Assessment of the environmental perceptions, attitudes, and awareness of city dwellers regarding sustainable urban environmental management: a case study of Dhaka, Bangladesh

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Received: 23 August 2020 / Accepted: 6 April 2022 / Published online: 4 May 2022 © The Author(s), under exclusive licence to Springer Nature B.V. 2022

Abstract
Environmental problems are very concerning, particularly in many cities of developing countries, because they obstruct the creation of a sustainable urban environment. Dhaka, Bangladesh was chosen as the research area of this study, as Bangladesh is a developing country with pollution; moreover, the level of residents’ environmental perception was assessed, and their environmental attitudes and awareness were examined in relation to their demographic characteristics. A face-to-face questionnaire survey involving 400 respondents was conducted across various zones of the study area. The mean score, standard deviation, and p value of each respondent’s answer were calculated separately using a one-way analysis of variance (ANOVA). Then, a grand mean, average standard deviation, and combined p values for environmental perception and attitude themes were computed theme-wise. Descriptive statistics were produced to illustrate the respondents’ level of environmental awareness. The study results revealed that the respondents had a moderate to high level of perceived knowledge about the causes and effects of environmental pollution. They also had an intention to reduce the environmental pollution in their surroundings. The score differences (p < .05) across the age groups, education levels, occupation types, and income groups were nearly all significant, except for those pertaining to the gender of the respondents. Surprisingly, only 18% of the respondents were aware of their home’s and neighborhood’s garbage management procedures. It is urgent to influence citizens’ environmental behaviors to ensure the city’s long-term sustainability. This study’s findings can be used in decision-making processes regarding sustainable urban environments worldwide.

Keywords Environmental pollution · Environmental knowledge · Environmentally friendly behavior · Environmental education · Sustainable city · Environmental management

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1 Introduction

Environmental contamination is one of the most alarming worldwide issues of this century (Kimani, 2007). Usually, the environmental pollution level of developing countries is higher than that of developed countries (Briggs, 2003; WHO and UNEP 2004). Likewise, city dwellers face higher pollution levels than rural residents in their everyday lives (Bernhard et al., 2013). Africa and Asia are less urbanized than America and Europe but experience the highest urbanization rates due to an imbalance between industrial development, informal economy, and rapid urban growth (Voigtlaender et al., 2008). The environmental challenges of the cities of these nations hinder their sustainable development. As a developing country in the South Asian region, Bangladesh also faces a major environmental contamination issue (Alam, 2009; Islam, 2008; Rahman et al., 2008). In this country, the quality of urban environments is declining by leaps and bounds. The rate of environmental pollution is higher in Dhaka than in any other city in this country (Islam et al., 2014; The World Bank, 2018). Dhaka, the primate and capital city of Bangladesh, is not only the most polluted city in this country but also the third most polluted city in terms of air pollution (Bhuiya, 2007; BIGD, 2015; WHO, 2014), the fourth least livable city considering its critical environmental condition (EIU, 2021; Rahman et al., 2008) and one of the most densely populated cities in the world (BBS, 2011; Sharmeen & Houston, 2020). Uncontrolled population growth, rapid urbanization, industrialization, inadequate and improper traffic management, inefficient solid waste management, etc., are the leading causes of environmental pollution in this city (Dewan et al., 2012; Islam et al., 2014; Khan, 2016; Swapan et al., 2017). Environmental pollution, such as air, water, land, and noise pollution, affects this city’s ecosystems, public health, and economic growth (Islam, 2008).

Due to a lack of environmentally friendly attitudes and irresponsible environmental behavior, environmental degradation is currently endangering many cities in developing countries (Ramsey & Rickson, 1976; Meinhold & Malkus, 2005; Meenakshi, 2009; Uddin, 2013). When people have environmental knowledge, they gain an environmentally friendly attitude that motivates their responsible environmental behavior (Hungerford & Volk, 1990; Rennie, 2007), but the limitations of this behavior model were confirmed in the early 1970s (Kollmuss & Agyeman, 2002). According to Ajzen and Fishbein (1980), attitudes impact our behavioral intentions, which influence our behavioral actions; such actions are also affected by societal (normative) forces (Kollmuss & Agyeman, 2002). To create a better urban environmental management plan, it is essential to know people’s level of perception and awareness of environmental components and quality (Bi et al. 2010; Aretano et al., 2013; Islam et al., 2014). Furthermore, people have the right to know and use the environmental information held by public authorities. It is also essential to make environment-related information available to people to achieve a sustainable environment (Babalola et al., 2010; EIR, 1992). With access to such environmental details, people can have complete knowledge about the importance of their activities within the environment, and they will be able to participate more efficiently in decision-making processes (Babalola et al., 2010; Choudri et al., 2016; UNESCO, 1992). Accordingly, it is essential to evaluate environmental knowledge, attitudes, and behaviors to understand the intricate relationship between people and their environment (Choudri et al., 2016; Meinhold & Malkus, 2005). In addition, the environmental knowledge, attitudes, and awareness of people are greatly impacted by their demographic characteristics throughout the world (Kibert, 2000), e.g., gender, age, education, occupation, income, social status, and place of residence (Bi et al., 2010; Digby, 2010; Xiao & Hong, 2010).
Numerous studies have demonstrated a gap between environmental perceptions, attitudes, awareness, and mannerisms, but no convincing explanation for this phenomenon has been found (Kollmuss & Agyeman, 2002). Sudarmadi et al. (2001) evaluated the environmental perceptions, knowledge, attitudes, and awareness of two Indonesian social groups. In the Sultanate of Oman, Choudri et al. (2016) investigated public knowledge, perceptions, and attitudes toward environmental concerns and management. Pereira et al. (2018) discovered a link between environmental perception and physical activity among Portuguese school children. Martínez-Borreguero et al. (2020) investigated teachers’ environmental awareness in relation to encouraging sustainable development. In Muscat, Oman, Al-Shidi et al. (2021) investigated public awareness, beliefs, and attitudes concerning air pollution and its health effects. Although a variety of studies have been conducted on the state of and relationships between public knowledge, perceptions, attitudes, awareness, and environmental issues, few studies have evaluated the associations between the environmental perceptions, attitudes, and awareness of urban residents and their demographic characteristics in the context of managing a sustainable urban environment in developing countries.

Therefore, in light of the discussion mentioned above, Dhaka City Corporation (DCC) was selected as a study area (Fig. 1); moreover, the levels of environmental perceptions and attitudes held by people were examined, and the status of the environmental awareness of the residents in the study area was shown. The outcomes of the study may support the delivery of information to authorities about public perceptions of causes of environmental pollution (PCEP), perceptions of effects of environmental pollution (PEEP), negative attitudes toward environmental actions (NAEA), positive attitudes toward environmental actions (PAEA), attitudes toward environmental initiatives and legislation (AEIL), awareness of activities and legislation of home and surrounding waste management (AHSWM). Participants from different zones and with various demographic characteristics in the study area were asked about various environmental issues, and their perceived responses are helpful for improving urban planning, setting strategies for pollution reduction, and making decisions regarding a sustainable urban environment.

2 Materials and methods

2.1 Study area

Dhaka, the capital of Bangladesh, is one of South Asia’s primate cities (Alom & Khan, 2014). The city covers an area of 1528 km² and lies between 23°42’ and 23°54’ north latitudes and 90°20’ and 90°28’ east longitudes (Banglapedia 2014a; Swapan et al. 2017). The city’s land is flat with slight undulations and surrounded by four major rivers (the Turag, Buriganga, Tongi, and Balu rivers) flowing to the west, south, north, and east (Ahmed et al., 2018). As a center of trade, commerce, and administration for the country, the city contributes greatly to the economy of Bangladesh. As Dhaka is an economic and political hub of the country, people from other districts come to this city for better educational facilities, health care services, and job opportunities, overcrowding the city. Dhaka is now home to nearly 37% of the total national urban population (DCNUP, 2018; Dhaka Structure Plan, 2016). As a result, the city suffers from severe environmental problems such as rapid population growth, unplanned urbanization and industrialization, improper waste management, climate change, and pollution due to the unsatisfactory and irresponsible environmental behavior of its residents.
the present study, Dhaka was selected as a study area for assessing residents’ environmental concerns regarding their place of residence and the surrounding environment, and residents’ perceptions, attitudes, and awareness levels about environmental pollution were assessed. In this regard, the whole Dhaka City Corporation (DCC) area was divided into two city corporations, the Dhaka North City Corporation (DNCC) and the Dhaka South City Corporation (DSCC), for administrative purposes (Banglapedia, 2014b).

2.2 Parameter selection, questionnaire preparation, sampling, and surveying

In the present study, five major demographic parameters were selected, and their influence on public environmental perceptions, attitudes, and awareness was examined. These demographic characteristics were gender, age group, education level, occupation type, and monthly income, which were selected based on a similar literature survey (Chin et al., 2019; Ma & Bateson, 1999; Musser & Diamond, 1999; Özden, 2008; Uyeki & Holland, 2000; Worsley & Skrzypiec, 1998; Zimmermann, 1996).

The study was conducted mainly based on primary data, although secondary data were also used. A questionnaire survey, key informant interviews (KIIs), and direct observations
Assessment of the environmental perceptions, attitudes, and awareness were conducted as primary data collection. A semistructured questionnaire was constructed based on a review of relevant studies (Gambo, 2004; ARD Inc. 2004; Islam, 2008; Vissers, 2010; Willet, 2011; Hao, 2007; Khuda, 2001; Singh & Singh, 2009) and consultations with experts. Then, the questionnaire was evaluated, and a pilot survey was conducted before the questionnaire was finalized. The questionnaire of this study was divided into three sections, i.e., environmental perceptions, environmental attitudes, and environmental awareness; in terms of themes, 20 environmental statements were included in each section. The environmental perception section consisted of two themes (Theme 1: PCEP - Perceptions of Causes of Environmental Pollution; and Theme 2: PEEP - Perceptions of Effects of Environmental Pollution), the environmental attitude section contained three themes (Theme 3: NAEA - Negative Attitudes toward Environmental Actions; Theme 4: PAEA - Positive Attitudes toward Environmental Actions; and Theme 5: AEIL - Attitudes towards Environmental Initiatives and Legislation), and the environmental awareness section included two themes (Theme 6: AALPR - Awareness of Activities and Legislation for Pollution Reduction; and Theme 7: AHSWM - Awareness of Home and Surrounding Waste Management) (Table 1). A five-point Likert scale was designed for the environmental perceptions and attitudes sections (1 = strongly disagree; 2 = disagree; 3 = undecided/neutral; 4 = agree; 5 = strongly agree). Simple checklists of Yes/No questions were arranged for the environmental awareness section. The responses to each statement/question in the questionnaire were scored in these ways, and the respondents were asked to select the appropriate options.

In this study, a questionnaire survey was carried out in the Dhaka City Corporation (DCC) area, which is now divided into two parts: Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC), and each city corporation has five zones. Due to the limited budget and short time frame, 400 respondents were selected from 10 zones of both city corporations. Due to the unavailability of zone-specific population data on the DNCC and DSCC areas, according to the formula for sample size determination of unknown populations by Cochran (1963), 40 respondents were selected based on a simple random sampling technique from each zone of both city corporations with a 95% confidence level, ±9.3% precision level, and 10% population proportion. Moreover, 20 key informant interviews (KIIIs) were conducted with two key informants from each zone in the study area. The key informants were engaged in different positions of authority in society, and they were mainly local administrative officials, teachers, police, government and non-government officers, bankers, and medical officers.

A research team of ten skilled interviewers conducted the questionnaire survey and KIIIs from March 2nd to March 16th, 2018. One interviewer was assigned to each zone based on the interviewers’ places of residence in Dhaka. The interviewers and respondents met at places selected based on the convenience and comfort of the respondents. Most of the face-to-face interviews were conducted with the respondents in their homes, on the street, or in workplaces. Each interview took approximately 30 min. Secondary data were gathered from various published and unpublished documents.

2.3 Data processing and analysis

Hao (2007) and Mugabi et al. (2018) analyzed the public’s perceptions, attitudes, and awareness levels using percentages, mean scores, and standard deviations. Özden (2008) evaluated student-teachers’ environmental awareness and attitudes using a one-way analysis of variance (ANOVA). Pereira et al. (2018) also investigated the relationship
| No. | Statements/Questions Organized by Theme                                                                 | References                                      |
|-----|--------------------------------------------------------------------------------------------------------|------------------------------------------------|
| **Theme 1: PCEP (Perceptions of Causes of Environmental Pollution)** |                                                                                  |
| 1.  | Rapid population growth is one of the main reasons for environmental pollution in Dhaka             | Swapan et al. (2017), The World Bank (2018)   |
| 2.  | Unplanned and ill-planned urbanization also increases the pollution in this city                     | Swapan et al. (2017), The World Bank (2018)   |
| 3.  | A decrease in vegetation has increased the pollution in this city                                     | Islam (2008)                                   |
| 4.  | Improper waste disposal contaminates this city’s soil, water, and air                                | GfK (2011)                                     |
| 5.  | Industry and automobiles are significant sources of air and noise pollution                           | Islam (2008), GfK (2011), Willet (2011)       |
| 6.  | Fossil fuels generate a high level of air pollution and contribute to soil contamination and water pollution | Islam (2008)                                   |
| 7.  | A variety of chemicals and wastes contaminate water bodies                                          | GfK (2011), Islam (2008)                      |
| 8.  | The waste in landfills deteriorates the city’s beauty and creates land pollution                     | Islam (2008)                                   |
| 9.  | Construction projects create air and noise pollution                                                 | Islam (2008)                                   |
| 10. | The indiscriminate use of loudspeakers generates noise in this city                                 | Islam (2008)                                   |
| **Theme 2: PEEP (Perceptions of Effects of Environmental Pollution)** |                                                                                  |
| 11. | Environmental pollution is a severe problem of urban life                                            | Khuda (2001)                                   |
| 12. | Pollution deteriorates environmental elements and affects the whole environment                    | Suggested by the experts                       |
| 13. | Environmental pollution can create numerous environmental hazards                                   | Khuda (2001)                                   |
| 14. | Pollution destroys biota and habitats and leads to an imbalance among ecosystems                   | Islam (2008)                                   |
| No. | Statements/Questions Organized by Theme                                                                 | References                        |
|-----|-------------------------------------------------------------------------------------------------------|-----------------------------------|
| 15. | Environmental pollution is harmful to human health and other living species                          | Suggested by the experts          |
| 16. | Air pollution alters elements of weather and climate and seriously affects human health               | Khuda (2001)                      |
| 17. | Global temperature has increased due to air pollution                                                | Khuda (2001)                      |
| 18. | Noise pollution affects people’s personal and working lives                                          | Khuda (2001), Islam (2008)        |
| 19. | Noise pollution seriously affects health                                                              | Khuda (2001), Islam (2008)        |
| 20. | Water, food, and airborne diseases are increasing daily due to environmental pollution in this city   | Islam (2008)                      |

**Theme 3: NAEA (Negative Attitudes toward Environmental Actions)**

| No. | Statements/Questions Organized by Theme                                                                 | References                        |
|-----|-------------------------------------------------------------------------------------------------------|-----------------------------------|
| 21. | I am not sure what is helpful or harmful for the environment                                         | GfK (2011)                        |
| 22. | Environmental problems are not affecting me personally                                                | Gambo (2004), Vissers (2010)      |
| 23. | I do not have enough time to be concerned about how my activities influence the environment         | GfK (2011), Willet (2011)         |
| 24. | Environmental maintenance is the responsibility of the government alone, so it is not my business    | Gambo (2004)                      |
| 25. | I think that environmental pollution-related issues have been overstated                                | Gambo (2004)                      |

**Theme 4: PAEA (Positive Attitudes toward Environmental Actions)**

| No. | Statements/Questions Organized by Theme                                                                 | References                        |
|-----|-------------------------------------------------------------------------------------------------------|-----------------------------------|
| 26. | Environmental protection is very important for us and future generations                              | Hao (2007)                        |
| 27. | Everyone should be concerned about environmental pollution                                            |                                   |
| 28. | I feel better when my actions keep the environment safe                                                | GfK (2011)                        |
| 29. | I feel worried when I see that my surrounding environment has been contaminated                        | Gambo (2004)                      |
Table 1 (continued)

| No. | Statements/Questions Organized by Theme                                                                 | References         |
|-----|-------------------------------------------------------------------------------------------------------|--------------------|
| 30. | We should keep land, water, and air pollution-free to create a beautiful and clean environment       | Vissers (2010)     |
| 31. | I would be embarrassed if my acquaintances caught me not recycling my daily waste                    | GfK (2011)         |

**Theme 5: AEIL (Attitudes toward Environmental Initiatives and Legislation)**

| No. | Statements/Questions Organized by Theme                                                                 | References         |
|-----|-------------------------------------------------------------------------------------------------------|--------------------|
| 32. | Personal and economic interests should be excluded from the creation of a better environment         | Islam (2008)       |
| 33. | Everyone should know how to control and mitigate environmental pollution                             | Islam (2008)       |
| 34. | The use of science and technology should be environmentally viable                                   | Vissers (2010)     |
| 35. | Local environmental groups may have realistic ideas about how to lessen different types of environmental pollution | Hao (2007)         |
| 36. | Polluters should be punished or paid to reduce their pollution                                       |                    |
| 37. | We need to control population migration to maintain a balance between populations and ecosystems     | Gambo (2004)       |
| 38. | A pollution-free environment should prioritized before any development work                          | GfK (2011)         |
| 39. | Environmentally friendly laws should be made and implemented for the management of our environment  | Islam (2008)       |
| 40. | Pollution control laws and rules should not be so strict as to discourage industrial development      | Gambo (2004)       |

**Theme 6: AALPR (Awareness of Activities and Legislation for Pollution Reduction)**

| No. | Statements/Questions Organized by Theme                                                                 | References         |
|-----|-------------------------------------------------------------------------------------------------------|--------------------|
| 41. | Do you know what things/activities/steps can be implemented to stop environmental pollution in your area? | Vissers (2010)     |
Table 1 (continued)

| No. | Statements/Questions Organized by Theme                                                                 | References                                                                 |
|-----|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 42. | Do you currently participate in any local or national environmental groups?                           | Hao (2007), Islam (2008)                                                  |
| 43. | Are you aware of the existence of any laws/policies enacted to prevent and control environmental pollution in Bangladesh? | https://shodhanga.inflibnet.ac.in/                                        |
| 44. | Do you know that the usage of plastic bags is banned in our country?                                   | http://www.agasm.cag.gov.in/forms/Questionnaire.pdf                        |
| 45. | Do you know about the punishments or penalties for breaking environmental laws?                        | GfK (2011)                                                               |
| 46. | Do you know which agency/organization is responsible for collecting garbage in Dhaka?                | ARD Inc. (2004)                                                          |
| 47. | Have you ever complained to any legal authority about any individual/group polluting the environment? | https://shodhanga.inflibnet.ac.in/                                        |
| 48. | Have you taken any personal initiatives involving tree planting to create a green environment in your area? | Islam (2008)                                                             |
| 49. | Have you ever participated in a program on environmental education conducted by the government or other agencies in your area? | http://www.agasm.cag.gov.in/forms/Questionnaire.pdf, Islam (2008)          |
| 50. | Have you taken any initiatives to protect yourself from environmental pollution?                       | Islam (2008)                                                             |

*Theme 7: AHSWM (Awareness of Home and Surrounding Waste Management)*

| No. | Statements/Questions Organized by Theme                                                                 | References                                                                 |
|-----|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 51. | Can you identify the different types of waste in your surrounding area, including your home?         | Suggested by the experts                                                  |
| 52. | Do you know how domestic and other garbage should be disposed of?                                     | ARD Inc. (2004)                                                          |
| 53. | Do you keep different types of domestic waste in separate bins/bags at your home?                     | Suggested by the experts                                                  |
Table 1 (continued)

| No. | Statements/Questions Organized by Theme                                                                 | References                  |
|-----|--------------------------------------------------------------------------------------------------------|-----------------------------|
| 54. | Do you dump your domestic waste in a fixed place in your area?                                         | Islam (2008)                |
| 55. | Do you reuse or recycle some things for waste management?                                              | Suggested by the experts    |
| 56. | Do you know what the best way to dispose of plastic bags is?                                           | Suggested by the experts    |
| 57. | Are you aware of sources of medical waste, municipal solid waste, e-waste, and battery waste in your area? | http://www.agasm.cag.gov.in/forms/Questionnaire.pdf |
| 58. | Do you know of any places near your residence where hazardous pollutants were dumped, spilled, or leaked in the past? | Vissers (2010) |
| 59. | Do you know of any heavily water-polluting industries/ factories in your area?                         | http://www.agasm.cag.gov.in/forms/Questionnaire.pdf |
| 60. | Are you aware that making noise can disturb other people in your area?                                 | Suggested by the experts    |
between physical activity and environmental knowledge using a one-way analysis of variance (ANOVA) test. In this study, the acquired data were processed using various statistical techniques. The data were compiled, processed, and statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software Version 23 and MS Excel 2016 and incorporated into the text, tables, and graphs of this study. The descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistics (p value with significance level established via a Chi-square test) of the data were calculated to depict the demographic characteristics of the respondents. To measure the environmental perceptions and attitudes of the respondents, initially, the mean (\( \bar{X} \)), standard deviation (SD), and \( p \) value were calculated separately for the respondent answers to each statement, which were given on a five-point Likert scale in the questionnaire, through a one-way analysis of variance (ANOVA). Then, for each theme, we computed a grand mean or a mean of the means (\( \mu_T \)) using the means of all the statements based on the formula of Everitt (2006). The average standard deviation (\( \pm S \)) was calculated for each theme based on the standard deviations of all the statements. The equations of Fisher (1932) were used to combine the \( p \) values corresponding to each theme.

A mean score interpretation chart developed by Nunnally (1994) and Ibrahim et al. (2015) was adopted to evaluate the level of environmental perceptions and attitudes held by the inhabitants of the study area (Table 2). The mean score interpretations of the themes of PCEP (perceptions of causes of environmental pollution), PEEP (perceptions of effects of environmental pollution), PAEA (positive attitude toward environmental actions), and AEIL (attitude toward environmental initiatives and legislation) were the same (for which the mean scores ranged from 1.00 to 2.00 = low, 2.01 to 3.00 = moderately low, 3.01 to 4.00 = moderately high, and 4.01 to 5.00 = high). The NAEA (negative attitude toward environmental actions) theme, on the other hand, was found to have an entirely different meaning, as environmental attitudes can be expressed in either a positive way or a negative way (Aydin & Cepni, 2010); the mean scores of this theme ranged from 1.00 to 2.00 (high), 2.01 to 3.00 (moderately high), 3.01 to 4.00 (moderately low), and 4.01 to 5.00 (extremely low) (low). To assess the significant score differences among the various demographic factors concerning the themes of environmental perceptions and the attitudes of the respondents, combined \( p \) values were used, where

| Themes | Mean score (\( \mu_T \)) | Interpretation of mean score |
|--------|-------------------------|-------------------------------|
| PCEP, PEEP, PAEA, and AEIL | 1.00–2.00 | Low |
| | 2.01–3.00 | Moderately low |
| | 3.01–4.00 | Moderately high |
| | 4.01–5.00 | High |
| NAEA | 1.00–2.00 | High |
| | 2.01–3.00 | Moderately high |
| | 3.01–4.00 | Moderately low |
| | 4.01–5.00 | Low |

PCEP perceptions of causes of environmental pollution, PEEP perceptions of effects of environmental pollution, PAEA positive attitudes toward environmental actions, AEIL attitudes toward environmental initiatives and legislation, and NAEA negative attitudes toward environmental actions.
\( p > 0.05 \) indicated nonsignificance, \( p < 0.05 \) indicated significance, and \( p < 0.01 \) indicated strong significance (Everitt, 1992; Imon, 2016).

The simplified conceptual framework of the study is presented in Fig. 2.

3 Results

3.1 Demographic profile of the respondents in the study area

The demographic characteristics of the respondents and the variables employed in this study are displayed in Table 3. A total of 400 participants were interviewed, of whom

![Fig. 2 Conceptual framework of the study (devised by authors)](image-url)
approximately 66.3% were male and 33.8% were female. Regarding age, individuals less than 18 years were not eligible respondents. Approximately 44.8% of the total respondents belonged to the 31–40 age group, 27.8% belonged to the 21–30 age group, and 26% were older than 40. The fewest respondents belonged to the 18–20 age group (1.5%).

Approximately 46.3% of the respondents had a tertiary level of education, approximately 37.8% had a secondary education, approximately 12% had a primary education, and only 4% were illiterate. The participants in the study area had diverse occupations. Approximately 34% of the respondents were engaged in various formal services (accountants, bankers, doctors, engineers, teachers, lawyers, police officers, etc.) and informal services (day laborers, hotel and restaurant workers, rickshaw pullers, telecom center workers, transport workers, beauticians, shoe shiners, barbers, food vendors, etc.). Approximately 28% of the respondents were involved with different types of business and commerce. Among the female respondents, 18.5% were home makers. Only 13.3% of the participants were students, and 6.8% were unemployed. The monthly income of the respondents varied in Bangladeshi Taka (BDT) from less than 10,000 BDT to more than 30,000 BDT. Approximately 33.3% of the respondents received less than 10,000 BDT in income. Approximately 28% of the respondents’ income was between 21,000 and 30,000 BDT, and approximately 22% of the respondents’ income was above 30,000 BDT (Table 3). According to a chi-square analysis of the participants’ demographic characteristics (Table 3), all the categorical variables, namely gender, age group, education level, occupation type, and

Table 3  The demographic information of the respondents in the study area

| Characteristics | Frequency (n = 400) | Percentage | Mean ± SD | Chi-square ($\chi^2$) | p value |
|-----------------|---------------------|------------|----------|-----------------------|---------|
| Gender          | Male                | 265        | 66.3     | 1.34                  | 0.473   | 42.250 | 0.000** |
|                 | Female              | 135        | 33.8     |                       |         |        |        |
| Age Group       | 18–20               | 6          | 1.5      | 2.95                  | 0.772   | 152.140 | 0.000** |
|                 | 21–30               | 111        | 27.8     |                       |         |        |        |
|                 | 31–40               | 179        | 44.8     |                       |         |        |        |
|                 | > 40                | 104        | 26.0     |                       |         |        |        |
| Education Level | Illiterate          | 16         | 4.0      | 3.26                  | 0.822   | 195.860 | 0.000** |
|                 | Primary             | 48         | 12.0     |                       |         |        |        |
|                 | Secondary           | 151        | 37.8     |                       |         |        |        |
|                 | Tertiary            | 185        | 46.3     |                       |         |        |        |
| Occupation      | Unemployed          | 27         | 6.8      | 3.04                  | 1.126   | 93.925 | 0.000** |
|                 | Business            | 112        | 28.0     |                       |         |        |        |
|                 | Service             | 134        | 33.5     |                       |         |        |        |
|                 | Home maker          | 74         | 18.5     |                       |         |        |        |
|                 | Student             | 53         | 13.3     |                       |         |        |        |
| Monthly Income  | < 10,000            | 133        | 33.3     | 2.98                  | 1.952   | 98.575 | 0.000** |
| (in BDT)        | 11,000–15,000       | 26         | 6.5      |                       |         |        |        |
|                 | 16,000–20,000       | 45         | 11.3     |                       |         |        |        |
|                 | 21,000–30,000       | 110        | 27.5     |                       |         |        |        |
|                 | > 30,000            | 86         | 21.5     |                       |         |        |        |

SD standard deviation, BDT Bangladeshi Taka, NS nonsignificant (p > .05), and * = significant at p < .05
monthly income in BDT, showed strongly significant relationships \( p < 0.01 \), indicating that the sample was representative of the study area’s population.

### 3.2 Level of environmental perception and attitudes of the respondents in Dhaka

The statistical results of the one-way analysis of variance (ANOVA) performed in this study revealed that the environmental perceptions and attitudes of the respondents toward different aspects of environmental issues in the study area were influenced more or less by five demographic factors, i.e., gender, age group, educational level, occupation type, and monthly income level.

#### 3.2.1 Gender-based environmental perceptions and attitudes of the respondents

Figure 3 shows that both the male respondents and the female respondents had a high level of environmental perception in relation to the PCEP \( \mu_T = 4.04, \pm S = 0.79, p = 0.49 \) and PEEP \( \mu_T = 4.24, \pm S = 0.76, p = 0.23 \) themes and high attitudes regarding the PAEA \( \mu_T = 4.08, \pm S = 0.73, p = 0.76 \) theme. Similarly, both the male respondents and the female respondents had moderately high environmental attitudes toward the NAEA \( \mu_T = 2.47, \pm S = 0.88, p = 0.24 \) and AEIL \( \mu_T = 3.83, \pm S = 0.83, p = 0.27 \) themes. The statistical analysis showed that the respondents’ level of perception was relatively high and that they were highly knowledgeable about the city’s environmental pollution. The mean score data of the graph highlight that there were no significant score differences \( p < 0.05 \) between the male and female respondents considering all the themes (PCEP, PEEP, NAEA, PAEA, and AEIL) in terms of environmental perceptions and attitudes (Fig. 3).

#### 3.2.2 Environmental perceptions and attitudes of the respondents by age group

In terms of age groups, Fig. 4 shows that the respondents over 40 years of age had a higher level of environmental perception in relation to the themes PCEP \( \mu_T = 4.09, \pm S = 0.78, p = 0.00 \) and PEEP \( \mu_T = 4.33, \pm S = 0.72, p = 0.22 \). Similarly, the

![Fig. 3 Effects of the gender of the respondents on their environmental perceptions and attitudes. This figure represents the mean of the means (\( \mu_T \)), the average standard deviation (\( \pm S \)), the error bars (mean ± standard deviation values), and the combined p value data of each environmental perception and attitude theme, where NS = non-significant (\( p > .05 \)), * = significant at \( p < .05 \), and ** = strongly significant at \( p < .01 \)]
Assessment of the environmental perceptions, attitudes, and…

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respondents 31–40 years of age had a high strong environmental attitudes toward the theme PAEA ($\mu_T = 4.11, \pm S = 0.71, p = 0.41$). Furthermore, across the age groups, the respondents had moderately high environmental attitudes toward the themes NAEA ($\mu_T = 2.47, \pm S = 0.91, p = 0.10$) and AEIL ($\mu_T = 3.91, \pm S = 0.88, p = 0.007$). The mean score data of the graph also showed strongly significant score differences ($p < 0.01$) across the different age groups for the themes PCEP and AEIL. No significant score differences ($p > 0.05$) were noticed between respondents from different age groups concerning the themes of environmental perceptions (PEEP) and environmental attitudes (NAEA and PAEA) (Fig. 4). From this analysis, it could be said that the levels of environmental perception and attitudes regarding environmental issues exhibited by the residents of Dhaka are higher for all age groups, and these individuals are informed about the causes and effects of environmental pollution.

3.2.3 Environmental perceptions and attitudes of the respondents by education level

According to the mean score data depicted by the graph, the respondents with higher education levels had better environmental perceptions of various aspects of environmental issues (Fig. 5). More highly educated respondents had greater levels of environmental awareness for the themes PCEP ($\mu_T = 4.07, \pm S = 0.75, p = 0.00$) and PEEP ($\mu_T = 4.30, \pm S = 0.73, p = 0.00$) and higher environmental attitudes toward the theme PAEA ($\mu_T = 4.22, \pm S = 0.72, p = 0.01$). Moreover, the respondents with different educational levels (especially primary education) showed moderately high environmental attitudes toward the themes NAEA ($\mu_T = 2.63, \pm S = 0.77, p = 0.00$) and AEIL ($\mu_T = 3.86, \pm S = 0.78, p = 0.01$). Figure 5 also shows that there were significant score differences ($p < 0.05$) between people with different levels of education when all the themes related to environmental perceptions and attitudes (PCEP, PEEP, NAEA, PAEA, and AEIL) were considered. The respondents were well informed about the causes and effects of the city’s environmental pollution, and they had strong pro-environmental attitudes.
3.2.4 Environmental perceptions and attitudes of the respondents by occupation

According to the results of the one-way ANOVA shown in Fig. 6, respondents with various occupations (especially service workers) had high levels of environmental perception in relation to the themes PCEP ($\mu_T = 4.08, \pm S = 0.77, p = 0.01$) and PEEP ($\mu_T = 4.27, \pm S = 0.73, p = 0.00$) and high environmental attitudes toward the theme PAEA ($\mu_T = 4.23, \pm S = 0.71, p = 0.01$). Based on a mean score analysis, moderately high environmental attitudes were found among respondents across all occupations (especially the business group) in relation to the themes NAEA ($\mu_T = 2.52, \pm S = 0.74, p = 0.11$) and AEIL ($\mu_T = 0.98, \pm S = 0.72, p = 0.17$).
3.86, ± S = 0.81, \( p = 0.00 \)). Moreover, the data depicted in the mean score graph show that there were significant score differences (\( p < 0.05 \)) across people with different occupations in relation to the environmental perception and attitude themes PCEP, PEEP, PAEA, and AEIL, but not in relation to the theme NAEA (Fig. 6). Considering their various jobs, the study area residents had relatively strong perceptions and attitudes under all circumstances.

### 3.2.5 Environmental perceptions and attitudes of the respondents by income level

The mean score data depicted by the graph indicates that the respondents’ environmental perceptions and attitudes about environmental pollution were stronger when their monthly income was relatively high (Fig. 7). Respondents across different income groups (especially those who had a monthly income higher than 30,000 BDT) showed higher levels of environmental perception toward the themes PCEP (\( \mu_T = 4.14, \pm S = 0.76, \ p = 0.00 \)) and PEEP (\( \mu_T = 4.35, \pm S = 0.72, \ p = 0.03 \)) and high environmental attitudes toward the themes PAEA (\( \mu_T = 4.24, \pm S = 0.75, \ p = 0.002 \)) but the theme AEIL (\( \mu_T = 3.93, \pm S = 0.89, \ p = 0.01 \)) displayed a moderately high environmental attitude. It is evident from the analysis that moderately high environmental attitudes were displayed by the respondents across all income groups toward the theme NAEA (\( \mu_T = 2.60, \pm S = 0.74, \ p = 0.09 \)), especially those with a monthly income of 11,000–15,000 BDT. Figure 7 also illustrates that significant score differences (\( p < 0.05 \)) existed across people with different monthly incomes in relation to the themes PCEP, PEEP, PAEA, and AEIL concerning environmental perceptions and attitudes. In contrast, no significant score differences (\( p < 0.05 \)) were noticed across the income groups for the theme NAEA.

### 3.3 Level of environmental awareness of the respondents in Dhaka

From the data processed by frequency and percentage distribution, it was evident that the respondents in the study area with certain demographic characteristics displayed a lower level of environmental awareness in relation to both aforementioned themes (Table 1) as well as the theme AALPR, which included 10 questions (41–50 no.), and the theme AHSWM, which also comprised 10 questions (51–60 no.). The percentage distributions

**Fig. 7** Effects of the income levels of the respondents on their environmental perceptions and attitudes. The figure depicts the mean of the means (\( \mu_T \)), the average standard deviation (\( \pm S \)), the error bars (mean ± standard deviations values), and the combined \( p \) value data of each theme concerning environmental perceptions and attitudes, where NS = nonsignificant (\( p > .05 \)), * = significant at \( p < .05 \) and ** = strongly significant at \( p < .01 \)
of the two themes showed that people are not very aware of activities and legislation that may mitigate the environmental pollution, waste management-related issues and pollution occurring in their home areas and the surrounding environment. Comparatively, the residents of the study area are much more conscious and up-to-date about reducing environmental pollution. Nevertheless, they do not attempt to keep their homes and surrounding environment neat and clean through environmental actions.

3.3.1 Status of the respondents’ awareness of activities and legislation designed for pollution reduction

Figure 8 shows that both the male and the female respondents had low levels of environmental awareness for all cases. The percentage distribution of the theme AAPLR showed that the female respondents (34.67%) were more conscious of environmental laws and rules than the male respondents (29.78%). Regarding age groups, it could be stated that the respondents had little awareness of all the environmental awareness themes across all the age groups. The percentage distribution of the theme AAPLR showed that the respondents who were more than 40 years (33.96%) were more conscious of environmental laws and rules than those in the other age groups. In connection with the education level of the residents in Dhaka, the respondents who had a tertiary level of education (34.79%) were more conscious about environmental laws and rules than those with other levels of education in

| Gender | Yes (%) | No (%) |
|--------|---------|--------|
| Female | 34.67   | 65.33  |
| Male   | 29.78   | 70.22  |

| Age Group | Yes (%) | No (%) |
|-----------|---------|--------|
| <10000 BDT | 31.28   | 68.72  |
| 11000-15000 BDT | 26.92 | 73.08  |
| 16000-20000 BDT | 36.44   | 63.56  |
| >30000 BDT | 36.26   | 63.74  |

| Occupation | Yes (%) | No (%) |
|------------|---------|--------|
| Student    | 28.11   | 71.89  |
| Home maker | 32.96   | 67.04  |
| Service    | 34.05   | 65.95  |
| Business   | 28.47   | 71.53  |
| Unemployed | 32.96   | 67.04  |
| Tertiary   | 34.79   | 65.21  |
| Secondary  | 27.87   | 72.13  |
| Primary    | 29.39   | 70.61  |
| Illiterate | 31.87   | 68.13  |

| Monthly Income | Yes (%) | No (%) |
|----------------|---------|--------|
| <10000 BDT     | 31.28   | 68.72  |
| 11000-15000 BDT | 26.92 | 73.08  |
| 16000-20000 BDT | 36.44 | 63.56  |
| >30000 BDT     | 36.26   | 63.74  |

Fig. 8 Distribution of the AALPR status of the respondents (Note: AALPR = Awareness of Activities and Legislation for Pollution Reduction)
related to the environmental awareness theme AAPLR. Regarding occupation, the income group percentage distribution displayed that people engaged in the service sector (34.05%) were more conscious about environmental laws and rules than those with other professions in relation to the environmental awareness theme AAPLR. Regarding income level, it was found that people who earned a monthly income of 16,000–20,000 BDT (36.44%) were more conscious about environmental laws and rules than other income groups in relation to the awareness theme AAPLR.

### 3.3.2 Status of the respondents’ awareness of home and surrounding waste management

Figure 9 demonstrates the percentage distribution of the environmental awareness theme AHSWM with the demographic parameters of the respondents. Both the male and the female respondents had low levels of environmental awareness in all cases. The female respondents (18.75%) were slightly more aware of waste management-related issues than the male respondents (18.23%). The respondents aged 31–40 years (20.44%) were more aware of waste management-related issues than those belonging to other age groups in relation to the environmental awareness theme AHSWM. Regarding education level, people who had a tertiary level of education (20.16%) were more responsive to waste management-related issues in their homes and the surrounding environment than those with other
levels of schooling in relation to the environmental awareness theme AHSWM. A percentage distribution based on occupation type showed that service holders (20.51%) were more aware of waste management-related issues in their homes and the surrounding environment than individuals with other occupations in relation to the environmental awareness theme AHSWM. In terms of income groups, respondents who earned more than 30,000 BDT (23.61%) monthly expressed more concerns about issues associated with waste management in relation to the environmental awareness theme AHSWM. The overall analysis showed that people of all income groups show little awareness of all the examined themes of environmental awareness.

4 Discussion

The inclusive results of this study reveal that the residents of Dhaka are well informed about having an environmentally friendly attitude but are not practicing environmentally friendly activities. Many factors influence the environmental behavior of the residents of the study area. First, over 25 environmental rules and regulations exist in Bangladesh, but the inhabitants of Dhaka have a common tendency to ignore such environmental legislation (Nahar et al., 2021). Second, developing countries face environmental problems due to poverty (Anand, 2013). In Dhaka, approximately 45% of people are classified as urban poor (Corner & Dewan, 2014) and are engaged in different informal jobs. The city facilitates much informal employment for unskilled people (Swapan et al., 2017). The lack of governmental attention toward environmental management and the improper practices of legislative enforcement at the national and regional levels are other factors contributing to environmental issues (Saricam et al., 2011). Since 1972, Bangladesh has enacted over 200 laws, policies, and national strategies to combat environmental crimes and protect biodiversity and the environment (CIP, 2016; Faroque & South, 2020), including the Environment Policy, 1992; the Bangladesh Environment Protection Act, 1995; the Environmental Conservation Rules, 1997; the Ozone-Depleting Substances (Control) Rules, 2004; the Bangladesh Environment Court Act (ECA), 2010 (formed in 2000); and the National Environmental Policy, 2018 (DoE, 2021; Nahar et al., 2021; Sajal, 2015). The National Environment Management Action Plan (NEMAP) is a policy framework that was developed by the Ministry of Environment and Forest (MoEF) from 1995 to 2005 to ensure environmentally friendly sustainable development for the provision of proper environmental management by raising awareness among the people (NEMAP, 1995). However, these laws and policies are not always well defined or consistently enforced for many reasons, and people’s lack of awareness is one such reason (Faroque & South, 2020). In addition, the Ministry of Environment and Forest of Bangladesh has been unsuccessful in enforcing environmental laws on the people (CIP, 2016).

Consequently, the entire environment of this city is degrading day by day, becoming unhealthy and dirty, and the quality of city life is being spoiled. In terms of reducing the environmental problems of Dhaka, increasing people’s environmental consciousness is the responsibility of the city’s residents as members of the community (Hasan & Mulamoottil, 1994). The overall results of this research showed that the respondents exhibited a relatively high level of environmental perception alongside an environmentally friendly attitude but that they also had a lack of environmental awareness. The results regarding the demographic variables of the respondents indicated that these variables influenced the respondents’ environmental knowledge, attitudes, and behaviors.
Public perceptions and attitudes showed different spatial patterns in relation to socioeconomic and demographic factors such as gender (Pereira et al., 2018), age, education, income, employment status, and residence duration (Bi et al., 2010; Xiao & Hong, 2010), and it was difficult to draw general conclusions. Studies on people’s attitudes have shown that people living in the Izmir city of Turkey have a higher environmental attitudes depending on age (Saricam et al., 2011). Some studies have been conducted on the relation between public awareness and people’s sociodemographic characteristics in developing countries, such as China and Malaysia (Chin et al., 2019; Liu et al., 2016; Qian et al., 2016). A similar study in Egypt assessed people’s perceptions and attitudes toward COVID-19-related sociodemographic characteristics (Abdelhafiz et al., 2020). Another study in the capital of Kenya showed that socioeconomic factors are correlated with people’s perceptions of local air quality, which was found to be low in the slums of Nairobi (Egondi et al., 2013).

The study results showed that except for gender, all the examined demographic parameters affected environmental knowledge, attitudes, and behavior. The findings of this study showed that there were no significant score differences ($p < 0.05$) between the male and female respondents considering all the themes (PCEP, PEEP, NAEA, PAEA, and AEIL) of environmental perception and attitude. Some studies have suggested that women and men do not show significant differences in their attitudes toward local environmental issues. We noticed few or no differences between men and women in urban areas concerning their views on the links between air pollution and health (Howel et al., 2003); moreover, no gender effect was found in a study examining the perceptions of inhabitants on heavy metal soil contamination (Dogaru et al., 2009; Grasmück & Scholz et al., 2005). Similar results in relation to COVID-19 were observed for male and female participants, with no statistically significant difference (Abdelhafiz et al., 2020). The mean score data for the male and female respondents are almost equal considering their high level of environmental perception and attitude; this indicates their tendency toward environmental thinking on these issues. Females are more careful about environmental initiatives, legislation, and environmental actions. In terms of awareness level, both males and females were shown to have lower levels of environmental awareness in all cases in terms of the AAPLR and AHSWM themes. The female respondents (34.67%) were more conscious about environmental laws and rules than the male respondents (29.78%) considering the theme AAPLR, and the female respondents (18.75%) were slightly more aware than the male respondents (18.23%) about waste management-related issues in relation to the theme AHSWM. Much of the time, females in Dhaka are concerned about their homes and surrounding environments and like to keep these places clean. Similar studies on public knowledge of pollution in the cities of Oman and India have shown that females have significantly higher levels of environmental awareness than their male counterparts (Al-Shidi et al., 2021; Larijani, 2010). However, women have less extensive environmental knowledge than men but usually show more concern about environmental degradation and are more willing to change because they are more emotionally attached to their surroundings (Kollmuss & Agyeman, 2002). Several studies have reported that women tend to have higher risk perceptions and a higher awareness of environmental issues than men (Chin et al., 2019; Cisneros et al., 2017; Dogaru et al., 2009; Liu et al., 2016; Vangeli et al., 2014; Yapici et al., 2017). Concerning the gender effect, men and women have different perceptions of environmental factors (Pereira et al., 2018). Furthermore, certain findings have made the literature in this area contradictory in relation to environmental attitudes, showing that men tend to be more concerned and knowledgeable than women regarding environmental issues (Hayes, 2001; Xiao & Hong, 2010).
As people age, they gain more knowledge and experience. The study findings showed that people over 40 years have higher environmental perceptions of the themes PCEP and PEEP. In contrast, people in the range of 31–40 years have strong environmental attitudes toward the theme PAEA. People from different age groups have a moderately strong attitudes toward the themes of NAEA and AEIL. There are strongly significant score differences \((p < 0.01)\) between the other age groups for the themes PCEP and AEIL. This indicates that older people (> 40 years) have sound knowledge about the causes of different types of pollution in their surroundings. They also are knowledgeable about activities related to environmental initiatives and legislation. Regarding environmental awareness, respondents across all the age groups had little awareness of all the themes (AAPLR and AHSWM) of environmental awareness. Regarding the theme AAPLR, respondents who were more than 40 years (33.96%) were more conscious of environmental laws and rules than other age groups. In contrast, those who were in the range of 31–40 years (20.44%) were more aware of waste management-related issues corresponding to the theme AHSWM. Therefore, people who are older than 31 years of age are more knowledgeable and concerned about the environment in most cases. Similar studies have shown that older people (> 46 years) pay more attention to health and safety issues associated with air pollution than young people (Al-Shidi et al., 2021; Fischer et al., 1991). Regarding the effect of the age factor, previous studies have determined that young people and adults have a higher environmental attitudes and that there is no significant difference between these age groups (Saricam et al., 2011). In contrast, in other studies, significantly lower knowledge mean scores have been found for adults (> 50 years) than for young people, with statistically significant differences (Abdelhafiz et al., 2020). Young people show more environmental concern than concern for other issues (Bi et al., 2010). Moreover, a negative correlation between age and environmental risk perception has been found (Yapici et al., 2017).

Education level is a vital demographic factor. A more extensive education helps one gain more extensive knowledge and awareness about environmental issues (Bi et al., 2010; Kollmuss & Agyeman, 2002). Similar knowledge about COVID-19 was observed among people with higher education, who had significantly higher mean learning scores than those with lower levels of education (Abdelhafiz et al., 2020). The statistical data of the study also proved that people who have received a tertiary level of education seem to have a high level of environmental perception in relation to the themes PCEP and PEEP and a stronger environmental attitude toward the theme PAEA. People with different education levels have moderately strong attitudes toward the themes of NAEA and AEIL. There are significant score differences \((p < 0.05)\) between people with different education levels considering all the themes (PCEP, PEEP, NAEA, PAEA, and AEIL) of environmental perception and attitude. The residents of Dhaka are well informed about the causes and effects of environmental pollution in their city, and they exhibit highly environmentally friendly attitudes. Regarding all the themes of environmental awareness (AAPLR and AHSWM), across educational levels, the respondents had little awareness of environmental issues. It was shown that people with a tertiary level of education (34.79%) are more aware of environmental laws and rules than those with other levels of education in relation to the theme AAPLR. Considering the theme of AHSWM, the respondents with a tertiary level of education (20.16%) were more aware of waste management-related issues in their homes and the surrounding environment than those with other levels of education. Previous studies have also noted that highly educated people tend to show more environmental concern than others (Duan & Sheng, 2018). Similar research has revealed that people with less education have little knowledge of air pollution and its impacts on health than those with more education (Al-Shidi et al., 2021). In this study, a higher level of education was associated
with higher awareness levels and a greater consciousness of the health risks of air pollution exposure (Qian et al., 2016).

Employment status significantly contributes to people’s perceptions (Dogaru et al., 2009). Individuals engaged in service sectors gain more experience directly from their work than individuals with other occupations. As a result, service workers know their home and adjacent environments well and are careful about them. The statistical analysis of this study demonstrated that the respondents engaged in the service sector had a higher level of environmental perception in relation to all the themes (PCEP and PEEP) and a strong environmental attitude toward the theme PAEA. Regarding the themes NAEA and AEIL, a moderately high environmental attitudes were found across people engaged in different businesses. There were also significant score differences ($p < 0.05$) between people with various occupations in relation to the environmental perception (PCEP and PEEP) and environmental attitude (PAEA and AEIL) themes. Across different professions, the respondents had little awareness of environmental issues. People engaged in the service sector (34.05%) were more aware of environmental laws and rules than people of other professions in relation to the theme AAPLR. In the same way, service holders (20.51%) were more responsive about waste management-related issues in their homes and the surrounding environment than individuals who held other jobs in relation to the theme AHSWM. A similar study conducted in different cities in China showed that government employees are more concerned about the environment than individuals of other professions (Bi et al., 2010; Xiao et al., 2013).

Of course, money is also an essential factor, and it determines the livelihood and residence of a person. In designing new policies and strategies, economic factors influence and change people’s decisions and behavior (Kollmuss & Agyeman, 2002). The current study’s findings identified a clear role of total income and income inequality in influencing people’s perceptions, attitudes, and awareness. Effective environmental pollution management can be ensured through the improvement of people’s real income (Yang et al., 2020). A study by Abdelhafiz et al. (2020) showed that people with fewer monthly payments have significantly lower mean knowledge scores than people with higher monthly incomes. Scott and Willets (1994) revealed that people with higher income show more pro-environmental concern. Generally, individuals in higher-income groups are well informed about environmental information, and they have environmentally friendly attitudes. They are active in reducing the environmental pollution in their homes and surrounding areas. In this study, respondents who earned a monthly income amounting to more than 30,000 BDT had a higher level of environmental perception for all the themes (PCEP and PEEP) and strong environmental attitudes toward the themes PAEA and AEIL but not NAEA. Moderately strong environmental attitudes were found among people in different income groups in relation to the theme NAEA. Significant score differences ($p < 0.05$) were observed across people in various income groups in relation to the environmental perception (PCEP and PEEP) and environmental attitude (PAEA and AEIL) themes. Some findings seemed contradictory in that they demonstrated that people with low incomes show more environmental concern than those with high incomes (Uyeki & Holland, 2000). In contrast to those undergoing economic development, people with higher income were shown to be unexposed to serious environmental problems, and others have found the same (Brody et al., 2004). From an assessment of awareness levels, it was observed that people of all income groups had little awareness of all the themes of environmental awareness. People who had monthly incomes ranging from 16,000 to 20,000 BDT (36.44%) were more conscious about environmental laws and rules than those in other income groups in relation to the theme AAPLR. People who earned monthly incomes greater than 30,000 BDT (23.61%)
were more concerned about issues associated with waste management related to the theme AHSWM.

Comparing the findings regarding all the themes of environmental perceptions, attitudes, and awareness, we may conclude that the residents of Dhaka are concerned about environmental pollution issues and their impacts on society. The environmental perceptions and attitudes of the city residents are strong, and they have a low level of environmental awareness. The study still has some limitations due to the rigorous design of the survey. For example, the classification of the survey sample requires further refinement. The participants of the study are from a megacity; thus, caution should be exercised, as the sample is unlikely to be socioeconomically representative of the entire population. Furthermore, city-wide research is required to fully comprehend this study’s larger context. Future studies should overcome the current study’s limitations by using more accurate and scientific data collection methods from available resources.

5 Conclusion

This study investigated public perceptions, attitudes, and awareness toward the causes, effects, and controls of environmental pollution to facilitate a better urban environment by showing the example of Dhaka. Both the male and female respondents of this study reported moderate to high environmental perceptions and attitudes when demographic data were taken into account. There was no significant difference in people’s perceptions and attitudes about the environment based on gender. All environmental perception and attitude themes revealed were strongly related with age groups, education levels, and income groups. People over the age of 40, those with high levels of education, those with jobs, and those with high incomes were more concerned about the environment than others. More highly educated people (34.79%) were shown to be more concerned about environmental laws and regulations. Females in Dhaka (34.67%) were shown to be more aware of environmental norms than males through their actions, as they strive to make their homes and surrounding areas pollution-free.

The study emphasizes the importance of increasing public awareness through environmental education in relation to reducing pollution and its consequences and the need to compel individuals to observe environmental regulations to safeguard the environment from contamination. Furthermore, research appears to show that improving low-income individuals’ financial situations can increase their environmental awareness. Environmentally conscious behavior can help enhance the public environment. Thus, a city’s pro-environmental orientation may improve the quality of life within it and ensure urban environmental sustainability. To encourage people to be more environmentally conscious, behavioral modification strategies must be employed. This study’s findings can be used in decision-making and solution creation for a cleaner city. The technique can be applied to other towns and countries to establish a global factor analysis.

The limitations of this study, which investigated the environmental perceptions, attitudes, and awareness of residents concerning pollution, must be accepted. To facilitate a better understanding, several other associated variables (e.g., environmental rules, resource use, and environmental infrastructure) must be examined. More research into this topic is needed to find gaps in the current understanding of why individuals do not conserve their surroundings and how people can become more aware of their surroundings for sustainable environmental development.
Acknowledgements  The authors wish to gratefully acknowledge to Dr. Mallik Akram Hossain, Professor; Shahana Akhter, Associate Professor; and Neegar Sultana, Associate Professor of Department of Geography and environment, Jagannath University, Bangladesh for their valuable opinions for selecting demographic factors and questionnaire improvement in this study. The authors are also thankful to Md. Mozaffar Hossain, Assistant Professor, Department of Statistics, Jagannath University, Bangladesh for his cordial support to understanding the statistical techniques and analysis. Moreover, the authors also show gratitude to all of the surveyors who actively participated in the questionnaire survey and all of the respondents for their voluntary participation. Finally, we express thanks to anonymous reviewers who have reviewed the paper.

Funding  The financial assistance was provided by the University Grants Commission and Jagannath University (UGC-JnU Project, 2017-18) of Bangladesh (Grant No. 131/2011/1540) to inspire the researcher for the research presented in the paper but the funding authorities have no involvement in the research.

Declarations

Conflict of interest  The authors declare no conflict of interest and the research was not published and under considerations anywhere.

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