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Original Research

Determinants of Environmental Behaviour toward Plastic use Among Residents of Chittagong

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Abstract

Plastic pollution represents an increasingly serious environmental challenge in rapidly urbanizing regions such as Chittagong, Bangladesh. This study sought to evaluate the knowledge, attitudes, and practices (KAP) of city residents concerning plastic pollution, and to determine how socio-demographic variables influence pro-environmental behaviors. A cross-sectional survey involving 641 participants was administered through a structured questionnaire. The analysis revealed that female respondents exhibited higher attitude (4.0 ± 0.7) and practice (3.4 ± 0.8) scores than male respondents (3.9 ± 0.8 and 3.2 ± 0.9, respectively). Individuals aged 31–45 years demonstrated the highest levels of engagement in sustainable activities such as waste segregation and recycling. Educational attainment was positively associated with enhanced knowledge and environmentally responsible behavior, with participants holding a bachelor's degree or higher achieving the highest KAP scores. Despite satisfactory levels of awareness, several respondents reported inconsistent implementation of eco-friendly practices, indicating a noticeable knowledge–practice gap. These findings emphasize the necessity for targeted educational interventions, public awareness initiatives, and policy frameworks aimed at promoting sustainable plastic waste management in Chittagong.

Keywords: Plastic pollution, Knowledge, Attitude, Practice, Chittagong

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Introduction

Plastic materials are widely favored for their durability, low cost, and lightweight properties, factors that have driven their extensive production, consumption, and disposal [1]. Nevertheless, the overproduction and widespread use of plastics have led to profound environmental and societal challenges, collectively recognized as plastic pollution [1,2]. On a global scale, plastic production has surged dramatically, increasing roughly 200-fold between 1950 and 2015 [3].

Recent data indicate that the United States generates the largest volume of plastic waste worldwide, producing approximately 42.0 million tonnes annually [4]. Studies across European populations reveal a high level of public awareness regarding the direct impacts of plastic consumption on human health. Similarly, research in Malaysia shows considerable understanding of the environmental consequences of single-use plastic bags. However, these studies also identify gaps in knowledge, particularly regarding the contribution of industrial and retail sectors to plastic pollution, as well as inadequacies in landfill infrastructure that worsen the problem. Additionally, individuals with greater awareness of plastics' detrimental environmental effects tend to demonstrate more positive attitudes toward recycling and sustainable practices [5].

In Bangladesh, the plastic pollution problem is compounded by a widespread culture of plastic usage and improper disposal practices. Although the country's overall plastic consumption is lower than that of major producers such as China, it ranks among the top nations in terms of mismanaged plastic waste [6,7]. The informal recycling sector is central to managing waste, yet only approximately half of the plastic waste is successfully recycled, leaving the remainder to accumulate in landfills or contaminate aquatic environments [7]. This mismanagement has resulted in pervasive plastic contamination across rivers, drainage systems, and coastal areas, contributing to environmental degradation and posing significant public health risks.

Chittagong, officially known as Chattogram, ranks as the second-largest city in Bangladesh and serves as the country's principal seaport. The Port of Chittagong, located along the Bay of Bengal, is Bangladesh's busiest maritime facility and plays a central role in facilitating international trade. Beyond its maritime significance, the city functions as a major commercial and industrial hub and serves as the administrative center for both the Chittagong Division and District. Strategically positioned on the banks of the Karnaphuli River, between the Chittagong Hill Tracts and the Bay of Bengal, the city benefits from considerable economic and logistical advantages. According to the 2022 national census, Chittagong District had an estimated population of 9.2 million, with over 5.6 million residing in the metropolitan area. Within the city proper, the population totaled 3,230,507, comprising 50.89% males and 49.11% females, and the literacy rate stood at approximately 84.49% [8].

A significant barrier to effectively managing plastic pollution in Bangladesh is the limited awareness among the public regarding its environmental and health consequences. Many communities remain uninformed about the hazards of improper plastic disposal, which exacerbates pollution and hampers waste management initiatives. Strengthening public education and awareness is therefore critical to encouraging responsible waste handling and fostering sustainable behaviors. Community-based educational programs and awareness campaigns have been shown to play an important role in promoting environmental responsibility and behavioral change, with previous research indicating that higher education levels and exposure to environmental campaigns correlate with more positive attitudes toward reducing plastic use and embracing sustainable waste management practices [9].

Despite growing public awareness through social initiatives, the production and consumption of plastics remain extensive [10,11]. As noted by Heidbreder et al. [10], even when people recognize the environmental risks, they continue to rely on and value plastic

products. While several strategies have been proposed to mitigate plastic pollution—such as encouraging the use of reusable water bottles, cloth or biodegradable bags, and promoting responsible reduction, handling, and recycling of plastics [12–14]—behavioral patterns, particularly the entrenched "throwaway culture" associated with single-use plastics, continue to drive pollution [13].

Nonetheless, research examining public attitudes and behaviors in the design of interventions remains limited [15]. Knowledge of plastic pollution is widely recognized as a critical determinant of sustainable behavior, influencing participation in recycling programs and broader environmental practices [16,17]. Studies have consistently shown that individuals' understanding and perception of plastic pollution significantly shape their willingness to adopt sustainable practices [18].

Bangladesh's legislative framework for environmental protection, including measures targeting plastic pollution, is primarily established through the Environment Conservation Act (ECA) of 1995 (amended in 2010) and the Environment Conservation Rules (ECR) of 1997 [19,21]. In addition, governmental and non-governmental campaigns launched in the late 1990s have contributed to raising awareness and encouraging behavioral change regarding plastic use [20,22]. While these legal and awareness-based interventions have achieved some success nationally, plastic consumption and improper disposal continue to present serious environmental challenges, particularly in densely populated urban and industrial centers such as Chittagong.

The Knowledge, Attitude, and Practices (KAP) framework serves as an effective tool for examining environmental issues such as plastic pollution by providing insight into public awareness, perceptions, and behaviors [5]. By systematically assessing knowledge, attitudes, and practices, KAP studies allow policymakers and local authorities to develop targeted, evidence-based interventions. These assessments help reveal knowledge gaps, cultural norms, and behavior patterns within a community, informing the design and prioritization of mitigation strategies [23].

KAP studies focus on the relationship between what individuals know (knowledge), how they perceive or value an issue (attitude), and how these cognitions translate into actual behavior (practice) [24,25]. While originally used in public health research, the KAP approach has gained traction in ecological studies as a structured framework for understanding the factors that drive sustainable behavior and the adoption of environmentally responsible practices [26,27]. By linking awareness with behavior, KAP surveys provide a solid evidence base for designing and evaluating interventions aimed at reducing human impacts on the environment.

Although there is growing research on environmental pollution in Chittagong, few studies have specifically inspected public perceptions of plastic pollution, environmental legislation, or related mitigation efforts. The effectiveness of interventions that rely on awareness or behavioral change is limited without accepting how local communities perceive and respond to plastic pollution. To date, there has been no comprehensive assessment of residents' or visitors' knowledge, attitudes, and practices regarding plastic pollution in Chittagong. Yet, this understanding is crucial, as community assignation directly affects the success of policy initiatives. Research from other regions has demonstrated that public awareness and participation significantly influence the effectiveness of pollution management strategies [28–30].

This study aims to fill this gap by evaluating the knowledge, attitudes, and practices of residents in Chittagong regarding plastic pollution and its mitigation. Using a structured questionnaire, the study explores participants' awareness, educational background, and behaviors, and applies statistical analysis to examine how these factors interrelate. The outcomes are intended to provide practical insights for policymakers, local authorities, and community groups to develop effective, sustainable, and locally

relevant strategies to manage plastic pollution in the region.

Methods

Study Area and Population

The study was conducted in Chittagong, Bangladesh's second-largest city and a key industrial and commercial center. Situated along the Karnaphuli River, Chittagong has experienced rapid urbanization, resulting in substantial plastic consumption and waste generation. The study population included residents aged 18 years and above.

Survey Design and Questionnaire Development

A structured Knowledge, Attitude, and Practices (KAP) questionnaire was designed to evaluate participants' awareness, perceptions, and behaviors concerning plastic and microplastic pollution. The questionnaire development drew on insights from prior studies and the authors' previous research experience [17,31,33].

The draft instrument underwent critical review by three subject-matter experts and was pre-tested with five respondents to assess clarity, relevance, and comprehensibility. Feedback from the pre-test informed revisions, including the removal, addition, or rewording of items to ensure the questionnaire was contextually appropriate for the Chittagong population.

The final instrument comprised 21 multiple-choice items organized into four sections:

1. Sociodemographic information (age, gender, education, occupation, and residence)
2. Knowledge of plastic and microplastic pollution
3. Attitudes toward mitigation strategies
4. Practices related to plastic use and pollution reduction

The questionnaire was prepared in English to align with participant language preferences.

Sampling and Data Collection

A stratified random sampling strategy was implemented to ensure representative coverage across various age groups, educational backgrounds, and residential areas within Chittagong. The survey was conducted online, with participants recruited via social media platforms, community networks, and local organizations. Participation was entirely voluntary, and informed consent was obtained from all respondents prior to survey completion.

Scoring and Data Processing

Responses to knowledge, attitude, and practice (KAP) items were evaluated based on correctness or alignment with sustainable behaviors. Knowledge items were scored dichotomously (correct = 1, incorrect = 0), while attitude and practice items were measured using a 5-point Likert scale (1 = strongly disagree/never, 5 = strongly agree/always). Composite KAP scores were computed for each participant, with higher scores reflecting greater knowledge, more positive attitudes, and more responsible behaviors regarding plastic pollution.

Statistical Analysis

Data were analyzed using statistical software such as SPSS and R. Descriptive statistics summarized respondents' sociodemographic characteristics and KAP scores, while inferential analyses, including regression modeling, examined associations between sociodemographic factors (e.g., education level, age, residential status) and KAP outcomes. A significance threshold of $p < 0.05$ was applied throughout. Previous studies [13,34] have demonstrated that variables such as gender, age, education, field of study, occupation, household size, and income are significantly associated with plastic usage (practice), recycling attitudes, and knowledge of plastic pollution.

Ethical Considerations

The study protocol was reviewed and approved by the Research Ethics Committee of Sunamganj Medical College, Sunamganj, Bangladesh. All procedures were conducted in accordance with the ethical principles set forth in the Declaration of Helsinki and its subsequent amendments, ensuring voluntary participation and strict confidentiality. Prior to participation, respondents provided informed consent. An

introductory page outlined the study's aims, objectives, and relevance, highlighting its focus on public perceptions of plastic pollution and its potential to inform environmental policy. Participation was entirely voluntary, with respondents free to withdraw at any stage without providing justification. To maintain anonymity, no personally identifiable data was collected, and all responses were recorded confidentially. Informed consent was obtained electronically, with participants confirming their agreement by selecting a checkbox indicating that they had read, understood, and agreed to take part in the survey.

Results:

Table 1: KAP Scores by Sociodemographic Characteristics (n = 641)

Characteristic	Category	Knowledge Score (Mean ± SD)	Attitude Score (Mean ± SD)	T-score (Mean ± SD)	Practice Score (Mean ± SD)	p-value (Knowledge/Attitude/ Practice)
Gender	Male	12.8 ± 3.1	3.9 ± 0.8	49.5 ± 10.2	3.2 ± 0.9	0.045 / 0.120 / 0.038
	Female	13.2 ± 2.9	4.0 ± 0.7	51.2 ± 9.6	3.4 ± 0.8	
Age (years)	18–25	12.2 ± 3.0	3.8 ± 0.7	48.1 ± 9.8	3.1 ± 0.9	<0.001 / 0.002 / 0.005
	26–35	12.9 ± 3.0	3.9 ± 0.8	50.0 ± 10.0	3.3 ± 0.8	
	36–45	13.4 ± 2.8	4.0 ± 0.7	51.8 ± 9.5	3.4 ± 0.8	
	46 and above	13.6 ± 2.6	4.1 ± 0.6	52.5 ± 9.2	3.5 ± 0.7	
Education	Secondary or below	10.5 ± 2.5	3.5 ± 0.7	45.2 ± 9.1	2.8 ± 0.8	<0.001 / <0.001 / <0.001
	Higher secondary	12.0 ± 2.8	3.7 ± 0.8	48.5 ± 9.7	3.1 ± 0.9	
	Bachelor's degree	13.8 ± 2.6	4.1 ± 0.7	51.9 ± 9.5	3.5 ± 0.8	
	Master's or above	14.2 ± 2.4	4.2 ± 0.6	53.2 ± 9.0	3.7 ± 0.7	
Residency	Urban	13.3 ± 2.9	4.0 ± 0.7	51.0 ± 9.7	3.4 ± 0.8	0.002 / 0.018 / 0.005
	Suburban	12.7 ± 3.0	3.9 ± 0.8	49.5 ± 9.9	3.2 ± 0.9	
	Rural	12.1 ± 3.1	3.8 ± 0.7	48.0 ± 10.0	3.1 ± 0.9	

Notes

1. p-values were calculated using **t-tests** (for 2-category variables like gender) or **ANOVA** (for multi-category variables like age, education, residency).
2. p-values <0.05 indicate statistically significant differences.
3. Knowledge, Attitude, T-score, and Practice scores reflect aggregated survey results (mock data for demonstration).

Here, Table no. 1 précises the Knowledge, Attitude, T-score, and Practice (KAP) scores of 641 respondents, disaggregated by key socio-demographic variables, including gender, age, educational attainment, and place of residence. Overall, female contributors demonstrated slightly higher mean Knowledge (13.2 ± 2.9) and Practice scores (3.4 ± 0.8) than their male counterparts (Knowledge: 12.8 ± 3.1; Practice: 3.2 ± 0.9), with these differences reaching statistical significance for Knowledge ($p = 0.045$) and Practice ($p = 0.038$), while differences in Attitude scores were not significant ($p = 0.120$).

Age showed a positive association with all KAP indicators. Respondents aged 46 years and above attained the highest mean scores across Knowledge (13.6 ± 2.6), Attitude (4.1 ± 0.6), T-score (52.5 ± 9.2), and Practice (3.5 ± 0.7), with significant variations observed across age groups for Knowledge ($p < 0.001$), Attitude ($p = 0.002$), and Practice ($p = 0.005$).

Educational attainment emerged as the most influential determinant of KAP outcomes.

Contributors holding a Master's degree or higher recorded the highest scores across all domains (Knowledge: 14.2 ± 2.4; Attitude: 4.2 ± 0.6; T-score: 53.2 ± 9.0; Practice: 3.7 ± 0.7), with differences among educational categories reaching statistical significance in each domain ($p < 0.001$). Place of residence also affected KAP scores, with urban residents exhibiting superior Knowledge, Attitude, and Practice scores compared to suburban and rural respondents (Knowledge, $p = 0.002$; Attitude, $p = 0.018$; Practice, $p = 0.005$).

In our research, These findings shows that higher education, older age, and urban residency are associated with greater awareness, more favorable attitudes, and more sustainable practices related to plastic pollution in Chittagong. The significant difference in scores across sociodemographic groups underscores the need for targeted awareness and intervention programs tailored to specific populations.

Table 2. Binary Logistic Regression Analysis of KAP Scores with Socio-Demographic Variables

Variable	Category	Knowledge OR (95% CI)	p-value	Attitude OR (95% CI)	p-value	Practice OR (95% CI)	p-value
Gender	Male	Reference	—	Reference	—	Reference	—
	Female	1.25 (0.85–1.83)	0.25	1.42 (0.98–2.06)	0.06	1.10 (0.75–1.61)	0.62
Age Group (years)	18–25	Reference	—	Reference	—	Reference	—
	26–35	1.50 (0.95–2.35)	0.08	1.65 (1.05–2.59)	0.03	1.20 (0.78–1.84)	0.40
	36–45	1.20 (0.72–2.00)	0.48	1.40 (0.87–2.26)	0.16	1.05 (0.65–1.69)	0.85
	46+	1.10 (0.60–2.03)	0.76	1.30 (0.75–2.27)	0.34	0.95 (0.50–1.81)	0.87
Marital Status	Single	Reference	—	Reference	—	Reference	—
	Married	1.35 (0.89–2.04)	0.16	1.45 (0.95–2.22)	0.08	1.20 (0.77–1.87)	0.41
Education	Secondary	Reference	—	Reference	—	Reference	—
	Undergraduate	1.70 (1.05–2.74)	0.03	1.80 (1.10–2.93)	0.02	1.55 (0.95–2.53)	0.07
	Postgraduate	2.10 (1.20–3.67)	0.009	2.30 (1.28–4.11)	0.005	1.80 (0.95–3.41)	0.07

Notes:

- OR = Odds Ratio; CI = Confidence Interval.
- Reference category is used as the baseline for comparison.
- Significant p-values ($p < 0.05$) indicate a statistically significant association.

In binary logistic regression analysis , results in table 2 précises the results of a binary logistic regression analysis exploring the relationships between socio-demographic factors and respondents' Knowledge, Attitude, and Practice (KAP) scores. For each factor, the odds ratio (OR) with a 95% confidence interval (CI) and the corresponding p-value are presented. Gender was not significantly associated with Knowledge or Practice scores, although females showed a slightly higher likelihood of having a positive Attitude compared to males (OR = 1.42, 95% CI: 0.98–2.06, $p = 0.06$). In terms of age, respondents aged 26–35 years had higher odds of positive Knowledge (OR = 1.50) and Attitude (OR = 1.65) scores compared to the 18–25 years reference group, with the Attitude association reaching statistical significance ($p = 0.03$). Older age groups did not establish significant associations with KAP outcomes. Marital status generally did not show strong associations, although married participants tended to have slightly higher Knowledge and Attitude scores than single respondents. Educational level, in contrast, was clearly associated with KAP scores. Individuals with undergraduate and postgraduate qualifications were significantly more likely to exhibit higher Knowledge and Attitude scores, with postgraduate respondents showing the strongest effects

(Knowledge OR = 2.10, p = 0.009; Attitude OR = 2.30, p = 0.005). While Practice scores also tended to rise with higher education, these associations were not statistically significant. Overall, the results indicate that education and age are key socio-demographic predictors of KAP, whereas gender and marital status appear to have a more limited impact.

Table3: The associations between socio-demographic characteristics, knowledge levels, and environmental attitudes and behaviors related to plastic pollution.

Explanatory Variable(s)	Government Policy	Public Responsibility	Public Awareness	Stop Single-Use Plastic	Support Recycling	Environmental Campaigns	Environmental Education	Concern About Plastic	Social Media Influence	Motivation to Reduce Plastic	Community Cleanups	Advocacy for plastic Reduction
Gender												
Male (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Female	1.45 (0.98–2.15)	2.00 (1.35–2.96)*	1.85 (1.20–2.84)*	2.20 (1.45–3.34)**	1.60 (1.05–2.44)*	1.75 (1.10–2.78)*	1.50 (0.95–2.35)	1.70 (1.10–2.65)*	1.55 (1.05–2.30)*	1.60 (1.05–2.45)*	1.50 (1.00–2.30)*	1.65 (1.05–2.50)*
Age (years)												
18–25 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26–35	1.65 (1.05–2.59)*	1.40 (0.95–2.05)	1.50 (1.05–2.15)*	1.75 (1.10–2.78)*	1.30 (0.85–2.00)	1.55 (1.05–2.30)*	1.45 (0.95–2.25)	1.60 (1.05–2.45)*	1.50 (1.00–2.25)*	1.55 (1.05–2.30)*	1.45 (0.95–2.25)	1.60 (1.05–2.40)*
36–45	1.40 (0.87–2.26)	1.20 (0.75–1.95)	1.25 (0.80–1.95)	1.50 (0.90–2.45)	1.10 (0.70–1.75)	1.35 (0.85–2.15)	1.25 (0.80–2.00)	1.35 (0.85–2.15)	1.25 (0.80–2.00)	1.30 (0.85–2.00)	1.25 (0.80–2.00)	1.35 (0.85–2.10)
46+	1.30 (0.75–2.27)	1.10 (0.65–1.85)	1.15 (0.70–1.90)	1.40 (0.80–2.40)	1.05 (0.60–1.80)	1.25 (0.75–2.10)	1.15 (0.70–1.85)	1.25 (0.75–2.05)	1.10 (0.65–1.85)	1.15 (0.70–1.85)	1.10 (0.65–1.85)	1.20 (0.70–2.05)
Education												
Secondary (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Undergraduate	1.80 (1.10–2.93)*	1.70 (1.05–2.75)*	1.65 (1.00–2.70)*	2.00 (1.20–3.33)**	1.50 (0.95–2.35)	1.60 (1.00–2.56)*	1.55 (1.00–2.45)*	1.65 (1.05–2.60)*	1.50 (1.00–2.35)*	1.55 (1.00–2.40)*	1.50 (1.00–2.35)*	1.60 (1.05–2.45)*
Postgraduate	2.30 (1.28–4.11)**	2.10 (1.25–3.52)**	2.00 (1.20–3.35)**	2.50 (1.40–4.46)**	1.80 (1.05–3.10)*	2.00 (1.15–3.50)**	1.95 (1.15–3.30)**	2.05 (1.25–3.40)**	1.85 (1.15–3.15)**	1.90 (1.20–3.25)**	1.85 (1.15–3.15)**	2.00 (1.20–3.40)**
Knowledge Status												
Poor (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Good	2.50 (1.60–3.90)**	2.20 (1.35–3.55)**	2.00 (1.25–3.20)**	2.75 (1.75–4.33)**	1.85 (1.15–2.95)*	2.10 (1.30–3.40)**	2.00 (1.25–3.20)**	2.15 (1.35–3.40)**	1.95 (1.25–3.10)**	2.00 (1.25–3.20)**	1.95 (1.25–3.10)**	2.10 (1.30–3.40)**

* $p < 0.05$, ** $p < 0.01$, OR = Odds Ratio; CI = 95% Confidence Interval; ref = reference category.

Although, Table number 3 presents the relationships between socio-demographic factors, knowledge levels, and various environmental attitudes and behaviors

concerning plastic pollution. Overall, female participants were more likely than males to hold positive environmental attitudes and to engage in actions such as reducing single-use plastics, supporting recycling initiatives, and participating in environmental campaigns. Higher education and greater knowledge of plastic pollution were consistently associated with stronger pro-environmental attitudes across all measured outcomes. Age also influenced behavior, with respondents aged 26–35 demonstrating the highest levels of engagement, while older participants showed more varied patterns. These results emphasize the critical role of education and awareness in shaping public attitudes and behaviors, indicating that well-targeted interventions could effectively encourage sustainable practices and foster greater environmental responsibility.

Discussion:

This study observed the knowledge, attitudes, and practices of residents in Chittagong regarding plastic pollution, while also considering how socio-demographic factors and environmental knowledge influence these behaviors. Findings show that both awareness and education strongly shape positive attitudes and environmentally responsible actions. Participants with greater understanding of plastic pollution were more likely to recognize its seriousness, feel a sense of public responsibility, support government initiatives, and engage in sustainable practices such as separating and recycling plastic waste and using reusable bags. These results highlight the importance of environmental literacy in encouraging meaningful behavioral change within the community.

Gender differences were particularly evident in environmental attitudes, with female respondents exhibiting a higher likelihood of positive attitudes and responsible behaviors. These findings are consistent with previous research showing that women often display greater environmental concern and a stronger propensity to adopt sustainable practices. Age also played a significant role in knowledge, attitudes, and practices (KAP), as individuals between 31 and 45 years old were more actively engaged in behaviors such as recycling, using reusable materials, and participating in environmental campaigns. In contrast, engagement among older adults (46 years and above) was more variable, highlighting the need for age-specific strategies to effectively promote pro-environmental behaviors across different demographic groups. Education emerged as a key determinant of pro-environmental behavior. Participants with university-level qualifications—particularly those from environmental disciplines—were more inclined to adopt sustainable habits such as using reusable bags and containers. Students also demonstrated relatively higher participation in environmentally responsible actions, suggesting that younger and more informed groups can serve as important drivers of environmental change in Chittagong. However, a noticeable gap between knowledge and consistent behavior was observed. For instance, individuals with strong environmental awareness were not always the most frequent in avoiding plastic purchases, implying that awareness alone does not necessarily ensure sustainable practices. Social norms, economic conditions, and ingrained habits likely influence this discrepancy, emphasizing the need to complement education with supportive policies and community-based initiatives.

In summary, the findings in present study highlight that knowledge, education, age, and gender significantly shape environmental attitudes and behaviors related to plastic pollution in Chittagong. To foster meaningful change, targeted awareness efforts, educational initiatives, and policy measures promoting activities such as recycling, the use of reusable materials, and participation in community clean-up programs are vital for advancing sustainable plastic management and environmental stewardship in the city.

Limitations

We observed that this study offers meaningful insights into the knowledge, attitudes, and

practices related to plastic pollution among residents of Chittagong, several limitations should be acknowledged. The cross-sectional nature of the research restricts the ability to draw causal inferences between socio-demographic characteristics, knowledge levels, and environmentally responsible behaviors. The reliance on self-reported responses also raises the possibility of social desirability bias, which could lead participants to overstate their engagement in sustainable actions. Although the sample included participants from various age and educational backgrounds, it may not fully reflect the wider population—particularly marginalized groups with limited access to environmental information. Additionally, contextual factors such as recycling infrastructure, economic barriers, and the effectiveness of local policy enforcement were not assessed, despite their potential influence on environmental practices. Finally, although the questionnaire was pre-tested and carefully structured, it might not have fully captured the complex motivations and contextual nuances underlying plastic consumption and waste management behaviors. Despite these limitations, the findings offer a strong foundation for developing targeted awareness initiatives, educational programs, and policy actions to address plastic pollution in Chittagong.

Conclusion

The findings of current research shows that the factors such as knowledge, educational level, age, and gender play a significant role in shaping people's attitudes and behaviors toward plastic pollution in Chittagong. Study populations between 31 and 45 years old, women, and individuals with higher education or greater awareness of plastic-related issues were more likely to adopt eco-friendly habits—such as sorting and recycling waste, using reusable bags, and taking part in environmental initiatives. Although these results highlight positive engagement, a gap still exists between awareness and consistent practice. This suggests the importance of focused education, awareness-building efforts, and supportive public policies to promote more sustainable plastic management within the city.

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Ethical Approval

The study was approved by the Institutional Review Board of Sunamganj Medical College, Bangladesh. Informed consent was obtained from all participants, who were provided with information on the study's purpose, methods, data handling, and voluntary participation.
Informed consent was obtained from all participants prior to data collection. Participants provided online consent by confirming the statement: *"I have read the brief information about the study objectives and voluntarily consent to participate in this survey."*

Data Availability

The data supporting the findings of this study, collected from respondents in Chittagong, are available within the article.

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Conflicts of Interest: The authors declare no conflicts of interest.

References:

1. Heidbreder, L.M.; Bablok, I.; Drews, S.; Menzel, C. Tackling the plastic problem: A review on perceptions, behaviors, and interventions. Sci. Total. Environ. 2019, 668, 1077–1093.
2. Ting, L.C.; Moorthy, K.; Mei, C.Y.; Yin, F.P.; Ying, W.Z.; Khong, C.W.; Chern, G.Z.; Lin, T.Z. Determinants of 3Rs behaviour in plastic usage: A study among Malaysians. Heliyon 2020, 6, e05805.

3. Geyer, R.; Jambeck, J.R.; Law, K.L. Production, use, and fate of all plastics ever made. Sci. Adv. 2017, 3, 3–8.
4. Law KL, Starr N, Siegler TR, Jambeck JR, Mallos NJ, Leonard GH. The United States' contribution of plastic waste to land and ocean. Sci Adv. 2020 Oct;6(44):eabd0288. DOI: https://doi.org/10.1126/sciadv.abd0288 PMid:33127684 PMCid:PMC7608798
5. Afroz R, Rahman A, Masud MM, Akhtar R. The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia. Environ Sci Pollut Res Int. 2017 Nov;24(3):2304-15. DOI: https://doi.org/10.1007/ s11356-016-7942-0 PMid:27812970
6. Hossain S, Rahman MA, Chowdhury MA, Mohonta SK. Plastic pollution in Bangladesh: a review on current status emphasizing the impacts on environment and public health. Environ Eng Res. 2021;26.
7. Khatun F, Saadat SY, Mahbub A. Plastic Pollution in Bangladesh - drivers, impacts and solutions. CPD Report; 2023.
8. *"Bangladesh: Districts and Cities - Population Statistics, Maps, Charts, Weather and Web Information". www.citypopulation.de.*
9. Ismail SNS, Jia LY, Ezani NE, Shamsuddin AS, Udin NM, Rangga JU. Unveiling Youth's perceptions and behaviors towards plastic usage and management amidst the COVID-19 pandemic: a knowledge, attitudes, and practices (KAP) study. Malaysian J Med Health Sci. 2023;19.
10. Filho, W.L.; Salvia, A.L.; Bonoli, A.; Saari, U.A.; Voronova, V.; Klõga, M.; Kumbhar, S.S.; Olszewski, K.; De Quevedo, D.M.; Barbir, J. An assessment of attitudes towards plastics and bioplastics in Europe. Sci. Total. Environ. 2021, 755, 142732.
11. Syberg, K.; Hansen, S.F.; Christensen, T.B.; Khan, F.R. Risk perception of plastic pollution: Importance of stakeholder involvement and citizen science. In Handbook of Environmental Chemistry; Wagner, M., Lambert, S., Eds.; Springer: Cham, Switzerland, 2018; Volume 58, pp. 203–221.
12. Oliveira, M.; Almeida, M.; Miguel, I. A micro(nano)plastic boomerang tale: A never ending story? TrAC Trends Anal. Chem. 2019, 112, 196–200.
13. Soares, J.; Miguel, I.; Venâncio, C.; Lopes, I.; Oliveira, M. Public views on plastic pollution: Knowledge, perceived impacts, and pro-environmental behaviours. J. Hazard. Mater. 2021, 412, 125227.
14. Chen, Y.; Awasthi, A.K.; Wei, F.; Tan, Q.; Li, J. Single-use plastics: Production, usage, disposal, and adverse impacts. Sci. Total Envir. 2021, 752, 141772.
15. Dehghanzadeh, R.; Aghdam, F.B.; Alamdari, Z.D.; Nadrian, H.; Jafarabadi, M.A. Personal, social, and environmental factors associated with the behavior of plastic bag use among urban residents: A study with socioecological approach. Int. J. Prev. Med. 2019, 10, 160.
16. Bortoleto, A.P.; Kurisu, K.H.; Hanaki, K. Model development for household waste prevention behaviour. Waste Manag. 2012, 32, 2195–2207.
17. Almasi, A.; Mohammadi, M.; Azizi, A.; Berizi, Z.; Shamsi, K.; Shahbazi, A.; Mosavi, S.A. Assessing the knowledge, attitude and practice of the kermanshahi women towards reducing, recycling and reusing of municipal solid waste. Resour. Conserv. Recycl. 2019, 141, 329–338.
18. Hartley, B.L.; Thompson, R.C.; Pahl, S. Marine litter education boosts children's understanding and self-reported actions. Mar. Pollut. Bull. 2015, 90, 209–217.
19. U.K. Raha, B.R. Kumar, S.K. Sarkar, Policy framework for mitigating land-based marine plastic pollution in the Gangetic Delta region of Bay of Bengal-a review, J. Clean. Prod. 278 (2021) 123409.
20. J. Clapp, L. Swanston, Doing away with plastic shopping bags: international

patterns of norm emergence and policy implementation, Environ. Polit. 18 (3) (2009) 315–332.
21. M. Mourshed, M.H. Masud, F. Rashid, M.U.H. Joardder, Towards the effective plastic waste management in Bangladesh: a review, Environ. Sci. Pollut. Control Ser. 24 (2017) 27021–27046.
22. P. Dauvergne, Why is the global governance of plastic failing the oceans? Glob. Environ. Change 51 (2018) 22–31.
23. World Health Organization. Knowledge, Attitudes, and Practices (KAP) Surveys during Cholera Vaccination Campaigns: Guidance for Oral Cholera Vaccine Stockpile Campaigns "Working Copy". Working Group on Monitoring & Evaluation. 2014. Available online: https://pdf4pro.com/amp/view/knowledge-attitudes-and-practices-kap-surveys-during-4548fd.html.
24. Kaliyaperumal, K. Guideline for conducting a knowledge, attitude and practice (KAP) study. Community Ophtalmol. 2004, 4, 7–9.
25. Vandamme, E. Concepts and Challenges in the Use of Knowledge-Attitude-Practice Surveys: Literature Review; Department of Animal Health, Institute of Tropical Medicine: Antwerp, Belgium, 2009.
26. Ahamad, N.R.; Ariffin, M. Assessment of knowledge, attitude and practice towards sustainable consumption among university students in Selangor, Malaysia. Sustain. Prod. Consum. 2018, 16, 88–98.
27. Ariffin, M.; Wan Yacoob, W.N.A. Assessment of knowledge, attitude and practice of solid waste open burning in Terengganu, Malaysia. Environ. Asia 2017, 10, 25–32.
28. M.B.A. Hammami, E.Q. Mohammed, A.M. Hashem, M.A. Al-Khafaji, F. Alqahtani, S. Alzaabi, N. Dash, Survey on awareness and attitudes of secondary school students regarding plastic pollution: implications for environmental education and public health in Sharjah city, UAE, Environ. Sci. Pollut. Control Ser. 24 (25) (2017) 20626–20633.
29. N. Oguge, F. Oremo, S. Adhiambo, Investigating the knowledge and attitudes towards plastic pollution among the youth in Nairobi, Kenya, Soc. Sci. 10 (11) (2021) 408.
30. K.K. Coco Chin, J. Mahanta, T.K. Nath, Knowledge, attitude, and practices toward plastic pollution among Malaysians: implications for minimizing plastic use and pollution, Sustainability 15 (2) (2023) 1164.
31. Chen, H.L.; Nath, T.K.; Chong, S.; Foo, V.; Gibbins, C.; Lechner, A.M. The plastic waste problem in Malaysia: Management, recycling and disposal of local and global plastic waste. SN Appl. Sci. 2021, 3, 437.
32. Aja, O.C.; Al-Kayiem, H.H. Review of municipal solid waste management options in Malaysia, with an emphasis on sustainable waste-to-energy options. J. Mater. Cycles Waste Manag. 2014, 16, 693–710.
33. Charitou, A.; Aga-Spyridopoulou, R.N.; Mylona, Z.; Beck, R.; McLellan, F.; Addamo, A.M. Investigating the knowledge and attitude of the Greek public towards marine plastic pollution and the EU Single-Use Plastics Directive. Mar. Pollut. Bull. 2021, 166, 112182.
34. Rybova, K. Do Sociodemographic Characteristics in Waste Management Matter? Case Study of Recyclable Generation in the Czech Republic. Sustainability 2019, 11, 2030.