PEDESTRIAN USAGE ANALYSIS OF FIVE FOOT OVER-BRIDGES IN DHAKA CITY

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ABSTRACT

Foot-Overbridge (FoB) are structures which are used for safe movement and passing of pedestrians. In Dhaka city, road users are often seemed to pass between a moving traffic stream rather than using foot-overbridge or underpass. This research deals with pedestrian behavior usage of FoBs and their preference on choosing different modes for passing or crossing a road. Total five footover bridge points have been chosen to conduct a questionnaire survey. The footover bridges are located near Mirpur-1, Mirpur-2, Mirpur-10, Elephant road and Basundhara Residential Area (Jamuna Future Park). Data was collected during 9 AM to 11 AM, 1 PM to 3 PM and 4 PM to 6 PM to see how many people actually use the pedestrian crossing facilities. They were interviewed about the factors that affects pedestrian behavior for reluctance to use foot over bridges. 200 people were interviewed in the process. Different demographic attributes like gender, age, occupation were checked behind any influence on pedestrian flow. From the study it was found that 41% people do not use the FoBs. It has also been found that 56% people prefer crossing the road directly or using zebra crossing. 11% people think underpass as a better mode of crossing than using a FoB. From statistical analysis, time consumption has been cited the most important reason for not choosing road crossing facilities and ignoring safety. Foot overbridge users also gave opinion that safety and discomfort issues often influence the pedestrian choice. Female participants often avoids using underpasses due to lack of safety. The study has been carried out to give an insight about the social factors that vastly influence the crossing mode choice and the developments that need to be taking place to inspire people to use a foot-overbridge or an underpass.

Keywords: *Footover bridges (FoB), pedestrian, attributes, safety, survey.*

1. INTRODUCTION

People run in the middle of the road or they jump by the medians of the street in arterial busy roads despite cars driving straight through. All of these are common scenerios in the streets of Dhaka. In the roads of Dhaka, it's common to see individuals sprinting in the center of the road while waving their hands to tell vehicles to stop. Running can be confusing to drivers and can occasionally cause a vehicle to tip over, leading to severe accidents. For this reason, a simple pedestrian running in the middle of the the can literally play with someone's life. People who walk on the road and use its amenities are known as pedestrians. They play a significant role in traffic and other road operations. Facilities for pedestrians should be given high attention in the transportation system in order to offer a safe environment. Zebra crossings, walkways and sidewalks, foot over bridges (FoB), and underpasses are a few of the facilities for crossing roadways. Walking is a crucial means of transportation as about 60% of daily travels are made on foot in Dhaka, Bangladesh (Rahman & Anowar, 2007). While rickshaw use has grown over the past ten years, there is some evidence to suggest that walking as the primary method of transportation has dropped. Walking and rickshaws combined accounted for 40% of trips (Jamal et al., 2022). Dhaka being a developing city, traffic congestion is a common phenomenon in the streets. In terms of extreme traffic blockage, walking is more preferable. It might be uncomfortable to walk on a sidewalk, especially for women. As they frequently cross the street in disorganized ways, pedestrians are frequently considered as one of the most dangerous group on the road. Between 2011 and 2017, a total of 2,720 accidents occurred, resulting in 1481 pedestrian fatalities and 1562 pedestrian fatalities. From 2010 to 2019, 25,879 fatalities and 26,464 accidents were reported in Bangladesh and the number of pedestrian fatalities is about half (Ahmed & Ahmed, 2013; Bhattacharjee et al., 2023). In another study, it was found that out of 2363 accidents in 2014, 62.4% comprised pedestrians (Pervaz & Newaz, 2016). The majority of pedestrian fatalities (54%) were at crossings, with the T-junction having the highest percentage of fatalities (33%). The main reasons that people walk is to get to work, shopping, visiting, going to places including local bus stops and educational institutions. Due to the structure of the city, traffic and pedestrian collisions are unavoidable, increasing in number (Rahman & Anowar, 2007).

Facilities for road crossings require infrastructure upgrades. Pedestrians should be encouraged for abiding by the traffic rules. According to data out of the two Dhaka city corporations, currently there are 43 foot over-bridges in the Dhaka North City Corporation, and 31 in the Dhaka South City Corporation. There are also 4 under crossings in Dhaka City, according to Dhaka North City Corporation (DNCC) (2013) (Pasha et al., 2015; Awosaf, 2018). Even though Dhaka's main roadways have several foot overbridges, most pedestrians choose to cross the street instead, possibly putting their lives in danger. (Rana & Hasan, 2021)

From pedestrian perspective, different factors affect the preference for usage of FoB. Presence of vendor and shopkeepers, filthy, dirty ambiance, proper access to roads or passageway, location of the overbridge are important variables to judge behaviour of pedestrians. Due to simple laziness, the majority of individuals often avoid road crossing facilities since doing so requires a lengthy walk or takes time. This paper discusses the situation of pedestrians using the overbridges and their perceptions on reason why they do not use the over bridges.

2. METHODOLOGY

2.1 Study Area

Dhaka city has a population 22,478,116 people, being one of the most densely populated cities (Dhaka Tribune, 2022). Dhaka is a city well-known for its severe traffic issues. However, as Bangladesh's capital, Dhaka draws pedestrians from a variety of demographics. To reduce the frequency of accidents, it's critical to make effective use of the pedestrian facilities. From police reports seventy seven percent of traffic accident fatalities were found to be pedestrians in Dhaka (Ahmed & Ahmed, 2013). In Dhaka, around the roundabouts at Mirpur 1 and Mirpur 10, heavy

rickshaw traffic causes serious congestion. Due to the hand-operated system and the illegal pedestrian crossing at this location, accidents frequently occur here. Substandard passenger loading and unloading on public transportation is another factor contributing to significant accidents in this location (Iffat, 2007).

Figure 1: Location of Mirpur-1 Over-Bridge

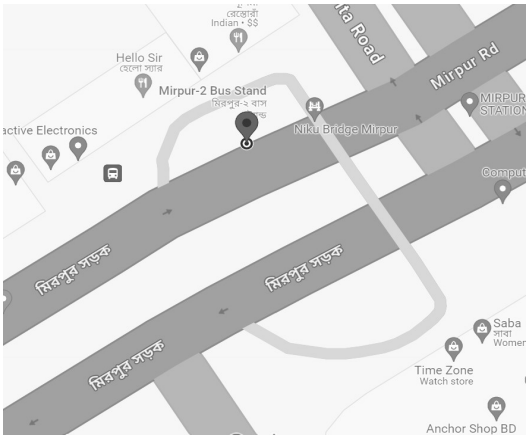

Figure 2 : Location of Mirpur-2 Over-Bridge

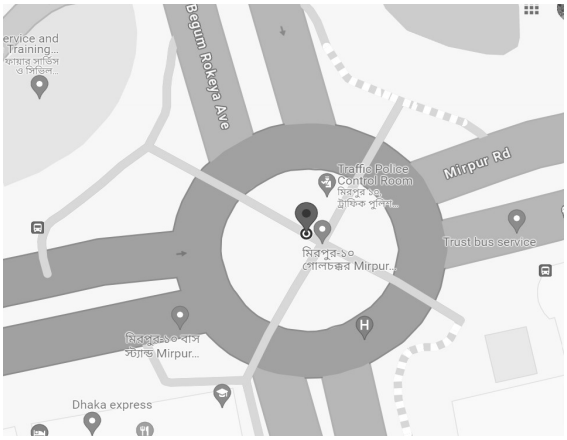

Figure 3: Location of Mirpur-10 Roundabout Over-Bridge

Figure 4: Location of Elephant Road Over-bridge

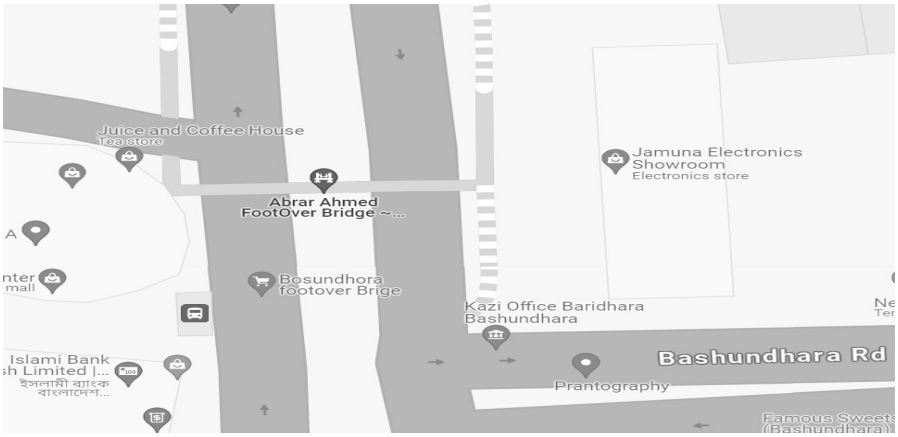

Figure 5: Location of Jamuna Future Park Over-bridge (Abrar Ahmed footover bridge)

Three significant overbridges - Mirpur-1, Mirpur-2, and Mirpur-10, that are situated around this Mirpur region have been examined for the study. The two foot over bridges that remain are situated close to large commercial centers. These retail centers frequently can draw large numbers of foot traffic. New Market to Science Lab Area corridor had 4.4 pedestrian casualities per km per year in 2007 while analyzing section wise casualty rating (Rahman & Anowar, 2007). Therefore, it is recommended to study unauthorized pedestrian movement at the five designated study locations. The perception behind the illegal crossing of passengers should be investigated and studied.

2.2 Data Collection and Processing

Users of the foot-over bridge have provided information on their perceptions using a questionnaire survey. The survey asked questions concerning several factors that users believed prevented them from using the overbridge. Ten attributes were selected in accordance with different researches (Pasha et al., 2015; Rana & Hasan, 2018; Zubaer et al., 2022). 200 people in all were interviewed. 40 pedestrians were interviewed at each location. Both at the FoBs and on the streets, interviews with pedestrians were conducted. Each attribute has been placed into five categories. These were ranked from 1 to 5, and the worst attribute was then ranked and the mean was calculated using Excel analysis. Other demographic data also have been collected as a pre survey data. For rating the pedestrian usage, data have been collected in three times of the day in weekdays.

3 RESULTS AND DISCUSSION

3.1 Pedestrian Flow Data

Table 1: User and Non user Data at the FoBs

Footover Bridges Location	User			Non User		
	9am-11am	1pm-3pm	4pm-6pm	9am-11am	1pm-3pm	4pm-6pm
Mirpur-1	1296	753	2827	2201	1103	4138
Mirpur-2	1016	489	1972	1756	1122	2520
Mirpur-10	5640	1321	7928	6234	2987	8102
Elephant road	7756	3340	6570	4568	3004	3765
Basundhara Residential Area(Jamuna Future Park)	5840	5133	8874	325	134	481

At the five locations, three different times were examined in order to comprehend variations in both peak and off-peak times. Table 1 above indicates that there is less usage at the roads on Elephant Road and in front of Jamuna Future Park compared to the Mirpur area overbridges. At Elephant Road and in front of Jamuna Future Park crossing by the road is generally outright a huge risk as straight through tragic is pretty high.

Figure 6: People are crossing by the road underneath footover bridge

Some site pictures of people crossing the roads right under the overbridges are showed in the previous part. At the Mirpur side, the number of people not using the overbridge is higher, as it is often seen high flock of people cross the through the road direct. Overall summing up the whole data, the percentage of pedestrians using the overbridge comes up as 59%. But the scenario at Mirpur area is different if it is calculated separately. 56% pedestrian do not use the FoBs at the Mirpur in accordance with the high accident rates of pedestrians discussed in the previous chapter. Breaking down the five locations separately, foot over bridge at Mirpur-1, Mirpur-2, Mirpur-10, Elephant Road and Basundhara Residential Area have percentage of people not using the overbridge are respectively 60.4%, 60.7%, 53.7%, 39.0 % and 4.3%.

3.2 Demographic Data

Total 200 people were interviewed in the survey. The primary objective of the survey was to investigate the pedestrian or the FoB users about the reason for not using the overbridge. Before that their personal profiles were also asked which is presented in table no 2.

Table 2: Demographic data of survey

Characteristics	Categories	Percentages (%)
Age	0-12(Children)	3
	13-19(Young/teen)	9
	20-30(Adult)	32
	31-59(Middle Age)	49
	Above 50 (Old aged)	7
Gender	Male	59
	Female	41
Occupation	Service	32
	Business	15
	Student	37
	Others	16

3.3 Attributes for Finding the Reason for Not Using Foot Overbridge

In this category respondents were asked to fill up a form for rating perception about pedestrians not using the overbridges. The attributes were asked to be ranked in five categories from ‘Strongly Agree’, ‘Agree’, ‘Neutral’, ‘Disagree’ and ‘Strongly Disagree’ which were ranked from 5 to 1. The answers are presented on pie charts in the following articles.

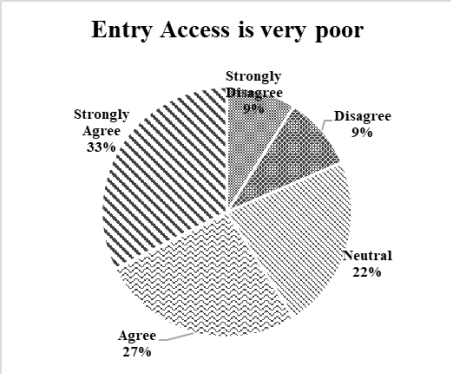

Figure 7. Survey results about entry access being poor.

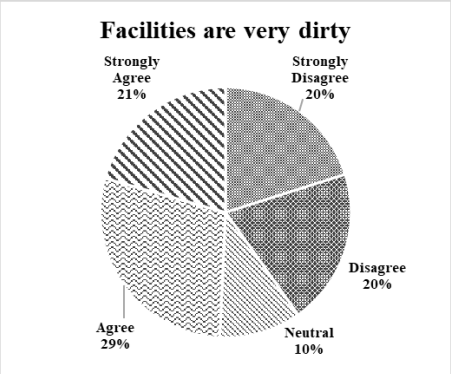

Figure 8. Survey results about atmosphere around foot-over bridge being dirty.

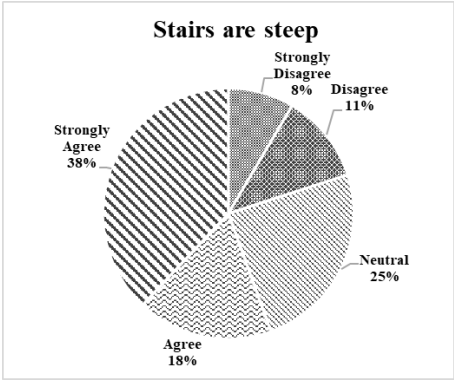

Figure 9. Survey results about stairs being steep.

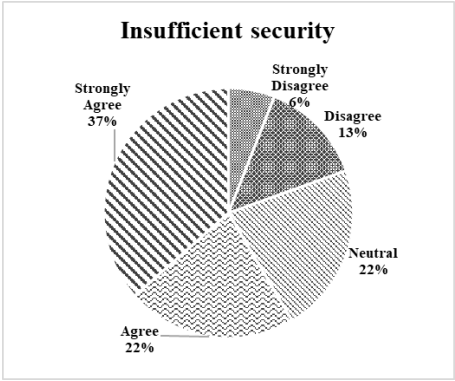

Figure 10. Survey results about insufficient security.

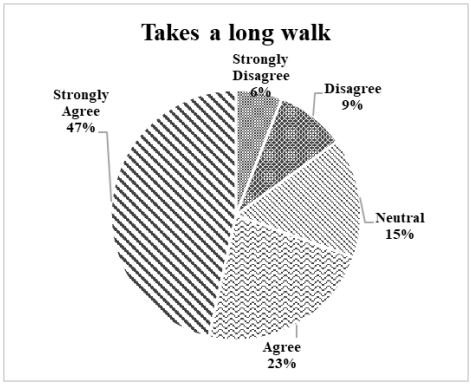

Figure 11. Survey results about covering a long distance for using over bridge.

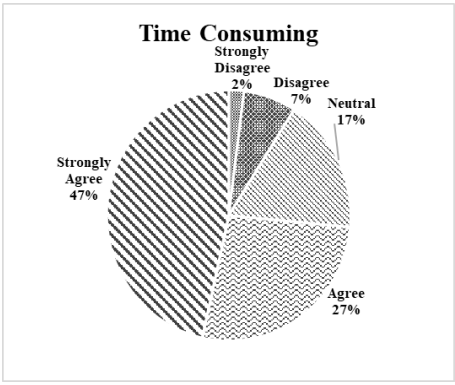

Figure 12. Survey results about it takes time to use the overbridge.

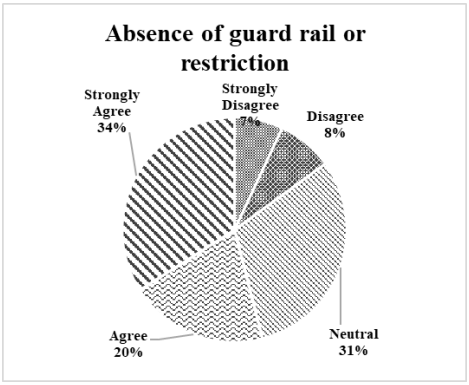

Figure 13. Survey results about absence of guard rail or restriction.

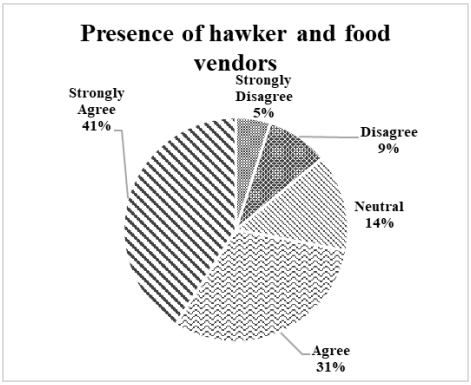

Figure 14. Survey results about presence of hawker and food vendors.

In any case a foot over bridge should be only used as a pedestrian crossing facility. It should be located in a convenient place where crossing the overbridge is free of hassle. But in terms of Bangladesh, overbridges are often used for other purposes like commercial use. Vendors or hawkers use the over bridges as their permanent points of sale. The area surrounding the overbridges and the space to embark on the overbridge should be convenient, clean and visually appealing.

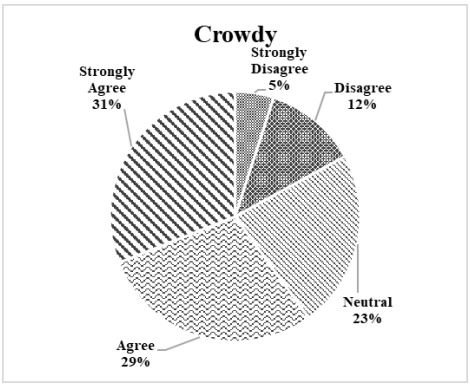

Figure 15. Survey results about foot overbridges being crowdy.

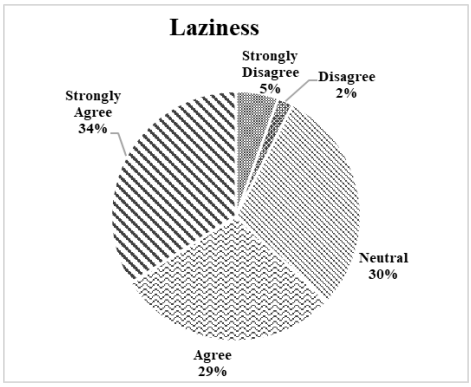

Figure 16. Survey results about laziness of pedestrians.

When pedestrians were interviewed about the outer and inner atmosphere of the overbridges, it was found in the survey that 33% people reported that the entry access is poor. There is less room to travel on the staircase because of the narrower stair case and entry access. Additionally, if individuals use the same staircase to enter and exit, pedestrian congestion is created in the staircase. These results in shoving and pushing which create discomfort especially to women. 21% and 29% respondents respectively strongly agreed and agreed that facilities are dirty around foot over bridge. 38% people opinionated that stairs are steep and the height of riser and trade should be proportional. The insufficient security question was asked in perspective to mainly women security. Not only pushing from other persons, lack of lights also creates a non-secured place. That is why, 37% people strongly agreed that the foot over bridges lack security. But the most respondents unanimously agreed that mostly people don't use overbridge because it is time consuming. They also agreed that people often have to walk a longer path to cross the overbridge which is tired some and people are often lazy to do that. That is why 47% people rated time consuming and taking long walk to cross overbridge as their primary reason for avoiding overbridges. 34% respondents blamed their own laziness for ignorance to using over bridges. Pedestrians get easy access for crossing in the middle of the road because often the guard barriers are broken and 34% people thus rated this as a reason for not using foot over bridge. A study in 2018, reported that 58 % people think presence of hawkers is a major issue. But now in the study, 72% of the survey results indicated that, presence of hawkers is often a matter of discourse (Rana & Hasan, 2018). Presence of hawkers or beggars may reduce the efficient width of the foot over bridge and does not leave enough room for people to walk freely at the space.

Figure 17. Guard Rails are missing right below Mirpur -1 over bridge.

Figure 18. Dirt right beside the stair case.

Figure 19. Hawkers station at the foot over bridge.

Figure 20. Series of guardrails being missing along the roads.

Table 3 Results of the survey related to finding reasons for avoiding using FoB

Categories	Mean	Standard Deviation	Variance	Rank
Entry acees being poor	3.64	1.27	1.62	5
Facilities being dirty	3.09	1.45	2.11	10
Stairs being steep	3.65	1.32	1.74	9
Insuffiecient Security	3.70	1.26	1.58	6
Taking a long walk	3.95	1.23	1.53	2
Time Consuming	4.09	1.05	1.10	1
Absence of Guard Rails or Restrictions	3.54	1.35	1.82	8
Presenece of Hawker and Food Vendors	3.68	1.26	1.58	3
Overbridge being crowdy	3.52	1.31	1.71	7
Laziness of pedestrians	3.84	1.09	1.19	4
Mean calculated considering Strongly Agree = 5, Agree = 4, Neutral= 3, Strongly Disagree = 2 and Disagree = 1				

Table 2 displays the statistical parameters that were obtained from the data analysis to identify the reasons why the FoBs were not used. From pedestrians' point of view, it is seen that consumption of time is prime reason for pedestrian not wanting to cross the FoB. As mean value of 4.09 has been found for the attribute. Secondly, they think it takes a long walk to cross any overbridge as location is not always convenient. After consumption of time, taking a long walk is the cause for negligence for not using overbridge with average of 3.95. Other than that presence of hawkers has also been rated a reason for less usage of overbridges. The highest varied opinions have been found for facilities being dirty. The overpass in front of Jamuna Future Park was deemed clean by pedestrians. The mean value indicate that this is the least rated attribute contributing less usage of FoB.

3.4 Survey Results About Road Crossing Facilities

For the survey people were told to choose one way of road crossing from the three choices over foot overbridge, underpass and crossing by the middle of the road. 46% people chose that crossing by the middle of the road is more convenient for them rather than using the road crossing facilities like underpass and foot over bridge. Survey data claims that 56% people will choose zebra crossing over underpass or overbridge.

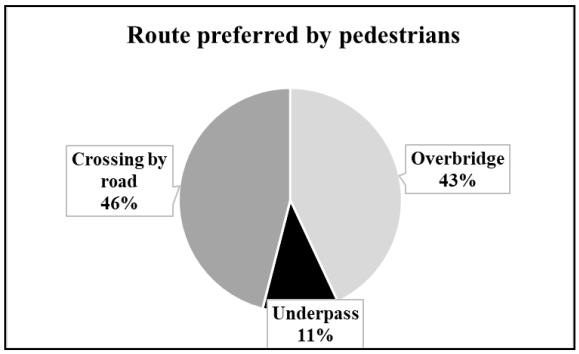

Figure 21. Survey results about route preferred by pedestrians

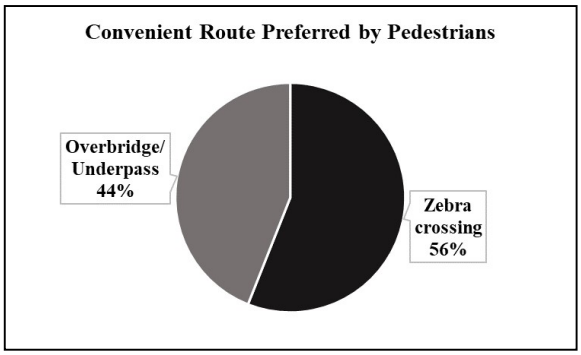

Figure 22. Survey results about convenient route preferred by pedestrians

4 CONCLUSIONS

Total 103195 pedestrians were found during the survey time, out of which 60755 pedestrians chose to cross with overbridge and 42440 pedestrians chose to use the roads beneath the overpasses. 42% of the 60755 pedestrians were female. In Mirpur -1, Mirpur -2 and Mirpur-10, the percentages of non-usage of pedestrians are high. The current survey shown an improvement in the usage of crossing facilities, with 59% of individuals utilizing the foot over bridges, despite earlier studies reporting that 46.6% of pedestrians use them. The purpose of the study was to see the trends in perception of pedestrians for not using the overbridges. Out of the attributes, consumption of time has been rated the most voted reason for not choosing overbridge as their prime road crossing facility. It takes time and takes longer stride to reach the overbridges. During the field survey, it was found that guard rails beneath the overbridges are missing. At these locations survey reports claim that, the location, crowdy scenario, time consumption and long walk to reach the overbridges, make pedestrians avoid particularly these over-bridges. At elephant road overbridge people have reported the FoB to being clean and aesthetic. Though it does have shade above, but still crossing the overbridge presents a comfortable journey for pedestrians. But the respondents here still voted time consumption and taking long walk is a big issue. Pedestrians do not get the choice to use the road below the Basundhara Area overbridge, that's why the overbridge usage is high. People think that overbridges should be repaired and aesthetically more convenient to attract more pedestrians. But moreover, the location might be their prime concern it might solve the issue of over time consumption. Though insufficient security ranks sixth in present research, from previous researches, insufficient security had been identified as the top reason for avoiding overbridge. In our study, 37% interviewees strongly agreed that the security system is inadequate. Most interviewees were female who comprehended that often the atmosphere in the overpass is not suitable for passing specially in night. This opinion is coherent with the usage of female commuters during survey time 4 to 6 PM. From the users found during 4 to 6 PM 38% are female. As only 7 % elderly people were among those whom were surveyed and 49% were middle aged. They reported on the issue of escalators being installed to promote the use of overbridges more.

To prevent people from illegally crossing the roads, law enforcement needs to come forward. Currently, Bangladesh does not have separate and specific laws for pedestrians. Bangladesh has several rules and regulations governing the movement of pedestrians in cities, but no established rules for guaranteeing pedestrian safety. In early 2021, The Dhaka Transport Coordination Authority prepared draft regulations. The draft says that pedestrians cannot enter or cross any road at places other than the spots where there are facilities for them to do so that vehicular movement remains uninterrupted (Akhter, 2021). Fines shall be assessed and realized in the event of a violation. And its Tk 100 fine for pedestrians. Pedestrians who failed to use the underpass, zebra crossing, or footbridge are often penalized by the mobile courts established by Dhaka Metropolitan Police. However, as soon as the court session concludes, commuters begin walking whenever they pleases, therefore the

initiative do not have the expected effect. Before law enforcement implementation, the infrastructures of these overpasses should be improved. The perception of pedestrians should be motivated straight from schools. Pedestrians believe that raising public knowledge is the most important way to encourage people to use foot overpasses in order to ensure their safety when crossing. That is why this study concentrated in finding out the infrastructural deficiencies and presented the perception of general commuters.

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