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Research Article

Current safety status during poultry processing in the traditional market of Dhaka, Bangladesh

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ABSTRACT

A cross-sectional study was conducted among 80 chicken sellers of Dhaka North City Corporation's randomly chosen traditional markets in order to examine the actual poultry selling and processing techniques through evaluating the socioeconomic characters and food safety knowledge, attitude and practices (KAP) of sellers. According to the findings, a substantial part of sellers (70%) were between the ages of 35 and 45, primary school dropouts (40%), had between 5 and 10 years of experience (75%), and none had any formal training in food safety or health certification. The majority of the birds (77.5%) were delivered by the supplier in the morning and slaughtered without any ante-mortem screening or feed withdrawal time. The interquartile range (IQR) of the median KAP scores were 10 (2–18), 18 (9–25), and 6 (3–10) respectively. With a mean total score of 10.98 ± 4.30, roughly 49.9% of the sellers demonstrated a sufficient degree of food safety knowledge. With a mean total score of 18.19 ± 3.98 approximately 54.4% of the meat handlers exhibited a good attitude toward safety precautions. With a mean overall score of 5.91 ± 1.74 (≤6), only 45.48% of chicken vendors followed sound food safety practices. The results also showed a statistically significant negative correlation between knowledge and practice (P<0.01), which depicts that even though the majority of poultry sellers have a basic understanding of meat processing safety practices, they do not put this knowledge into practice. As a result, meat handlers should receive ongoing training in food safety as well as hands-on experience, which can enhance solid safety measures through an increased understanding and a positive mindset.

Introduction

The amount of broiler meat consumed per person in Bangladesh is 6.3 kg per year, which accounts for 40% of the country's overall meat consumption (DLS, 2020). In addition, the nation eats 1,26 million tons of poultry meat per year, or 3,340 tons daily (Karmoker, 2022). The poultry birds are mainly sold live or dressed in the traditional marketplaces, with the exception of a few large commercial processing palnts. Due to their lack of confidence in the slaughtering process and the physiological condition, Bangladeshi buyers prefer to acquire live birds, which are executed and prepared in the local market in front of them to prepare for the kitchen. However, handling and processing live poultry is linked to food safety problems such as microbial contamination of meat that reduces the meat's quality and shelf life and also results in zoonotic and food borne illness in workers involved in that profession (Komba *et al.*, 2012).

Food safety, which is defined as the processes and circumstances that prevent food from being contaminated by harmful substances or microorganisms, continues to be a major global public health concern (WHO, 2015). Food security, nutrition, and safety are all closely related to one another. Most raw food, especially those from livestock (meat, milk and egg), are extremely susceptible to microbial contamination and food poisoning due to richness of nutrients (Soriyi *et al.*, 2008; Bersisa *et al.*, 2019; Akinyera *et al.*, 2018). The meat of poultry and livestock may get infected with foodborne pathogens while being the process of slaughtering, dressing, handling and storage. The sources of contamination can be hand and clothing of an infected processor, the animal's exterior, its intestinal tract, processing knives and equipment, or infections by contact with other

fresh agricultural items at local markets (Clayton *et al.*, 2002; Greig *et al.*, 2007; Rasschaert *et al.*, 2008). Poor handling approaches, which contribute in large part to meat-related risks (Devleesschauwer *et al.*, 2018; Mangen *et al.*, 2018), are responsible for around 600 million foodborne illnesses and 420,000 fatalities each year (WHO, 2014). According to a World Bank study, unhealthy food costs low- and middle-income countries close to US$ 110 billion annually in lost productivity and medical costs (World Bank, 2018). Processed poultry has a higher microbial load, which can lead to food-borne diseases, as a result of the poultry sellers in traditional markets' unconsciousness Decreased foodborne pathogen contamination of poultry carcasses is therefore of the utmost importance to both the industry and consumers as a whole (Berrang *et al.*, 2009).

The primary factors influencing food contamination are the food handler's health and hygiene habits (Tefera *et al.*, 2014). In addition to this, the pre-slaughter and post-slaughter management like maintenance of feed withdrawal period, bleeding time, directly affect the meat quality. Fasting before slaughter helps to clear the gastrointestinal tract, which lessens fecal contamination of the carcass. Proper bleeding reduces the microbial growth in meat. The introduction of excellent hygienic procedures throughout meat processing, packing, and supply also depends on market sellers' understanding of food safety and foodborne pathogens (Mahajan *et al.*, 2014). However, the majority of food sellers lack the necessary training in food safety regulations to produce healthy and safe food (Ghatak and Chatterjee, 2018). Therefore, to minimize the transmission and infection of foodborne pathogens in the poultry processing facilities or its nearby settings, sellers must improve their knowledge, attitude, and practices through training.

The knowledge, attitudes, and practices (KAP) of food handlers with regard to food safety and foodborne pathogens have been the subject of numerous studies around the world (Ansari-Lari *et al.*, 2010; Gomes-Neves *et al.*, 2007; Haileselassie *et al.*, 2013; Siddiky *et al.*, 2022), but little is known about the practices currently used for poultry marketing and processing in traditional markets. Therefore, the purpose of the current study was to investigate the current practices in marketing and processing chicken in selected areas of Dhaka North City Corporation's traditional market as well as the sociodemographic details of the poultry sellers. The study also sought to assess chicken sellers' understanding, attitudes, and actions regarding food safety and foodborne diseases at conventional chicken wet markets.

Materials and methods

Selection of Survey Area

The survey was carried out in Zone 1 and Zone 4 of Dhaka North City Corporation (DNCC) area of Bangladesh during January 2023 to April 2023. A total of 40 sellers from each zone (total 80) were chosen at random from 10 local markets situated in the DNCC territory (Figure 1).

Figure 1. Location of the survey area.

Questionnaire Preparation

Several published, trustworthy, and tested questionnaires that had been utilized in related studies served as the foundation for the structured questionnaire's creation with necessary modification to accomplish the goal of this study (Adesokan and Raji, 2014; Tegegne and Phyo, 2017; Siddiki *et al.*, 2022). Prior to the actual data collection, the developed questionnaires were pretested among a few of the chicken sellers of target area. The final questionnaires were created after making the necessary edits, modifications, and adjustments based on the results of the pretesting. The study was entirely relied on primary information that the researchers themselves obtained through in-person interviews. In order to communicate with sellers easily, the questionnaire was also translated into Bengali.

There were four main sections of the questionnaire. The first section of the questionnaire was about socio-economic information (such as vendor sex, age, education level, years of vending, income, occupation status, way of experience, health certificate, and food safety training) and practices in poultry selling and processing (such as Chicken sold every day, types of poultry sold, types of chicken sold, source of live bird, types of vehicles, chicken kept time at shop, sick bird isolation, ante-mortem inspection, maintenance of feed withdrawal period, selling system, device used for bleeding, slaughtering method, maintenance of bleeding time, dressing method, carcass cleaning, types of cuts, cleaning slaughter area, cleaning agent, etc).

The second section of the questionnaire had 22 closed-ended questions concerning the sellers' knowledge of food safety, with three possible responses ("Yes," "No," and "I do not know"). Categorical variables (correct or incorrect answer) were used to evaluate the response. With a maximum score of 22, one (1) mark was awarded for each correct response and zero (0) for each incorrect response. Sellers with an overall score of less than <15 were deemed to have "unsatisfactory" food safety knowledge, while those with a score of at least ≥ 15 were deemed to have "satisfactory" knowledge.

The third part of the survey asked 14 questions regarding chicken seller's attitude toward food safety. The response from the responder was marked as "right answer," "wrong answer," or "no idea." and with the corresponding points being 2, 1, and 0, for a possible maximum score of 28. Respondents with scores of <19 were considered to have "poor" attitudes, whereas chicken dealers with scores of ≥ 19 were considered to have "good" attitudes. Chicken sellers were asked to answer 13 questions about their safety practices in the final phase of the questionnaire, with "yes" or

"no" responses marking 1 or 0, respectively and a maximum score of 13. Chicken sellers who received a score of ≥ 9 were considered to have "good" practices, while those who had a score of < 9 were thought to have "poor" practices.

Statistical Analysis

Participants' socio-demographic characteristics and KAP scores were evaluated by percentage/frequency analysis. Descriptive statistics were considered to represent frequency, percentage, mean, and standard deviation. KAP scores were categorized using cut-off values of 70%. A score equal of 70% or above was deemed "good", whereas one below that mark was deemed "poor." The Spearman's rho (ρ) test was used to determine pairwise correlations among Knowledge, attitude and practice. A *P*-value <0.01 was considered significant. The interpretation of the r value of Spearman's rho correlation is stated in accordance to Dancey and Reidy (2004) to indicate the strength level of the relationship between the variables. The Statistical Package for the Social Sciences (SPSS) software version 20 was used to analyze the data.

Results and Discussion

Socio Demographic Features of Poultry Sellers

Table 1 provides an overview of the sellers' sociodemographic features. According to the findings, 12.5% of sellers were between the ages of 25 and 35, while 70% of merchants were between the ages of 35 and 45. In partial consistent with our study Khairunnesa *et al*. (2020) also reported that more than half the poultry seller of the wet market of Gazipur city was within the age range of 30 to 49.With a lowest age of 19 and a highest age of 50, the sellers' average age was 28.35± 6.23 years which was lower than several previous studies (Akabanda *et al*., 2017; Sharif and Al-Malki, 2010; Soares *et al*., 2012; Tegegne and Phyo, 2017) but higher than former study of Farahat *et al*. (2015). All 80 participants in this study were men, which was consistent with the findings of earlier investigations by Adesokan and Raji (2014), Jianu and Golet (2014), and Tegegne and Phyo (2017). The majority of the sellers (40%) were elementary school dropouts, followed by a sizeable percentage (37.5%) of illiterates, and no one had any training in food safety or a health certificate. Our results are in consistent to the previous studies of Banna *et al*. (2021), Khairunnesa *et al*. (2020), Sharma *et al*. (2022), and Siddiky *et al*. (2022). With an average length of 6.70 ± 2.12 years, almost 75% of sellers have been engaged in this industry for between 5 and 10 years, and 20% have more than 10 years of experience. In contrast, Siddiky *et al*. (2022) reported 66.9% of the respondent with less than 5 years' experience with an average experience of 3.68 ± 2.207 years.

About half of the sellers (50%) sold chicken weighing between 100 and 200 kg, followed by 30% who sold less than 100 kilograms and 20% who often sold 200 to 300 kg per day. In contrast Siddiky *et al*. (2022) reported that major portion of the sellers (51.7%) sale <100 kg of poultry per day. About 12.5% of the sellers sold chicken, duck, and pigeon together compared to almost 85% of sellers who only sold chicken. Of all sellers, 45% sold both broiler and sonali chicken together, followed by 30% who sold only broiler, 20% who sold broiler, sonali and deshi chicken, and only 5% who sold broiler with deshi chicken. Our results are in full consistent with the findings of Siddiky *et al*. (2022) who also reported that highest portion of the vendor sold broiler and sonali chicken together. Most sellers (42.5%) made between 10,000 and 20,000 BDT per month, while 32.5% made between 20,000 and 30,000 BDT per month which is partially consistent with the findings of Sharma *et al*. (2022). Each vendor had their own unique manner of doing business.

Table 1. Profile of personnel engaged in poultry processing in the traditional market of Dhaka North city corporation.

Features	n	%	Mean ± SD	Range
Age				
<25	6	7.5	28.35±6.23	19-50
25-35	10	12.5		
35-45	56	70.0		
>45	8	10.0		
Gender				
Male	80	100		
Female				
Educational level				
Illiterate	30	37.5		
Primary	32	40.0		
Secondary	14	17.5		
Higher Secondary	4	5		
Year of vending			6.70 ± 2.12	2-13
<5	4	5		
5-10	60	75		
>10	16	20		
Chicken sold every day (kg)			127.5 ± 37.52	80-300
<100	24	30.0		
100-200	40	50.0		
200-300	16	20.0		
Types of poultry sold				
Chicken	68	85.0		
Chicken + Duck	2	2.5		
Chicken + Duck +Pigeon	10	12.5		
Types of chicken sold				
Broiler	24	30		
Broiler+Sonali+Deshi	16	20.0		
Broiler+Sonali	36	45.0		
Broiler+Deshi	4	5.0		
Income/month			38354 ± 1425.36	20000-200000
10000	14	17.5		
10000-20000	34	42.5		
20000-30000	26	32.5		
>30000	6	7.5		
Way of experience				
Personal	80	100		
Training	0	0		
Have food safety training?				
Yes	0	00		
No	80	100		
Have health certificate ?				
Yes	0	00		
No	80	100		

Management and Selling Practices in the Traditional Market

Table 2 shows the feedbacks of the traditional market poultry sellers to the management and selling techniques. In the study area, live birds arrived at the markets in the morning between 7:00 and 10:00 pm. About 77 % of sellers bought their chicken straight from the supplier, 5% from the farm, and 17.5 % from both sources, depending on what was available. In contrast, Khairunnesa *et al*. (2020) reported that major portion of the bird were brought from farm and arrived at the evening in the traditional market of Gazipur. A sizable

portion of sellers (57.5%) held their chicken for one day, 37.5% kept it for two days, and 5% stored it for a week before selling. In agreement to our result, Siddiky *et al.* (2022) also reported that major portion of the sellers kept the bird in their shop for one day. Before being slaughtered, birds in the current study were freed from their cages or containers by clutching their wings (90%) and legs (10%) which is in agreement with Khairunnesa *et al.* (2020).

About 92.5% of the vendor did not practice ante-mortem inspection and none of them maintain feed withdrawal period before slaughtering. Contrary to our result, Khairunnesa *et al.* (2020) reported 100% of the sellers practice ante-mortem inspection and maintain feed withdrawal period. This variation may be due to regional differences and knowledge level of the sellers. All the sellers sell birds either live or dressed depending customer need. In contrast, Khairunnesa *et al.* (2020) reported around half of the sellers practice both live and dressed selling system. About 87.5% of the sellers use drum for bleeding and only 12.5% used cone while all of them maintained the ideal bleeding time (1-2 min). In Khairunnesa *et al.* (2020) study, they reported two third of the sellers use cone for bleeding and about half of them maintain the bleeding period which is in contrast to our findings. About 85% of the sellers slaughtered bird using halal method and only 15% slaughtered bird using both halal and Jatka method which is in line with the findings of Khairunnesa *et al.* (2020). Most of the sellers used both manual dressing method (65%), sell whole chicken (95%) and clean carcass with water after dressing (87.5%) which is in agreement with findings of Khairunnesa *et al.* (2020). Only 17.5% of the sellers practiced post-mortem inspection, while 82.5% did not. In contrary Khairunnesa *et al.* (2020) reported all of the sellers practice post-mortem inspection. All of them clean the slaughter area on a daily basis, while about 42.5% of them used detergent with water to clean the surface followed by 35% used disinfectant with detergent and water and 22.5% used only water for the cleaning purpose. Our results, are in agreement with Khairunnesa *et al.* (2020).

Table 2. Current management and selling practices of poultry in the traditional market of Dhaka North city corporation.

Features	n	%
Arrival of Bird		
Morning	80	100
Afternoon	-	-
Source of live birds		
Direct farm	4	5
Supplier	62	77.5
Both	14	17.5
Kept at shop for selling		
One day	46	57.5
Two days	30	37.5
Week	4	5.0
Grasping birds from cage/crate		
Wing	72	90
Legs	8	10
Ante-mortem screening		
Yes	6	7.5
no	74	92.5
Maintenance of feed withdrawal period		
Yes	0	0
No	80	100
Selling system		
Live	-	-
Dressed	-	-
Both	80	100
Device used for bleeding		
Cone	10	12.5
Drum	70	87.5
No Device	-	-
Slaughtering method		
Halal	68	85.0
Halal+Jatka	12	15.0
Maintenance of bleeding time (1-2 min)		
Yes	80	100
No		
Dressing system		
Manual	52	65.0
Mechanical	14	17.5
Both	14	17.5
Carcass cleaning		
Yes	70	87.5
No	10	12.5
Types of Cuts		
Whole	76	95.0
Cut up parts	4	5.0
Post-mortem inspection		
Yes	14	17.5
No	66	82.5
Cleaning slaughter area		
Daily	80	100
Weekly	-	-
Bi-weekly	-	-
Cleaning Agent		
Detergent +water	35	42.5
Detergent and Disinfectants	28	35.0
Water only	18	22.5

Distribution of KAP Score

Figure 2 displays how the KAP scores of study participants were distributed. The median [interquartile range (IQR)] KAP scores were 10 [2-18], 18 [9-25], and 6 [3-10], correspondingly, showing that most individuals had average knowledge attitude and practice scores. The average (standard deviation) scores for knowledge, attitude, and practices related to food safety were 10.98 (4.30), 18.19 (3.98), and 5.91 (1.74), respectively.

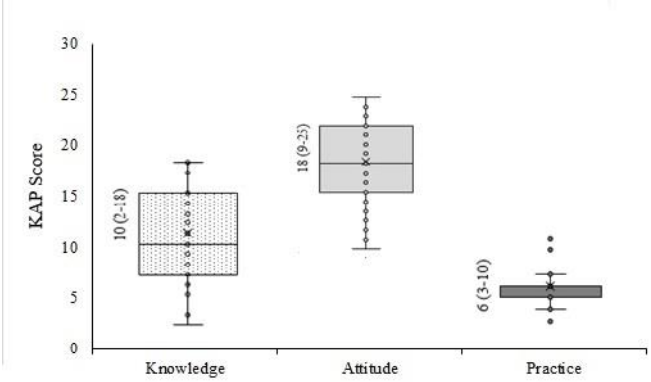

Figure 2. Distribution of the knowledge, attitude, and practice scores of the participants. The median (IQR) is represented by the numbers on the left. (Take note that the ranges for knowledge, attitude, and practices are 0-22, 0-28, and 0-13, respectively.)

Sellers Knowledge of Safety in Meat Processing

Table 3 displays the level of general food safety knowledge possessed by chicken sellers. The respondents' responses to 22 questions about food safety revealed that the chicken vendors had insufficient knowledge of food safety and

foodborne diseases (49.89±25.6% of positive answer). A significant number of the sellers were not familiar with food safety concern (70%), antimicrobial resistance (92.5%), zoonosis (95%) and foodborne pathogens (76.25%) specially *Salmonella* and *E. coli* (92.5%). This results are in line with findings of Siddiky *et al.* (2022), except the knowledge of food safety where they reported that about 70% of the sellers give positive answer. Only 27.9% of food handlers in India were reported to be aware of foodborne illnesses, according to a survey conducted by Kubde *et al.* (2016). The high percentage of uneducated and primary school dropout meat handlers in the research area may be to responsible for this. Additionally, none of the meat handlers had any training in food safety. In traditional markets, vendors' inadequate understanding of food safety, foodbornepathogens, antibiotic resistance, and zoonosis could lead to the spread and contamination of these pathogens as well as disastrous repercussions on both sellers and customers. Since sellers can act as carriers or vehicles for foodborne viruses, they must be proficient in the handling of chicken, hand washing, and other crucial hygienic standards. In our study, majority of the sellers had satisfactory knowledge about the importance of hygienic measures such as proper cleaning and handling of instruments (80%), washing hands before and during chicken dressing (65%), uses of personal protective equipment like gloves (70 %) and apron (65 %), cleaning of knives (70 %), cleaning of chopping boards (80 %), regular cleaning and using disinfectant (80 %), proper disposal of poultry wastages (72.5%) and checking workers' health status (78.25%), which are in alignment with the findings of Abdullah Sani and Siow (2014), Ansari-Lari *et al*., (2010); Tegegne and Phyo (2017) and Siddiky *et al.* (2022). Sellers also had moderate knowledge on, insects and pest contamination (58.75%), and frequent changing of carcass dressing water (60%). About 42.5% of the sellers believe that diarrhea can be transmitted by contaminated meat and eating and drinking in the market can increase the possibility of contamination. However, Siddiky *et al.* (2022) found only 16.6% respondents has knowledge about transmission of diarrhea from contaminated meat. Only 16.25% of the sellers knows that meat handlers' hands and utensils can be a source of cross contamination. In consistent to our findings, Tegegne and Phyo (2017) and Siddiky *et al.* (2022) also reported least percentage of the respondents had knowledge about chances of cross contamination from meat handlers' hands and utensils.

Table 3. Overview of the knowledge of poultry sellers regarding safety during poultry processing in the traditional market of Dhaka North City Corporation.

Statements	Response n, (%)		
	Yes	No	Don't know
1. Do you have any knowledge about food safety?	24(30)	44(55)	12(15)
2. Are you aware of the concept of antibiotic resistance?	6(7.5)	66(82.5)	8(10.0)
3. Do you understand zoonosis?	4(5)	61(77.5)	14(17.5)
4. Do you have knowledge of foodborne pathogens?	19(23.75)	28(35)	33(41.25)
5. Do you know what Salmonella and E. coli are?	6(7.5)	70(87.5)	4(5)
6. Chicken dressing expose you to any food-borne pathogens	30(37.5)	40(50.0)	10(12.5)
7. Can a foodborne pathogen infect dressed chicken?	28(35)	18(22.5)	34(42.5)
8. Cleaning and handling utensils properly helps lower the danger of contamination and spread.	64(80)	8(10)	8(10)
9. Regular hand washing lowers the possibility of germ contamination before and during chicken dressing.	52(65)	18(22.5)	10(12.5)
10. Wearing gloves limit the chance of contamination while dressing.	56(70)	20(25.0)	4(5)
11. Wearing aprons limit the chance of contamination while dressing.	52(65)	12(15)	16(20)
12. Cleaning knives frequently and regularly can help to lower microbial infection.	56 (70)	12(15)	12(15)
13. Cleaning a cutting board frequently and regularly can lessen microbial infection.	64(80)	6(7.5)	10(12.5)
14. Regularly cleaning and disinfecting work surfaces can stop the spread of bacteria.	64(80)	6(7.5)	10(12.5)
15. Pests and insects could contaminate raw dressed chicken	47(58.75)	2(2.5)	31(38.75)
16. A foodborne pathogen might cause sellers diarrhea.	34(42.5)	10(12.5)	36(45.0)
17. Eating and drinking in a wet market raise the possibility of microbial contamination	34(42.5)	6(7.5)	48(60.0)
18. Proper disposal of poultry waste lowers the risk of microbial infection and spread.	58(72.5)	6(7.5)	16(20)
19. Changing the carcass dressing water on a regular basis prevents microbial infection and spread.	44(55)	10(12.5)	26(32.5)
20. Cross contamination occurs when bacteria from one infected piece of meat are transferred to another by the meat handler's hands or utensils	13(16.25)	17(21.25)	50(62.5)
21. People who have open wounds, gastroenteritis, or ear or throat illnesses shouldn't handle meat.	60(75)	20(25)	0(0)
22. Prior to employment, workers' health status should be assessed	63(78.25)	26(32.5)	0(0)
Total average percentage of correct responses	49.89±25.6		

Sellers Attitudes Towards Safety in Meat Processing

Table 4 describes the attitude scores of the participants for food safety. More than half of the respondents (54.38±15.29%) were highly concerned about the issue of food safety and thought that the poultry processing environment is very unsafe in Bangladesh's traditional market. A highest percentage of the meat handlers showing positive attitude towards taking food safety training to improve meat safety and hygiene practices (78.25%). This result was higher than the finding of Siddiky *et al.* (2022, 48.6%) but lower than the finding of Tegegne and Phyo (2017, 81%. Meat handlers' attitude towards using personal protective outfit to improve hygienic practice (71.25%) of our study was comparable to the findings of Tegegne and Phyo (2017, 71%) and Siddiky *et al.* (2022, 76.9%). However, the result of attitude towards proper hygienic and sanitary practices to reduce microbial spread in meat (75%) was higher than Siddiky *et al.* (2022). About 65% of the

meat handlers professed foodborne pathogens have harmful effects on human health and cleaning shop and utensils can reduce the risk of illness each, can be comparable with the findings of Siddiky *et al.* (2022). More than half of the sellers believed that meat handlers with wounds, bruises and injuries should not dress chicken (56.25%), knives, dressing water and cutting board can be source of contamination (57.5%), hand washing before handling can reduce risk of contamination (51.25%) and proper sanitization of knives and cutting surfaces can prevent cross contamination (57.5%). In line to our result Siddiky *et al.* (2022) also reported that major portion of the respondents showed positive attitude towards the above facts. On the other hand, about 46.25% of the sellers show positive attitude on the fact that safe meat handling to avoid contamination is meat handlers job responsibilities, which was below than the findings of Tegegne and Phyo (2017, 69%). Below 40% of the sellers believe the facts that sneezing and coughing could contaminate meat (36.25%), surfaces and equipment should be clean before reusing for meat processing (38.75%), processing leftover should be kept in a cool place (31.25%), and food borne pathogens can be transmitted easily during meat dressing (31.25%). The findings of our study was lower than the findings of the similar previous study (Tegegne and Phyo, 2017; Siddiky *et al.*, 2022). The variation in the results of respondent attitude may be due to regional and time variation.

Table 4. Overview of the attitude of poultry sellers regarding safety during poultry processing in the traditional market of Dhaka North City Corporation.

Statements	Response n, (%)		
	Right answer	Wrong answer	Not idea
1. Meat handlers with wounds, bruises and injuries on their hands must not dressing chicken	45(56.25)	14(17.5)	21(26.25)
2. Cutting boards, dressing water, and knives all have the potential to contaminate meat.	46(57.5)	19(23.75)	15(18.75)
3. Using personal protective outfit (apron, shoes, gloves, hair cover) could help to improve hygienic practices	57(71.25)	12(15)	11(13.75)
4. Hand washing before handling reduce the risk of contamination	41(51.25)	23(28.75)	16(20)
5. Having a clean workspace and utensils lowers the risk of disease	52(65)	16(20)	12(15)
6. To prevent cross contamination, knives and cutting surfaces should be adequately cleaned	46(57.5)	24(30)	10(12.5)
7. Meat could become contaminated if cough or sneeze without protecting mouths and noses	29(36.25)	24(30)	27(33.75)
8. Prior to reuse, surfaces and equipment should be clean.	31(38.75)	23(28.75)	26(32.5)
9. After processing meat any leftover should be kept in a cool place within	25(31.25)	21(26.25)	34(42.5)
10. A meat handler's job duties include handling meat safely to prevent disease and contamination	37(46.25)	19(23.75)	24(30)
11. Chicken dressing is an easy way to spread a foodborne illness.	25(31.25)	24(30)	31(38.75)
12. Foodborne pathogen has harmful effects on human health	52(65)	6(7.5)	22(27.5)
13. Good hygiene and hygienic measures might lessen the spread of microorganisms	60(75)	6(7.5)	14(17.5)
14. Food safety training can improve meat safety and hygiene practices	63(78.75)	6(7.5)	11(13.75)
Total average percentage of correct responses	54.38±15.29		

Table 5. Overview of the practice of poultry sellers regarding safety during poultry processing in the traditional market of Dhaka North City Corporation.

Statements	Response n, (%)	
	Yes	No
1. Eating and drinking at shop	38(47.5)	42(52.5)
2. Smoke during dressing the chicken	36(45)	44(55)
3. Wash hands before chicken dressing	28(35)	52(65)
4. Wash hands after chicken dressing	78(97.5)	2(2.5)
5. Use gloves while chicken dressing	7(8.75)	73(91.5)
6. Wear apron while chicken dressing	10(12.5)	70(87.5)
7. Wash knife before chicken dressing	36(45)	44(55)
8. Wash cutting board before carcass dressing	32(40)	48(60)
9. Change carcass dressing water regularly	54(67.5)	26(32.5)
10. Wash hands with soap after using toilet	57(71.25)	23(28.75)
11. Use sanitizer when washing utensils (knives and cutting boards)	7(8.75)	73(91.25)
12. Have proper drainage and waste management facility at shop	54(67.5)	26(32.5)
13. Clean shop with disinfectant at the time of closing	33(41.25)	47(58.75)
Total average percentage of correct responses	44.90±25.42	

Sellers Practices of Safety Measures in Meat Processing

Personal hygiene standards of the meat processors are essential for ensuring food safety and protecting consumers from food poisoning and intoxication. To assess the food safety practices among the poultry sellers of Dhaka, Bangladesh's traditional markets, 13 questions enquired for 80 meat handlers. A total 44.90 ± 25.42 % (mean ± SD) of sellers gave affirmative responses, which revealed poor practices of chicken vendors regarding food safety and foodborne pathogens. Per the survey result, 47.5 % of sellers eat and drink, and 45 % smoke at their workplace which is lower than the findings of Banna *et al.* (2021) and Tegegne and Phyo (2017). Almost no chicken sellers used gloves (91.5 %) and an apron (87.5%) during the dressing of chicken which is in line with the findings of Siddiky *et al.* (2022) and Banna *et al.* (2021). However, Tegegne and Phyo

(2017) reported that about 41% of the meat handlers use apron while working. Before preparing the chicken, the majority of the sellers (63.75%) did not wash their hands; however, practically everyone (97.5%) did it afterward. Our results are in line with findings of Siddiky *et al.* (2022). Less than half of the sellers washed their knives (45%) and cutting board (45%) before chicken dressing and clean their shop with disinfectants at the time of closing (41.25%) which are a little lower than the findings of Siddiky *et al.* (2022). However, about 70% of the sellers change the dressing water regularly, wash hands with soap after using toilet and had proper drainage facility at their shop which is in agreement with the findings of Siddiky *et al.* (2022) and Tegegne and Phyo (2017). About 91.25% of the sellers did not used any sanitizer to disinfect tools such as knives and cutting boards which is higher than Tegegne and Phyo (2017).

Correlation Among KAP

Knowledge is akeyfactorinfluencing the attitudes and practices of food handlers. Table 6 shows an association between KAP of meat handlers. There was a statistically significant weak negative correlation between knowledge and practice (Spearman's rho: -0.289, p = 0.004) indicated that even though the poultry sellers have good knowledge about food safety, their practice level is low. Thisdemonstratesthatpossessionofprofoundknowledgedoesnotalwaysleadtopositiveaction (Mahat *et al.*, 2017). However, this relation of knowledge with attitude was non-significantly negative (Spearman's rho: -0.174). Contrary to our results several earlier investigations revealed a significant positive association between knowledge, attitude and practice (Al-Shabib *et al.*, 2016; Sharma *et al.*, 2022). In addition, attitude had a negligible correlation with practice (ρ: 0.057).

Table 6. Correlations among knowledge, attitude, and practice scores.

	Knowledge	Attitude	Practice
Knowledge	1	-.174	-0.289**
Attitude	-.174	1	0.057
Practice	-0.289**	0.057	1

** Correlation is significant at the 0.01 level (2-tailed)

Conclusion

In conclusion, most of the poultry seller in the study area were primary school leaver or illiterate, had 5 to 10 years of working experience and no food safety training or health certificate. These factors may be responsible for inadequate knowledge, poor attitudes and practices of the poultry sellers about meat handling related food safety issues. Furthermore, the negative correlation between knowledge and practices indicated the unawareness or unwillingness of the poultry sellers to apply their knowledge in the practical field. Therefore, it is necessary to conduct continuous food safety training and hands-on training for meat handlers to improve good safety practices through better understanding and positive attitudes.

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