOT using Pedestrian Bridge (% Group)					
		1	2	3	4	5	6
Gender	Male	32.14	10.71	7.14	14.29	7.14	28.57
	Female	43.75	6.25	3.13	9.38	12.50	25.00
Age	<20	18.18	9.09	0.00	36.36	0.00	36.36
	20/30	40.00	4.00	12.00	8.00	8.00	28.00
	30/40	16.67	16.67	0.00	0.00	33.33	33.33
	40/50	61.54	7.69	0.00	7.69	0.00	23.08
	50/60	66.67	0.00	0.00	0.00	33.33	0.00
	60>	0.00	50.00	0.00	0.00	50.00	0.00
Education level	Primary	0.00	0.00	0.00	0.00	0.00	0.00
	SSCE	37.50	0.00	0.00	50.00	0.00	12.50
	Diploma	40.00	8.00	4.00	4.00	4.00	40.00
	Degree	23.53	17.65	11.76	11.76	17.65	17.65
	Post Graduate	50.00	0.00	0.00	0.00	50.00	0.00
	Informal	62.50	0.00	0.00	0.00	12.50	25.00

Figure 2 gives the percentage response of the reasons for not using the bridge among pedestrians. The height of the bridge was the reason with the highest percentage (38.5%) followed by poor ramp design 26.7%. 11.7% are discouraged by beggars on the bridge which needs to be addressed to enable smooth flow of the pedestrians on the bridge.

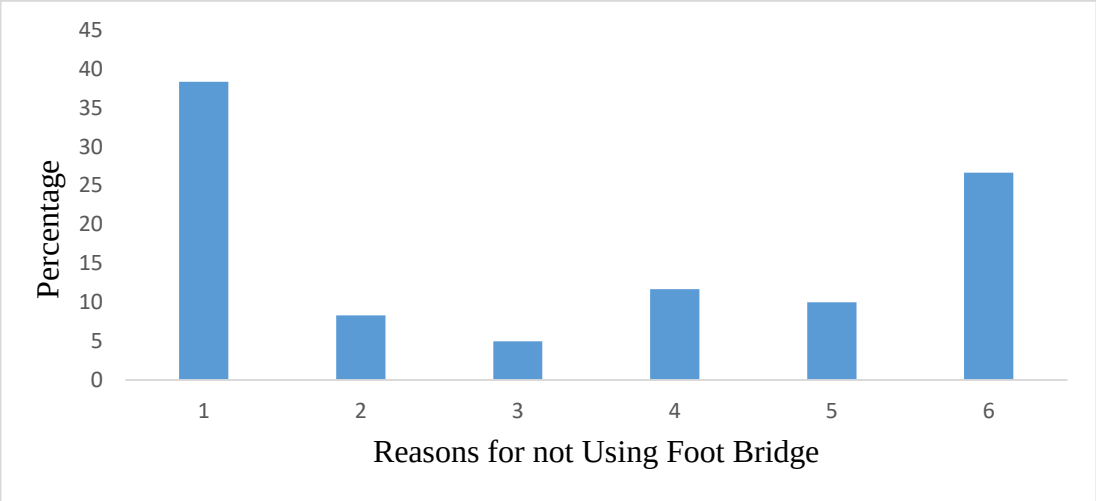

Figure 2: Pedestrians Use of Not Using Bridge

4. CONCLUSION

A survey on the use of pedestrian footbridge was conducted in Kano City, to know the factors influencing and affecting the pedestrian's decisions on utilization of the bridges. 70% of the pedestrians surveyed were found to be using the footbridges and 30% were not using it. Gender and age were found to be important demographic factors influencing pedestrian's utilization of the bridge while the level of education was found to be insignificant. The pedestrian's main reason for using the footbridge to cross the road tallies with the main purpose it was installed for that is safety followed by the fence (barricades) provided under the bridge to compel pedestrians to use it or walk extra distance than when the bridge was used. Pedestrians that were not using the bridge attributed that to the height of the bridge (6m) and poor design of the ramps that exhaust person while trying to use the footbridge. Proper design of the overpass footbridges, use of escalators will surely improve the pedestrians use of the bridge. Alternative bridges like underpass will also help if proper lighting is provided as that resolve the height and ramps problems faced by the pedestrians.

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Geliş/Recieved: 15 Ekim 2018/15 Oct 2018
Kabul Ediliş/Accepted: 30 Kas 2018/30 Nov 2018