

## Research Article

# Willingness to Pay for Safe Chicken Meat in Bangladesh: A Contingent Valuation Approach

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The poultry meat industry is primarily dominated by broilers, and conventional broiler meat is claimed to be malicious to human health and environment since it is produced using hazardous feeds and other dietary supplements. This study aimed to evaluate consumers' willingness to pay (WTP) for safe broiler chicken meat following a contingent valuation model (CVM). Also, consumers' consumption and different types of perceptions on safe broiler meat were assessed from the data collected among 300 consumers in Bangladesh. Consumers' health and environmental perception of safe broiler meat are found to be high, indicating that they are more concerned about these attributes in the case of consuming broiler meat. The results reveal that conventional broiler meat loses its appeal to consumers after a certain income level and is mainly consumed by lower- and middle-income groups. This study divulges a unanimous demand for safe broiler meat among the consumers who intend to consume about 36% higher than their present consumption level if the availability was ensured in their local market. The average WTP premium for safe broiler meat is estimated to be about BDT 39.87 per kg. The consumers' WTP is positively influenced by their education, income level, the current consumption of broiler chicken meat, health perception, and taste and nutrition perception. This study recommends meat producers, entrepreneurs, and farmers adjust their production and marketing plans by incorporating suitable quality control procedures to meet the unfilled consumer demand for safer broiler meat. Besides, slow-growing safer broiler chicken needs to be introduced to improve meat's taste and nutritional aspects.

## 1. Introduction

Global poultry meat consumption has doubled over the last three decades, where per capita consumption reached about 15.55 kg in 2019 [1]. However, people in the least developed countries (LDCs) consumed only 4.36 kg per capita, about 28% of the global per capita consumption [1]. It is noteworthy that the consumption of poultry meat in developing countries expanded more than the developed countries due to the rising income [2]. FAO states that LDCs contributed only about 3% of the global poultry

meat production in 2018, and it is growing each year [1]. This boost in the poultry industry in LDCs has increased the demand for processed foods made from poultry meat. It is one of the most efficient sources of protein and is consumed across numerous cultures [3]. Besides, poultry meat has a relatively lower fat content and a positive unsaturated/saturated fatty acid ratio compared with red meats (e.g., beef and mutton) [4]. Because of these attributes, poultry meat is not considered carcinogenic to humans by the International Agency for Research on Cancer (IARC) [5].

However, the quality of poultry meat has become a growing concern in recent years, especially in developing countries, due to the presence of health hazards, chemical contamination, and toxic elements in poultry feed [6–10]. Poultry is often grown on steroids, antibiotic growth regulators, and vegetable oils for fattening and faster growth. The presence of different contaminants with a high concentration of heavy metals or trace elements such as arsenic, cadmium, mercury, ammonia, and lead in poultry meats was also reported in Pakistan [11], India [12], Brazil [6], and Bangladesh [13, 14].

These toxic elements can be biomagnified through bioaccumulation in the food chains and can lead to many life-threatening health hazards such as heart attack, blocked heart veins, cancer, piles, fatness, diabetes, eye problems, joint pain, kidney stones, and liver problems [15]. These are the long-term side effects of consuming meat that comes from unsafe poultry feed [16–18]. These contaminants have lasting disastrous impacts not only on human health but also on the environment. The trace elements in the poultry diet are often excreted through the feces and urine; hence, these wastes could potentially threaten the environment [19, 20]. Moreover, the United States Department of Agriculture (USDA) reported the presence of bacteria such as *Salmonella* and *Campylobacter* in poultry meat [21], which was also found in China [22] and European countries [23]. Therefore, safer poultry meat production has become a burning concern in developing countries.

Among different poultry meat, broiler (fuel chicken) alone contributes about 82% of global poultry meat production [24], and the meat consumption growth in developing countries is dominated by broiler due to its lower price [25, 26]. Besides, lower production costs and a short rearing period have made it very popular among entrepreneurs, especially in South Asian countries [27, 28]. The broiler can be produced in a safe way using *Azolla* (*Azolla pinnata*), spirulina, probiotics, phytobiotics, and other nonchemical feeds and inputs, which are safe for human health [29–33]. Safe broiler does not refer to fully organic broiler since a fully organic broiler is produced by all organic inputs, including organic hatching of eggs and chicks [34]. A safe broiler is produced on hazardous element-free feed, with herbal supplements, maintaining a bio-secured system, without any antibiotics and growth-promoting agents, or maintaining their due withdrawal period if used (Figure 1).

However, inputs such as feeds, medicines, and herbal growth promoters used in this production procedure are not available in most markets. The rearing period is also longer as a result of not using chemical growth hormones or medicines [29]. Consequently, the cost of producing a safe broiler chicken would be higher than the conventional one. Hence, consumers would have to pay more money for safe broilers compared with conventional broilers. This study evaluates the expected demand for safe broilers, how much extra money the consumers are willing to pay for it, and the factors that may influence the willingness. On the other hand, consumers would express their will according to their perception. It is a prerequisite for the study to inform them of the concept of the safe broiler and then evaluate their perception of it.

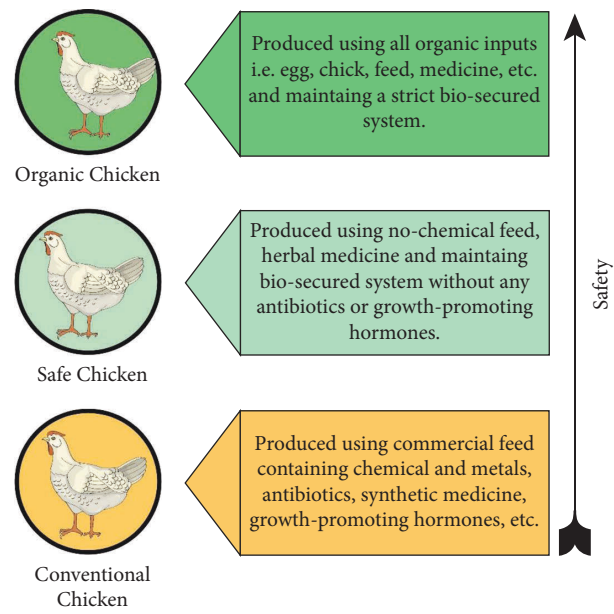


FIGURE 1: Concept of safe chicken meat (adopted from USDA [34]).

Nevertheless, it is crucial to look for insights into existing literature related to consumers' behavior regarding safe or organic foods, especially poultry products. Gifford and Bernard [35] investigated the effect of definitions for organic and natural on willingness to pay a premium for organic over natural chicken using logistic regression. The study informed that half of the respondents increased their premium after information. Mulder and Zomer [36] examined the consumers' willingness to pay (WTP) for the welfare of broiler chickens in the Netherlands using a discrete-choice experiment and a random parameter logit model. It showed that WTP was positively related to the number of consumers buying the same product and if they knew that animal welfare practices were subject to public or collective supervision. Van Loo et al. [37] used a choice experiment for analyzing consumers' WTP for a general organic label and a USDA-certified organic label on chicken breast. They elicited that the consumers were willing to pay a substantial premium price for both categories, and WTP differs between demographic groups and between different types of consumers based on the purchase frequency of organic meat products. Li and Kallas [38] used meta-analysis for assessing consumers' willingness to pay for sustainable food products and found that the overall WTP premium for sustainability (in percentage terms) is 29.5% on average. Ha et al. [39] studied the difference between rural and urban consumers' willingness to pay for organic vegetables in Vietnam using a contingent valuation model. The study illustrated that consumer perception about organic vegetables, trust in labels, and disposable family income increased WTP for organic vegetables in both regions. Consumer perceptions of a product or service can have a significant impact on purchase behavior. Bryant et al. [40] reported that consumer acceptability of products or services is highly influenced by their exposure of information regarding the particular products or services.

Despite these studies, there is a limitation in the literature on consumers' perception and purchasing behavior about organic or safe foods. However, safe chicken meat is a novel concept, especially in developing countries such as Bangladesh, where food security is still a major concern. This study, therefore, assessed the consumers' perception and willingness to pay for safe chicken meat, including their present and intended consumption status. Thus, this study has threefold objectives. First, it explores how consumers perceive safe broiler chicken meat in terms of its various attributes. Second, it examines the current consumption status of broiler meat and consumers' intention for future consumption of safer meat. Finally, the willingness to pay of the consumers is evaluated, and various factors affecting their WTP are discussed.

## 2. Materials and Methods

**2.1. Study Design and Data.** To estimate the consumers' consumption status, perceptions, and willingness to pay using the contingent valuation method (CVM), this study has selected the antibiotic-free live broiler chicken reared using nonchemical feeds in a bio-secured system as a hypothetical nonmarket good. The reason for selecting live chicken is that due to buyers' cultural choices, religious convictions, and a lack of marketing infrastructure, more than 90% of poultry sold live in Bangladesh [41, 42]. Besides, fast-growing broiler and Sonali are the two types of commercially produced chicken in Bangladesh. Broiler meat is Bangladesh's most popular poultry product due to its affordability and variety of purposes, which is also the highest consumed meat with 5.5 kg annual per capita consumption [43].

A consumer survey was administered in Mymensingh City, a major market for foods in the country, to collect data. The city was purposefully chosen for being one of the largest wet markets of poultry meat along with Dhaka City and Chittagong City [43]. The city has an area of around 90 km<sup>2</sup> with a population of 813 thousand [44]. The required sample size for the study was calculated to be 267, with a 6 percent margin of error, assuming a 50% response distribution and a 95 percent confidence interval. This study collected primary data from 300 consumers, which is higher than the required sample size. A structured questionnaire was designed to collect the information on consumers' socioeconomic characteristics, perception of safe broiler meat, consumer demand, buying behavior, and willingness to pay (WTP). Open-ended, close-ended, and Likert scale questions were included to fulfill the objectives of the study. The draft survey schedule was pretested by interviewing ten consumers, and then, the necessary modification was made according to key objectives. Then, the data were collected through the face-to-face interview method. Before the survey, each respondent was briefed about the concept of safe broiler meat. The data obtained from the consumers were first put into a master spreadsheet and then compiled, tabulated, and finally analyzed. Qualitative data were converted to quantitative wherever it was deemed necessary. Both descriptive and statistical methods were used for this study. At the time of the survey, USD 1 was approximately equal to BDT 84.

## 2.2. Empirical Methods

**2.2.1. Assessment of Consumers' Perception of Safe Broiler Meat.** As shown by some empirical studies [40, 45], information provisioning is a critical component of consumer acceptability. This shows that the more familiar a customer is with a product, the more likely they are to accept it. Contrarily, the greater the general aversion to a new food experience, the lesser the willingness of the consumers to try the novel food product, resulting in a lower acceptance of its benefits [46]. Therefore, this study assessed the perception of Bangladeshi consumers about safe broiler meat. Consumer perception for the factors of willingness to pay about broiler meat was health perception factor, perception about availability, perception about taste and nutrition, perception about expensiveness, and the perception about the environment, which indicates why the consumers were willing to "pay extra or not" and also indicate the level of satisfaction. The perception of consumers about the broiler meat was estimated as "ranked," which was measured by five points of the Likert scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1), while dichotomous questions were coded as "1" for the positive responses and "0" for the negative responses that indicate the consumer level of satisfaction on safe broiler. For the measurement of consumer perception, the study estimated the rank by gaining the total score and maximum score for the statements or questions. The measurement of the estimated equation is as follows:

$$\text{perception score} = \frac{\sum \text{total score gained}}{\text{maximum score}} \times 100. \quad (1)$$

**2.2.2. Willingness to Pay Eliciting Method.** Consumers' willingness to pay was measured by following the contingent valuation method (CVM), which was first developed by Davis [47]. This particular method is used for nonmarket valuation of goods and services based on a market survey where the respondents are asked for their preferences towards the presented hypothetical market [48]. The method combines neoclassical economic theory and socio-empirical methods to estimate the monetary value of goods, services, or public programs [49]. However, CVM represents a problem stemming from the hypothetical nature of questions asked to respondents. Hypothetical bias was respondents' tendency to overstate the amount they were willing to pay for new products of research interest. The hypothetical bias was thought to arise solely when people failed to evaluate the impact of an additional expenditure on their family's budget. The survey design utilizes the cheap chat script method to avoid potential bias. Furthermore, this research discovered that knowing the exact WTP required the use of a cheap talk script roll. Because of the hypothetical nature of the inquiry, the cheap talk script was created to solve overstatement issues primarily in the context of WTP. When new products are accessible on the market, it may persuade respondents to not overestimate the amount they wish to spend [50–52].

There are different types of elicitation techniques in CVM. These include payment cards, bidding games, open-ended questions, closed-ended single-bound dichotomous choice questions, and closed-ended double-bound dichotomous choice questions [53]. The double-bounded approach has been used extensively in valuing nonmarket goods and for consumers' willingness to pay [54–57]. The bidding technique was used in this study, which allowed the consumer to choose two bids, hence double-bounded questions. In the double-bounded dichotomous choice format, respondents are presented with a follow-up bid offer right after the first bid. By following this method, consumers were asked directly to express their willingness to pay at the given premium price, whether they are willing to “pay” or “not” for safe broiler chicken consumption. Positive responses (accept) lead to the upper bid level, while negative responses (reject) lead to the lower bid level at given different price premiums, which are determined based on the price of broiler meat in Bangladesh and experience in pretest. If the response is “yes” to the first bid, then it goes to the upper bid, and if it is “no” to the first bid, then it goes to the lower bid. Therefore, the following four possible responses, “yes-yes,” “yes-no,” “no-yes,” and “no-no,” were taken from the consumers on whether they “pay” extra money per kg of safe broiler or “not.” These possible four outcomes were distributed as a whole for the frequency distribution of safe broiler consumption in the respondents' households. Finally, respondents were asked the maximum money they were willing to pay for the safe broiler meat.

In this study, consumers' willingness to pay for premiums follows the linear regression assumptions. Therefore, an ordinary least-squares (OLS) regression model was used to estimate the factors affecting WTP for safe chicken meat, which was as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \varepsilon \quad (2)$$

Here,  $Y$  = willingness to pay premium (BDT/kg),  $X_1$  = age (years),  $X_2$  = gender (0 = female; 1 = male),  $X_3$  = education (years of schooling),  $X_4$  = marital status (0 = otherwise; 1 = married),  $X_5$  = family size,  $X_6$  = dependency ratio,  $X_7$  = religion (0 = Islam; 1 = Hinduism),  $X_8$  = market distance (km),  $X_9$  = household (HH) income (BDT/month),  $X_{10}$  = current broiler meat consumption (kg/month),  $X_{11}$  = health perception,  $X_{12}$  = availability perception,  $X_{13}$  = taste and nutrition perception,  $X_{14}$  = expensiveness perception,  $X_{15}$  = environment perception,  $\beta_0$  = intercept,  $\beta_1$  to  $\beta_{15}$  = coefficients, and  $\varepsilon$  = random error. Estimation of robust regression tackled the likely problem of heteroscedasticity. Variance inflation factor (VIF) for the independent variables did not find evidence of multicollinearity as the values of VIF for all the variables are less than 10.

### 3. Results and Discussion

**3.1. Sociodemographic Profile of the Respondents.** Table 1 represents the sociodemographic characteristics of the respondents in this study. It shows that the majority of them

(45.33%) are young aged, while the mean age of the sampled respondents is estimated at 34.42 years. The average year of schooling is calculated at 9.47 years, while more than one-third of the respondents have a graduation level of education. The households in this study consist of an average of 4.56 members, and the dependency ratio is estimated at 3.06, implying that every three members of the family depend on one member. The sample of this study is male-dominated, while 78.67% of them are married. In terms of religious views, the majority of the respondents are Muslims and only 10.33% are Hindus, which is in line with the national demographic distribution. However, most of the consumers in this study usually buy their chicken meat from the wet market (93.67%). The average distance to the nearest market from the respondents is calculated at 0.69 km. In terms of food purchasing behavior, most of the respondents are responsible for their household food purchasing.

#### 3.2. Consumers' Present Consumption Status of Broiler Meat.

People from almost every community of Bangladesh consume broiler chicken meat due to its lower price and higher availability. However, it varies from consumer to consumer because of personal attributes. The results of this study revealed that sampled households consume an average of 4.51 kg of broiler meat per month. By considering the respective family size of each sample, the annual per capita consumption of broiler meat is estimated at 12.86 kg. Table 2 presents the broiler meat consumption level of different income groups (BDT per month per household). It is found that households with income between BDT 30001 and 40000 have the highest consumption of broiler meat, while households with income above BDT 50000 have the lowest. Further, it can be noticed that the households' consumption level increases with their income but decreases for the upper levels. It is clearly eliciting the quadratic relationship between the two variables. The lower price of broiler meat (BDT 104–138) compared with other meats such as indigenous local chicken (BDT 311–400), beef (BDT 425–498), or mutton (BDT 656–690) could be the reason for such finding [59].

To show the relationship between the household broiler meat consumption and their income, a polynomial regression line is shown in Figure 2. The graph reveals an inverted  $U$ -shaped association between the two implying the quadratic relationship. According to the estimated regression line, people increase their consumption of broiler meat with their increasing income up to BDT 41565. At this income, the highest estimated consumption is found at 4.63 kg per month. Beyond this income, people start to decrease their broiler meat intake as the income grows. A broiler is sold at a considerably lower price than indigenous chicken and even most fish in Bangladesh due to the consumers' perception of inferior taste and quality [60]. For this reason, broiler meat is more preferred among the communities of lower- and middle-income groups. Consumers of higher-income groups prefer indigenous chicken (non-descript *Desi*, *Aseel*, Naked Neck, Hilly, and *Sonali*) meat, which costs much higher than broiler due to health

TABLE 1: Sociodemographic characteristics of the respondents.

Characteristics	Categories	% of respondents	Mean	SD
Age (years) <sup>a</sup>	Young (up to 35)	45.33	34.42	11.33
	Middle (36 to 50)	35.00		
	Old (above 50)	19.67		
Education (years of schooling)	Illiterate (0)	14.33	9.47	6.54
	Primary (1–5)	22.67		
	Secondary (6–10)	21.67		
	Higher secondary (11–12)	5.00		
	Graduation or above (>12)	36.33		
Household monthly income (BDT)			32491	35645
Family size (no.)			4.56	1.65
Dependency ratio			3.06	1.24
Gender	Female	14.00		0.35
	Male	86.00		
Marital status	Single	21.33		0.41
	Married	78.67		
Religion	Islam	89.67		0.30
	Hinduism	10.33		
Market place from where chicken meat bought	Wet market	93.67		0.55
	Super-shop	2.67		
	Farm gate	0.33		
	Others	3.33		
Distance to the market (km)			0.69	0.54
Family member responsible for food purchasing	Respondent	70.00		
	Jointly with spouse	9.00		
	Spouse	10.67		
	Someone else	10.33		

<sup>a</sup>Age is categorized according to the national youth policy of Bangladesh [58]; SD = standard deviation.

TABLE 2: Present broiler meat consumption across different income groups.

Income groups (BDT/month/ household)	Percentage of respondent (%)	Monthly household consumption (mean)	Annual per capita consumption (mean)
Below BDT 10000	14.67	4.23	10.85
BDT 10001–20000	30.00	4.33	12.46
BDT 20001–30000	18.33	5.02	13.15
BDT 30001–40000	16.67	5.14	13.83
BDT 40001–50000	8.00	4.25	9.94
Above BDT 50000	12.33	3.81	8.95
Overall present mean consumption		4.51	12.86

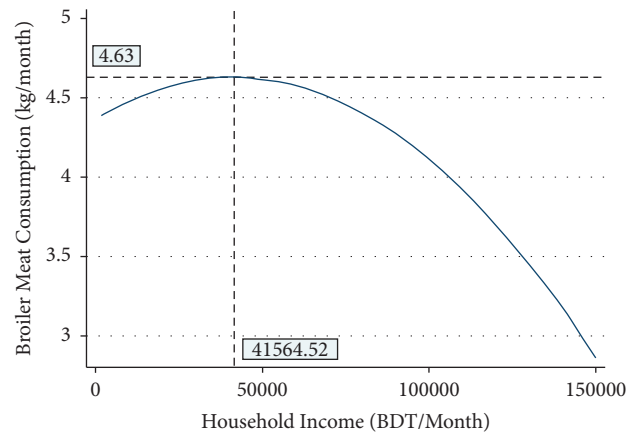


FIGURE 2: Inverted *U*-shaped relationship between broiler meat consumption and household income. Note: the intersection of the dotted line indicates the turning point of the polynomial graph. The estimated polynomial regression equation is as follows:  $Y = 4.36711 + 0.0000125X - 1.5e^{-10}X^2$ .

concerns. These chickens are usually grown in home yards with homemade feeds and have a much longer rearing period, making the production cost very high [61]. Due to the production process and homemade feed, indigenous chicken meat possesses less health risk than commercial broiler meat [62].

*3.3. Consumers' Perception of Safe Broiler Meat.* Consumers' choice of a commodity over another depends on their perception of the particular commodity. They will consume safe broiler meat over conventional one only when they think it is safe to consume. Hence, this study tried to assess consumers' different perceptions such as health perception, environment perception, taste and nutrition perception, expensiveness perception, and availability perception of safe chicken, which is presented in Table 3.

The average score of the consumers' health perception of safe broiler meat was 76.72%, which is the second highest among the five different perceptions (Figure 3). The majority of the respondents agreed that conventional broiler meat is unsafe for human health (49.7%), it contains heavy metal (45.7%), and safe chicken meat will be safer (41.7%). Although the majority (41%) were neutral, about 37.3% agreed that unsafe chemicals and growth hormones are used in the production of broiler. These findings imply that consumers perceived conventional broiler meat as unsafe for human health and contain various heavy metals and unsafe chemicals and growth hormones used in the production process. They positively comprehended the less health risk and greater safety of the safe broiler meat. The results align with the study of Petrescu and Petrescu-Mag [63] and Ahmed and Juhdi [64]. Environmental perception of the consumers ranked highest with an average score of 84.67%. The majority of the respondents strongly agreed that existing broiler production is harmful to the environment (48.7%) and safe broiler production would be environmentally sustainable (90.7%). Most of them also agreed that heavy metals hamper the environment through the existing broiler production process (47.3%) and producing safe broiler meat would be environmentally safe (44.3%). The results are supported by Petrescu and Petrescu-Mag [63] and Zagata [65]. The average taste and nutrition perception score was 76.53%, which ranked third among the five perceptions. Most of the respondents agreed that safe broiler meat would be tasted better than the conventional broiler (41.3%) and strongly agreed that it would be more nutritious (56.3%). The study by Hossain et al. [66] also elicited that consumers are concerned about the taste of meat in addition to the nutritive values.

The respondents' average perception score on the expensiveness of broiler meat was 65.36%. Although the majority of the respondents agreed that safe broiler meat would be beyond their budget, they were mostly neutral on whether it would only be afforded by higher-income groups (41%). However, the larger part of them perceived that safe broiler meat would be too expensive (88.3%). Yin et al. [67] and Hjelm [68] also found consumers anticipate the higher price of safe foods. The average perception score of the respondents on availability was about 58.56%, which is

the least ranked perception. More than half of the respondents searched for safer or healthier broiler at the stores (50.3%), and most of them believe that the broiler available at the market is not safe (75%). However, almost cent percent of respondents reckoned that safe broiler meat should be available in all stores. Chang and Zepeda [69] also found lower availability of safe food perceived by consumers.

*3.4. Consumers' Willingness to Pay (WTP) for Safe Broiler Meat.* Before measuring the willingness to pay, the consumers' intentions were assessed. Figure 4 presents the positive responses of the consumers on their probable behavior regarding safe broilers. Initially, respondents were asked whether they were willing to consume safe broiler meat, and about cent percent (99.67%) intended to consume it if available. Next, they were asked about their willingness to pay a premium price for safe broiler meat, and almost everyone (98.67%) was ready to pay the premium price. It indicates that consumers are concerned about the risk of the conventional broiler, and they will consume safe broiler meat by paying a higher price if available. Finally, respondents were asked whether they would continue paying a premium price for safe broiler meat over the year, and most responded (88%) positively. Similar findings were reported by Lestari et al. [70], Adepoju and Salimonu [71], and Liu and Zhang [72].

Figure 5 illustrates the frequency of respondents willing to purchase safe broiler meat. It was found that respondents were willing to pay premiums starting from BDT 10 to BDT 140 per kg of safe broiler meat. The number of respondents was comparatively higher at the lower bid premiums, i.e., from BDT 10 to BDT 80, which can be corroborated by the study by Lestari et al. [70]. The highest number of respondents who expressed their interest in paying a premium for safe broilers meat is about 30.41% at the bid price of BDT 10. The cumulative number of respondents willing to pay extra also decreased with the increasing bid price. As per the law of demand, the quantity demanded decreases as the price of goods increases, conditional on all else being unchanged. However, consumers are willing to sacrifice extra money for safe broiler meat because of its positive attributes. The results reveal that a higher number of respondents have expressed their interest in safe broiler meat at the initial premiums. The frequency of willing consumers decreases as the premium increases, which the law of demand can explain. Similar consumer demand behavior was found by Onel et al. [73] for different organic commodities in Denmark.

The average willingness to pay of the respondents across different income groups is presented in Figure 6. It shows that respondents with an income above BDT 50000 exerted the highest WTP for safe broiler chicken meat. Their average WTP premium is estimated at BDT 53.92. The lowest WTP is found among the respondents with an income between BDT 10001 and 20000, and their mean WTP is BDT 33.67. It is noticeable in the graph that the mean WTP of the respondents has an increasing trend with their income level. However, the overall mean WTP premium for one kg of

TABLE 3: Consumers' perception of safe broiler meat.

Statements/questions	Responses, n (%)				
	Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)
<b>Health</b>					
Conventional broiler meat is unsafe for health	85 (28.3)	149 (49.7)	66 (22.0)	0	0
Chicken feed contains various heavy metals	54 (18.0)	137 (45.7)	105 (35.0)	3 (1.0)	1 (0.3)
Different unsafe chemicals and growth hormones are used in production of broiler	61 (20.3)	112 (37.3)	123 (41.0)	3 (1.0)	1 (0.3)
Safe broiler meat will be safer to consume and contain less health risk	56 (18.7)	125 (41.7)	112 (37.3)	5 (1.7)	2 (0.7)
<b>Environment</b>					
Existing broiler production process is harmful for environment	146 (48.7)	143 (47.7)	10 (3.3)	0	1 (0.3)
Heavy metals of broiler meat get mixed with environment and pollute it	49 (16.3)	142 (47.3)	108 (36.0)	1 (0.3)	0
Safe broiler meat is environmentally safe to produce	46 (15.3)	133 (44.3)	118 (39.3)	3 (1.0)	0
Safe broiler meat production is environmentally sustainable	272 (90.7)	19 (6.3)	7 (2.3)	0	2 (0.7)
<b>Taste and nutrition</b>					
Safe broiler meat will be tasted better than conventional broiler	63 (21.0)	124 (41.3)	84 (28.0)	12 (4.0)	17 (5.7)
Safe broiler meat will be more nutritious	169 (56.3)	26 (8.7)	84 (28.0)	9 (3.0)	12 (4.0)
<b>Expensiveness</b>					
Safe broiler meat will be beyond your budget	57 (19.0)	160 (53.3)	39 (13.0)	26 (8.7)	18 (6.0)
Only high-income group can afford safe broiler meat	6 (2.0)	46 (15.3)	123 (41.0)	67 (22.3)	58 (19.3)
Do you think safe broiler meat will be too expensive?	Yes (1)		No (0)		
	265 (88.3)		35 (11.7)		
<b>Availability</b>					
Do you search for safer or healthier broiler?	151 (50.3)		149 (49.7)		
Is chicken available in the market where you shop safe?	75 (25.0)		225 (75.0)		
Should safe broiler meat be available in all stores?	297 (99.0)		3 (1.0)		

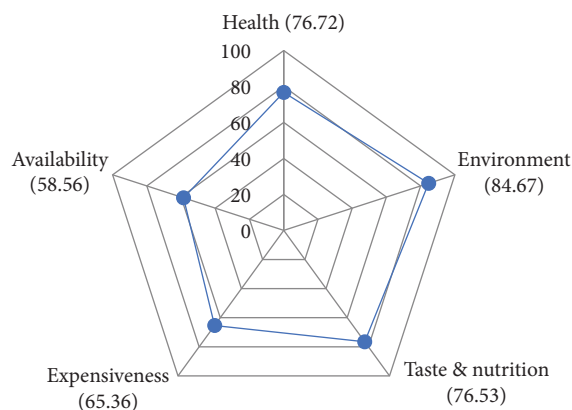


FIGURE 3: Scores by different perceptions of safe broiler meat.

broiler by the respondents in this study is calculated at BDT 39.87.

The respondents were asked to express their intended consumption of safe broiler meat at their exerted WTP that are presented in Table 4, according to their income level. It is found that all the income groups are interested in increasing their consumption level if they can buy safe broiler meat. It clearly indicates that consumers are willing to consume safer

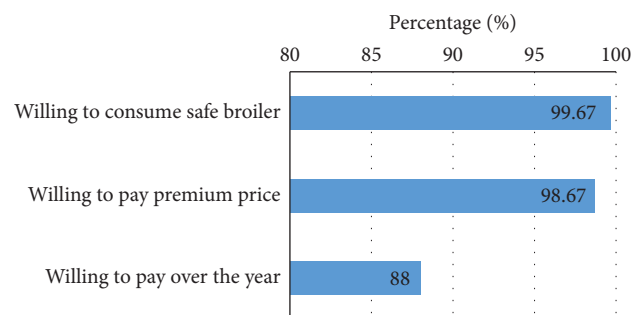


FIGURE 4: Consumers' intentions for safe broiler meat.

broiler meat even at a higher price. However, the respondents with an income between BDT 20001 and 30000 have the highest amount of anticipated consumption, which is 6.73 kg of safe broiler meat. Contrarily, the lowest anticipated consumption level is exerted by the respondents with an income above BDT 50000. The highest increase in consumption is found among the respondents with an income between BDT 40001 and 50000, where they are willing to consume a 52% higher amount of broiler meat compared with their present level. The respondents of the BDT 30001–40000 income group express the lowest incremental consumption of broiler meat, which is 29.57%. Overall, the

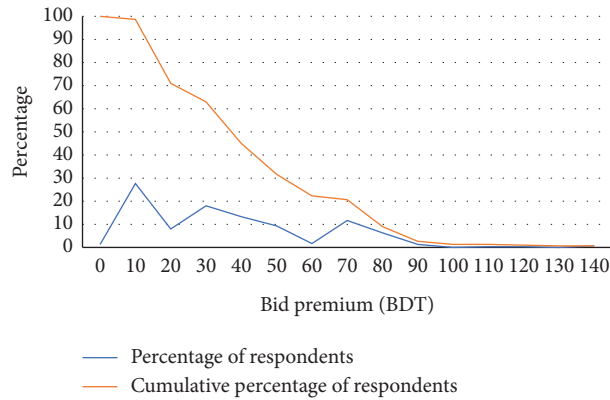


FIGURE 5: Number of respondents willing to pay for safe broiler meat at different bid premiums.

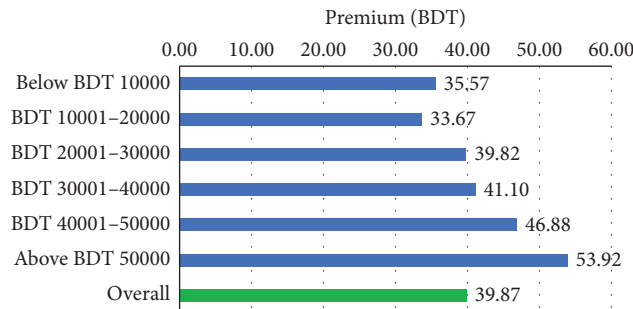


FIGURE 6: Average WTP for price premium by different income groups.

TABLE 4: Intended consumption of broiler meat at the express WTP.

Income groups	Intended monthly consumption at WTP (kg/HH)	Percentage of increment
Below BDT 10000	6.02	42.32
BDT 10001-20000	5.67	30.95
BDT 20001-30000	6.73	34.06
BDT 30001-40000	6.66	29.57
BDT 40001-50000	6.46	52.00
Above BDT 50000	5.54	45.41
Overall intended consumption at WTP	6.13	35.92

respondents of this study express that they will consume 6.13 kg of safe broiler meat per month per household, which is 35.92% higher than the present level of their broiler meat consumption. The study by Akgüngör et al. [74] also confirms that consumers usually have the intention of purchasing a higher amount of safe and organic food items.

To identify the significant factors affecting the consumers' WTP for the premium price of safe broiler meat, this study employed an OLS regression model, and the results are presented in Table 5. It reveals that education positively influenced consumers' WTP, implying that educated consumers were more willing to pay for the safer broiler meat than their counterparts. Higher education facilitates the consumers to prefer safer food products that are also supported by Hossain et al. [66] and Wang et al. [75]. The study

further found that the monthly income of the respondents positively influences their willingness to pay for safe broiler meat. If the respondents had a higher-income level, they would want to sacrifice more money to consume safe broiler meat. This finding is consistent with studies by Lestari et al. [70] and Zhang et al. [76], where both the studies found a positive impact of respondents' income on their willingness to pay for safe products. The monthly broiler consumption of the respondents had a positive and significant influence on their WTP. Broiler consumers' comprehension to ensure safer meat could be the reason behind this finding. Hossain et al. [66] also reported similar findings where chicken consumers were willing to pay more for certified meat. Among the five perceptions of the respondents about the safe broiler, 'health' and 'taste and nutrition' perception positively and significantly affected their WTP, which means



TABLE 5: Factor affecting willingness to pay (WTP) for safe broiler meat.

Explanatory variables	Coefficient	Robust standard error
Age (years)	0.090	0.168
Gender (0 = female; 1 = male)	2.971	5.322
Education (years of schooling)	0.982***	0.271
Marital status (0 = otherwise; 1 = married)	-2.398	4.456
Family size	-0.905	0.995
Dependency ratio	0.514	1.335
Religion (0 = Islam; 1 = Hinduism)	-2.878	4.155
Market distance (km)	-0.514	2.091
HH income (BDT/month)	0.0001*	0.0001
Current broiler meat consumption (kg/month)	1.625**	0.669
<b>Perceptions</b>		
Health	0.256*	0.131
Availability	-0.036	0.052
Taste and nutrition	0.156*	0.083
Expensiveness	0.073	0.092
Environment	-0.016	0.115
Constant	-12.641	16.332
Number of observations		300
F (15,284)		4.44***
R <sup>2</sup>		0.1722

Note. \*\*\*, \*\*, and \* indicate the significance level at 1%, 5%, and 10%, respectively.

consumers express higher WTP when they perceive greater health benefits and availability in the market. This is because consumers are concerned about the health risk of convention broiler and would pay higher for purchasing safe broiler meat. Similarly, taste and nutrition are also crucial factors for the consumers in this study as it has a significant positive impact on their WTP. Due to their superior taste and nutritious features, Bangladeshi consumers spend nearly double or even treble the price for Sonali and nondescript local chickens [66]. Since broiler meat is considered less tasty and nutritious, the slow-growing safer broiler chicken needs to be introduced to improve its taste and nutritional elements [66, 77].

#### 4. Conclusion

The stigma around chicken meat is based on the conventional broilers available in the markets, which are usually produced on unsafe feeds, antibiotics, unknown feed supplements, and growth hormones that have detrimental effects on consumers' health. Contrary to the common misconception, it is possible to produce safe broiler meat without using the health-threatening elements. However, the production cost will naturally be higher for better quality feed and certification, which will, in turn, increase the price to a certain extent. Therefore, it is imperative to understand the consumers' behavior and intention towards safely produced broiler meat by assessing their consumption status and perceptions. With these goals, this study evaluated the WTP premium by the consumers consuming safe broiler meat and identified factors affecting their WTP. It showed that consumers' health and environmental perception are dominant over others, indicating that they are more concerned about the consequences of broiler meat on these two aspects. The consumers' current consumption of broiler

meat declines among the higher-income groups, maybe because of the other available meat sources of higher prices. However, it was evident that they intend to consume a higher amount of broiler meat even by paying a premium price. Broiler meat consumption could be enhanced by around 36% if a safer version of broiler meat was available in the market. These findings show that there is a demand for safe foods, and customers are willing to pay a considerable price premium for them. Widespread production of safe broiler meat is needed to meet the demands of these people. Meat producers, entrepreneurs, and farmers should adjust their production and marketing plans by implementing suitable quality control procedures at all levels of the value chain, not only at the farm. According to the study, consumers' willingness to pay for safe broiler meat is positively influenced by their education, income level, and current consumption of broiler meat. Consumers with higher health, taste, and nutrition perception of safe broiler meat express higher WTP. To improve the taste and nutritional value, researchers and farmers might need to consider introducing slow-growing safer broiler chicken.

#### Data Availability

The data presented in this study are available on request from the authors.

#### Conflicts of Interest

The authors declare that there are no conflicts of interest.

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