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Effects of Socio-economic and Behavioral Factors on Urban Household Food Waste Practices in Bangladesh: A Regression Analysis

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Abstract

Introduction: Food waste has severe economic and environmental repercussions globally. Developing nations like Bangladesh, where food insecurity is a significant issue, waste substantial food along the supply chain. The Food Waste Index 2024 indicates that a Bangladeshi on average discards around 82 kg of food each year, with the predominant portion originating from the household sector. Due to lack of awareness of the negative impacts, food waste has increased to 10 kg per head in three years. Assessing the factors contributing to household food waste is essential to designing effective interventions.

Objectives: This research aims to identify the factors that instigate food waste among the urban households of Bangladesh from a socio-economic and behavioral perspective.

Methods: Using a multi-stage sampling procedure, 500 data were collected from four city corporations of Bangladesh and analyzed using descriptive statistics and linear regression model.

Results: Results indicate that among demographic variables, household members of 30-50 age group, education level of the households, household size, and having a pet in the house are significant. The frequency of online food shopping, motivation by special or discount offers, making a shopping list and sticking to the written list, knowledge of food waste, storage facilities, and environmental concerns are the significant behavioral aspects that influence food waste in the study area.

Conclusions: This study provides more precise information to identify the causes and ways to make solutions initially. The findings can assist practitioners, scholars, and legislators in developing consumer awareness campaigns aligned with target 12.3 of the Sustainable Development Goals (a 50% reduction of the global per capita FW by 2030).

Keywords: Food Waste, Urban Households, Behavioral and Socio-economic Factors, SDGs, Linear Regression.

1. Introduction

In the present world, a significant amount of perfectly edible food is wasted every year, like 'we appear to be drowning in waste'(Spring et al., 2020). The 2024 Food Waste Index Report states that each year, 1.05 billion metric tonnes of food waste is generated, equivalent to 132 kilograms per person and approximately one-fifth of the food accessible to consumers. This amount contains both edible and inedible components. Out of the total food waste, the residential sector accounted for 60% of total food waste in 2022, with food services and retail accounting for 28% and 14%, respectively (UNEP, 2024a). If food waste were a country, it would be the world's third-largest emitter of greenhouse gases behind China and the United States.(FAO, 2013) As a result, food wastage is becoming a prominent regional, national, and global issue.

The wastage of food generates considerable economic and environmental impacts through energy, water, soil, and labor of transforming uneaten or excessive food from farm to fork. The economic costs of food wastage are substantial and amount to almost USD 1 trillion each year; environmental costs reach around USD 700 billion; and social costs reach around USD 900 billion (FAO, 2014). Again, most of the wastes in developing countries are thrown in landfills and the methane gas generated from the deterioration of food when it is discarded is 25 times more harmful than CO_2 (Spring et al., 2020). According to FAO, around 250 km3 of surface or groundwater (more than 38 times the amount of water utilized by US households) and 1.4 billion hectares of land (or 28% of all agricultural

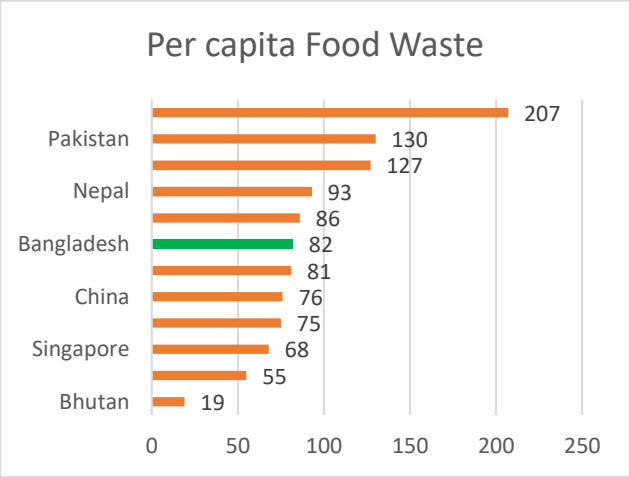
land) are used in the production of wasted food (FAO, 2013).

Regarding food security, globally around 800 million people are chronically undernourished and one-third of food produced is lost or wasted along the food chain (Raj & Babu, 2021). A total of 50 million people in 45 countries are teetering on the edge of famine due to Russia-Ukrainian conflict, climate shock, the COVID-19 pandemic, and rising living costs (World Food Programme, 2022). To meet the global food supply needs, food production is required to increase by 70% as the human population is predicted to reach 9.8 billion by 2050 (United Nations, 2020). Thus, the issue of wasting food is becoming more crucial not only for the food production and distribution stages but also for the required energy and other resources such as water, energy, transportation, and land.

For the growing economic, social, and environmental concerns, the United Nations is giving more importance to reducing food waste included in the Sustainable Development Goals (SDGs) in 2015. Where food waste is indirectly related to Goal 2 "Zero Hunger" and directly to Goal 12 "Responsible Consumption and Production," concerning Target 12.3, which requires, by 2030, to "halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses"(Amicarelli & Bux, 2021), this target is tough to achieve within the time frame of SDGs if the global investment in tackling food waste is not remarkably increased. This should be prioritized to create public awareness not just for governments but also for all including multinational organizations, private business firms, charitable foundations, and individuals. For this, understanding on our needs and eating habits is essential for reducing food waste (Diana et al., 2023).

In countries like Bangladesh, India, and Pakistan household food waste is not separated from municipal solid waste, where a mix of food and agricultural waste accounts for almost 57%-60% of MSW (Roy et al., 2022) hampering the resource recovery opportunity (Alam et al., 2015). However, the average food waste is 70 kg per capita in a year in the South Asian countries (UNEP, 2024a).

Figure 1: The per capita food waste in Asia Pacific countries by Food Waste Index 2024



Source: Food Waste Index Report, 2024

Figure 1 indicates the per capita food waste among the Asia-Pacific countries published by UNEP through the Food Waste Index Report 2024. Where Bhutanese families waste the least amount of food per person annually among Asia Pacific nations (19 kg), followed by India (55 kg), Sri Lanka (75 kg), China (76 kg) and Malaysia (81 kg). On the other hand, the Maldives has the highest level of food waste per capita in the area, wasting 207 kg annually; Pakistan, Afghanistan, Nepal, and Thailand follow with 130, 127, 93, and 86 kg, respectively. Besides, a Bangladeshi wastes 82 kg of food annually (UNEP, 2024a).

2. Food Waste in Bangladesh

Bangladesh is ranked as the 8th most populous country and 5th most densely populated country in the world. With the transition from a least-income to a lower-middle-income country, the lifestyle of Bangladeshis has improved. With this changed and improved lifestyle, a large quantity of waste is generated which is primarily linked to restaurants, agricultural operations, kitchen trash, and related residential activities and social parties. Besides, due to unplanned urbanization and population growth, municipal solid waste (MSW) generation and management programs become a social challenge, especially in the larger cities.

In a study on urban areas, Baul et al. (2021) found that the lion's share of MSW comprises food waste (74%). According to the UNEP food waste index 2021, an average Bangladeshi wastes 65 kg of food annually and yearly total wasted food is nearly 3.7

million metric tons (Ananno et al., 2021). In a very recent report of UNEP published in 2024, per capita food waste of Bangladeshis has risen to 82 kg annually, and 14.10 million tones are wasted by households (UNEP, 2024b). This indicates food waste is a problem that exists and presents a challenge for Bangladesh.

However, Bangladesh does not have a national statistical system for food waste and thus no official data on food waste exists. Though we have some studies on municipal waste management, especially on solid waste management, few research is done on food waste (Sujauddin et al., 2008; Shams et al., 2017). Some quantitative research has been done on out-of-home food waste, especially in restaurants showing that about 858 kg of biodegradable and 77 kg of non-biodegradable waste are produced per month in the reported restaurants in Chattogram (Baul et al., 2021). Most of the waste is dumped in landfills which are unmanaged and open. Therefore, it is creating serious environmental degradation. However, the quantification, impacts, and measurement of food waste in Bangladesh were described through secondary literature (Alam et al., 2015). In short, a clear demonstration of the waste type, the determinants and causes of household food waste behavior, and food waste estimation is not sufficient in Bangladesh.

Bangladesh faces the challenge of controlling food waste as a highly populated urban landscape. This calls for a detailed understanding of the elements that influence urban families' food waste. Here, "food waste" at home refers to an accumulation of incorrect food-handling techniques by people or families (Tomaszewska et al., 2022). According to REFRESH (an EU research project against food waste in households), household food waste (HFW) is the edible portion of food and drink from goods or meals that are purchased for human consumption but are not eaten and are thrown away (Van Geffen et al., 2017). People's intention to reduce food waste is greatly influenced by their level of food literacy, social standards, and past eating experiences (Farr-Wharton et al., 2014). For this reason, this study aims to identify the factors that instigate food waste among the urban households of Bangladesh.

3. Methodology

3.1 Study area

In this study, members of urban households are chosen as the target group to ensure accurate responses regarding food waste status of the households. Bangladesh is divided administratively into eight divisions, with twelve city corporations. In these twelve municipalities and urban areas a total of 3.78 million tons of wastes are generated annually. We have purposively chosen the four largest city corporations (Rajshahi City Corporation, Chattogram City Corporation, Khulna City Corporation, and Dhaka (north) City Corporation) of Bangladesh for our study. From each city corporation, two wards have been selected randomly.

This study only includes participants who are accountable for at least half of the grocery shopping and meal preparation in their homes. Since residential wastes are relatively homogeneous where variation occurs in waste composition depending on income levels and category of sources, we ensured that the sample contained enough variation in terms of age, gender, education level, and income. The sample size of this study was calculated by using Yamane's formula for a known population where the margin of error is 5% and the confidence level is 95% (Uakarn et al., 2021).

$$n = \frac{N}{1+N(e)^2} \quad \ldots (1)$$

The total number of households in four city corporations was 10,478,309 and the required sample size as per this rule is 400. However, as larger sample gives more robust results, we have taken 500 urban households from these four city corporations in Bangladesh.

3.2 Data Analysis

In this study, the relationship between household food waste-generating behavior and socioeconomic factors influencing waste quantity is analysed. As a result, both descriptive statistics and multiple regression models were used to determine the factors that affect waste generation in households. Parameters were estimated using the ordinary least square (OLS) approach. The model is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + u \quad \ldots (2)$$

Where Y is the dependent variable which denotes the food waste concern of the urban households which is a dummy variable with the value 1 if food waste is generated in the house and zero otherwise. The independent variables are Gender (X_1), Age of the household (X_2), Education level of the households (X_3), Household size (X_4), Income of the households(X_5), Online shopping frequency of the urban households (X_6), Physical shopping frequency of the urban households (X_7), Motivated by special offers which is a dummy variable with the value one if yes and zero otherwise (X_8), Making a list for shopping (X_9) which is a dummy variable with the value one if yes and zero otherwise, Stick to the previously written list(X_{10}) which is a dummy variable with the value one if yes and zero otherwise, Having a pet of the respondents (X_{11}) with value one if yes and zero otherwise, Knowledge about food waste (X_{12}) with the value one if yes zero otherwise, the Storage capacity of food of the urban households (X_{13}) and Environmental concerns of the households for wasting food (X_{14}). $\beta_0 \ldots \beta_{14}$ are the coefficients of the explanatory variables and u is the stochastic error term.

4. Results and Discussions

4.1 Descriptive analysis of the socio-demographic variables

Socio-demographic data makes it easier to comprehend respondents' backgrounds and analyze the unique characteristics of a certain research question. To facilitate a better understanding, the characteristics of the sampled households need to be elaborated. These have been explored in the following sections:

4.1.1 Age distribution of the households

Age is one of the key determinants of food waste and can significantly impact food waste reduction. Because it relates to the wisdom, power, and experience that come with age, as well as to the intrinsic worth of generational knowledge transfer. The age of households can directly affect food waste and the success of the reduction of household food waste.

Table 1: Age distribution of the urban households

Age range	Freq.	%	Min	Max	Mean	SD
<20	4	0.8	18	68	38.44	8.59
21-30	108	21.6				
31-40	205	41				
41-50	145	29				
51-60	32	6.4				
>60	6	1.2				

Table 1 presents data on the distribution of urban households in various age groups, along with the number of households in each group and their respective percentages of the total population. Here, the age structure is divided into six age groups, where the minimum age is 18 and the maximum is 68 years along with mean age of 38.44 years. A total of 500 households were surveyed. The age group 31-40 has the highest number of households, with 205 respondents accounting for 41% of the study population. The second largest age group is 41-50 with 145 households making up 29% of the total. The third highest age group 21-30 consists of 108 households, accounting for 21.6% of the total population. Besides the age group 51-60 accounts for 6.4% and the group 60+ accounts for 1.2% of the total population in the study area.

Figure 2: Age distribution of the households in different city corporations

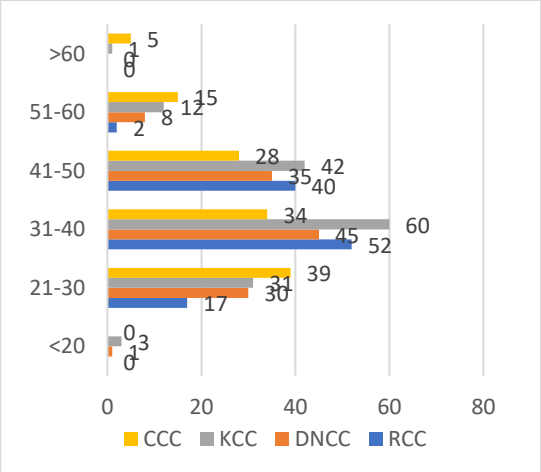


Figure 2 presents the age distribution among the city corporations. From this figure, we can see that the number of households person aged 31-40 is the largest age group in Khulna, Rajshahi and Dhaka North City corporations, and the age group 21-30 is

highest in Chattogram City corporation out of the the sampled population.

4.1.2 Educational Qualification of the Urban Households

Education plays a role in raising awareness about the importance of reducing food waste. Well-educated individuals are more likely to adopt food-saving practices.

Figure 3: Educational qualification of the respondents

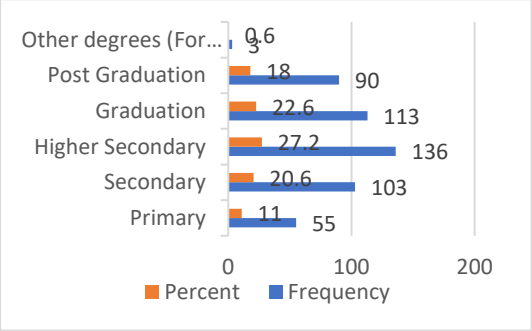


Figure 3 illustrates the education level of the urban households from four city corporation areas. Among the 500 households surveyed, it is observed that 11% have completed primary-level education (5 years of schooling), and 20.6% secondary education (10 years of schooling). The highest proportion, 27.2% of respondents have completed higher secondary education. Along with that 22.6% have completed their graduation and 18% are post-graduates.

4.1.3 Family Size

The number of people living in the family is a major socio-demographic determinant of giving accurate information about food waste behavior (Busari et al., 2022). It affects food waste both positively and negatively based on the age of the households. Larger households often waste more food as it can be challenging to estimate the right amount of food to prepare for everyone.

Table 2: Household size in the study area

No. of people	Freq.	%	Mean	SD	Max	Min
1-3	105	21.0	4.44	1.303	11	1
4-5	303	60.6				
6-7	80	16.0				
7+	12	2.4				
Total	500	100.0				

Along with that due to changes in taste of the household members and the number of children in the house, food waste may also rise. Table 2 lists the number of households in each size group along with the corresponding percentage. It demonstrates that the majority of households (60.6%) surveyed have four to five individuals including children. In addition, 16% of the respondents in the selected group have family members that are between the ages of 6-7. There are 21% and 2.4% of households in the smaller (1-3) and larger (7+) size groupings, respectively.

4.1.4 Number of children

Food waste is positively related to the number of children in the households. Families with children squander more food than families without children do. Children pressure parents to make impulsive purchases of products pushed by retailers, picky eating habits, and constantly shifting their preferences(Kansal et al., 2022). The number of children in the family is frequently correlated with the amount of food wasted.

Table 3: Number of children in the study area

Number of children	Frequency	%
0	55	11
1	103	20.6
2	230	46
3	86	17.2
4	17	3.4
5	6	1.2

In the study area, most of the families (46%) have two children. A household with one child is 20.6% of the surveyed population. Along with that 17.2% of households have three children. While some exceptionally larger families are also found mainly in CCC and DNCC. 3.4% of families have four and 1.2 % have five children. The frequency of the number of children in the respondent's family is shown in Table 3.

4.1.5 Households' Monthly Income

The income of the households serves as a crucial factor in the decision-making process of the family and therefore in the shopping practices. Higher-income levels among households enable access to better food and lifestyles. Since Bangladesh is emerging as a developing country, the percentage

of lower middle income is high but at the same time, the percentage of upper middle-income group is also rising, which is creating a significant impact on the wastage of food.

Table 4: Monthly income distribution of the households

Monthly Income	Freq	%	Mean	SD	Max.	Min.
>15000	45	9.0	34865.60	19420.142	150000	5500
15000–45000	368	73.6				
45000–75000	68	13.6				
75000-100000	12	2.4				
100000+	7	1.4				
Total	500	100				

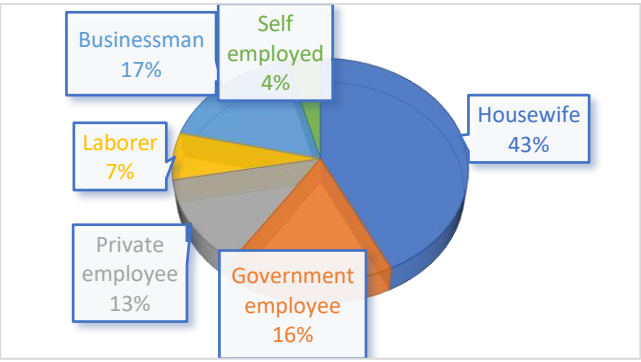
Based on the provided data in Table 4, the income distribution of the urban households in the study area reveals a varied economic landscape. The largest percent of households, approximately 73.6% fall in the middle-income group which is 15000-45000 BDT per month. Additionally, approximately 13.6% of the respondents belong to the income group 45000-50000 BDT per month indicating a substantial number of households are in the higher middle-income group. 2.4% of households have an income between 75000-100000 BDT whereas 1.4% of urban households have an income greater than 100000 BDT. It is observed from the collected data that the sampled households earned a monthly income of BTD 34865 on average.

4.1.6 Occupation of the respondents

Employment status is a modest predictor of food waste behavior (Grasso et al., 2019). While highlighting the influence of socio-demographics attributes of households on food waste generation in South Africa, it is found that higher amounts of food waste were produced by students, house executives (housewives), and other groups than by employed and self-employed people (Machate, 2021).

Figure 4 shows the employment status of the respondents. Based on the provided data, 53% of the respondents are employed in different public and private sectors, 4% are self-employed, and 39% are housewives. Here, a housewife is the dominant occupation. Among the employed households, the percentage of government employees, private employees, laborers, and businessmen are 16%, 13%, 7%, and 17% respectively.

Figure 4: The percentage of occupational status of the households



4.1.7 Training on food waste reduction

For raising awareness about the negative impact of food waste, training on waste reduction techniques can be proved effective. Figure 5 shows that only 2% of people received basic training or education while working on a government project on food security under the target of achieving SDGs. It should be noted that 98% of people had no prior knowledge of it. All they were taught about minimizing food waste was a value passed down through the generations. Nonetheless, 61% of households are interested in receiving training in ways of reducing food waste, so that they can make an economic contribution to both their family and society. In contrast, 39% of respondents claimed they have little time and have no interest in receiving training which has been shown in figure 6.

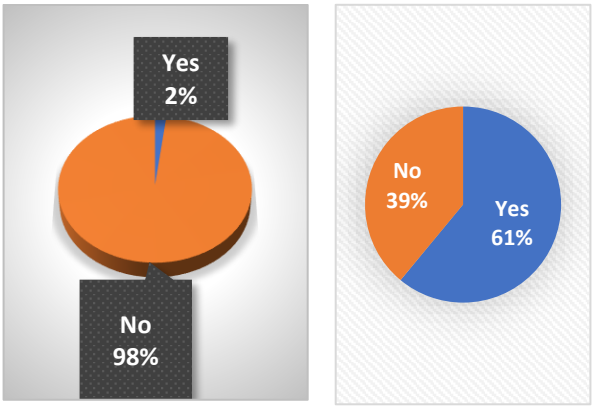


Figure 5: Households have training or education on FW

Figure 6: Interested in receiving training

4.2 Food shopping behavior of the urban households in the study area

The frequency distribution of food shopping behavior among the urban households is shown in Table 5 and it was found that the majority of them like to do grocery shopping physically where they buy for multiple days at once (31.2%).

Table 5: Frequency distribution of food shopping behavior

Parameters		N	%
How often do you do your grocery shopping online?	Never	308	61.6
	Rarely	98	19.6
	Sometimes	81	16.2
	Frequently	13	2.6
What describes how you do your grocery shopping best?	I buy for multiple days at once	156	31.2
	I buy as many products as possible at once and buy a few products other times	182	36.4
	I buy a few products each time	162	32.4
How often do you go grocery shopping (physically)?	1 x per month	35	7.0
	2 x per month	89	17.8
	1 x per week	133	26.6
	2/3 x per week	165	33.0
	4/5 x per week	71	14.2
	Daily	7	1.4
Are you motivated by special offers?	Yes	268	53.6
	No	232	46.4
Before going to the market, do you check what is already in the house?	Never	9	1.8
	Rarely	18	3.6
	Sometimes	62	12.4
	Frequently	300	60.0
	Always	111	22.2
Do you typically make a shopping list?	Yes	317	63.4
	No	183	36.6
If yes, do you stick to the shopping list?	Yes	197	60.1
	No	131	39.9
Do you have time to cook your food every day?	Yes	356	71.2
	No	144	28.8
Do you have a pet?	Yes	129	25.8
	No	371	74.2

With the advance of technology and reliability, the percentage rate of online grocery shopping in Bangladesh is also rising where 16.2% sometimes and 2.6% frequently do their grocery shopping online. Along with that 268 (53.6%) get motivated by discounted market. Before going to the market, 300(60%) frequently and 111 (22.2%) always checked what products they had in their stock whereas 63.4% bought products from previously written shopping lists. It is also noted that among the people who make a shopping list before shopping, 39.9% buy more than the written list.

Food waste also varies according to having time to prepare. Out of 500 houses, 144 (28.8%) stated that they were too busy to cook, and their family members or helping hands helped out. They eat outside since they don't have enough time. Thus, consuming food from outside for extended periods increases the likelihood of wasting food that has been prepared at home. Their prepared meal is either thrown out or kept in the refrigerator as they eat outside quite a bit. Once more, occasionally they discard food that has been refrigerated for an extended period since they do not want to eat it for changing taste. Though pet ownership can help to decrease food waste in this case, yet 74.2% of people did not own any pets in the urban areas.

4.3 Behavior related to recycling and minimization of food waste

Since there is limited scope for recycling food waste individually, the residents of urban areas mainly depend on the service provided by the city

corporations. People, who have a garden or pet in their house, try to use FW as compost or feed the animal. However, the majority of people living in urban areas place it in the garbage or on the roadsides due to a lack of recycling opportunities. if the authority provides facilities, the percentage of taking part in recycling may rise.

From Table 6, it is noted that more than half of the households throw their leftovers in the garbage of food waste are discouraged from taking part in food waste recycling.

immediately after every meal and only 28.2% of families take enough time to separate food waste into categories for recycling regularly. Though there are very limited facilities for recycling food waste in cities, people are still interested in taking part in it if the state provides the facility. Contrarily, 45.3% of families who produce only a small amount

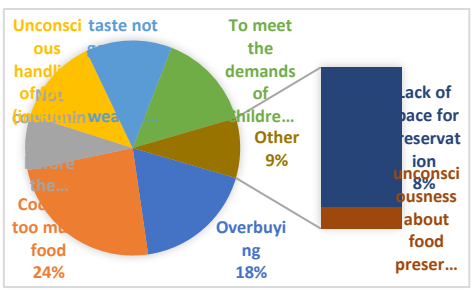
Table 6: Distribution of urban households' pattern of recycling food waste

Statements	Never	Rarely	Sometimes	Very often	Always
After every meal, we immediately place leftovers in the garbage.	63 (12.6%)	63 (12.6%)	100 (20.0%)	184 (36.8%)	90 (18.0%)
We take enough time to separate food waste into categories that can be recycled and reused from those that cannot	97 (19.4%)	123 (24.6%)	139 (27.8%)	107 (21.4%)	34 (6.8%)
If recycling food waste is convenient, we take part in it.	86 (17.2%)	82 (16.4%)	118 (23.6%)	154 (30.8%)	60 (12.0%)
If there are facilities in our town for recycling food waste, we'll take part.	33 (6.6%)	78 (15.6%)	112 (22.4%)	172 (34.4%)	105 (21.0%)
If there isn't a trash can or bag nearby that we can put the food waste in, we are discouraged from recycling it.	47 (9.4%)	81 (16.2%)	140 (28.0%)	152 (30.4%)	80 (16.0%)
Because we only produce a small amount of food waste, we are discouraged from taking part in food waste recycling.	52 (10.4%)	109 (21.8%)	111 (22.2%)	160 (32.0%)	68 (13.6%)

4.4 Reasons for Wasting Food by Urban Households

Food waste reduction is considered a global challenge for food security. In Bangladesh, it is also a matter of great concern. According to the Food Waste Index 2021 report published by UNDP, each Bangladeshi wastes 65 kg of food yearly. This study tries to find the most common reasons for household food waste in urban areas. The response gathered from the households is shown in Figure 7.

Figure 7: Reasons for household food waste in the study area



In this diagram, it is seen that the highest frequency among the reasons for food waste is cooking too much food (24%). A lot of food is wasted merely for cooking extra food during a home wedding, during any festival, or any other occasion when guests are present. According to Bangladeshi culinary tradition, large amounts of food are frequently prepared and served during social events and holidays. When food is offered at wedding ceremonies, a lot of it goes to waste since guests can't eat it all. Again, the second-ranked cause of food waste in the urban area of Bangladesh is overbuying (18%). As the number of higher middle-class people is rising, their consumption practices are also changing rapidly(Solaiman, 2019).

Another important finding was the food was wasted due to meeting the excess demands of the children (15%). Besides excess hot weather in the extended summer season in Bangladesh reduces the taste of regular food. For this type of hot

environment, demand for food has shifted and their regular food has become wasted which has been found in 13% in the study area. Additionally, unconscious handling of food by family members (13%), not understanding the expiry date (8%), lack of space for preservation (8%), and unconsciousness about food preservation (1%) were found as the major reasons for food waste in the study area.

5. Regression Results

The regression results estimated by the ordinary least squares (OLS) method are presented in Table 7, which helped to identify the significant factors that affect household food waste decisions in the urban areas of Bangladesh. The influence of various factors (both behavioral and demographic) on urban households' food waste reduction concerns in the urban areas of Bangladesh has been analyzed. Among these factors, knowing food waste appears to have the strongest impact. The beta value for knowledge of food waste is 0.3890 and it is significant at a 1% level of significance. This indicates that a one percent increase in the knowledge of food waste will lead to a 0.3890 percent increase in households' food waste reduction concerns.

Another factor is the storage facilities of the households. Here the coefficient value is -0.1022 which is significant at 1% level of significance which implies that a one percent increase in storage facilities of the households will decrease food waste reduction concern by 0.1022 percent. Along with these, the environmental concern of the urban people is also significant at a 1% level of significance. Here an improvement in environmental concern by one percent corresponds to a 0.1391 percent increase in food waste reduction concern.

Among the shopping behavior of the urban households, the frequency of online food shopping is more significant with a coefficient value -0.0691and in one percent level of significance. This implies that a one percent change in the frequency of online food purchasing will lead to a fall in food waste. This is because people buy or order food according to their particular tastes and preferences through various apps and websites.

Table 7: The results of the determinants of food waste in urban households from OLS

Variables	Coefficient (β)	Std. Error	t- value	p-value
Age				
30-40	.3487**	.2100	1.66	0.097
40-50	.3604**	.2110	1.71	0.088
50-60	.4493**	.2221	2.02	0.044
Education	.0349**	.0173	2.01	0.045
HS	-.0504***	.0154	-3.27	0.001
Frequency of online food shopping	-.0691***	.0252	-2.73	0.006
Special Offer	-.0792**	.0380	-2.08	0.038
Making List	.0976**	.0471	2.07	0.039
Stick to list	.1025**	.0468	2.19	0.029
Having Pet	.1112**	.0433	2.57	0.010
Knowledge of FW	.3890***	.0850	4.57	0.000
Storage facilities	-.1022***	.0389	-2.62	0.009
Environmental concern	.1391***	.0463	3.00	0.003
ln_Income	.0646	.0477	1.35	0.176

R^2=0.1361; Adjusted R^2=0.1037 Number of Observations: 500

(Note *** and ** represent significant at 1% and 5% respectively)

Again, special or discount offer made by the food companies is also a prominent factor with a coefficient value of -0.0792 with a 5% level of significance. It indicates that a one percent rise in taking special offers will decrease food waste reduction concerns. Where a previously written shopping list for food is positively related to food waste reduction behavior. Here, the coefficient is

0.0976 with a 5% level of significance which means that a one percent rise in making a list of food shopping will raise food waste reduction concerns. Additionally, households who stick to the list also create an impact on food waste reduction.

For reusing wasted food, having a pet in the house has a positive effect on food waste reduction. which is consistent with our study, the beta value of having a pet is 0.1112 and it is significant at 5%. Among the demographic variables, the size of the household is more significant. The beta value of household size is -0.0504 and it is significant at a 1% level of significance. It denotes that a one percent increase in household size will reduce the reduction of concerns about food waste in urban households. Another important determinant is the education level of the households which may make a positive impact on food waste reduction. In this study. The beta value of the education level of urban households is 0.0349 which is significant at 5% level of significance. Along with this, the age of the urban households has also a positive impact on food waste reduction especially the age group among 30-60 is significant at 5% level. Besides, gender is also positively significant. Lastly, though the income of the households has a positive influence on food waste reduction, it is found insignificant.

6. Food Waste Reduction and Sustainability in Bangladesh

Food waste is a significant global issue under the aegis of sustainability that is gaining public, legislative, and business attention. Since a huge amount of food is wasted in the retail and consumer sectors annually which costs up to a trillion US dollars globally and contributes 8%-10% of the world's greenhouse gas emissions, to build low-impact, resilient, and healthful food systems it is imperative to minimize food waste, as hundreds of millions of people worldwide now experiencing food insecurity. However, it demands collective efforts to increase food accessibility and the sustainability of the world's food supplies by tackling waste.

Although Bangladesh, as a developing country, has taken sustainable development goals, no proper measures have so far been taken to ensure goal 12.3 (halve food waste by 2030). As a result, in comparison to the prior estimate, the poor state of food waste has gotten worse. According to the Food Waste Index Report 2021, Bangladeshis squander 65 kilograms of food per person annually at home but by 2024, that amount had increased to 82 kg per person annually (both edible and inedible food) (UNEP, 2024b). Which is much higher than that in rich countries like the United States (73kg), Netherlands (59kg) and Japan (60kg); neighboring countries like India (55kg), Sri Lanka(76kg) and Bhutan(19kg). In contrast, countries like Australia, Norway, United States have set targets to reduce the amount of food waste annually to meet the target. Since 2016, throwing away food by the retailers in France has been illegal, and in Italy, they have a law to donate food to banks and charities (Mccafferty, 2022). Again, Asian countries like Malaysia and India have also initiated separate food waste laws and started campaigning against food waste. However, there is a lack of awareness of the negative impact of food waste among the people of Bangladesh in all sectors. As a result, no such measures have been taken yet. It is high time Bangladesh can also take some policy by observing the internal factors. But only the law is not sufficient for reducing food waste, we need to change our behavior for reducing food waste as well. Creating sustainable solutions to address food waste requires taking into account the interests, attitudes, and perceptions of the many stakeholders as well as the intertwining of the economic, social, political, and environmental domains (Archip et al., 2023). As a result, this research on the determinants of urban households' food waste concern will be helpful in policy making and public campaigning.

7. Conclusion

This study explores relevant factors affecting the reduction of household food waste in Bangladesh. This study identified the determinants of food waste in the four major city corporations of Bangladesh. Results concluded that demographic and household level factors such as household size, education, age group, etc. as well as behavioral factors like frequency of online food shopping, motivation by special or discounted offers, a previously written shopping list of foods, sticking on shopping list, knowledge on food waste, storage facilities and environmental concerns etc. influence the level of households' food waste status. Based

on the findings of the study, it is recommended that households with children and large family members need to strictly monitor the food consumption practice to minimize food wastage. The consumption habit of the working-age group of people (who frequently eat outside of the home) also needs to be monitored. Besides, food waste can be reduced by understanding the taste and food preferences of family members as well as adopting leftover management strategies to ensure that food is acceptable and consumed. Along with that, introducing lessons on the impacts of food waste and the importance of not wasting food from early schooling will make a change in the behavior of the children.

From behavioral aspects, planning shopping schedules and designating household food purchasers are most important to avoid repeated purchasing. Again, household food providers need to enhance their food preservation knowledge and skills. Bangladesh's climate instigates food waste in households if there is a lack of a preservation system. This study suggests that the application of new technology and knowledge on food preservation can help household food handlers to keep food fresh for longer. Besides, campaigning on the negative impacts of food waste on the environment nationally will also help people understand the importance of reducing food waste.

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