

To Walk or Not To Walk: Pedestrians' Perception on the Structure of Sidewalk

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Abstract: The study aims at determining the factors that prohibit the pedestrians to use the sidewalks. Study area was Gulzar Circle of Chawkbazar, an active area of Chittagong city Bangladesh. Questionnaire survey was done on-site and on-line by adapting simple random sampling. Interview of a member of the authority was done. Both on-line and on-site survey showed that the sidewalks are poorly structured according to more than 90% respondents. Sidewalk width was the main concern among the pedestrians along with other factors. A member of Chittagong Development Authority pointed out the reasons that caused the deterioration of the sidewalk structure. The result showed the importance of rectifying the structural faults of sidewalks. Recommendations are provided in this regard. Limitations were also pointed out for the benefit of future research.

Keywords: Walking, Pedestrians, Sidewalk structure, pedestrians' perception.

1. INTRODUCTION

The world is now experiencing advancements in technology. This advancement can also be seen in transportation sector which is making our travel easier. Despite such development, the importance of walking still prevails in the world. Different organizations are taking necessary steps to ensure environment for uninterrupted walking. According to Jeff Speck (2012), four major conditions can ensure walkability in a city: usefulness, comfortability, safety and interesting surroundings. NACTO (n.d) mentioned that safe, accessible and well maintained sidewalks are necessary in order to ensure general public health and maximize social capital.

Sidewalks are pedestrian lanes, separated from the roads provide pedestrians the facility of walking, running etc. Properly structured sidewalks help reducing pedestrian collisions with motorized vehicles. (PBIC, n.d.)

As sidewalks play vital role in city life, it is important to maintain them properly ("Sidewalks and Walkways", n.d.). People use sidewalks to go from one place to another, also for exercise purpose, social gathering etc. According a report by WHO(2018), 28% of all the deaths represents pedestrians and cyclists which is alarming. It is, thus, important to put emphasis on the structure of sidewalk along with other factors.

In countries like Bangladesh where the population is increasing and people are moving from one place to another for different purposes, improvement of sidewalks has become an important issue. A survey was conducted in an area of Dhaka regarding the pedestrian comfort

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showed that 71% of the respondents mentioned about the physical structure of the sidewalks

affecting their using the sidewalks (Rahaman, K.R., 2010). This data shows the importance of the structure of sidewalks for the pedestrians.

Chittagong is the second largest city of Bangladesh. According to the website of Chittagong City Corporation, the population of Chittagong city is 25,82,401. The facilities for walking outside are not enough to serve this large number of people. There lack reports on the percentage of pedestrian casualties in Chittagong for which the extension of pedestrian fatalities are unknown. In Chittagong, Chawkbazaar is one of the busiest places with a good number of important institutions, offices and shops etc. Many people use this area for different purposes. Traffic congestion is common in weekdays in this area, for which people rely on using the sidewalks. While using the sidewalks, their structures, along with other factors, affect walking. The aim of this paper is to assess the views and issues mentioned by the pedestrians regarding the structural condition of the sidewalks. The paper will also discuss about the view of the responsible authority on this important matter. Some recommendations are expected to be produced that can contribute to the improvement of this situation.

2. LITERATURE REVIEW

2.1 Basic Notion

Walking is often considered the cheapest mode of sustainable transportation and also adds to various advantages (IEREK , 2017). A lot of discussions have been done over this mode.

There are many advantages of walking. In case of social benefits, walking on a regular basis helps to increase face-to-face interaction that can eventually build trust, sympathy, respect, understanding, co-operation and loyalty (Victoria Walks, 2019). When people use motorized vehicles, there are always concerns about toll, parking fees etc. In case of any damage, extra hassle and cost need to be carried out. All these concerns can be reduced if walking can be embraced in regular life (Litman, 2004). Including walking in daily life can be beneficial to brain functioning along with overall cognitive function (Winchester, 2013). Walking also helps people to reduce weight, body mass index, blood pressure etc. and improve metabolism without any type of side-effects (Kim, 2014). Varia (2018) wrote that regular physical activity, like walking, can help to combat non-communicable diseases such as: hypertension, heart disease, diabetes, cancer etc. A community which gives walking priority over cars to cover shorter distance can reduce air pollution, because the lesser the number of motorized vehicles, the lesser the air is polluted (McLaren, 2016).

2.2 Global Organizations on ‘Walking’

There are many international organizations who have put emphasis on the importance of walking. Different policies are being followed worldwide for a better future.

2.2.1 SDG

SDG (Sustainable Development Goals) is a set of goals to build a sustainable future by 2030 for the people and the planet. Among the 17 goals, the motto of goal 3 was to ‘ensure healthy lives and promote well-beings for all at all ages’. One of the targets of this goal is to end epidemics of AIDS, TB, malaria neglected tropical diseases and tackle hepatitis, water borne diseases and other non-communicable diseases. (UN, 2016)

Previously in this study, it was mentioned that walking can help fight the

non-communicable diseases. So, it can be said that ensuring walking can contribute to acknowledging this goal of SDG.

2.2.2. New urban agenda (NUA)

New Urban Agenda aims at generating practical and evidence-based guidance being implemented and urban dimensions of the SDG's while collaborating with national and international authority of different levels and mobilization of experts. One of the categories of NUA is urban planning and design under which, there are several articles. In article number 37 of this category, promotion of 'safe, inclusive, accessible, green and quality public spaces' as well as 'streets, sidewalks, cycling lanes, squares, waterfront areas, gardens and parks' is aimed to be fulfilled. These above mentioned spaces are recognized as multifunctional areas promoting 'social interaction and inclusion, human health and well-being, economic exchange and cultural expression' and 'dialogue among wide diversity of people and culture'. The spaces are being considered as 'designed and managed to ensure human development and build peaceful, inclusive and participatory societies, as well as to promote living together, connectivity and social inclusion'. (UN-Habitat, 2016)

This article of NUA represents sidewalk, along with other structures, as an important element of a place and thus maintenance of this structure thus is very important.

2.3 Previous Studies

Studies were conducted regarding the structure of sidewalks and their effects on walking conditions. Nascimento et al. (2017) carried out a research that revolved around the structure of sidewalks along with other related factors. Later some solutions were proposed for the improvement of the problems that were detected through interaction networks.

Drahos (2014) divided his research into three categories which are: safety, sidewalk and street conditions, and neighborhood appearance. For the assessment of sidewalk and street conditions, sidewalk issues were gathered and put into ArcGIS. This study shows the importance of the condition of sidewalk structure along with other matters.

Pun-Cheng et. al. (2018) conducted a research on Hong Kong considered safety and comfort for analyzing perceived and actual walking behavior by considering safety and comfort. The result of the study showed that for comfort, after lower pedestrian flow, wider sidewalks were prioritized, followed by more greenness, walking on major road and few traffic lights (less waiting time). Several recommendations were made in this study. It was also recommended that the government should take the matter of increasing greenness and expanding the width of sidewalks into consideration.

Sousa (2017) proposed of a multicriteria method, ELECTRE TRI, for the assessment of sidewalk performance which can be used for any city, at any scale by municipal authorities for determining effective sidewalk maintenance actions. In his study, he mentioned about several criteria for sidewalk assessment which are: width, pavement suitability, conservation status, accessibility, safety from traffic, lighting, obstacle density, walking environment, and pedestrian density. He mentioned about the importance of proper width and surface condition of sidewalks, curb height with other related issues, buffer from street, components around the sidewalks etc. Using the proposed method, he came up with some suggestions. He suggested of a two-stage maintenance of the sidewalks, giving affordability a priority.

A study conducted by Aziz et al. (2017) showed, one from many of the results, that increasing of sidewalk width can increase the number of pedestrians using sidewalks. The results suggested that local authorities should emphasize on contributing to infrastructure

improvement.

Zegeer et al. (2012) studied about pedestrian crash trends happened in different countries. He also described about several measures that can decrease the number of pedestrian fatalities, such as pedestrian-friendly geometric guidelines, implementing different safety treatments, expand funding and implementation of pedestrian-safety programs in schools, developing guidelines for safe bus-stops design and placement, use of enforcement, making pedestrians more visible to motorists, developing pedestrian-friendly features in vehicles, developing pedestrian safety program etc.

Leather et al. (2011) stated that fewer facilities prevail in the Asian cities regarding the improvement of walking. Their conducted a survey on some Asian cities. The results, according to them, can be used for the improvement of betterment of walking and walkability assessment methodology can raise awareness among policy makers and city officials.

Moayed et al. (2013) segregated the attributes to assess pedestrian facilities on the level of importance. Pedestrian walking surface was one of the 'high importance' factors. Maintenance, path size and buffer were among the other 'medium importance' considerations. They suggested that the factors should be given priority at the early stage of development by the authority.

Mohamed et al. (2016), in their study, found four factors affecting the walkability and open space in Libya which are : aesthetics and activities, access to services, pedestrian and walking facilities, safety and security. Result showed that under the factor safety and security, maintenance of sidewalk was the main consideration among the users, followed by maintenance of traffic signals and widening the sidewalks.

Rani et al. (2017) found after survey that improvement of sidewalk condition (separation between sidewalk and road, raised sidewalks, guardrails etc.) was one of the considerations that can positively affect walkability of Indian cities.

Hadiyanto et al. (2017) conducted a research to identify the factors refraining pedestrians to use the sidewalks. The result showed that vendor and parking lot on sidewalks, poor surface condition (surface materials, holes, existing cracks), curb ramp absence, suboptimal curb ramp, existence of driveway between sidewalks were major factors. Second major factors were instability or discontinuation of sidewalks due to height difference, narrow sidewalks. The third factors were steep slope and absence of bollards.

Many studies mentioned in this chapter considered sidewalk structure as one of the factors that can contribute to the importance of walking. However, perceptions of the pedestrians of Chittagong City should be examined to evaluate whether they differ from the mentioned studies or not. It should also be considered whether the responsible authority has taken any initiatives or not for the improvement of the structure of the sidewalks.

3.METHODOLOGY

3.1 Study Area

The study was carried out in Gulzar Circle, Chittagong. Crowd can always be seen on the sidewalks. Reasons for the presence of crowd are presence of schools, colleges, shopping malls, restaurants, street vendors, coaching centers etc. This part of the city plays an important part in the city dwellers' lives. Being an area combined of different uses, the congestion is always visible. Rickshaws, taxis, private cars dominate the streets. The sidewalks are used to go to different parts of this area. As the sidewalks play very important roles, it is necessary to assess whether they are usable or not. The map of Figure 1 shows how

dense the area is. Figure 1 (marked yellow) also denotes the area to be surveyed and observed. In this study, the population of whole Chittagong City was considered.

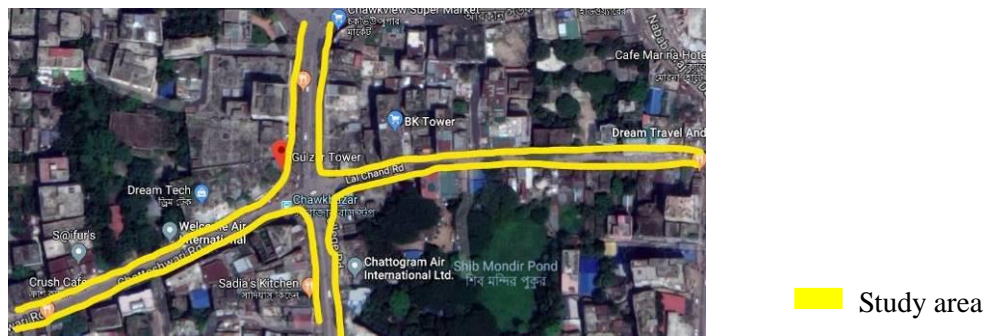


Figure 1. Google Map of Gulzar circle

Inclusion criteria of the respondents:

- 18 years and above.
- Male and female both were considered.
- Those who have used the sidewalks at least once.

3.2 Survey Method

Descriptive survey method was used in this study. In Descriptive survey method, information is gathered through interviews and questionnaire survey. Then, the researcher describes the collected information. (Jackson, 2008). Observation of the survey area was conducted.

3.3 Sources of Data

For the study, primary data was collected through questionnaire survey and interview. In the survey, pedestrians were given a questionnaire where they were asked whether the structure of the sidewalks of the study area refrains them from walking or not and select the appropriate options mentioned in the questionnaire. Interview of a member of the authority was taken to place his views on the pedestrians' perceptions. The questionnaire was also provided to the people who use the area frequently as Google form. The variables considered for this study were finalized after on-site observation and then consulting Global Street Design Guideline on the basis of the result of sidewalk-structure observation (Table 1).

According to Global Street Design guide, there are some guidelines following which can help to improve the walking environment for the pedestrians. The guidelines mentioned about several steps regarding the sidewalk structure that can be followed. A clear path for pedestrians should be free of obstructions or deformities to make it accessible (NACTO, 2016, pp 82). The sidewalks of surveyed area have "uneven surfaces" and "holes" that appears as deformations of the sidewalks. Level difference from road or curb is important consideration as it discourages any vehicles to enter the pedestrian area (NACTO, 2016, pp 77). Width of sidewalk should be enough so that two people with wheelchair can pass by each other without any discomfort (NACTO, 2016, pp 82). Width is, thus, an important factor regarding the sidewalk structure that needs to be considered.

Table 1: Variables of the Survey

Variables	Variables ID
Uneven surface	Q10_1
Level difference from road	Q10_2
Narrow width	Q10_3
Holes	Q10_4
Others	Q10_5

As a source of secondary data, the website of Chittagong City Corporation was used to know the size of population of Chittagong City. According to the website, the population of Chittagong City is 25,82,401.

3.4 Sampling

Simple random sampling was considered in this study. In this process, selection of the respondents entirely depends on probability. A sample size calculator, available online by 'Creative Research Systems', was used to determine how many people are needed to be interviewed (Figure 2).

Figure 2. Sample Size Calculator

With 95% confidence level and 7 as confidence interval, a minimum of 196 people were needed to be interviewed.

3.5 Data Analysis

Collected data will be analyzed using bottom-up approach. The perception of the pedestrians will determine the overall structural condition of the sidewalks and then we can reach to a conclusion on the structural condition of the sidewalks. Data was entered in SPSS to determine the frequency of the survey.

4.FINDINGS

4.1 On-site Survey

There were 160 respondents for the on-site questionnaire survey. Table 2 and Table 3 shows the number of respondents of different age groups and ratio of male and female respondents.

Table 2: Number of respondents for each age group

Age Group	Frequency	Percentage
1 (18-30)	91	56.9

2 (31-40)	45	28.1
3 (41-50)	19	11.9
4 (51-60)	5	3.1

In Table 2, age group 18-30 were identified as 1, 31-40 as 2, 41-50 as 3 and 51-60 as 4. From the table, it is visible that age group 1 were 91 in number, 56.9% of the total respondents. Age group 4 were very less in number, only 5 respondents belonged to this group.

Table 3: Number of male and female respondents

Gender	Frequency	Percentage
Male	106	66.3
Female	54	3.8

Table 3 shows that number of male respondents were almost double than the female respondents. Male respondents were 66.3% of the total, whereas female respondents were 33.8% with 54 of them.

Table 4: Case summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
\$Structure_sidewalk ^a	149	93.1%	11	6.9%	160	100.0%

The respondents were asked whether they felt that the sidewalk was poorly structured or properly structured. Those who agreed that the sidewalk was poorly structured, they were asked about the structural features of the sidewalks that prohibited them from walking. They were allowed to choose more than 1 factors. From Table 4, we found that 149 out of 160 respondents agreed that the sidewalks were poorly structure. The missing number indicates the number of respondents who thought the sidewalks to be well structured.

Table 5: Structure_sidewalk Frequencies

		Responses		Percent of
		N	Percent	Cases
Structure_sidewalk ^a	Q10_1	72	26.0%	48.3%
	Q10_2	43	15.5%	28.9%
	Q10_3	97	35.0%	65.1%
	Q10_4	65	23.5%	43.6%
Total		277	100.0%	185.9%

Referring to Table 5 and Table 1, it can be said that 35% of the total respondents considered narrow width as the main barrier that affects the use of sidewalks followed by uneven surface (26%), holes (23.5%) and level difference from the road (15.5%).

Out of 160 respondents, only 14 mentioned about other factors. Among the 14 respondents, only the response of 1 was taken into consideration which are: cracks on the

sidewalk and broken sidewalk. The rest 13 mentioned about the non-structural factors.

4.2 Online Survey

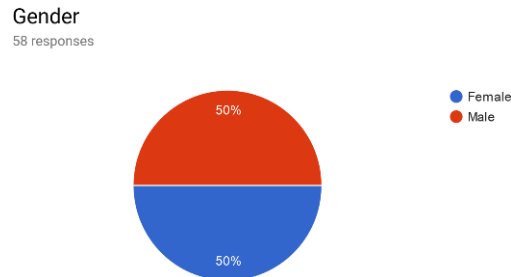


Figure 3: Percentage of Participants

58 respondents participated in the online survey. Among them, 50% were male and 50% were female (Figure 3).

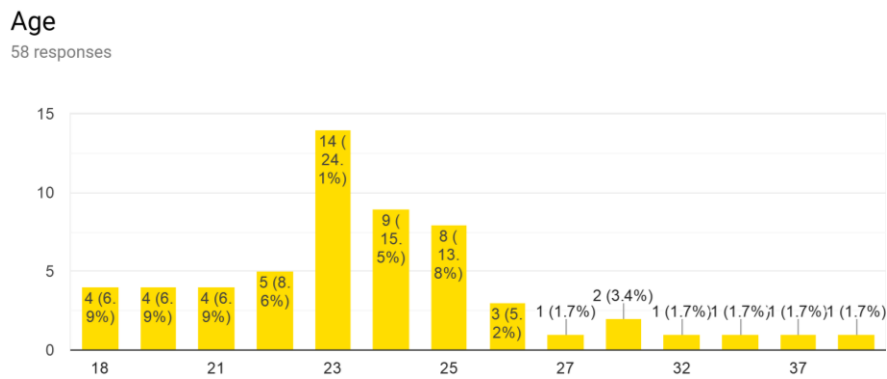


Figure 4: Percentage of age group

In online survey, 54 respondents were from age group 18-30, 3 from age group 31-40 and only 1 from age group 41-50 (Figure 4).

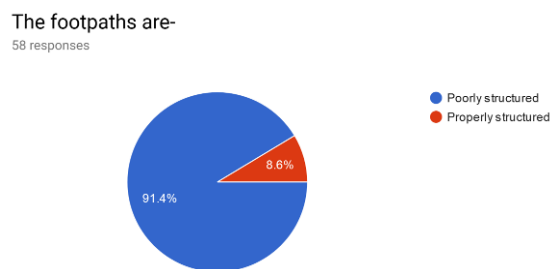


Figure 5: Percentage of response on the sidewalk structure

Like the on-site survey, 53 of the total respondents (91.4%) agreed that the sidewalks (or footpaths) were poorly structured and according to the rest 5 respondents (8.6%), the sidewalks were properly structured (Figure 5).

What are the structural features that prevents you from using the footpaths? (if any) (1 or more options can be chosen)

54 responses

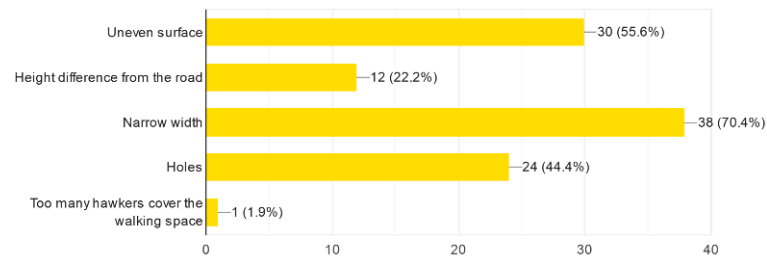


Figure 6: Percentage stating the structural flaws of sidewalks

Although there were 54 responses (Figure 6), 1 response was not considered as he mentioned about the issue that was non-structural. Narrow width was considered as the main barrier by the online respondents, followed by uneven surface, hole and level difference from the road.

4.3 Observation

Observation was done to investigate whether the sidewalks have poor structural features or not.



Figure 7: Holes in the sidewalk



Figure 8: Uneven surface, holes in sidewalk and level difference



Figure 9: Uneven surface and narrow width

Referring to Figure 7, 8 and 9, it can be stated that the perceptions of the pedestrians were similar to the issues identified during observation. Holes in the sidewalks were visible in some of the sidewalks. Some sidewalks were very narrow and often occupied by the tea stalls, vendors etc. Most of the sidewalks had poor sidewalk surface and litters were here and there.

4.4 Interviews

An interview was conducted where one of the members of the Chittagong Development Authority (CDA) was asked about the stand of them against the issues mentioned by the respondents. Upon asking, it was told by interviewee that lack of co-ordination among different authorities and public can be one of the reasons why the structure of the sidewalks is not up to the mark. The buildings beside the sidewalks were built before the improvement of the streets. Due to the buildings built higher from the road surface, the authority had to compromise with the level difference from the road, giving priority to the buildings. Regarding the width, the member informed that roads were given more priority over the sidewalks previously, but now in some parts of the city, they are working on to improve the sidewalk quality.

5. DISCUSSION

The findings clearly state that sidewalk structure is an important factor among the pedestrians. Walking contributes to benefits in multiple ways, such as: public health and quality of life, environment and economy (IPA, et al., 2014). The structural issues that were stated by the pedestrians can hamper the walking and thus they will not be privileged enough to get the benefits resulted by adopting walking on regular basis. Narrow width of the sidewalks was among the main structural issues stated by the respondents of both on-site and online survey. Sometimes vendors do their business while setting up their stalls on the sidewalks, also some park their bikes on the sidewalks that can interrupt walking. In the presence of the crowd most often, it will be difficult to work on the width and level difference of the sidewalks. The condition of the sidewalk indicates that there is a lack of maintenance. The surface of the sidewalks is uneven at places. It was also visible that the sidewalks were not disabled people friendly. If such conditions are not treated properly, they can cause harm to the pedestrians in near future. Lack of co-ordination among the authorities and the general people can accelerate the issues to be occurred in other areas as well.

6. CONCLUSION AND RECOMMENDATION

The study mainly focused on the structure of the sidewalks and pedestrians' perceptions on

the structural barriers of the sidewalks. To include the variables for the survey, references were taken from previous studies and field observation. After the on-site and online survey, it was proved that more than 90% of the respondents from both type of surveys identified the sidewalks to be poorly structured. Among the issues stated by the pedestrians, width was main factor because of which they prevent themselves from using the sidewalk. There were also other significant factors to be considered.

To ensure pedestrian walking not hampered by the structural features, special attention should be paid. The issues are needed to be categorized into ‘urgent solving needed’ and ‘not urgent’ categories. However, the economical limitations should also be considered while solving the problems.

Co-ordination is important in removing the barriers. Regular meetings among authorities from different field related to sidewalk structure and maintenance is crucial. Transparency should be ensured for the improvement of the sidewalks. Including experts of this field in the policy making can play a vital role. If regular surveys are conducted which include pedestrians, they will be cautions enough in properly using the sidewalks. Laws should be made and properly implemented to ensure proper use and maintenance of sidewalks.

In Literature review section of this paper, specifically subsection 2.2.1 and 2.2.2, it was stated that different international organization, such as United Nations and others are giving priority to walking due to its’ various benefits. To comply with the targets of SDG and NUA for a better future, research should be done in-depth and the root cause should be identified. The data that are available online regarding the population size along with fatalities related to sidewalks are insufficient and not updated, because of which proper research could not be done. The data should be updated regularly so that it can help researchers to provide solutions to the issue. It is hoped that the limitations will be taken into consideration and more studies will be conducted for further improvement of the sidewalk conditions.

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