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# An analysis of the harassments and challenges faced by the public transport users in a developing country of South Asia

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Bangladesh—located in south Asia and home to almost 167 M people, is one of the most densely populated countries in the world. Despite high population density, the country is yet to have a well-coordinated mass transit system. However, most people rely on public transportation due to comparatively low motorization. Public transport users, especially vulnerable cohorts (e.g., women), face enormous challenges, including molestations, assaults, and rape during their daily commute. Few studies that analyzed the state of harassment exclusively focused on women, which might not be comprehensive enough to understand the state of the problem and devise effective policies. Therefore, the current study explores the state of harassment in the three cities of Bangladesh, namely, Dhaka—the capital; Rajshahi; and Mymensingh across all genders. The study also investigates people's perception of women's mobility, the experience of using public transport, and the desirable safety precautions to understand the gender differences and the variability across the three cities. A detailed questionnaire survey was conducted to collect data from the three cities. The study found considerable gender differences regarding the perception of women's mobility hindrances, the experience of using public transportation, and desirable safety precautions. The differences across the three cities were also noticeable. Contrary to the general belief, the study found that people from smaller towns like Mymensingh were more likely to get harassed than those from the bigger cities like Dhaka and Rajshahi—insinuating the lack of reporting from the smaller towns of the country. The findings from the study could be helpful for the transit and city planners in creating a conducive transit ambience in Bangladesh. Based on the desirable safety precautions, female-only rides, especially at night, would be beneficial. City planners could also plan small and medium business activities around transit stops to attract the crowd and reduce the possibility of getting harassed while walking alone to access transit.

## KEYWORDS

public transport, harassments, challenges, developing country, gender

## 1 Introduction

Bangladesh is one of the most densely populated countries in the world—the population density of the country is almost three times that of the neighboring country, India<sup>1</sup>. Dhaka—the capital of Bangladesh, is one of the fastest-growing megacities. The country's population primarily relies on public transportation (e.g., public bus, taxi, CNG) for daily commutes. According to an inner cordon survey of the Dhaka metropolitan area, the modal share for public bus account for more than sixty percent<sup>2</sup>. However, a glaringly high percentage of the population, especially women, report abuse (87% of women reported violence against them<sup>3</sup>) in public transportation. Persistent crime could discourage the use of the public mode and push people towards individualized transportation modes which could be deadly for the country's traffic congestion.

Over the last few years, Bangladesh has become a vulnerable region to accelerating gender-based violence, especially in public places, which has restricted women's mobility (Mazumder and Pokharel, 2019; Closing the gaps for gender, 2016). It is postulated that many women in Bangladesh will endure sexual harassment, abuse, and assault at some point in their lives (Khairuzzaman, 2019). According to a national survey on violence against women, 21% of women consider public transportation the most likely place for sexual assault (Hossein). A recent study interviewing 2,500 women from every district of Bangladesh found that 90% of women and girls have suffered sexual harassment while on public transport (Ferdous and Dipu, 2019). Additionally, bus stops, footpaths, and stations are frequently reported as places of harassment in Bangladesh (Rahman, 2010).

Though most studies show that women are more likely to be victimized than men, violence against men on public transportation is not unheard of (Gordon and Roger, 1989). A study conducted on 5,000 participants in New Delhi, India, reported harassment of both men and women. However, sexual harassment is seen as the gravest threat to women's safety in Delhi, according to a study published a few years ago (Strategic Framework.pdf, 2022). In developing countries such as India, women travel fewer distances within restricted geographical areas for multipurpose trips (e.g., shopping, child escort, healthcare) and consequently rely more on public transport than men (Need to make public transport, 2017). Furthermore, women are more likely than men to travel at a slower speed and spend a more significant percentage of their

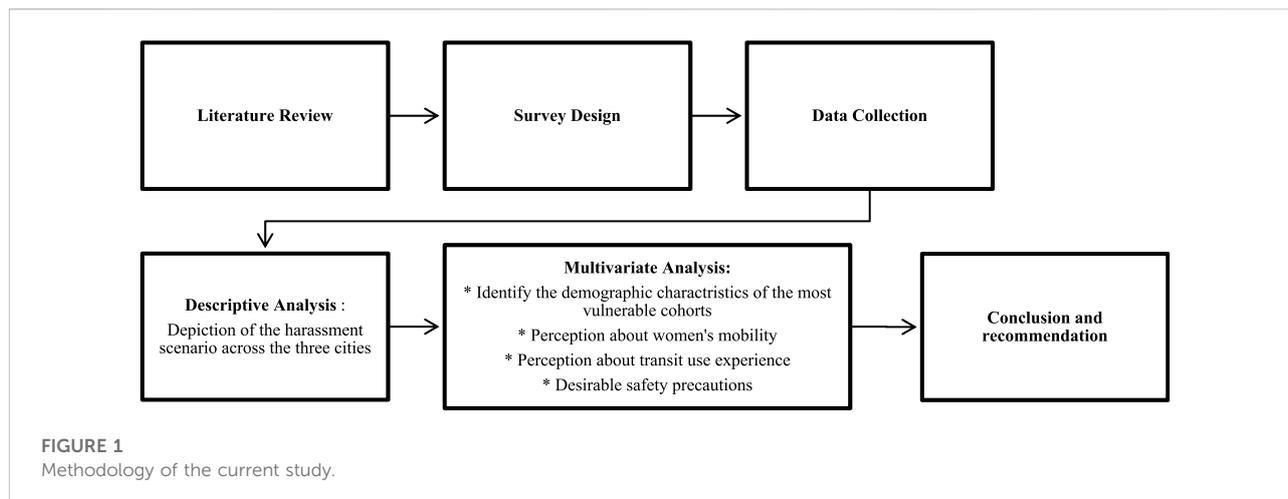
time on transportation, exposing them to gender-based violence and several forms of transit assault (Strategic Framework.pdf, 2022). A survey on public transportation in Chennai, India, found that 30% of respondents had experienced all forms of abuse, with inappropriate touching (37%), stalking (37%), being asked for sexual favors (17%), and comments on physical attributes (14%) (Valan, 2020). According to another study conducted in Lucknow, India, 45% of respondents believed that young women are the most common targets of harassment on public transportation. However, there was no agreement on whether any attribute, such as traveling alone or during rush hours, making them particularly vulnerable to sexual harassment on public transportation (Tripathi et al., 2017).

Other developing countries such as Nepal, Pakistan, Indonesia, Turkey, and Bogota face similar challenges regarding harassment on public transportation. According to a study conducted among 280 female students in the Kathmandu valley, Nepal, 219 students faced harassment before (Gautam et al., 2019). As per another study in Nepal, 97% of the people surveyed had experienced at least one or more incidents of sexual harassment on public transport in Kathmandu. This shows that sexual harassment is a ubiquitous experience for consumers of public transportation in Nepal (Neupane and Chesney-Lind, 2014). According to research on public transit harassment in Lahore, Pakistan, 77% of those surveyed have been harassed. 14% of them said it happened to them regularly (Awan, 2020).

Similarly, Kirchhoff discovered in his research that 39% of the females surveyed in Jakarta, Indonesia, had been sexually harassed on public transportation and that the harassment incidents were a frequent occurrence for them (Kirchhoff et al., 2007). A study in Istanbul, Turkey, asked participants to share their experiences utilizing public transportation. All participants reported ample negative experiences, including discrimination, assault, or harassment. The reported incidents varied from minor harassment (e.g., finger-pointing) to physical assault (Shakibaei and Vorobjovas-Pinta, 2022). Bogota, the capital of Colombia, was named the most dangerous place to travel alone at night, especially for women (EXCLUSIVE-, 2014). According to a survey on public transportation in Bogotá, 84% of women have been harassed at some point. Interestingly, only 10% of women who have experienced harassment have reported it—demonstrating severe underreporting (Quinones, 2020).

The harassment scenario on public transportation is not very different in the more developed countries either. The most susceptible cohort to such harassment in Japan is middle-aged employed women and school and university students (Burgess and Horii, 2012). In Seoul, South Korea, sexual harassment is pervasive in packed vehicles as passenger mobility is limited, resulting in unwanted physical contact (Kim et al., 2020). The number of transport assaults has also climbed drastically in recent years in Hong Kong. Chui and Ong conducted a study on public transit in Hong Kong, finding 125 cases of sexual assault over 10 months in 2006 (Chui and Ong, 2008). The most

- 
- 1 <https://ourworldindata.org/most-densely-populated-countries> - Accessed on October 2022.
  - 2 ESCAP (2018). Final report on Sustainable Urban Transport Index for Dhaka, Bangladesh.
  - 3 <https://www.ucanews.com/news/most-bangladeshi-women-suffer-abuse-on-public-transport/98579> - Accessed on October 2022.



prevalent forms of harassment on public transportation in the United States include groping, unwanted touch, stalking, and accosting (Hsu, 2011). According to an international survey conducted in 2014, in London, 32% of women are being harassed regularly, with 19% having experienced direct physical assault on public transportation (Foundation, 2022).

From the literature review above, it can be inferred that harassment inside public transportation is common in Bangladesh and other developing and developed nations. Patrolling public transportation could be one of the ways to reduce the occurrence of such incidents. However, continuous policing is not feasible, especially in a high-density country like Bangladesh. Instead, educating harassers and enabling victims to undertake desirable safety measures could be more effective means to safeguard travelers. Such measures would require a better understanding of individuals' perceptions of the challenges and the acceptable safety precautions. There is a dearth of systematic studies, especially in the context of developing nations, that explored the root cause of the spreading of violence inside the transportation system. Very few researchers that have investigated these issues have often only analyzed women's opinions on the subject (Tokey and Shioma, 2017)—which is not comprehensive enough to understand the depth of the problem and determine the causes of prejudice against victims. Therefore, this study attempts to understand the barriers to safe mobility inside transportation by investigating people's perceptions and desirable safety precautions. The study also investigates the harassment scenario across all genders in three different cities of Bangladesh.

The current study has four primary objectives, namely (i) depict the harassment scenario in the three major cities of Bangladesh—Dhaka, Rajshahi, and Mymensingh; investigate the gender difference in the (ii) perception of women's mobility; (iii) experience of using public transportation; and (iv) desirable safety precautions. The variability across the three cities is also investigated.

To this end, the study has undertaken a primary data collection effort—a survey is designed to solicit information from different demographic groups residing in Dhaka, Rajshahi, and Mymensingh. The collected information is analyzed using the descriptive analysis technique, followed by the development of multivariate models which control for different demographic factors while investigating the effect of gender and geography. Specifically, a binary logit model is developed to identify the most vulnerable cohorts of the three cities. To understand the perception of different demographic cohorts on women's mobility, public transportation experience, and desirable safety precautions, multiple ordered probit models are developed. To the best of the authors' knowledge, this is one of the first studies to investigate the heterogeneity in the perception towards women's mobility, the experience of riding public transportation, and desirable safety precautions to devise policies against harassment inside public transportation. The findings from the study will be helpful for city and transportation planners to promote a safe and secure transit system in Bangladesh and other countries with similar socio-economic backgrounds.

The rest of the paper is organized as follows. The next section provides a brief description of the survey. The harassment scenario of the three cities is also depicted in this section through descriptive analysis. The section briefly elaborates on the two statistical model forms used in the analysis—the binary logit and the ordered probit models. The result section presents the findings of the different statistical models. The paper ends with a succinct description of the research findings. The policy implications of the findings are also presented in the discussion section.

## 2 Materials and methods

The research started with a literature review. Next, a survey was designed to understand the respondents' perceptions about

women's mobility, the experience of using public transportation, and the desirable safety precautions of transit users. The survey intended to collect information about the harassment incidents encountered by the survey participants. A detailed descriptive analysis was conducted to understand the harassment scenario across the three cities. Particularly the descriptive analysis focused on the spatial and temporal distribution and the modal distribution of the harassment incidents. The descriptive analysis was followed by developing a binary logit model to capture the demographic characteristics of the most vulnerable population. Additionally, multivariate analysis is conducted to understand the gender and geographic differences in the perception of women's mobility, public transportation experience, and the desirable safety precautions. A flow chart depicting the significant steps of the study is provided in [Figure 1](#).

## 2.1 Survey

The study conducted a detailed questionnaire survey in the three cities of Bangladesh, namely, Dhaka, the capital city; Rajshahi; and Mymensingh, between September and November 2021. The survey was distributed online and restricted to people over 16 years old. The data collection followed the convenience sampling technique since we used our social media network to augment the number of respondents. The survey was distributed among all genders since we intended to depict the scenario of harassment and understand the perception of harassment among both genders.

The survey included multiple sections on demographics (e.g., age, gender, household income, education level, family structure, marital history, and so on), daily travel behavior (e.g., household car ownership, frequency of trips executed for a variety of purposes by different modes of transportation), perception about women's mobility, experience of using public transportation, desirable safety precautions to reduce harassment, and personal and family harassment history. The answers to the perception questions (towards women's mobility, public transportation, and safety measures) were collected on a five-point Likert scale ranging from strongly agree to disagree strongly. To capture participants' perceptions of the barriers to women's mobility, the respondents were asked to indicate their (dis) agreement about multiple contributing factors such as fear, discrimination in rights, income, employment, and tendency to rely on others. The experience within public transport was recorded on several dimensions, such as space and congestion inside the vehicles, the driver/conductor's behavior, and the quantity and condition of seats. To understand the safety precautions, the questionnaire asked to indicate different actions the respondents exercise, such as avoiding rush hours, traveling alone, traveling at night, and sitting closer to drivers.

The last section of the survey collected information about respondents' and their family-friends' harassment history, including the location, time, and the severity of the incident if they ever faced any. There was also an open-ended question asking respondents to provide additional detail about their harassment incident.

## 2.2 Descriptive data analysis

[Table 1](#) summarizes the distribution of the important socio-economic variables. The survey collected information from 452 respondents. Almost 2/3rd respondents are female, and the rest are male. About 50% of the respondents belong to the 16–25 years age group—the high representation of this age group might be due to the tech savviness of this generation (as mentioned earlier, the survey was conducted online). Only 2% of the survey respondents are above 55 years old. Due to the high representation of the young age group, 60% of the survey respondents are students, and only 34% of the respondents are employed. Slightly less than half of the respondents are married. 42% of the sample completed undergraduate education, and 20% of the respondents completed higher secondary certificate level education. Slightly more than 70% of the respondents' household consists of more than three members. Around 40% of the respondents have a household income of more than 50,000 BDT per month<sup>4</sup>.

### 2.2.1 Spatial and temporal distribution of the harassment incidents

[Figure 2](#) presents the proportion of respondents who faced harassment at least once in their lifetime. The harassment proportion of female respondents in each of the three cities is much more significant than that of male respondents. Also, Mymensingh has the highest rate of harassment towards women than the other two cities.

[Figure 3](#) presents the spatial and temporal distribution of the harassment incidents faced by women in the three cities. According to the figure, for most women (around 1/3rd of the sample), the harassment happened inside public transportation—this trend is very similar across the three cities. Similarly, the percentage of women harassed while getting into vehicles is higher in the major cities—Dhaka and Rajshahi than in Mymensingh. It should be mentioned that due to extremely high population density and poor transit system, public transportation is usually overcrowded in the country. Hence, harassing women while boarding transit vehicles is a widespread occurrence. The lower reporting of such occurrences in Mymensingh might be due to the relatively less crowded

<sup>4</sup> 1 US Dollar = 101.81 BDT as of 26 Nov, 2022.

TABLE 1 Distribution of the socio-economic variables of the sample.

Sample size		452			
Socio-demographic characteristics		% (count) (All 3 cities)	% (count) (Dhaka)	% (count) (Rajshahi)	% (count) (Mymensingh)
Gender	Male	42.1% (172)	50.9% (85)	33.8% (48)	39.39% (39)
	Female	57.7% (236)	49.1% (82)	66.19% (94)	60.6% (60)
Age	16–25	47.7% (195)	62.87% (105)	41.26% (59)	31.31% (31)
	26–35	22% (90)	15.57% (26)	27.27% (39)	25.25% (25)
	36–45	18.1% (74)	14.97% (25)	15.38% (22)	27.27% (27)
	46–55	10.5% (43)	5.99% (10)	13.98% (20)	13.13% (13)
	55+	1.7% (7)	0.598% (1)	2.09% (3)	3.03% (3)
	Marital status	Married	40.8% (167)	25.75% (43)	48.25% (69)
	Unmarried	55.8% (228)	70.66% (118)	48.25% (69)	41.41% (41)
	Divorced	1.7% (7)	2.99% (5)	0.69% (1)	1.01% (1)
	Widow/Widower	1.7% (7)	0.59% (1)	2.89% (4)	2.02% (2)
Student	Yes	60.6% (243)	72.12% (119)	55% (75)	49.5% (49)
	No	39.4% (158)	27.88% (46)	45% (62)	50.5% (50)
Highest level of education	I have not received any formal education	0.49% (2)	0.60% (1)	0.69% (1)	—
	Secondary school (up to class eight)	0.98% (4)	1.2% (2)	—	2.04% (2)
	Secondary School Certificate (SSC)	2.7% (11)	2.41% (4)	4.19% (6)	1.02% (1)
	Higher Secondary Certificate (HSC)	20.64% (84)	26.51% (44)	16.78% (24)	16.33% (16)
	College Degree	12.04% (49)	11.45% (19)	12.59% (18)	12.24% (12)
	Undergraduate (4-year university degree)	42.01% (171)	42.77% (71)	46.85% (67)	33.67% (33)
	Postgraduate - Master's degree	13.02% (53)	10.24% (17)	13.98% (20)	16.33% (16)
	Postgraduate - Ph.D	4.91% (20)	4.21% (7)	4.89% (7)	6.12% (6)
	Technical Education	1.23% (5)	—	—	5.1% (5)
	Diploma	1.96% (8)	0.60% (1)	—	7.14 (7)
	Household Members	1	0.7% (3)	1.19% (2)	—
2		4.2% (17)	3.59% (6)	4.89% (7)	4.04% (4)
3		27.4% (112)	23.95% (40)	24.48% (35)	37.37% (37)
4		45.2% (185)	44.31% (74)	55.24% (79)	32.32% (32)
More than 4		22.5% (92)	26.95% (45)	15.38% (22)	25.25% (25)
Household Members (Below 16-year-old)	0	53.8% (220)	58.08% (97)	55.24% (79)	44.44% (44)
	1	32.8% (134)	29.34% (49)	31.46% (45)	40.40% (40)
	2	10% (41)	7.78% (13)	11.89% (17)	11.11% (11)
	3+	3.4% (14)	4.79% (8)	1.39% (2)	4.04% (4)
Household's monthly income (in Bangladeshi Taka or BDT)	Less than 5,000	0.24% (1)	0.59% (1)	—	—
	5,000–10,000	1.7% (7)	1.79% (3)	1.39% (2)	2.02% (2)
	11,000–20,000	3.4% (14)	5.39% (9)	2.09% (3)	2.02% (2)
	21,000–30,000	10.5% (43)	8.38% (14)	13.98% (20)	9.09% (9)
	31,000–40,000	17.8% (73)	11.38% (19)	19.58% (28)	26.26% (26)
	41,000–50,000	19.6% (80)	17.37% (29)	20.97% (30)	21.21% (21)
	More than 50,000	40.1% (164)	46.71 (78)	36.36% (52)	34.34% (34)
	I prefer not to say	6.6% (27)	8.38% (14)	5.59% (8)	5.05% (5)

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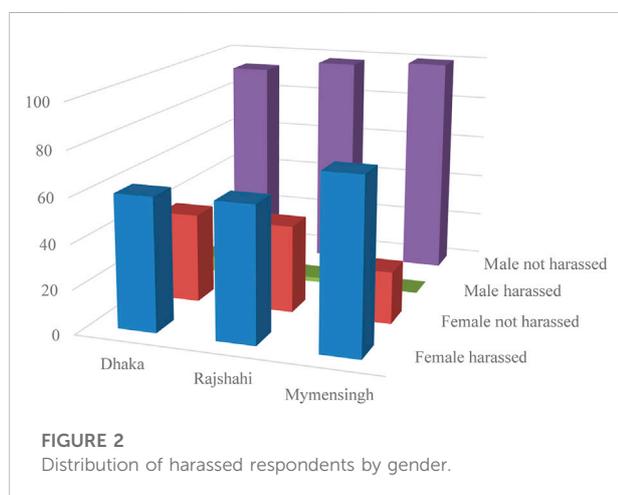
TABLE 1 (Continued) Distribution of the socio-economic variables of the sample.

Sample size		452			
Socio-demographic characteristics		% (count) (All 3 cities)	% (count) (Dhaka)	% (count) (Rajshahi)	% (count) (Mymensingh)
Employment	Employed	34% (139)	28.74% (48)	32.17% (46)	45.45% (45)
	No - not looking for employment	48.2% (197)	53.89% (90)	50.35% (72)	35.35% (35)
	No - looking for employment	17.8% (73)	17.36% (29)	17.48% (25)	19.19% (19)

condition of the transit vehicles in Mymensingh than in the other two cities. The footpaths in Rajshahi are less safe than that in the other two cities.

Interestingly, in terms of temporal distribution, in Dhaka—the capital city, the harassment is almost equally likely to happen between 11 a.m. and 11 p.m. In Rajshahi, the highest harassment occurs during the evening rush hours. In general, the rush hours facilitate more public contact and hence more opportunities for misconduct. Dhaka is a more densely populated city than Rajshahi and remains crowded for most of the day, spreading the harassment incidents over a longer time window. On the other hand, in Mymensingh, the highest amount of harassment happen between 7 p.m. and 11 p.m. Mymensingh being a smaller town becomes quieter earlier than the other two cities—this might create an opportunity for the harassers to indulge in misconduct during this time window.

According to Figure 3, every form of the harasser is approximately equally involved in the harassment incidence, indicating a lack of education and respect towards people. Harassment by standing co-passengers is significantly higher in Rajshahi, while it is lower by the driver and helpers than in the other two cities. The narration of the harassment incidents by some of our respondents is provided below.



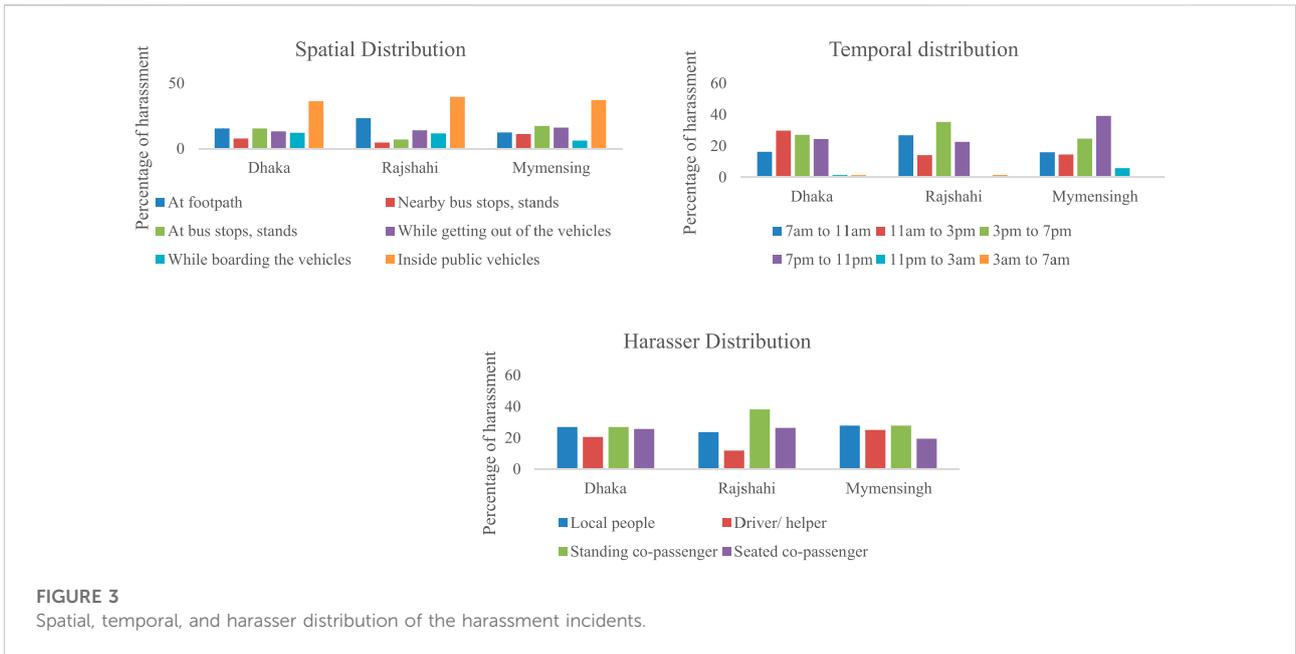
- 1) “I was trying to get to my seat, my co-passenger stretched his leg, and I fell. He also tried to touch my private parts. I could do nothing but leave the bus.”
- 2) “Helper tried to touch my back while I was getting off the bus.”
- 3) “A middle-aged guy was saying double-meaning words towards me. That was so embarrassing.”
- 4) “My sister was going to meet one of her friends *via* Auto Rickshaw. A co-male passenger, after a while, joined the ride and tried to sit close to her though she had notified him to maintain a distance. However, the male passenger did not listen to my sister. My sister was a little afraid and stopped the driver and left the ride immediately.”

## 2.2.2 Modal distribution of the harassment incidents

According to Figure 4, most harassment occurs on public buses, the predominant type of public transportation in Bangladesh. Interestingly, harassments are highly likely to occur inside CNG—one form of auto-rickshaw driven by Compressed Natural Gas, hence the name CNG—in Mymensingh than in the other two cities. This could be due to the differences in the operational characteristics of this mode across the cities. In Mymensingh, unrelated travelers share trips in CNG—while in Dhaka and Rajshahi, only friends and families travel as a group in CNG, reducing the chances of harassment. The percentage of harassment in Lagoon (human haulers) is higher in Dhaka than in Rajshahi and Mymensingh. This might be due to a higher share of Lagoon (human haulers) operating in the capital than in the other cities. According to recent statistics, 18,025 registered human haulers are operating around the country—of which almost one-third are operating in the capital city ([Human haulers a threat in, 2022](#)).

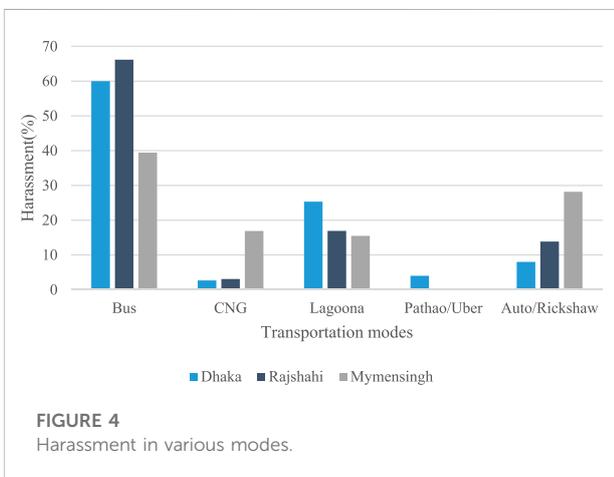
## 2.3 Statistical model

The descriptive analysis conducted above helps understand the impact of the single independent variable on the endogenous variable—for example, the probability



**FIGURE 3**  
Spatial, temporal, and harasser distribution of the harassment incidents.

of getting harassed. Multivariate analysis is necessary to capture the relative influence of multiple exogenous variables on the variable(s) of interest. In this study, the heterogeneity in the probability of getting harassed is captured using the binary logit model. The heterogeneity in the responses to different statements capturing perception towards mobility challenges, riding experience in public transportation, and desirable safety precautions are captured using the ordered probit model. It can be noted that the ordered probit model captures the effect of different demographic characteristics. However, primarily the models plan to address the variation across gender and geography in Bangladesh. Below is a brief description of the two model forms—binary logit and ordered probit.



**FIGURE 4**  
Harassment in various modes.

### 2.3.1 Binary logit model

The probability of an individual getting harassed can be expressed using equation (Mazumder and Pokharel, 2019) below.

$$P_{ih} = \frac{\exp(U_{ih})}{\exp(U_{ih}) + \exp(U_{inh})} \quad (1)$$

In Equation 1,  $P_{ih}$  is the probability of an individual,  $i$ , getting harassed, and  $U_{ih}$  and  $U_{inh}$  represent the “(dis)utility” of getting harassed and not harassed, respectively.  $U_{ih}$  is a function of multiple exogenous variables, including demography (e.g., location, gender, income, education) and travel characteristics (e.g., trip purpose).  $U_{ih}$  and  $U_{inh}$  can be expressed using Eq. 2 below, where  $\beta$  is the vector of the parameter to be estimated,  $X$  is the vector of exogenous variables, and  $\epsilon$  is the vector of random error assumed to be Gumbel distributed. In Eq. 2, the coefficient vector,  $\beta$ , is estimated concerning the harassed “alternative” or, in other words, not harassed alternative serves as the base alternative in the model.

$$U_{ih} = \beta'X_i + \epsilon_{ih} \quad (2a)$$

$$U_{inh} = \epsilon_{inh} \quad (2b)$$

### 2.3.2 Ordered probit model

As mentioned earlier, the (dis)agreement to multiple statements captures the perception of women’s mobility, the experience of using public transportation, and desirable safety precautions. The responses to these statements were collected on a Likert scale. Hence, the responses are treated as categorical variables. The latent propensity that derives the responses to the statements could be captured using Equation 3 below.

TABLE 2 Binary logit models results: who are more likely to get harassed.

Independent variables	Who are more likely to get harassed	
	Estimate	Robust t-ratio
Constant (harassed)	-3.503	-7.65
Female Indicator	3.703	9.45
Location Indicator (Dhaka)	-0.450	-1.24
Location Indicator (Rajshahi)	-0.285	-0.87
Trip Purpose Indicator by Bus (Shopping)	0.760	0.92
Trip Purpose Indicator by Bus (Recreation)	1.109	1.26
Trip Purpose Indicator by Bus (Work)	1.331	1.52
Student Indicator	0.596	1.87
Employment Indicator (Employed)	1.064	3.25
Household Vehicle Indicator (Private Car)	-0.121	-0.39

$$U_{ik}^* = \alpha'_k X_i + \varepsilon_{ik} \quad (3)$$

Where  $U^*$  is the latent propensity of individual  $i$  towards statement  $k$ ,  $\alpha$  is the vector of parameters, and  $X$  is the vector of exogenous variables, including the individual's demographic characteristics and travel conditions.  $\varepsilon$  is the vector of random error that is assumed to be independently, identically, and logistically distributed across the individuals and the statements.

The latent propensity could be related to the responses of the individual using Equation 4 below with the help of the threshold parameters.

$$U_{ik} = j \text{ if } \theta_k^j < U_{ik}^* < \theta_k^{j+1} \quad (4)$$

In Equation 4,  $j$  is the response category of the individual  $i$  to the  $k^{\text{th}}$  statement, and  $\theta$  is the corresponding threshold parameter.

The binary logit and the ordered probit models are estimated using the maximum likelihood estimation technique. The Apollo package in R<sup>5</sup> is used to estimate the models.

## 3 Results

### 3.1 Likelihood of being harassed

The binary logit model results on the most likely cohort to get harassed are provided in Table 2. It can be noted that the primary objective of the model is to identify the gender and geographic difference in the propensity to get harassed; however, the model controls for other demographic attributes and trip characteristics. According to the model results, people from Dhaka and Rajshahi are

less likely to get harassed than those from Mymensingh. One reason could be that in the bigger cities, harassers are often afraid to engage in widespread misconduct due to the availability of closed-circuit (CC) cameras. Interestingly, this finding contradicts the widespread belief that people from bigger cities are more prone to harassment than those from smaller towns. Low media coverage in the smaller towns could be the reason behind such intuition. The study reveals that being a student or a female increases the likelihood of getting harassed. Being employed also increases the probability of getting harassed significantly. The findings are similar to those obtained from other developing cities. For example, 55% of the women surveyed in Karachi, Pakistan, reported being sexually harassed on public transportation. In comparison, only 16% of working women and 18% of students said they had never been accosted on public transit (Rapid Assessment of Sexual Harassment, 2014). Employed people are more likely to travel alone, increasing their chances of getting harassed. People traveling to work by bus are very likely to get harassed. The study found that owning household vehicles decreases the possibility of getting harassed. However, this finding is not statistically significant.

### 3.2 Perception of Women's mobility

Table 3 presents the results on the perception of women's mobility. Four statements were used to capture the perception of women's mobility. The results of the four ordered probit models corresponding to four statements are discussed below.

#### 3.2.1 Statement: Fear of possible victimization hinders women's mobility

Previous research has posited that fear of potential violence influences women's travel, consequently limiting their mobility (Mukerjee, 2019). However, whether different cohorts of society brace such a notion is yet to be verified. According to the current

5 Hess, S., and D. Palma. 2019. "Apollo: A Flexible, Powerful and Customisable Freeware Package for Choice Model Estimation and Application." *Journal of Choice Modelling* 32: 100170.

TABLE 3 Ordered probit model results on perception of women's mobility.

Independent variables	Women's mobility hindrance			
	Fear of possible victimization	Income/employment status	Gender Discrimination	Tendency to rely on Others
	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)
Female Indicator	0.396 (2.57)	0.404 (2.79)	0.589 (3.65)	0.164 (1.07)
Harassment Indicator (Individual)	—	-0.129 (-0.92)	0.229 (1.71)	0.214 (1.49)
Harassment Indicator (Friends & Family)	0.207 (1.67)	—	—	—
Location Indicator (Dhaka)	-0.447 (-2.63)	-0.263 (-1.99)	0.218 (1.45)	-0.104 (-0.73)
Location Indicator (Rajshahi)	-0.969 (-5.97)	-0.132 (-0.99)	0.495 (3.38)	0.211 (1.44)
Age Indicator (26–35)	—	—	-0.291 (-1.85)	0.207 (1.49)
Age Indicator (36–45)	0.272 (1.65)	—	-0.574 (-3.08)	0.296 (2.22)
Age Indicator (More Than 45)	—	—	-0.642 (-3.11)	—
Married Female Indicator	-0.223 (-1.39)	—	0.213 (1.22)	—
Employment Indicator (Employed)	0.319 (2.23)	0.055 (0.47)	—	-0.185 (-1.45)
Employment Indicator (Looking for Employment)	0.302 (1.66)	—	—	0.228 (1.33)
Household Vehicle Indicator (Motorcycle)	-0.378 (-3.01)	0.146 (1.31)	0.269 (2.33)	0.250 (1.99)
Household Vehicle Indicator (Private Car)	-0.195 (-1.28)	0.225 (1.73)	0.080 (0.60)	0.172 (1.27)
Dependent Children Indicator (One or More than one)	—	-0.131 (-1.19)	—	—

study, irrespective of geography, women are more likely (than men) to agree that fear of victimization is a likely cause of their mobility impairment. On the other hand, respondents from Dhaka and Rajshahi are less likely than Mymensing to agree that fear impairs women's mobility. Dhaka and Rajshahi being more urbanized, have fostered women's empowerment to a greater extent. Consequently, these two cities have higher women's employment rates than Mymensingh. Even though Dhaka is rated seventh in the world for violence against women (Report, 2017)- women continue to travel for jobs and survival in the city. Hence, people are less likely to agree that women being fearful of possible victimization is one of the major causes of their impaired mobility.

Interestingly, married women are less likely to agree that the fear of being harassed restricts their mobility. Married women in Bangladesh are more likely than unmarried women to be accompanied while traveling. This might help married women to be less fearful about possible victimization. Compared to those not working, employed respondents and those seeking employment regard fear of victimization on public transportation as a substantial mobility impediment. The trip-making frequency is higher among the employed cohort—which might make them more dreadful about the harassment situation. Interestingly, respondents with household-owned vehicles and motorcycles are less likely to agree that fear of victimization is a likely cause of women's mobility impairment. Respondents with

access to household vehicles might be less dependent on public transportation resulting in such a perception.

### 3.2.2 Statement: Income and employment status hinders women's mobility

Women consider unfavorable income and employment status impair women's mobility. People from Dhaka and Rajshahi are less likely than Mymensingh to agree that the poor income and employment condition of women is a likely reason behind their lack of mobility. Dhaka and Rajshahi being more progressive might be the reason for not supporting the claim as strongly as Mymensingh. Employed individuals agree with the perception more strongly than unemployed individuals. People owning household cars and motorcycles also agree that dissimilar income and employment create additional challenges to women's mobility.

### 3.2.3 Statement: Discrimination in gender hinders women's mobility

Compared to males, females are more agreeable regarding gender discrimination as a barrier to mobility. Interestingly, unlike the other two statements, Dhaka and Rajshahi respondents agree more with this statement than Mymensingh's. Notably, people from bigger cities feel gender discrimination more strongly than those from smaller cities. People in the middle age group agree with the statement less vigorously than those in the younger and older cohorts. Unlike

TABLE 4 Ordered probit model results on the experience of using public transportation.

Independent variables	Bus conductor and driver misbehave with women	Inside of public vehicles are overcrowded	The condition of the seat is very poor	Space inside public vehicles is not sufficient
	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)
Female Indicator	0.549 (3.21)	0.099 (0.65)	0.151 (1.03)	0.624 (4.00)
Harassment Indicator (Individual)	0.101 (0.69)	0.154 (1.06)	0.202 (1.68)	0.252 (1.71)
Harassment Indicator (Friends & Family)	—	0.249 (1.97)	—	0.139 (1.15)
Location Indicator (Dhaka)	0.266 (1.62)	0.295 (1.94)	-0.067 (-0.47)	-0.239 (-1.70)
Location Indicator (Rajshahi)	0.306 (1.98)	0.348 (2.32)	0.305 (2.29)	-0.268 (-1.89)
Age Indicator (26–35)	0.311 (1.88)	-0.554 (-3.32)	0.198 (1.36)	0.249 (1.80)
Age Indicator (36–45)	0.219 (1.16)	-0.769 (-5.47)	0.219 (1.54)	0.299 (2.41)
Age Indicator (More Than 45)	0.325 (1.57)	-0.577 (-3.14)	—	0.263 (1.53)
Married Female Indicator	-0.337 (-0.01)	—	—	—
Employment Indicator (Employed)	0.143 (1.03)	—	—	—
Household Vehicle Indicator (Motorcycle)	—	—	—	0.083 (0.74)
Household Vehicle Indicator (Private Car)	0.226 (1.60)	—	—	0.137 (1.02)

the fear of victimization statement, married women do consider gender discrimination to be a reason for mobility hindrance. This might reveal the social norm of the country, where anecdotal evidence suggests that married women's lives are more closely monitored (most often by the spouse and in-laws) than those of unmarried women. Respondents from households owning motorcycles agree with the statement strongly. The country's predominant motorcycle owners/drivers are young males (Bray and Holyoak, 2015). Therefore, having a motorcycle might make the household members more aware of gender discrimination.

### 3.2.4 Statement: Relying on others hinders women's mobility

Gender difference is least pronounced in this statement than in the last three. Individuals from Rajshahi support this claim more than those from Dhaka and Mymensingh. Unlike the previous statement, the middle age group agrees with this statement more than the younger and older age groups. Employed people are less likely to believe in this statement. Having household-owned cars and motorcycles also make people agree with this statement more strongly.

## 3.3 Experience of traveling in public transportation

Table 4 provides the results of the respondents' experiences while using public transportation. The experience of using public transportation was captured using four statements. The results of

the four ordered probit models corresponding to the four statements are discussed below.

### 3.3.1 Statement: Bus conductor and driver misbehave with women

Females agree more strongly with this statement than males. Moreover, people with friends and families who have experienced harassment before agreed with this statement more strongly. Respondents from Dhaka and Rajshahi are more likely to support this statement than those from Mymensingh. This might indicate that public bus operators from bigger cities are more likely to harass passengers than those from smaller towns like Mymensingh. Individuals in the middle age group agree with the statement more strongly than the younger and older cohorts. It is interesting to note that married women are less likely to agree with this statement. Married women, most often being accompanied by fellow travelers, might face such harassment less than their unmarried counterparts. Employed people agree with the statement slightly more strongly than those who are not employed. Frequent travel might be the reason behind the comparatively more bitter experience of the employed cohort than those who are not employed. Also, people belonging to households with access to private cars agree with the statement more intensely than people from households without private vehicles.

### 3.3.2 Statement: Inside public vehicles are overcrowded

Unlike the previous statement, people from opposite genders are less likely to argue about this statement—indicated by the non-significant coefficient to the female indicator. Having harassment

TABLE 5 Ordered probit model results on safety measures taken by individuals.

Independent variable	Avoid rush hour	Avoid night travel	Avoid walking alone	Sit close to the driver
	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)	Estimate (Robust t-ratio)
Female Indicator	0.187 (1.32)	1.081 (8.844)	0.619 (3.86)	0.189 (1.22)
Harassment Indicator (Individual)	0.123 (0.93)	—	0.212 (1.46)	0.189 (1.25)
Harassment Indicator (Friends & Family)	—	0.146 (1.18)	—	—
Location Indicator (Dhaka)	0.043 (0.28)	-0.256 (-1.17)	-0.209 (-1.52)	0.226 (1.64)
Location Indicator (Rajshahi)	-0.184 (-1.31)	-0.193 (-1.29)	-0.224 (-1.63)	0.062 (0.46)
Age Indicator (26–35)	—	—	0.286 (1.99)	0.489 (3.18)
Age Indicator (36–45)	-0.194 (-1.29)	—	0.313 (2.04)	0.442 (2.67)
Age Indicator (More Than 45)	-0.331 (-2.02)	—	0.252 (1.39)	0.229 (1.24)
Employment Indicator (Employed)	0.146 (1.09)	—	-0.052 (-0.38)	-0.277 (-1.95)
Employment Indicator (Looking for employment)	0.343 (2.05)	—	-0.07 (-0.44)	-0.217 (-1.34)
Household Vehicle Indicator (Motorcycle)	—	—	0.099 (0.87)	—
Household Vehicle Indicator (Private car)	0.094 (0.68)	-0.07 (-0.56)	0.148 (1.11)	—

experience either first-hand (i.e., experienced by the respondents) or second-hand (experienced by their friends and family) make respondents more likely to agree with this statement. This might indicate that victims of harassment consciously or subconsciously associate harassment with the overcrowding of public vehicles. Respondents from Dhaka and Rajshahi are more likely to agree with the statement than people from Mymensingh. Dhaka and Rajshahi's overcrowded public transportation system could be the reason behind more robust agreement towards this statement from these two cities. Interestingly, people from the middle age group less strongly agree with this statement than those from the younger and older cohort. This is non-intuitive since this age group travels ravenously for various purposes. It might happen that frequent travel has made the middle age group less sensitive to the crowded condition of public vehicles.

### 3.3.3 Statement: The condition of the seat is very poor

The (dis)agreement to this statement by various societal cohorts is very similar to the previous statement (overcrowding). One significant difference is that respondents from Dhaka agree with this statement less likely than those from the other two cities. Though this observation is only marginally significant, this might indicate that the condition of the public vehicles in the capital city is comparatively better than that of the other two cities.

### 3.3.4 Statement: Space inside public vehicles is not sufficient

The gender difference is very significant in this statement. Like the previous statements, earlier harassment experiences (either personally or with family and friends) make people

agree with this statement more strongly. This might indicate that people with a harassment history associate space insufficiency inside public transportation with harassment incidents. Respondents from Dhaka and Rajshahi are less likely to agree with this statement than Mymensingh. This might indicate that spaces inside the public transportation in the bigger cities are comparatively more conducive than those in Mymensingh. People from households owning private vehicles agree with the statement more strongly than those not having household vehicles. Having alternative transportation options might make people more sensitive to public transportation conditions, resulting in a more positive coefficient.

## 3.4 Desirable safety precautions for traveling via public transportation

Table 5 shows the outcomes of individual safety measures adopted during travel. Four statements were used to capture the desirable safety measure. The results of the four ordered probit models corresponding to the four statements are discussed below.

### 3.4.1 Statement: Try to avoid rush hours while traveling in public transport

Compared to men, women are more likely to contemplate avoiding rush hour. This finding is like previous research. For example, in a study conducted in the United Kingdom, girls and young women reported preferring empty vehicles to prevent harassment (Finsgate S +44300 777 9777, 2018). People who experienced harassment have slightly higher chances of avoiding

rush hours than those who did not. Respondents from Rajshahi are less likely to agree with the statement—comparatively less congestion and low bus frequency in Rajshahi could have contributed to this perception. Employed individuals are more likely to agree with this statement than others. Employed individuals are more likely to travel during rush hours—which might have persuaded them to be extra sensitive towards the inconvenience of rush hour travel. People in the middle age group are less likely to agree—this age group usually takes care of various family, and work responsibilities and hence must travel frequently. All-consuming travel needs might have made this cohort less sensitive toward rush hours.

### 3.4.2 Statement: Try to avoid traveling at night in public transport

Compared to males, females more strongly agree with the need to avoid nighttime travel to ensure safety. This is supported by previous research—according to World Economic Forum Annual Meeting in 2020, women are more likely than men to opt for costly transportation alternatives (e.g., taxis, privately owned vehicles) at night to ensure safety (There are differences in how, 2022). People who encounter harassment among family and friends are more likely to avoid night travel than others. Compared to Mymensingh, respondents from Dhaka and Rajshahi are less likely to agree with this statement. Mymensingh is a suburban town that gets quiet earlier than the two major cities—Dhaka and Rajshahi. Avoiding night travel might not be feasible for respondents from the two major cities.

### 3.4.3 Statement: Try to avoid walking alone

Females, unlike men, are more apprehensive about safety while traveling—hence, they avoid walking alone to reduce risk. Individuals who have been harassed prefer not to go alone, indicating they associate walking alone with getting harassed. This finding has been corroborated by earlier research—according to the research by Logan and Walker in the USA; women are more likely than men to avoid traveling alone (Logan and Walker, 2021). Residents of Dhaka and Rajshahi disagree with the statement more than those from Mymensingh. Walking alone might deem riskier in Mymensingh because of the low population density. Older adults are more likely to agree with the statement than younger adults. It might be easier for older adults to find a company than younger adults, making it feasible to practice this safety measure.

### 3.4.4 Statement: Try to sit close to the driver

Females agree with this statement more than males. People who got harassed previously agree with this statement more than those who did not. Dhaka's Respondents agree more with this statement than those from Rajshahi and Mymensingh. People of the middle to high age group (more than 26 years old) agree with this statement more than those of the younger age

group. Interestingly employed individuals agree with this statement less than those who are unemployed. Frequent need for travel might make it impractical for the employed individuals to find a seat near drivers, which might have caused the insignificant estimate of this parameter.

## 4 Conclusion

Harassments on public transportation have become common, particularly in underdeveloped countries. However, such incidents appear infrequent due to insufficient reporting. Furthermore, the very little research conducted in this realm in the context of developing nations does not investigate the public perception of the situation—which is an essential precursor for developing successful mitigation strategies. The current study was designed to understand the perspective of different demographic cohorts on various issues related to the use of public transportation in the context of Bangladesh—a densely populated, developing country in South Asia. The study starts by depicting the harassment scenario on public transportation in three major cities of the country—including the identification of demographic differences in the occurrence of harassment incidents and the spatial and temporal variation in the incidents across the three cities. Next, the study explores the perception of different demographic groups on women's (the most vulnerable group, according to previous literature) mobility, experience of using public transportation, and desirable safety precautions to avoid harassment.

The study's primary contribution lies in identifying the gender and geographic differences in the perceptions towards mobility challenges faced inside public transportation and the desirable safety precautions. According to current (and previous) studies, women are the predominant victims of harassment in public transport. Therefore, by changing the established attitudes and mentalities towards women, it will be possible to mitigate the problem largely. Moral principles of the younger generations must be strengthened at home and school through educational curricula such as gender discrimination awareness, gender equality, and female empowerment. While analyzing the barriers to women's mobility, the study found that men are not as likely as women to agree about the challenges women face in transportation (for example, gender discrimination, unequal social status in terms of income and employment, and fear of victimization). Therefore, special care should be taken to educate the boy child.

It is also interesting to note that no significant gender difference was noted in some of the riding experience indicators—such as crowding situations and seating conditions of public transportation. However, in terms of misconduct of the transport operators, women are much more likely to agree to the indicator than men. Therefore, special care should be taken to educate the transportation operators, such as ticket takers, drivers, and other support personnel. Mandatory training can

educate transportation operators who frequently interact with passengers since most do not receive formal education. According to the study, this might be more important for the smaller towns such as Mymensingh—since people from bigger cities such as Dhaka and Rajshahi are less likely to experience such misconduct. Newspapers, television, and social media might play a role in this realm.

The notable gender difference was found in terms of the desirable safety precautions. Women are significantly more likely to avoid night travel and traveling alone than men to ensure safety. This could seriously limit women's mobility and discourage women's empowerment. Particular attention should be given for ensuring women's safety at night. City and transport planners should think of launching female-only services to ensure safe commutes for women who need to travel alone. Exceptional security could also be provided in selected services at night to safeguard lone female travelers. According to the study, small towns such as Mymensingh are much more in need of such services than the bigger cities such as Dhaka and Rajshahi.

In general, since the propensity of females traveling alone is increasing rapidly because of women's empowerment, city and transport planners should reserve seats for women in public transportation. This is not a long-term solution, but it will assist in lessening harassment for the time being. A follow-up survey could be conducted to determine the desired number of seats to be reserved. In the beginning, women could be allocated at least one-fourth of all seats available in a public vehicle.

Peak-hour traffic is generally crowded, and our research found that the rate of harassment is exceptionally high at these times. Due to the more significant number of female passengers than the number of reserved seats during periods of heavy traffic, females are compelled to stand while traveling on public buses and consequently become exposed to harassment. Therefore, more female-friendly transit facilities need to be supplied during peak hours.

Unfortunately, despite the several rules and regulations, the harassment situation on public transportation in Bangladesh is exacerbating continuously. Therefore, adequate enforcement of the regulations and proper punishment of the harassers must be ensured. On the other hand, victims of harassment must not feel ashamed and raise their voices to draw the attention of the concerned authorities.

Finally, city and transportation planners need to recognize the impact of harassment on the utilization of public transit—a

predominant mode of transport in developing countries like Bangladesh. A proper understanding of the challenges would help transit planners build efficient transit systems and foster a safety culture across the country. The recommendations outlined in this article could be helpful in other countries with similar socio-economic backgrounds facing similar challenges in public transportation.

Due to the COVID-19 situation, the survey was conducted online, which might have limited the participation of the urban poor due to a lack of internet access. Future studies should aim to collect a portion of the survey data in person to capture the perception of the underprivileged population of Dhaka, Rajshahi, and Mymensingh.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Author contributions

Study concept and design: SY, TA, AE; Data collection: SY, TA; analysis and interpretation of results: SY, TA, AE; draft manuscript preparation: SY, TA, AE.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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