

Research Paper

School-Based Trips in Rajshahi City, Bangladesh: An Analysis of Trends, Modes, and Influencing Factors

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Abstract

The ongoing urbanization trend in Bangladesh is pressuring transportation infrastructure, driving the need for inventive strategies to promote sustainable mobility, underlining the importance of understanding travel behaviours for harmonizing local traffic volume and development. The transportation choices and behaviours of school-going students, particularly their trips to and from school, have significant implications for student safety. The objectives of the study encompass assessing school-based trip patterns along with the adequacy and efficiency of transportation infrastructure around schools in the city. A questionnaire survey and observational assessments were conducted to collect primary data and assess the infrastructure conditions in two schools of Rajshahi City. After investigating the factors influencing modal choice, more than 35% of the respondents chose rickshaw as their preferred mode for home-based trips. While road conditions were generally satisfactory, disparities in amenities like footpaths and parking were evident in both institutions under consideration. These findings emphasize the need for holistic urban transportation planning in Rajshahi City, with targeted improvements to infrastructure, student-focused mobility solutions, and safety to support effective and equitable transport policies.

Keywords Safety, School-based Trip, Transportation Infrastructure, Transportation Planning, Travel Behaviour, Trip Pattern.

1. Introduction

A well-functioning transportation system is crucial for urban mobility, particularly for school children who contribute to a significant portion of daily commuters. As urbanization accelerates, transportation demand is rising, influenced by factors such as time, cost, convenience, infrastructure quality, and geographical location (Mwale et al., 2022). Designing sustainable transportation policy that improves accessibility and safety requires thorough understanding of school-based trip pattern. Trip patterns illustrate the movement between locations, incorporating trip frequency, purpose, mode choice, distance, and timing (Breyer, 2021). These patterns are essential in transportation planning by revealing modal interactions, traffic volumes, and development implications.

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Analysing travel behaviour aids to identify key determinants and facilitates the development of sustainable transportation strategies (Das et al., 2016).

Research shows that active travel to school, like walking or cycling, benefits children's physical and psychological well-being, social skills, and promotes sustainable transportation habits for the future (Katsavounidou et al., 2024). A global shift in children's commuting behaviour is also underscored by numerous studies, which indicate a decline in active travel modes—such as walking and cycling and increase in reliance on motorized transport. This transition has implications on urban congestion and the physical activity level of children (Hossen & Zaman, 2022; Manoj et al., 2020; Sener et al., 2019). Factors such as household income, parental safety concerns, and the built environment shape travel choices. Children from higher-income families are more likely to use private vehicles, while those from lower-income backgrounds are more likely to walk (Daisy, 2013; Hossen & Zaman, 2022). Furthermore, parental influence is substantial; mothers' traffic concerns often discourage active travel, while fathers' work flexibility may facilitate it (Ermagun et al., 2015a; Sener et al., 2019). These dynamics emphasize the necessity for policies that encourage safer and healthier school commutes.

Rajshahi, a prominent educational hub in Bangladesh, is well-connected by roadways and public transportation, including buses, rickshaws, and auto-rickshaws (Jamal & Mohiuddin, 2020). While Bangladesh's transportation policies increasingly prioritize active travel for young people, studies in Dhaka reveals a dependence on walking and rickshaws for first- and last-mile connections (Mohiuddin et al., 2022). School transportation is an essential daily requirement for students, who utilizes different modes based on cost, convenience, and safety considerations (Lopez & Wong, 2017). However, school-related traffic exacerbates congestion, especially during peak hours, impacting city's mobility and livability (Das et al., 2016). Perception of safety, attributes to the built environment, and psychosocial factors, such as family dynamics and academic stress, substantially influence children's mobility and mental well-being (Paul et al., 2024; Zannat et al., 2023). Analyzing these aspects in Rajshahi can yield significant insights for urban planning and policy interventions to enhance student mobility.

Research on school trip patterns is still limited in Rajshahi though the city is experiencing significant urban expansion and enhanced road infrastructures. A comprehensive study is essential to analyze school-based travel pattern and to evaluate the adequacy of transportation infrastructure surrounding schools. This research addresses that gap by analysing student mobility in Rajshahi, aiming to improve safety, reduce congestion, and optimize transportation planning. The objective of this study is to analyse the characteristics of school-based trips and assess the sufficiency and effectiveness of transportation infrastructure around schools in Rajshahi City.

Nevertheless, there are some limitations to this study. The findings may lack generalizability due to the focus on just two institutions, which could limit the diversity of perspectives represented by the sample size. Furthermore, the depth of data collected may be constrained by the timeframe of the study. Despite these challenges, the research aims to enhance the effectiveness of transportation policies in Rajshahi by prioritizing students.

2. Literature review

Understanding school-based trip patterns is essential for formulating transportation policies that promote sustainable and active commuting among children. Research has extensively examined the determinants of school travel behaviour, emphasizing regional variations, socio-economic issues, gender disparities, and the role of community engagement in reducing auto-dependency.

Children's choice of travel mode is influenced by environmental, social, and policy-related factors. Proximity to educational institutions markedly enhances active commuting as children in older neighbourhoods demonstrates elevated walking rates attributable to advantageous urban design (Larsen et al., 2009, 2015). Government initiatives, such as school clustering, improve accessibility for active travel. Household dynamics and children's independent mobility also influence travel decisions, with supportive environments fostering active transportation (Stevens, 2010). These interconnected factors highlight the need for a multi-faceted approach to promoting sustainable school travel (Lay & Jenkins, 2010).

Moreover, in developing countries, socio-economic inequalities significantly influence school travel behaviour. In Jordan, children from low-income areas primarily walk to school, whereas affluent families prefer private vehicles (Shbeeb, 2023). In Yemen, socioeconomic status and gender impact travel choices. Again limitation of public transportation, disproportionately affecting low-income households, particularly females (Al-Kaderi & Ali, 2024). Parental supervision linked with parental income and educational attainment also impact children's independent mobility (Zannat et al., 2023). These discrepancies highlight the necessity for targeted interventions to enhance accessibility for school-going children (Mashiri et al., 2005; Porter et al., 2010).

Furthermore, informal transportation systems are vital for school commutes, particularly in urban areas where accessibility and safety are primary concerns. In Dhaka, community-managed school van services offer a cost-effective alternative to private transport, while efficiency challenges persist (Das et al., 2022). Safe Routes to School programs have demonstrated efficacy in encouraging active travel and reducing automobile dependency (Stewart, 2018). European studies highlights the influence of school location policies in

shaping transportation choices, while Australian community-led initiatives have effectively involved school communities in active transport programs, reducing car trips and fostering sustainable travel habits (Hansen et al., 2012).

Community engagement and infrastructure development are essential for reversing auto-dependency trends in school transportation. School Travel Plans (STPs) and Safe Routes to School (SRTS) initiatives have increased active travel rates and reduced automobiles dependency (Buliung et al., 2011). California's SRTS program demonstrates how infrastructure investment and strategic planning enhance safety and promote walking and cycling (McMillan et al., 2004). Traffic-calming initiatives and pedestrian-friendly designs enhance active school commuting, though enduring community engagement is essential for long-term change (Smith et al., 2020).

However, gender disparities in school travel are also apparent throughout different regions. Boys are more inclined to participate in active commuting compared to girls, while discrepancies exist; in Czechia, 65% of both sexes commute actively, whereas in Germany, only 42.6% of girls do so (Brindley et al., 2023). Safety concerns contribute to these differences, as girls are more sensitive to distance and traffic risks (Javadpoor et al., 2023). In sub-Saharan Africa, cultural barriers and safety issues further restrict girls' movement (Porter et al., 2010). These findings highlight the necessity for gender-sensitive transportation policies to ensure equitable access to active school commuting (Colley & Buliung, 2016).

Globally, school travel behaviour has shifted toward greater dependence on non-active modes, resulting in physical inactivity and traffic congestion (Ermagun et al., 2015b; Ji et al., 2022). In Canada, almost 60% of children residing within two km of their schools rely on automobiles, despite the advantages of proximity (Lay & Jenkins, 2010). In Bangladesh, school travel behaviour is influenced by socio-economic factors, built environment attributes, and parental supervision (Daisy, 2013). Initiatives such as STPs and SRTS prioritize infrastructure improvements and community engagement to promote active transportation (Lay & Jenkins, 2010; Lopez & Wong, 2017).

Additionally, diverse methods are employed to analyse school-based trip patterns, each presenting distinct advantages. Hands Up surveys offer classroom-level insights, whereas household surveys capture wider factors affecting travel behaviour. Activity-based travel diaries provide significant data on urban travel patterns, revealing the impact of socio-economic and built environment factors on modal choice (Daisy, 2013). Structured surveys using Likert scales assist in determining parental perceptions, facilitating targeted interventions (Prasad & Maitra, 2019). A synthesis of these methods yields comprehensive insights into school travel behaviours.

The insights gained from existing research served as a foundation for assessing school-based trip characteristics and evaluating transportation infrastructure around schools for this study. This process helped in identifying key variables, refining research methodologies, and selecting appropriate data collection techniques. This study is unprecedented in Rajshahi City context, as no prior research has examined particularly school travel patterns and infrastructure adequacy in this urban setting.

3. Study area profile

Rajshahi hosts a diverse array of educational institutions, ranging from primary schools to renowned universities. The following study was conducted in the Rajshahi City Corporation (RCC) area which is the divisional headquarter of the district of Rajshahi located in Bangladesh (Kafy et al., 2019). Rajshahi City Corporation (RCC) is located in the North-Western region of Bangladesh. With numerous educational institutions, it has garnered the reputation of being an educational city. The RCC area includes of total 56 schools. As a result, the student demographic of Rajshahi is heterogeneous. Not all institutions are exclusively Bangla-medium. Schools situated in residential area often exhibit more intriguing travel pattern. Consequently, the selected institutions for the survey includes Rajshahi Cantonment Public School and College (Raj-CPSC) and Paramount School and College (PSC) as these schools encompasses both English-medium and Bangla-medium students with primary and secondary levels, situated in prominent residential areas- Upashahar and Padma Residential Area and also covered male and female students, thereby representing a diverse scenario with varying socio-economic background of students.

Rajshahi Cantonment Public School and College marked “1” in Figure 1, is situated in Sopura, Cantonment Rajshahi. It is housed in a separate, six-story, custom-built structure. It is a Bengali-medium co-educational institution, serving both male and female students. At present, there are 1,377 students enrolled in the institution, including elementary to intermediate level. The classes are held in two shifts, one in the morning and one at noon. It is registered with Rajshahi Board of Education following National Curriculum stream (<https://rajcpsec.edu.bd/>).

Moreover, Paramount School and College marked “2” in Figure 1 is located in Chandrima Residential Area. It occupies a separate four-story building and operates as an English-medium school, enrolling both boys and girls. About 300 students are enrolled in the school, in both elementary and secondary level. Classes are held in only one shift starting from morning. It is registered with both Cambridge International Examinations and Rajshahi Board of Education. It has two curricular streams: the GCE (O and A Level)

stream and the English-Medium National Curriculum stream (Paramount School and College, Rajshahi, Bangladesh, n.d.)



Figure 1: Location of the schools selected for the study (Source: RCC and modified by the authors, 2023)

4. Methodology

The data collection process encompassed primary data obtained through questionnaire surveys administered at selected educational institutions, as well as secondary data sourced from reliable references, including websites, research publications, and reports. A questionnaire was developed to fulfil the study objectives, incorporating basic questions and variables related to transportation in the study area. Convenience sampling technique was utilized for the study. At 90% confidence level and a 10% confidence interval were maintained separately for the two schools for sample size calculation. A total sample size of 121 was determined comprising 65 from Rajshahi Cantonment Public School and College and 56 from Paramount School and College and data were collected between July and August 2023.

The respondents included parents of students in grades below Class 8, alongside a combination of students and their parents for those in grades above Class 8. Observation surveys were conducted in the study areas to assess existing conditions and transportation

infrastructure efficiency. The collected data were analysed using Microsoft Excel. Finally, recommendations were formulated to enhance transportation facilities in the study area, providing practical insights derived from the theoretical and empirical findings.

5. Results

The objective of the study is to understand how students commute to school and the determinant factors influencing their travel choices. The income-based categorization (Table 1) highlights how socio-economic factors influence transportation choices. For instance, higher incomes families (above BDT 40,000) are more inclined to own and utilize private vehicles, whereas those in lower income segments (BDT 10,000-20,000) predominantly depend on economical transportation options like rickshaws or walking. The data reveals disparity, as Paramount School and College, with a majority of students from affluent families, exhibits a higher percentage of car usage (28.57%) compared to Rajshahi Cantonment Public School and College (18.46%). In contrast, the subsequent school, with a more diverse income distribution, has a higher dependence on rickshaws (36.92%) and non-motorized modes like walking (7.69%). These findings highlight the significance of incorporating income levels in formulation of transportation policies to ensure equitable access for all socio-economic groups.

Table 1: Demographic and trip related information

Variables	Rajshahi Cantonment Public School and College (Raj-CPSC) (%)	Paramount School and College (PSC) (%)
Monthly Household Income (BDT)		
5,000-10,000	1.54	0
10,000-20,000	12.3	0
20,000-40,000	56.92	7.14
> 40,000	29.23	92.86
Family Vehicle Ownership and Usage		
Yes	44.62	89.29
Yes, and used	24.14	56
No	55.38	10.71
Travel Mode Usage		
Auto/Easy Bike	7.69	21.43
Bicycle	4.62	0

Bus	7.69	0
Car	18.4	28.57
Motorcycle	16.92	10.71
Rickshaw	36.92	35.71
Walking	7.69	3.57
Accompany to School		
Parents	64.62	50
Friends	10.77	7.14
Alone	23.08	17.86
Others	1.53	25

(Source: Questionnaire survey by authors, 2023)

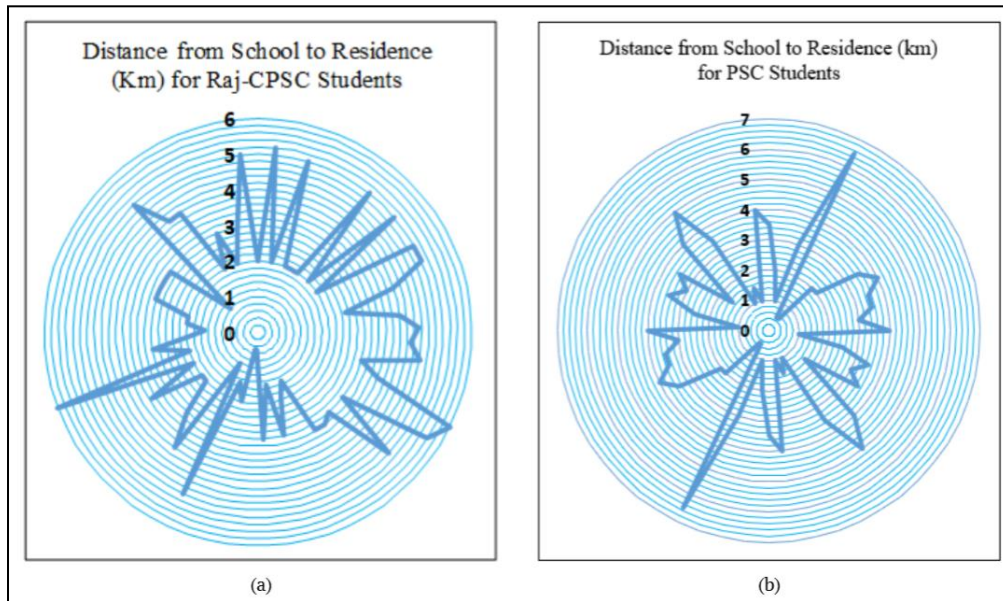
The study reveals differences in vehicle ownership and utilization between the two institutions. At Rajshahi Cantonment Public School and College, 44.62% of families own a vehicle, however, 24.14% of them do not use it for school trips. In contrast, 89.29% of families at Paramount School and College own vehicles, while 56% utilizes other transportation modes. This highlights variations in travel preferences among the school students.

Moreover, parental involvement also varies. At Rajshahi Cantonment, 64.62% of students are accompanied by parents, compared to 50% at Paramount. Fewer students travel alone (23.08% vs. 17.86%), with a small portion commuting with friends or other family members. The higher parental involvement in both schools suggests concerns over student safety, potentially influenced by age and independence levels.

5.1. Distance from school to residence

The radar graph of Figure 2 shows the distance from where students have to travel to school. For both school, maximum travel distance varies from 6 to 6.5 km radius. They travel from different location to the school using different mode of transport.

Figure 2: Distance from school to residence (Km) for Raj-CPSC and PSC students (Source:



Questionnaire survey by authors, 2023)

Table 2 outlines the residence locations and the corresponding average one-way travel times for students attending the schools. For students attending Rajshahi Cantonment Public School and College, the average travel time to reach the school is approximately 16 minutes. For students attending Paramount School and College, the average travel time to reach the school is comparatively shorter, approximately 12.36 minutes. Students from remote locations attend Rajshahi Cantonment Public School and College than Paramount School and College due to its more diversified socioeconomic advantage, rendering it a more affordable option. The following table 2 provides valuable information in assessing commute times to these schools from various locations.

Table 2: Residence locations and average one-way travel times for students

School Name	Residence Location	Average travel time (One Way)
Rajshahi Cantonment Public School and College	Kadirganj, Court Station, Terokhadia, Padma Residential Area, Upashahar, Nowdapara, Sopura, Lokkhipur, Horogram Bazar, Vodra, Bornali, Shalbagan, New Market, Choto Bongram, C&B, Sagarpara, Veripara, Bahrampur, Sadurmor	16 min
Paramount School and College	Court Station, Padma Residential Area, Upashahar, Sopura, Lokkhipur, Vodra, Bornali, Shalbagan, Bongram, Choto Bongram, Hadir Mor, Boalia, Ammchattar	12.36 min

(Source: Average travel time measured by authors, 2023)

5.2. Transportation costs

Table 3 contains the transportation costs for two different schools as determined by this study. For Rajshahi Cantonment Public School and College, the monthly education fees vary based on the level of education. The Primary level fees are around BDT 1800 while the Secondary level fees are around BDT 2,500. It is worth mentioning that, the school offers transportation services for an additional fee of BDT 1,200. The average transportation cost to this school for respondents is nearly BDT 54.38 per day and students generally attend school 20 days at a month. So, the monthly average transportation costs stand nearly BDT 1,087.6.

Table 3: Transportation costs

School Name	Monthly Transportation Cost (BDT)	Fee for School Transport Services (BDT)
Rajshahi Cantonment Public School and College	$54.38 \times 20 = 1087.6$	1200
Paramount School and College	$48.93 \times 20 = 978.6$	Not Available

(Source: Questionnaire survey, 2023)

On the other hand, for Paramount School and College, the monthly education fees vary based on the level of education. The school doesn't currently provide transportation services, after Covid-19 pandemic. Respondents' average transportation cost for this

school is nearly BDT 48.93 per day and students generally go to school 20 days at a month. The monthly average transportation fees stand nearly BDT 978.6. It is observed that the average monthly transportation cost for Paramount School and College going students is slightly less than that of Rajshahi Cantonment Public School and College. Plausible reason for such scenario could be the clustering of most of the students within 4 km range as seen in Figure 2(b).

5.3. Trip types

This study depicts that all of the students' trip categories (Figure 3) are home based. The majority of the students (83.47%) return directly to home from the school. However, 14.88% students are required to attend coaching after school and they typically return home afterwards. Only 1.65% students mentioned that they visit other places that are not explicitly mentioned.

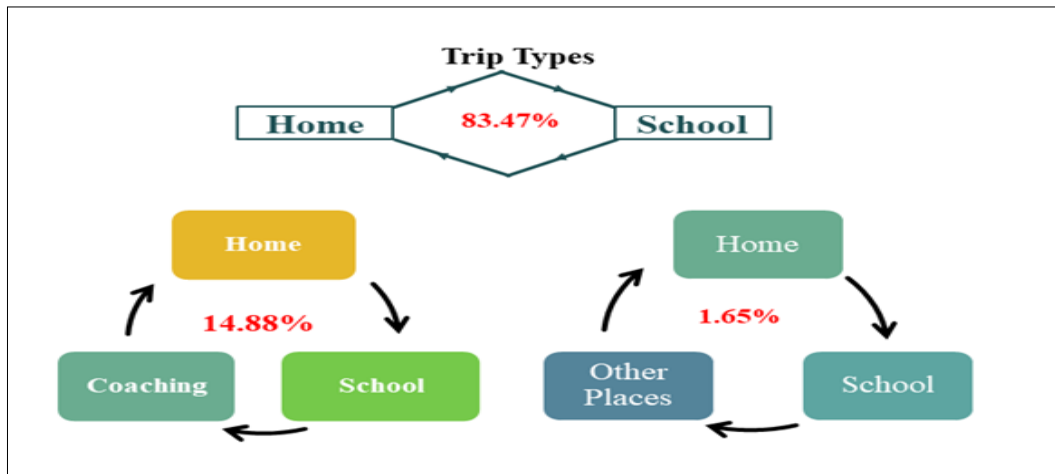


Figure 3: Trip types along with percentage (%) distribution (Source: Questionnaire survey, 2023)

5.4. Factors influencing modal choice

The factors influencing the choice of travel mode among students are presented in Figure 4. Convenience is the most significant factor that influences their choice of travel mode for the highest percentage of students (61.98%). This indicates that the ease and comfort of the chosen mode of transportation play a crucial role in their decision-making process.

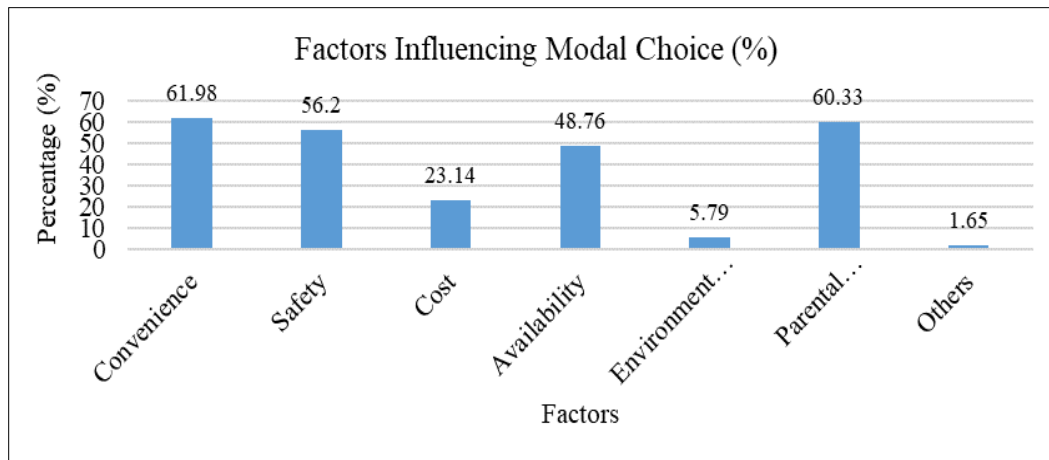


Figure 4: Percentage (%) distribution of the factors influencing modal choice (Source: Questionnaire survey, 2023)

Safety is also a significant determinant, with 56.2% of students considering it an essential factor. This suggests that students prioritize modes of transportation that they perceive to be safe. Approximately 23.14% of students consider cost into account when choosing the mode of transportation. This indicates a consideration for affordability and financial constraints. Approximately 48.76% of the students are influenced by the availability of transportation alternatives. This suggests that the accessibility and frequency of transportation play a role in their decision-making. A smaller percentage (5.79%) of students consider the environmental impact of their travel mode, indicating a certain level of awareness and concern for sustainable transportation choices or by weathering impacts like rain, storm etc. A significant portion (60.33%) of students take their parents' preferences into consideration when selecting their travel mode. A small number of students (1.65%) mentioned "others," implying the presence of additional criteria such as, "Time Table" and "Travel with Friends", influencing their choice travel mode.

The significance of convenience, safety, and parental preference as influential factors indicates that students often consider not only their own comfort but also the well-being and preferences of their families. The Travel Cost and the Travel Time depend on the mode choice, and distance from home to school. Respondents prioritize the "Availability" factor while travelling using their own vehicle or by rickshaw due to its availability in Rajshahi City. Respondents signify "Safety" while they travel with their own vehicle. While respondents choose "Parental Preference" factor, most of the time they travel with their parents.

5.5. Challenges or difficulties during school-based trips

A substantial percentage of students (42.15%) encountered challenges during their school-based trips whereas 57.85% respondents experienced no significant issues. Some challenges they faced are: traffic congestion in pick hour, narrow road to school, improper crowd management, noise pollution, unavailability of rickshaw and unexpected rain/weather conditions etc.

5.6. Respondents view on road conditions to school

As represented in Figure 5(a), majority of respondents (49.23%) of Rajshahi Cantonment Public School and College reported that the road conditions near the school are "Good". Approximately 29.23% of responses are "Average" and with 15.38% of respondents perceived the road conditions as "Excellent". Only a small percentage of respondents, 3.08%, rated the road conditions as "Poor" or "Very Poor". On the other hand, the half of the respondents (50%) of Paramount School and College marked that the road conditions to school are "Good" shown in Figure 5(b). Approximately 21% stated as "Average" and with 29% of respondents perceived the road conditions as "Excellent". No one mentioned that the road conditions near the school are bad or very bad which is a good sign for the school.

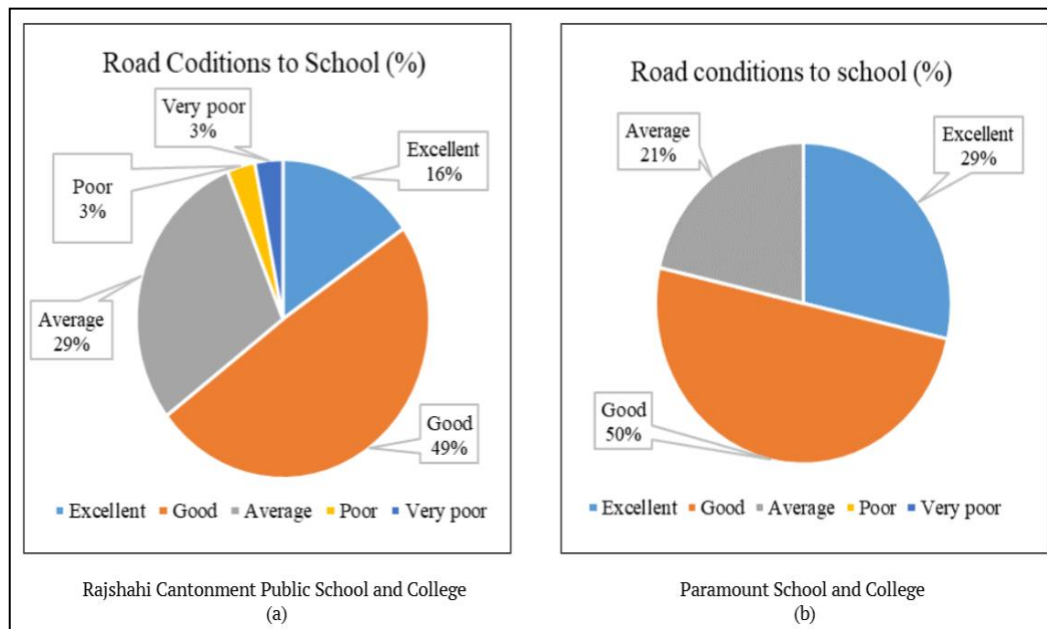


Figure 5: Respondents view (%) of road condition for Raj-CPSC and PSC (Source: Questionnaire survey by authors, 2023)

5.7. Willingness to pay more for improved transportation services

A significant proportion, 19.83%, of respondents express a strong willingness to pay more for improved transportation services (as shown in Figure 6) whereas 14.88% of respondents show moderate willingness. This indicates that a broader segment of the population recognizes the benefits of enhanced transportation but might have some reservations or limitations in terms of affordability. The majority, 65.29%, of respondents are not willing to pay more for improved transportation services. This finding suggests that a considerable portion of the population either perceives the current transportation services as sufficient or some different aspects.

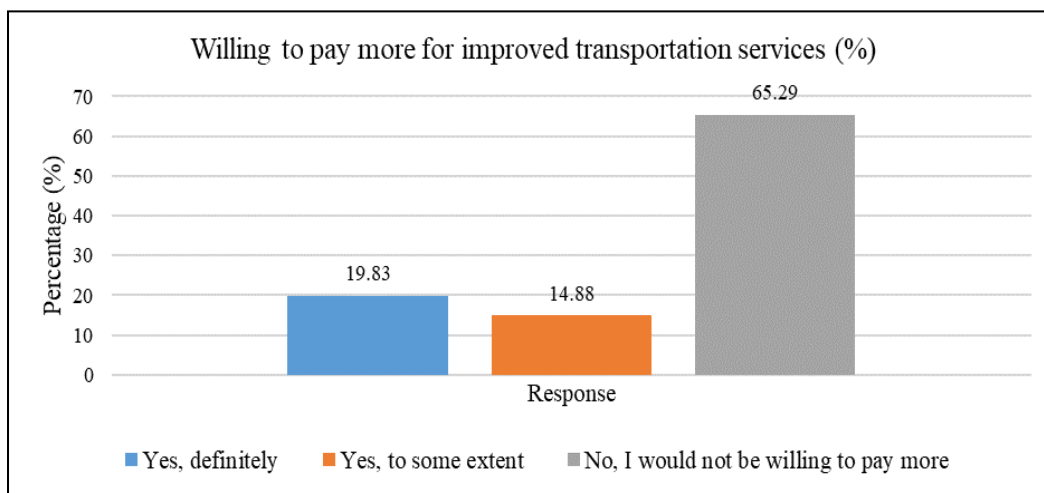


Figure 6: Percentage Distribution (%) of the Respondents Willingness to Pay More for Improved Transportation Services (Source: Questionnaire survey by authors, 2023)

5.8. School transportation services utilization (If provided by school)

A total of 20% of students reported that they always utilize (or will utilize if the school provides) school transportation services (presented in Figure 7). This suggests that a small but consistent portion of the student population relies on these services for their daily commute to school. Another 20% of students expressed that they use school transportation services (or will utilize if the school provides) occasionally, specifically when the need arises. This suggests a flexible approach, where these students might have other transportation options but choose school services as required. The majority, 60%, of students do not use school transportation services at all.

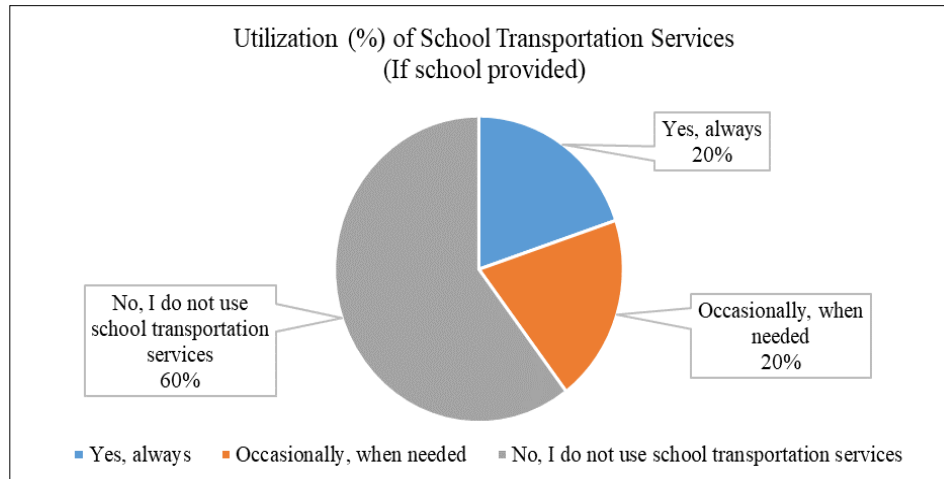


Figure 7: Utilization percentage (%) of school transportation services (If school provided)
(Source: Questionnaire survey by authors, 2023)

This finding suggests that the largest portion of the student population either prefers alternative transportation options, such as private vehicles, walking, or public transport, or that the school transportation services might not be meeting their needs or preferences. Specifically, they mentioned some reasons for not using school transportation services like-

- i. **Convenience:** Convenience is a critical factor that affects transportation decisions provided by the school authority. Students and their families generally choose transportation methods that are most suitable for their schedules and preferences.
- ii. **Proximity to school:** The proximity of the students' residences to the school is a significant determinant. Students living near the school find it more convenient to walk or use alternative modes of transport.
- iii. **Ownership of a car:** Families owning a car prefer to use their own vehicle for transportation, as it offers greater flexibility and control over travel schedules.
- iv. **Traveling with parents:** Students traveling with their parents align their transportation choices with their parents' commuting arrangements.
- v. **Parental preference:** Parental preferences play a crucial role in transportation decisions, as parents often prioritize what they perceive to be the safest and most convenient option for their children.
- vi. **Time table mismatch:** Mismatch between the school bus schedule and the students' schedules influences transportation decisions. If the bus schedule doesn't align well with students' activities, they can choose other options.
- vii. **Age limit for bus services:** The restriction on providing school bus services till a certain grade (e.g., class 4) impact families' decisions, especially if they have students in the upper grades.

- viii. **Cost considerations:** The affordability of school bus fares relative to other transportation options greatly influence choices. The school bus is perceived as pricey; families opt for more economical alternatives.
- ix. **Availability of school bus route:** The availability of the school bus route near the students' homes significantly impacts the feasibility of using school transportation services.
- x. **Risk of missing the school bus:** Some families opt not to use school transportation services to avoid the potential stress of missing the bus and its associated consequences.
- xi. **Autonomy and flexibility:** Families prefer modes of transport that offer greater autonomy and flexibility in travel times and routes.

5.9. Additional findings from the two schools

Some other issues related to school trips includes:

- i. **Consistent school attendance:** Students attend 5-6 days a week, underscoring the continuous need for efficient and reliable transportation options.
- ii. **Proper footpaths:** Available near Rajshahi Cantonment Public School and College but absent near Paramount School and College.
- iii. **Designated pickup zone:** Both schools lack designated pickup areas, causing congestion.
- iv. **Peak hour congestion:** Significant at Rajshahi Cantonment Public School and College, minor at Paramount School and College.
- v. **School transportation facilities:** Available at Rajshahi Cantonment Public School and College. Paramount School and College doesn't provide transportation facilities now; they provided the facilities before Covid-19 Pandemic.
- vi. **Affordable bus service:** The monthly fee for the school bus service at Rajshahi Cantonment Public School and College is set at approximately 1200 TK. This financial aspect plays a role in families' decisions when considering transportation options for their children.
- vii. **Bicycle parking facilities:** Available at Rajshahi Cantonment Public School and College, absent at Paramount School and College.

6. Discussion

In line with the prior researches that emphasizes the impact of socio-economic factors, travel distance, and infrastructure quality on student mobility, this study findings add to

the expanding dimension of knowledge on school trip patterns in urban context (Al-Kaderi & Ali, 2024; Shbeeb, 2023; Stewart, 2018; Zannat et al., 2023). This study reveals that, the school students of Rajshahi depend substantially on informal transport modes due to affordability and accessibility concerns, which is similar to research conducted in Dhaka and other South Asian cities (Daisy, 2013; A. Das et al., 2022; Das et al., 2016). However, the result indicates that, lack of a structured school transportation system in Rajshahi has led to greater dependence on rickshaws in contrast to research conducted in metropolitan areas where public transport plays a more significant role (Daniels & Mulley, 2013).

Gender differences in school travel behaviour observed in this study further support existing literature, which reports that female students face greater mobility constraints due to safety concerns and parental restrictions (Javadpoor et al., 2023; Porter et al., 2010). These findings corresponds with previous research in Bangladesh and other developing countries, where perceived safety risks lead to a increased dependence on private modes or escorted travel (Daisy, 2013). The study further corroborates the role of parental influence in mode choice, consistent with findings from studies conducted in both urban and suburban settings (Zannat et al., 2023).

This study further extends prevailing research by evaluating the adequacy of transportation infrastructure near schools, a domain often overlooked by authorities (Buliung et al., 2011; McMillan et al., 2004). The findings reveals that although Rajshahi has a relatively developed road network, inadequate pedestrian facilities, congestion around educational institution, and an absence of designated drop-off points adversely impact student safety and travel efficiency. These findings align with research emphasizing the necessity for improved infrastructure to support safe and sustainable school commuting (Smith et al., 2020).

Overall, this research highlights the significance of context-specific school transport policies. While previous studies have primarily focused on large urban centres (Ji et al., 2022), this study highlights how mid-sized cities like Rajshahi encounter distinct challenges, necessitating targeted interventions to enhance student mobility. Further research could explore how policy interventions, such as school bus programs or pedestrian-friendly infrastructure, impact travel behavior in comparable urban settings.

7. Conclusion and recommendations

This study provides a multifaceted analysis of school transportation dynamics in Rajshahi, identifying key factors influencing students' travel choices, including convenience, proximity, car ownership, parental preferences, cost, autonomy, and safety concerns. The findings highlight consistent school attendance patterns and emphasize the importance of

adequate infrastructure, such as footpaths, while also revealing challenges like peak-hour congestion and inadequate pick-up/drop-off zones. Notably, while one school provides transportation services, the other lacks such facilities post-pandemic, necessitating alternative solutions.

To foster a more equitable and sustainable school transportation system, targeted interventions are needed. Paramount School and College should consider reinstating its transportation services to accommodate students from diverse socio-economic backgrounds and reduce dependence on private vehicles. Collaborating with local authorities to improve road infrastructure, widen streets, and establish designated pick-up/drop-off zones would mitigate congestion and enhance student safety. To promote sustainable commuting, it is important to organize awareness campaigns that encourage students to walk or cycle, along with providing adequate bicycle parking facilities. Encouraging older students to cycle, in particular, could be an effective strategy. Promoting shared or alternative transport options could further reduce congestion as many students have access to private vehicles.

Moreover, collaborative initiatives with local authorities to address peak-hour traffic congestion are essential. By implementing these strategic interventions, both schools may contribute in the establishment of an inclusive, sustainable, and accessible transportation system that benefits students and the broader community.

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