MOBILITY CONSTRAINTS OF CHILDREN IN BANGLADESH: A STUDY ON TRAVEL TO SCHOOL IN DHAKA CITY

Dr M. Shafiq-Ur Rahman
Department of Urban and Regional Planning,
Jahangirnagar University, Dhaka 1342, Bangladesh
shafiq_urp@yahoo.com

Noor Ali Shah
Urban and Regional Planning, Jahangirnagar University,
Dhaka and Research Assistant, Urban Research & Practice Group (URPG), Bangladesh
nooralishahsrsp@gmail.com

ABSTRACT
Dhaka city is the administrative, financial, business, and cultural capital of Bangladesh. The city contains inhabitants of over a hundred million people. However, the traffic and transport situation in Dhaka is very chaotic and often characterized as gross congestion and delays, inadequate transport infrastructure and services which resulted a widening gap between demand and supply. Often it is claimed by several researchers that trips to school to drop and collect children, largely on private carsparticularly during morning and afternoon peak, is one of the major causes of congestion in Dhaka city. Travel pattern and mobility of school children is often different than the overall pattern of city dwellers or adults however, this topic is not researched by academia or professionals in Bangladesh. This research provides an overview of travel pattern of school students in Dhaka and suggests how to overcome their major mobility constraints. Four hundred and twenty students from 21 different primary schools were interviewed using a pre-determined questionnaire and analysed to fulfil the research aim. It was found that the majority of students do travel to and from school with an escort (adult family member) by car or rickshaw whilst walking and cycling is very limited. Findings of this research may help to improve overall mobility and travel experience of school students.

KEY WORDS: school, children, travel pattern, access, preference.

1. INTRODUCTION

Traffic and transport situation in Bangladesh is very chaotic and often characterized as underdeveloped and inadequate infrastructure provision, lack of discipline and poor traffic management, severe safety problems and a widening gap between demand and supply.Dhaka city is the main administrative, political, economic and academic centre of Bangladesh. However, traffic congestion and delay is one of the major problems of the city. Congestion is a common phenomenon in the streets of Dhaka and the situation becomes worst in peak hours(e.g. opening and closing time of office and educational institutions). Average hourly speed of vehicles in Dhaka's street now-a-days become only 8 km per hour. Furthermore, recently Dhaka became the 2nd worst ranked city in the world (The Economist Intelligence Unit Limited, 2015).

A large number of schools are located in the central part of Dhaka city which attracts a significantamount of traffic during morning and afternoon peak hours. Though car ownership rate is very low and car's contribution in modal share is very low, a considerable amount of school students in Dhaka city travel on cars. Consequently, during school starting and closing

time,a large number of personal cars are seen in the roads of Dhaka which often create congestion in and around the school.School trips are one of the major causes of increasing trip generation and congestions in Dhaka city (Esrar, 1993). Moreover, school children have different travel needs and every day they do face various travel problems during their school trips. Furthermore, school children are one of the most vulnerable groups at risk of traffic accidents globally (Morris et al, 2001). Therefore, as Yarlagadda and Srinivasan (2008) argued, factors influencing children's travel mode to school need to be examined to expand benefits from policies and programs.

Transport professionals and the city authority often focus on mass transport for planning and management. However, despite school children are the most vulnerable groups (Morris et al, 2001), school trips do not get special attention in transportation planning in Bangladesh.Besides, gender is a factor that influence modal choice for school trip (Ahmed, 2016), however, it is often neglected in the policy making and planning in Bangladesh.In developed countries like USA or UK, transport professionals and city authority consider school children's travel with high importance. However in developing country, it is still very limited. A number of research have been conducted on school children's travel globally(e.g. Rahman, 2009; McDonald, 2007; Black et al, 2000; Yarlagadda and Srinivasan, 2007; Badri et al, 2012) with a very few in Bangladesh context (e.g. Haque et al, 2013; Islam, 2015).

Exploration of travel pattern of school children will help to understand existing condition and factors influencing modal choice of school trips. This understanding may guide the planning needs as well as help to propose some guidelines for improving experience of school travel.This study is an attempt to explore school tripsin Dhaka city; travel pattern and influencing factors for modal choice of primary school children in Dhaka city.

2. OBJECTIVES AND METHODOLOGY

The purpose of this paper is to explorethe existing travel pattern of school children in Dhaka city and what are the major problems of school trips. The paper also explores what are the factors that influence modal choice of school trips.However, factors such as location of the school, parent's profession, availability of travel mode are not considered in this research. The scope is limited to only primary school students. Therefore, students of high school and college/university are beyond the scope of this research. School transport services managed and operated by the school itself is also beyond the scope of this research.

Multistage sampling method was applied for data collection.Seven case study locations in Dhaka city were identified and selected on the basis of spatial pattern so that they represent the whole city.Sevenselected areas are: Uttara, Gulshan-Bonani, Jatrabari, Dhanmondi, Mirpur, Khilgao-Basabo and Old Dhaka (as seen in Figure 1).The list of schools for each of these areas were prepared and categorized into three groups: government primary school, non-government primary school; and English medium school. One school for each type, thus three schools, from each of the locations were identified. Thus, a total 21 primary schools were selected and 20 respondents from each school were considered for the interview.

A total 420 interviews were conducted at school premise,either before or after the school, using a pre-determined structured questionnaire. The questionnaire had questions relevant to personal information, school trips, school transport service (if available), usual mode for school trips and household information.The respondents are either guardians or students of primary

school.Collected datawereanalysed usingMicrosoft Excel and SPSS software and exploratory data analysis technique has followed for analysis.

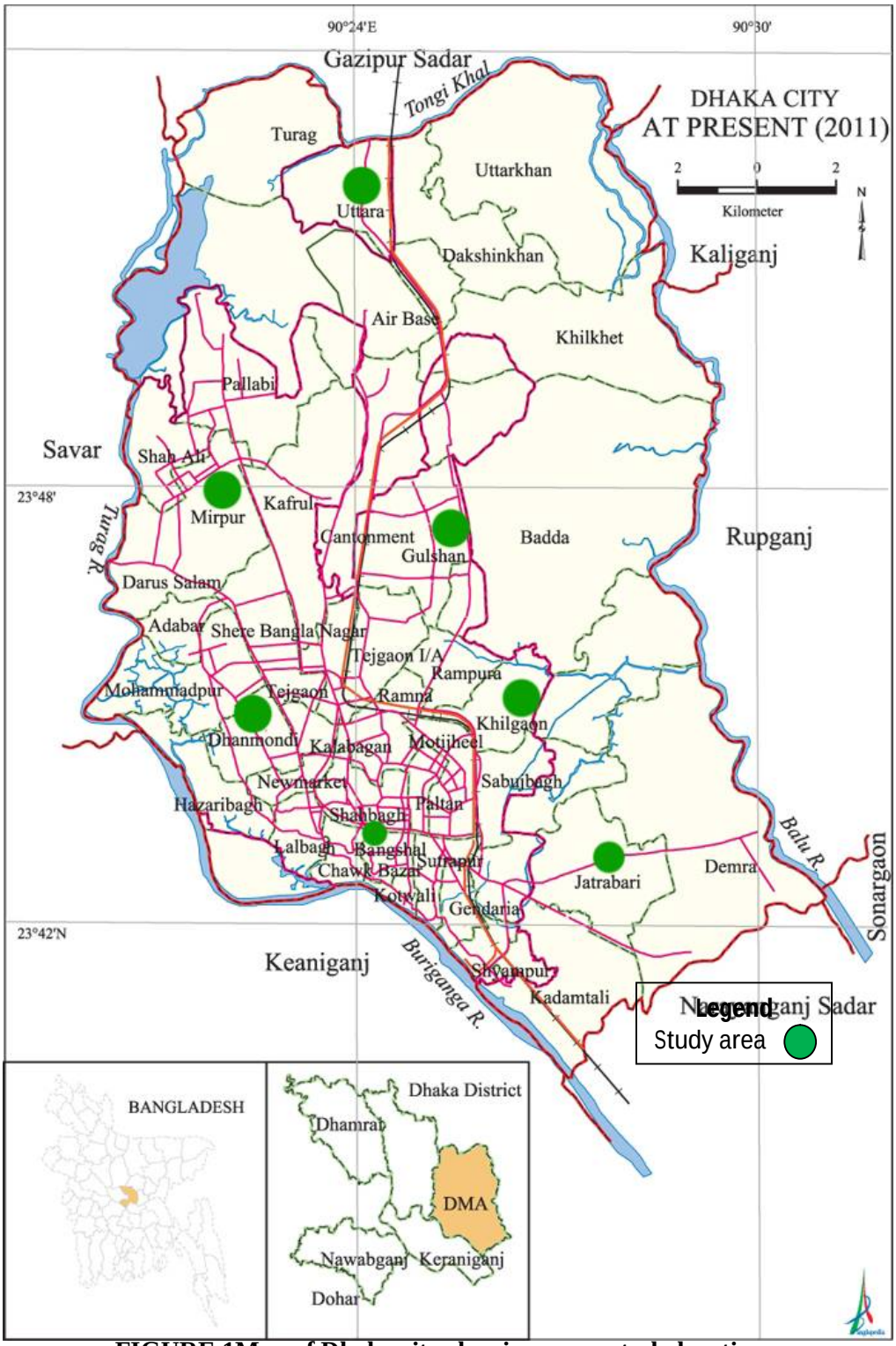

FIGURE 1Map of Dhaka city showing seven study locations

Source: Banglapedia, 2011; modified by the authors.

3. TRAVEL PATTERN OF SCHOOL CHILDREN IN DHAKA CITY

This section discuses bout the demographic profile of the respondents, existing travel pattern and school trips of the students, and factors that influence modal choice of school children.

3.1 Demographic profile of the respondents

Among the total 420 respondents, almost 87% are students and the remaining 13% are guardians. In terms of age group, 8% are below 8 years,60% are in 9-12 years and 32% are over 13 years. Among the students the ratio of male and female is 100:62.About 39% of the respondents belong to lower- and lower-middle income (household monthly income is up to Tk 30,000 per month) and 30% in middle-income (Tk 30,000 to 100,000) whilst only 10% fall in higher income (Tk 100,000+) groups and only 6%have monthly income below Tk 10,000.

Almost 65% of the respondents have no personal vehicle owned by the family. Figure 3 shows only 19% of the respondents' household have car whilst 8.5% have motorbike, 5.5% have bicycle and 1.5% have CNG and Others. However, despite having car ownership of 19%, only 2% respondents use their car for school trips.

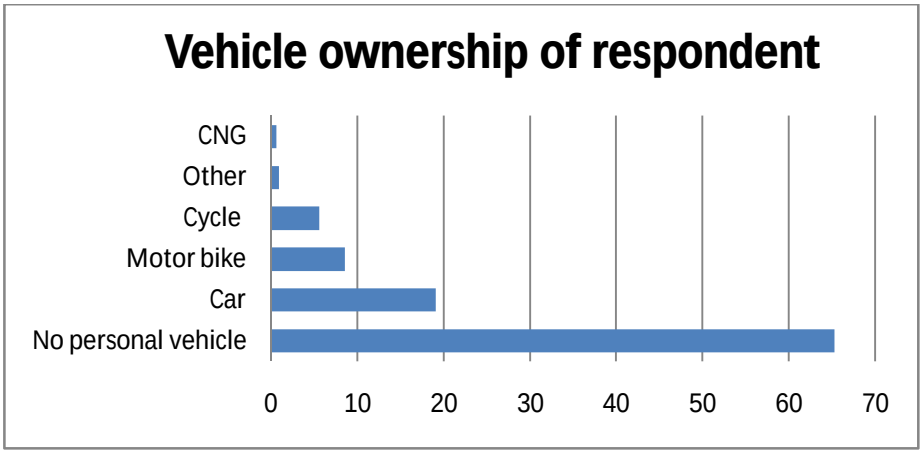

FIGURE 2 Respondent's household ownership of vehicles

Source: Field survey, 2017.

3.2 Usual mode for school trips

Usual trip to school for a student is 12 per week as only a day is weekend in Dhaka. Data revels that the respondents' average total trips per week is 18. Students usually use different range of travel modes for school trips. The majority (56.5%) do walk to/from school whilst about 18.5% use car and 17.5% use rickshaws for school trips. Use of school bus, cycling and public buses are very low; only 2.5%, 1.8%, and 1.5% respectively. The majority do walk for school trips might be attributed due to short distance – probably the school (as it is primary level) is situated within the neighbourhood or walking distance. The distance of school trips, as shown in Figure 3, reveals the prevailing assumption is correct: 55.6% of the trips are less than 500m. However, 11.5% trips are up to 2 km whilst only about 2% trips are over 2 km (but less than 5 km). In terms of gender, usually there is no significant difference in using a particular travel mode for school trips. However, school trips on rickshaws it is found that female students are more than the male whilst on bicycle and bus the male students are more than the female.

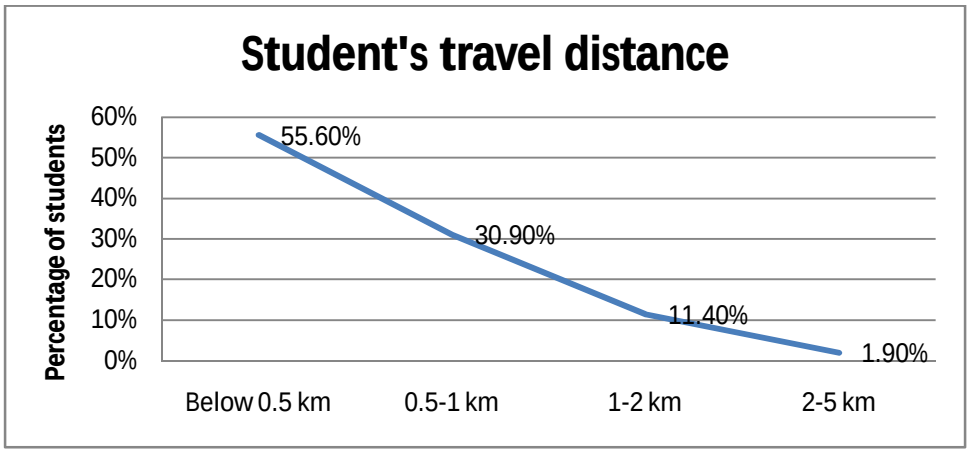

FIGURE 3 Distance of school trips

Source: Field survey, 2017.

Students donot need to pay any fare if they usehousehold vehicle or walk or cycle for school trips. If they use school bus, need to pay either monthly or weekly basis. This should be noted that a very few students in Dhaka do use school bus services. For instance, only 2.5% of the respondents used or using school bus. This is probably because existing school bus services in Dhaka cityis available only in one route. Students using rickshaws or auto-rickshaws or busesspend for a tripon average Tk25; usually it is Tk5-20 on bus, Tk25-80 on rickshaw, and Tk80-150 on auto-rickshaw or taxi.

Students of the higher income group, having a family owned car, usually use a car for school trips. However,private cars for school trips significantly contribute in creating congestions in and around the school during opening and closing hours. While using the private car for a school trips, it is hardly shared with otherstudents. Data reveal that among the car users almost 84% donot share the car with others during school trips.

3.3 School transport service

Only in a few schools (particularly English medium schools)they have own transport services for students.The service is rather expensive, monthly average cost Tk1,000. Some private schools also provide transport services by school bus or school van for students. School van is relatively cheaper and accessible by middle or lower-middle income groups. Of the 21 sample/studied schools, only fiveof them have own transport services and only 12% of their students use the service. The main reason why the majority are not using school transport services are: having personal car or parents are unwilling that the child would travel alone in a school van due to safety/security concerns. As already mentioned earlier, a major portion of trips are short, that means who are living close to school, can walk and donot need the service.

Nevertheless, in January 2011,Bangladesh Road Transport Corporation (BRTC) introduced a school bus service for the students. The purpose of the scheme was to discourage private car usage for school trips and thus reducing congestion around schools in peak hours. In route Mirpur 12 to Azimpur, only 14 buses were deployed (now only 2 of them are operating) to serve more than 26 schools with a charge of Tk5 for students and Tk10 for guardians per trip. However, the service is not successful to attract students and due to other problems. Currently

the service is available in the morning (at 6:00 am and 10:00 am) and afternoon (at 12:00 pm and 4:00 pm) for return trip.

3.4 Comfort level of existing modes for school trips

Comfort level of travel mode is very significant factor for modal choice. Comfort level of the existing transport mode usage varies from person to person according to their modal usage. For instance, students using car and some other students using school bus or walking mentioned their mode are very comfortable. Students usually prefer comfortable mode for their school trips. Different mode users have different experience of comfort for school trip. Figure 4 shows the comfort level for different modes.

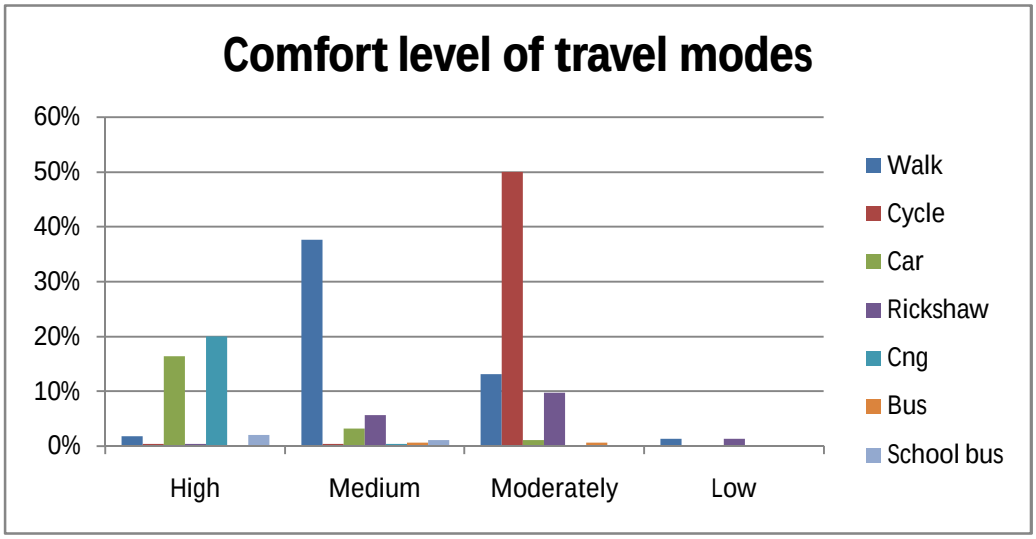

FIGURE 4Comfort level of different travel modes.

Source: Field survey, 2017.

About 18% students feel fully comfortable (of them 75% use car, 10% school bus and 9% walk) and 52.5% feel comfortable (of them 72% walk and 11.5% use rickshaws) with their existing mode forschool trips. Around 25.5% students feel moderately comfortable and only 3.5% feel uncomfortable about their existing mode of school trips.

TABLE 1The share of modal use according to comfort level (in percentage)

	Walk	Cycle	Car	Rickshaw	CNG	Bus	School bus	Others	Total
Fully comfortable	8.8	2.2	75.8	2.2	1.1	0	9.9	0	100
Comfortable	75.2	1.0	6.7	11.4	1.0	1.4	2.4	1	100
Moderately comfortable	51.4	1.9	4.7	38.3	0	2.8	0.9	0	100
Un-comfortable	50	0	0	50	0	0	0	0	100

4. FACTORSINFLUENCINGMODALCHOICEFORSCHOOLTRIPS

Different factors do influence modal choice for school trips. For example, socioeconomic factors (e.g. gender, age, household income and car ownership) and trip character (e.g. trip distance,

availability of travel mode and school transport, travel cost and time). Data reveals that girls are less likely to prefer walking or biking while they are more likely to use rickshaws to travel to/from school. In the contrary, boys prefer walking or school bus. Modal choice variation and shared students according to household income is shown in Figure 5.

Age is another important factor that influences modal choice of students. Students are classified into three age groups: below 8 years, 9-12 years group and over 13 years group. Almost 47.5% respondents of theage group 1-8 years use car whilst 34% walk and 16% use rickshaws for school trips. They usually do not use cycle and bus or school bus service. However, age group 9-12 years mostly prefer walking (about 57%) whilst car and rickshaw are 22% and 13% respectively.

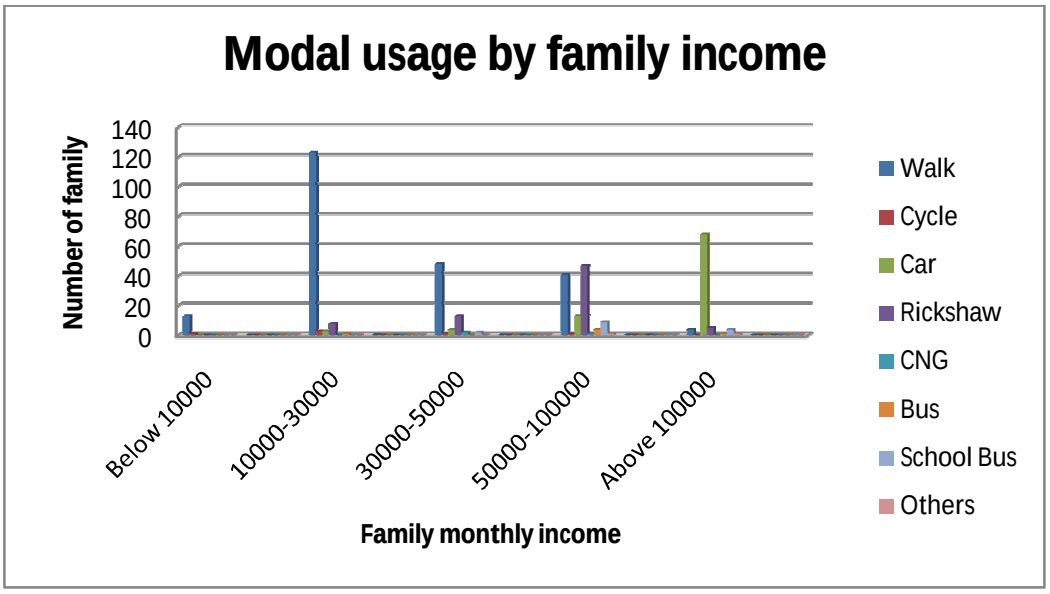

FIGURE 5 Modal choice by household income

Source: Field survey, 2017.

Respondents having household income less than Tk10,000 mostly walk for school trips all of them are government primary school students. Respondents of income group Tk10,000-30,000 also walk (29.5% of the total) and a few use rickshaws. Students of income group Tk30,000-50,000 prefer walking and rickshaw for this trip. Around 11% students use walking and 3.1% use rickshaw as the mode of this trip. Use of rickshaw increased in this group. In 50,000-100,000 income group, there is a significant change and huge variation in modal usage. Use of car and rickshaw increased in this group. Around 11% of the total respondents use rickshaw and 3.1% of them use car. Use of school bus also increased in this group. In income group over Tk100,000, maximum students use car for school trips.

The distance to school from home is an important factor for choosing a particular travel mode. With the changes of travel distance, modal choices also change. Normally students go to school on foot if the school is close to home. For distance less than 0.5 km,about 44% walk and 7% use car and 3.5% use rickshaw for school trips. Though the distance is short, significant number of students use car. When distance increases to 1-2 km, students travel by rickshaw and car.

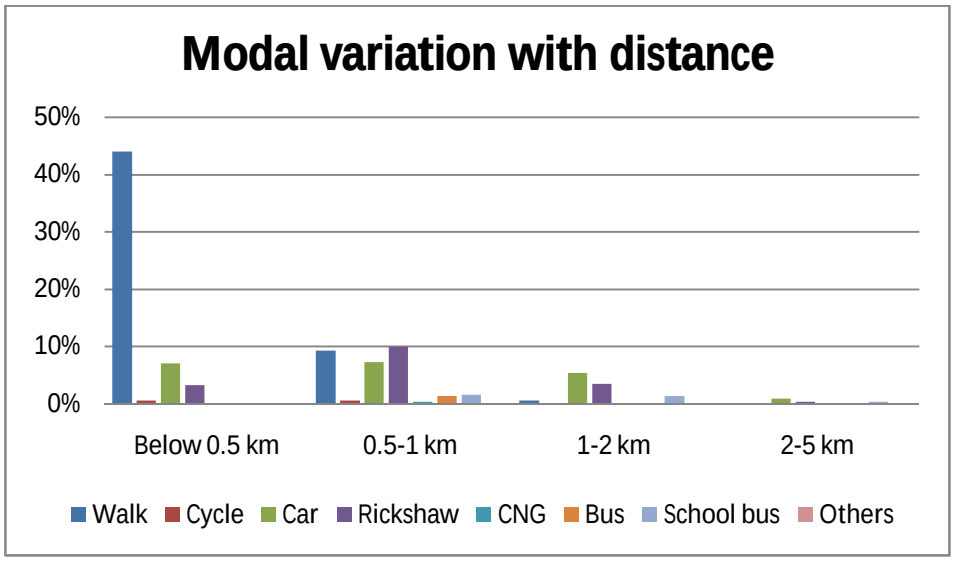

FIGURE 6 Modalvariation with travel distance

Source: Field survey, 2017.

Almost 83% students get accompany during school trip and other 17% go to school alone. Accompany during school trip is a factor for choosing different modes. Because students and their accompany person choose different types of mode for their school trips. Students are often escorted by guardians or others mainly for their safety concerns. About 46% students go to school with their class mate and other 30.5% go with their parents whilst the rest go with some other people like driver, caretaker etc.

5. PROBLEMS AND PRACTICES OF SCHOOL TRIPS

This section reports on existing problems of school trips and students' preferable mode for school trips.

5.1Problems of school trips

Almost 60% students face problems while travelling to school and theyface different types of problems.The common problems are:

- Traffic jam
- Road construction work
- Dust, noise, polluted air
- Unsafe road crossing
- No or poor walking facilities
- Insecurity etc.

One of the major problems for school trip is traffic jam which makes their journey time longer and sometimes they are late in school. Students who use various modes except walking often face this problem. Their school starting time is between 7:00 am and 10:30 am. Road construction or different development projects are carried out in Dhaka city throughout the year. These activities hamper traffic flow as well as pedestrian. Sometimes it becomes the cause of dust and pollution.

Over pollution is another problem facing by the students. Noise for the children affects mostly. Randomly use of horns and bells of vehicles hamper their mind and body. Fumes of vehicles also affect them. Dust and waste beside road also disturb. There is hardlyno pedestrian facility in Dhaka city. The existing facility for walking is not well developed and continuous. Footpath is accompanied with street hawkers and various construction materials which makes the footpath unusable for pedestrian. Again, scarce of foot over bridge makes road crossing very hard and unsafe for the children. Students as well as guardians often feel unsafe in Dhaka city. Sexual harassment, hijacking, kidnapping has become a regular occurrence in here. For these reasons safety threat has become a major issue for school trip.

5.2 User's preferable mode

Usually students prefer their existing travel mode. Figure7 shows their preferable mode for school trips.

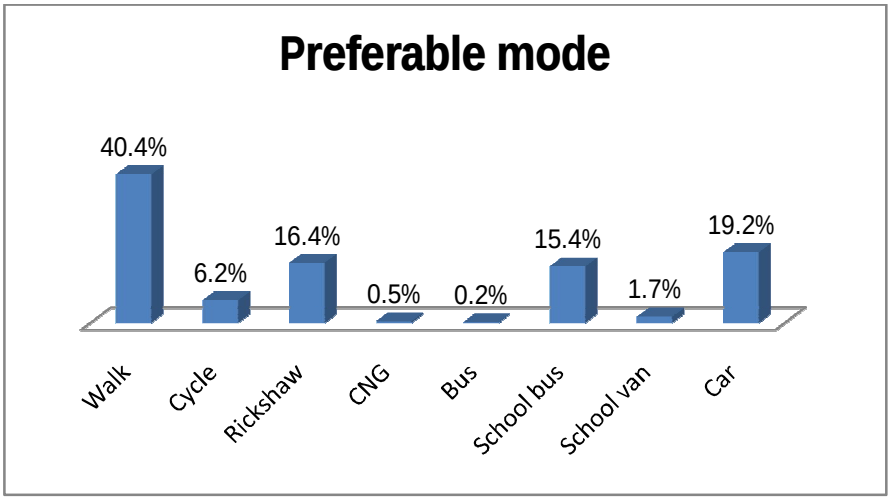

Figure 7: Preferable mode for school trip (percentage of respondents)

Source: Field survey, 2017.

Most of the students prefer walking and their share is 40.4%. About 19.2% students prefer car for school trips. Some 16.4% of them prefer rickshaw and 15.4% prefer school bus. Though the school bus users are very little in number, there are some other people who want to use it also.

5.3 Ranking of the factors

The factors that influence the travel mode for school trips are ranked according to the respondent's perception. Significant level of correlation between the factors and usual modearecalculatedand statistical bivariate correlation method was followed for this ranking. The test of significance is two-tailed and Pearson is selected as correlation coefficient. Significance value 0.50 or above represents strong relation with variable. With the decease of this value, the significance becomes weaker and it becomes neutral when the value is zero. In this study, Statistical Package for Social Science (SPSS) software has been used to calculate significance.Table 2 shows the significance of correlation, factors have been ranked.

TABLE 2 Ranking of the factors calculating correlation with usual mode.

Factors	Significance	Ranking
Gender	-0.013	
Age	0.020	7
Travel distance	0.542	2
Travel time	0.559	1
Cost of travel	0.233	5
Comfort level	-0.121	
Family monthly income	0.519	3
Household vehicle ownership	0.149	6
Student escort	0.263	4

Source: Field survey, 2017.

Table 2 shows there is a strong correlation between travel time and modal choice whilst travel distanceand household income ranked as the second and third influencing factors. These three factors have strong correlation with modal choice. Some other factors that influence modal choice are: students escort, travel cost, household vehicle ownership and age of student. Comfort level and gender has negative significance in modal choice. These factors have no influence in choosing travel modes for school trips.

6. SUGGESTIONS

This study suggests following for reducing problems associated with school trips:

- ***Providing more school bus with adequate facilities***

A large number of respondents are interested to use school bus service if it is available with proper facilities. If proper routes are selected and adequate number of school buses is provided with improved facilities, than a large number of students who are using other modes will be shiftto school bus. Existing school van can be replaced by school minibus because most of the students do not feel comfort in this school van. Increasing the utility of school bus service is a great way to reduce the use of personal car for school trips.The school bus should ensure the following facilities:

- School bus should provide both pickup/drop off.
- It should provide direct services to make travel time short.
- Presence of teacher in school bus.
- It should ensure affordable fare.
- Mobile facilities to contact with parent.

- ***Introduce 'walking school bus' program***

The majority of students' travel to school less than 1 km and the majority walk. So there is a scope to establish walking school bus program in this area. The safety of students who walk to school can be ensured by introducing several walking bus in this area. It is widely used in

different developed countries of the world. Under such programs the children walk to school in a group along a set route with adequate supervision. Each 'bus' (group of students) walks along a set route with at least one adult 'driver' in front and an adult 'conductor' bringing up the students. The conductor of the bus brings students from the gate of their house. Here the interested parents of the students should be registered with the group. The students whose school is located within a walking distance can join this program. Routes are selected in a way all the interested students can join this program easily (Islam 2015).

- ***Improve pedestrian facilities***

Though a major portion of students walk to/from school, pedestrian facilities in Dhaka are not good. Adequate sidewalk need to be provided, particularly on major roads, as well as improving the conditions of the sidewalk network .The sidewalk should be prepared in a way that students can easily move. Streets should be smooth and non-slip. Cracks of the streets and footpaths should be repaired. Crosswalks and crossing guards should be added for encouraging parents to have their children walk.

- ***Ensure safety and security***

Safety and security are major problems for school trip. Adequate safety and security should be ensured for the students of this area. Crosswalks and crossing guards could be used to ensure student safety in walking to and from parking areas. Parents also expressed a desire for crossing sign at major intersections both near the school and along the way many students would travel to school. The driver of school bus could successfully pass a review for a criminal record including convictions of child sexual abuse and incidents or arrests for driving under the influence of alcohol or other drugs.

- ***Establishing parking zones around school area***

Private cars parking in front of the school creates congestion around the school. Parking zone inside school for drop-off and pick-up student may reduce congestion at immediate school site. Creating no-parking zones to restrict street parking that might be adding to congestion and restricting student pedestrians' visibility. Cars should be parked in the parking lot inside the school, otherwise students should enforce for school bus.

- ***Encourage parents for reducing the use of personal car***

During school hour increasing traffic make congestion around school area. Primary cause of congestion is the sheer volume of traffic, which far exceeds the carrying capacity of existing roads during school hour. Significant portion of those vehicles is parents' dropping off and picking up their children from school. The school authority can arrange different types of program to encourage parents' of the students for reducing the use of personal car for their children's school trips. School authority can reduce the utility of the car by imposing parking restriction around the school area.

- ***Encourage safe route to school program***

The school authority can take different initiatives for encouraging safe route to school program which is designed to improve children's health by making walking and bicycling to school safer and easier. This is achieved by mapping out the safest ways those that avoid busy intersections and providesafe route to encouraging parents to have their children walk to school.

7. CONCLUSIONS

The trip between home and school is the most common form of travel for the children. The importance of mode choice for the school trip is becoming increasingly apparent in the face of increased awareness and to develop a good transportation system for students. This research attempts to explore existing travel pattern and to identify factors affecting modal choice for school trips in Dhaka city. Different types of socioeconomic and demographic characteristics of the students strongly influence the travel pattern of school trips. Though people prefer different types of modes according their socioeconomic characteristics, but they should be motivated for such modes that will reduce total number of vehicle on roadway significantly during school starting and closing time as well as save time and money. The existing travel pattern is not well developed. The students don't get proper school bus services and pedestrian facilities. Significant amount of students use car to travel to and from school. Only a few students use public bus. Significant amount of students also use foot. Car is the main reason of congestion around the schools. Most of the schools do not have school bus system.

The findings of this research indicate that travel time, travel distance, family monthly income, students escort, cost of travel, household vehicle ownership and student's age etc. affect a student's mode choice. The pedestrian facility and level of service of sidewalks in the study area should be improved to promote the choice of walk mode among children to ensure sustainable mode of transport as well as to increase the level of active travel among children. The findings of this study can help school boards, urban planners, and other policy makers to understand the structural and behavioural conditions necessary for students to choose different modes of transportation.

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