



# Assessment of hygienic and sanitation practices among poultry butchers in selected Municipality areas of Assam (India)



**R. Islam<sup>1</sup>, S. Islam<sup>1</sup> and M. Rahman<sup>2</sup>**

Department of Animal Husbandry & Dairying,  
Biswanath College of Agriculture,  
Assam Agricultural University, Biswanath Chariali-784176

Citation: Islam, R., Islam, S. and Rahman, M. 2022. Assessment of hygienic and sanitation practices among poultry butchers in selected Municipality areas of Assam (India).

*J. Vet. Anim. Sci.* **53**(2): 269-278

DOI: <https://doi.org/10.51966/jvas.2022.53.2.269-278>

Received: 11.11.2021

Accepted: 20-12-2021

Published: 30.06.2022

## Abstract

A study was conducted in Dhubri and Biswanath Chariali Municipality areas to assess the adoption of hygienic and sanitation practices being followed by poultry butchers. A total of 60 poultry butchers were selected randomly, 30 from each Municipality area so that the final sample consisted of 60 poultry butchers. Data were collected using a pre-tested structured interview schedule by personal interviews. The schedule was designed to collect information on the socio-economic profile of the butchers, personal and meat shop hygiene, maintenance of meat shop and its equipment. The data revealed that all the poultry butchers were male among which (75%) of them had an education level only up to eight standard. The overall mean age of the poultry butchers was found to be  $39.95 \pm 8.64$  years of which majority (75%) of them belong to middle age group. The present study indicated that none of the poultry butchers underwent any formal training for hygienic meat handling. It was also pointed out that most (85%) of the butcheries were located at market area, while only a few (15%) were found in the residential area. Only 18.33 per cent of the poultry butchers wore clean clothes while 81.67 per cent of them did not adopt this practice during working.

Majority (88.33%) of them did not wash their hands after smoking/ chewing tobacco. It was also revealed that majority (88.33%) of the butchers did not clean knives before and after cutting of meat. Majority of the butchers agreed that cleanliness of equipment (71.67%), the meat shop and its surrounding (68.33%) and personal hygiene (68.33%) were some of the important factors that were essential to ensure wholesome meat production. From the above study, it may be concluded that appropriate interventional measures by the concerned agencies such as awareness trainings for poultry butchers on crucial areas of food safety, hygienic practices relating to meat handling and personal safety are imperative. The results of the study also shed light on the need for measures to improve the infrastructural facilities in poultry meat butcheries and for appropriate interventions to strengthen the food quality control system by the government regulatory authorities.

1. Assistant Professor

2. Assistant Professor, Department of Animal Husbandry & Dairying, SCS College of Agriculture, Assam Agricultural University, Rangamati, Dhubri-783371

\*Corresponding author: [rafiquel.islam@aau.ac.in](mailto:rafiquel.islam@aau.ac.in), Ph: 9613851428

Copyright: © 2022 Islam et al. This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**Keywords:** *Hygiene, poultry butchers, meat handling, meat borne disease*

Diarrhoeal diseases are the most common illnesses resulting from consumption of contaminated food, causing 550 million people to fall ill and 230000 deaths every year in the world (FAO, 2020). Unsafe food creates a vicious cycle of disease and malnutrition, particularly affecting infants, young children, elderly and the sick. Meat is a rich source of various nutrients and is one of the highly perishable food items. Hence, it is highly susceptible to microbial contamination that results in food borne illness among consumers. Microbial contamination also causes spoilage of meat. This can result in quality deterioration with resultant quantity and economic losses in addition to and public health concerns (Komba *et al.* 2012). The types and extent of microbial contamination depend on the extent to which sanitation procedures and hygienic practices are adopted during meat handling, storage, distribution and processing (Ercolini *et al.* 2006; Adu-Gyamfi *et al.*, 2012). Failure to adopt good sanitation and hygiene practices such as washing of hands, wearing of protective clothing, cleaning and sanitization of butchery equipment and utensils, transportation of meat in clean containers and storage of meat at appropriately low temperatures can lead to microbial contamination, meat quality deterioration and post-harvest meat losses (Bogere and Baluka., 2014). Moreover, during slaughter, meat and poultry carcasses can become contaminated if they are exposed to even small amounts of intestinal contents. A lack of awareness and the conventional practices followed in processing, handling, and marketing reflect the poor quality of meat. Poor meat hygiene and sanitation may lead to increased risk of food borne illness upon consumption (Gurmu *et al.*, 2013). In many developing countries the fresh meat is primarily distributed through markets or small or medium meat stalls where the hygiene is the least concern. Along with the above issues, knowledge of meat handlers and butchery workers about such hygienic precautions is very poor due to which public are suffering because of the parlous state of meat consumed (Gurmu *et al.*, 2013). Due to sluggishness of the concerned authority on licensing, inspection,

supervision etc., the hygiene and sanitation status is in a poor condition in Assam. Although there are laws and legislation governing the operations of abattoirs in India, awareness among the butchers with regard to meat hygiene and personal hygiene are far from the desired state of affairs. It was in this context that the present study to assess the personal hygienic practices adopted by butchers, as well as their way of handling and processing meat, perception about maintenance of meat hygiene in the poultry meat stalls of the Municipality areas of Dhubri and Biswanath Charilali (Assam state, India) was carried out.

### Materials and methods

The study was conducted in Dhubri and Biswanath Chariali Municipality areas of Dhubri and Biawanath districts of Assam, respectively. Thirty poultry butchers were selected randomly from each municipality area, thus a total of sixty poultry butchers were selected for this study. Before the study, a series of discussions were held with scientists, extension educationists and extension functionaries to develop the interview schedule. After developing the interview schedule draft, it was pre-tested among five butchers in each municipality area to assess the relevancy. Finally, it was mailed to five different experts (judges) of College of Veterinary Science, AAU, Khanapara, who were specialized in this field. After getting response from the experts, certain modifications were made in the interview schedule to make it for final use. Thus, a structured interview schedule was developed containing all relevant information on social profile of the butcher, their experience in butchering, location and structure of shop, license details, awareness towards the personal hygiene, meat borne diseases and meat hygiene. In addition, maintenance of shop and its equipment, the level of personal and meat hygiene maintained during selling of meat, disposal of the poultry wastes and drainage facilities availability were also recorded. The data were collected during the month of June to September, 2021 by personal interviews with poultry butchers. Some of the data were also recorded while visiting the poultry butchers by observation and discussion. The data so collected were coded, classified, tabulated

**Table 1.** Distribution of respondents based on their socio-economic profile

Parameters	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Sex	Male	30	30	60 (100.00)
	Female	0	0	0 (0.00)
Education	Illiterate	2	0	2 (3.33)
	Up to 5 <sup>th</sup> Std.	7	6	13 (21.67)
	6 <sup>th</sup> to 8 <sup>th</sup> Std.	18	12	30 (50.00)
	9 <sup>th</sup> to 12 <sup>th</sup> Std.	3	9	12 (20.00)
	Above 12 <sup>th</sup> Std.	0	3	3 (5.00)
Age (Years)	Young (<30)	6	3	9 (15.00)
	Middle (30-50)	21	24	45 (75.00)
	Old (>50)	3	3	6 (10.00)
	Mean $\pm$ SD	38.93 $\pm$ 8.92	40.97 $\pm$ 8.37	39.95 $\pm$ 8.64
Experience as a poultry butcher (Years)	Low (Up to 5)	6	6	12 (20.00)
	Medium (6 to 10)	11	18	29 (48.33)
	High (Above 10)	13	6	19 (31.67)
	Mean $\pm$ SD	9.63 $\pm$ 4.10	8.2 $\pm$ 3.60	8.92 $\pm$ 3.88
Any other occupation	Yes	0	2	2 (3.33)
	No	30	28	58 (96.67)
Training attended in meat hygiene	Yes	0	0	0 (0.00)
	No	30	30	60 (100.00)
Do you possess a trade license for a butcher	Yes	20	22	42 (70.00)
	No	10	8	18 (30.00)

and analyzed using the software; Statistical Package for the Social Science (SPSS 16.0). The presentation of data was done to give pertinent, valid and reliable answer to the specific objectives. Frequencies, percentage, mean and standard deviation were worked out for meaningful interpretation.

## Results and discussion

### ***Socio-economic profile of poultry meat butcher***

It was found that all poultry butchers were male in both Dhubri and Biswanath Chariali Municipality areas, which might be due to male dominated society in the study areas. Gutema *et al.* (2021) also observed that all meat handlers in beef cattle slaughterhouses and retail shops in Bishoftu, Ethiopia were male. Education plays an important role in motivating people towards adopt practices related to cleanliness and hygiene in their day-to-day activities. In the present study the education of majority of the respondents (75%) was only up to eight standard, which indicated that education level of the respondents was very poor (Table 1).

The poor educational status of the respondents might be one of reasons for poor knowledge of butchers on proper handling of meat and personal hygiene. Hence proper training on meat handling could improve knowledge about sanitation and hygiene during meat handling. Afnabi *et al.* (2014) indicated that employees with basic level (at least a primary) of education had a good concept of hygiene practices, while bad practices were attributed to illiterate ones. The overall mean age of the poultry butchers was found to be 39.95 $\pm$ 8.64 years of which majority (75%) of them belonged to middle age group (Table 1). The overall mean age recorded in the present study indicated that the people who were more energetic and who were the most responsible member of the family engaged in poultry butchering. Salifu and Teye (2006) also reported that butcher operations were quite energy demanding and might involve a lot of travelling to livestock markets. Hence the older men were unable to cope. The overall mean years of experience that the respondents in poultry butchering was recorded as 8.92 $\pm$ 3.88 years among whom almost half of the (48.33%) of the butchers had

**Table 2.** Distribution of respondents based on location and structure of the poultry meat shop

Parameters	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Location of the shop	Residential area	4	5	9 (15.00)
	Market area	26	25	51 (85.00)
Structure of the shop	Open (Table with big umbrella)	19	14	33 (55.00)
	Temporary shed with Tarpaulin roof	6	7	13 (21.67)
	Permanent shed inside the market yard	5	9	14 (23.33)
<b>Other facilities</b>				
Had potable water	Yes	8	11	19 (31.67)
	No	22	19	41 (68.33)
Had soap	Yes	7	10	17 (28.33)
	No	23	20	43 (71.67)
Had detergents	Yes	6	3	9 (15.00)
	No	24	27	51 (85.00)
Had disinfectant	Yes	8	12	20 (33.33)
	No	22	18	40 (66.67)
Had adequate lighting	Yes	28	26	54 (90.00)
	No	2	4	6 (10.00)
Had glass cabinet to display carcasses	Yes	2	9	11 (18.33)
	No	28	21	49 (81.67)
Had dustbins for storing wastes	Yes	19	27	46 (76.67)
	No	11	3	14 (23.33)

medium level (6 to 10 years) of experience and slightly less than one third (31.67%) of them had more than 10 years of experience (Table 1). Along with the educational status, experience will also make one more skillful to perform the work more precisely. Reddy *et al.* (2019) also found that in addition to educational status, experience would also reflect the judgment levels of the butchers in understanding the measures that need to be taken. Majority of the respondents had no other occupation except being engaged as poultry butcher, which indicated that this vocation provided them with a secure means of livelihood. Although training is a basic requirement for the personnel working in slaughter house and meat retail shop, the results of the present study indicated that none of the poultry butchers had undergone any formal training in hygienic meat handling. Earlier studies also indicated that considerable proportions of meat processing employees and meat retail shop employees did not receive any basic training on hygienic handling of meat (Haileselassie *et al.*, 2013; Wassie *et al.*, 2017).

The poultry butchers should be trained on food safety issues. The Food and Agriculture Organization (FAO) also recommends the provision of food safety training to food handlers as an important intervention to improve their knowledge and skills (FAO, 2019). Majority (70%) of the poultry butchers had trade license issued from respective Municipal Board, while the rest (30%) did not have any license for engaging in this vocation and this was a major cause of concern.

#### **Location, structure and facilities available in poultry meat butcheries**

The present study revealed that most (85%) of the butcheries were located at market areas, while only a few (15%) were found in residential areas (Table 2). Reddy *et al.* (2019) also opined that majority of the butcheries were located in the market area in YSR Kadapa district of Andhra Pradesh. Majority (55%) of the butcheries in this study were open and did not possess a roof. The butcheries studied did not possess the required shelter provisions and were in most cases just a table, meat cutting slab

**Table 3.** Distribution of respondents based on their personal hygiene at the meat shop

Attributes	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Wore clean cloth	Yes	3	8	11 (18.33)
	No	27	22	49 (81.67)
Wore face mask/Head gear/ Hand Gloves/Aprons	Yes	2	5	7 (11.67)
	No	28	25	53 (88.33)
Wore rings	Yes	7	11	18 (30.00)
	No	23	19	42 (70.00)
Washed hands before and after meat handling	Yes	9	12	21 (35.00)
	No	21	18	39 (65.00)
Washed hands after nose blowing	Yes	12	18	30 (50.00)
	No	18	12	30 (50.00)
Washed hands after smoking, chewing tobacco etc.	Yes	3	4	7 (11.67)
	No	27	26	53 (88.33)
Washed hands after visiting toilet	Yes	26	28	54 (90.00)
	No	4	2	6 (10.00)
Washed of hands after handling of money	Yes	1	0	1 (1.67)
	No	29	30	59 (98.33)
Washed hands after touching bins or other objects	Yes	2	3	5 (8.33)
	No	28	27	55 (91.67)
Spitting while working	Yes	19	21	40 (66.67)
	No	11	9	20 (33.33)
Butcher had open cuts on the hands	Yes	3	4	7 (11.67)
	No	27	26	53 (88.33)

etc. and were seldom covered by a temporary umbrella. The results of this study also indicated that 21.67 and 23.33 per cent of the butcheries studied had a temporary shed structure with a tarpaulin roof and permanent shed structure inside the market yard respectively. The present study indicated that none of the poultry meat butcheries had the requisite organized building structures. According to Food Standard and Safety Authority of India (FSSAI) (2018), the floor of butcheries should be hard, impervious and washable, non-slippery and made of non-toxic materials, without crevices and should be easy to clean and sufficient slope to allow adequate drainage. Similarly, walls should be made of impervious materials, smooth and without crevices for easy cleaning and sanitation and to avoid accumulation/absorption of dust, blood/meat particles, and microbial/fungal growth. In absence of organized building structures, meat for sale at the butcheries were displayed openly without any protective covering and were thus exposed to dust particles and domestic flies posing the risk of every chance of microbial contamination led to spoilage of meat. The unorganized structures

of the poultry meat butcheries might be due to lack of awareness of the butchers. The FSSAI is the supreme authority, which is responsible for regulating and supervising the food safety. So, it is mandatory to take FSSAI license as per the law. Most (68.33%) of the butcheries did not have potable water. Only 28.33 per cent of the butcheries had a provision for soap while in the rest (71.67%) soap was not made available for the use of butchers (Table 2). Tuneer and Madhavi (2015) revealed that majority of the butchers used only water for the purpose of washing, while only a few of them used soap with water. They further observed that most of the butchers used the same water for the whole day continuously for washing and processing purposes. They also reported that none of the workers in slaughterhouses wore aprons nor covered their hairs. Similarly, in the present study only 15 per cent of the butcheries had detergents while majority (85%) of the butcheries had no detergents for washing of equipment. Two-third of the butcheries had no disinfectants. This indicated that most of the butcheries were in unhygienic conditions, which might be due to lack of awareness of

**Table 4.** Distribution of respondents based on meat shop hygiene and maintenance of equipment

Attributes	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Means to control flies and mosquitoes	Yes	7	11	18(30.00)
	No	23	19	42 (70.00)
Disposal of wastes	Nearby open space	19	20	39 (65.00)
	Municipal sewer	11	10	21 (35.00)
	Soak pit	0	0	0 (0.00)
Presence of stray animals, wild birds etc.	Yes	28	27	55 (91.67)
	No	2	3	5 (8.33)
Had clean and rust-free knives	Yes	26	27	53 (88.33)
	No	4	3	7 (11.67)
Had clean cutting slab	Yes	17	20	37 (61.67)
	No	13	10	23 (38.33)
Had clean cage	Yes	6	10	16 (26.67)
	No	24	20	44 (73.33)
Washing of knives before and after cutting of meat	Yes	4	3	7 (11.67)
	No	26	27	53 (88.33)
Used soap and clean water to wash equipment	Yes	5	7	12 (20.00)
	No	25	23	48 (80.00)
Had clean surrounding	Yes	8	10	18 (30.00)
	No	22	20	42 (70.00)

**Table 5.** Distribution of respondents based on the slaughtering practices

Attributes	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Slaughter method	Halal method	25	4	29 (48.33)
	Stunning method	5	26	31 (51.67)
Ensured complete drainage of blood from the carcass	Yes	9	2	11 (18.33)
	No	21	28	49 (81.67)
Blood was collected to prevent environmental pollution	Yes	2	1	3 (5.00)
	No	28	29	57 (95.00)
Blood was spread over the carcass	Yes	29	30	59 (98.33)
	No	1	0	1 (1.67)
Washed carcass before and after evisceration	Yes	10	5	15 (25.00)
	No	20	25	45 (75.00)
Removed viscera immediately after killing the bird	Yes	7	8	15 (25.00)
	No	23	22	45 (75.00)

the respondents. Majority (90%) of the poultry meat shops had adequate lighting facility (Table 2). Displaying carcasses under open sky might expose to dust resulting in deterioration of meat quality. Most (76.67%) of the shops were equipped with waste bins to store wastes before being permanently disposed off.

#### **Personal hygiene of poultry meat butchers**

Only 18.33 per cent of the poultry butchers wore clean cloth while 81.67 per cent of did not wear clean cloth during their job in

the study areas (Table 3). Majority (88.33%) of the respondents did not wear protective clothes (face mask, head gear, hand gloves and aprons), and only a few (11.67%) of them wore such protective clothes. Wearing clean clothes and other protective clothes could be the good practices at personal level to produce superior quality meat.

The use of gloves by butchers is a significant hygienic measure that could protect the meat against contamination (Alhaji and

**Table 6.** Perception of butchers regarding maintenance of meat hygiene

Attributes	Category	Dhubri (n=30)	Biswanath (n=30)	Total (n=60)
Selection of healthy birds is important for hygienic meat production	Yes	26	27	53 (88.33)
	No	4	3	7 (11.67)
Cleanliness of the equipment is important for hygienic meat production	Yes	24	19	43 (71.67)
	No	6	11	17 (28.33)
Cleanliness of the meat shop and surrounding is important for hygienic meat production	Yes	20	21	41 (68.33)
	No	10	9	19 (31.67)
Personal hygiene is important for hygienic meat production	Yes	19	22	41 (68.33)
	No	11	8	19 (31.67)
Aware of the diseases that are transmitted through butchering or eating meat	Yes	2	4	6 (10.00)
	No	28	26	54 (90.00)
Aware of occupational hazards/ diseases from birds	Yes	0	2	2 (3.33)
	No	30	28	58 (96.67)
Refrigerator is required to store meat to prevent spoilage	Yes	23	19	42 (70.00)
	No	7	11	18 (30.00)
Spread of blood over meat is safe for hygienic meat production	Yes	26	29	55 (91.67)
	No	4	1	5 (8.33)

Bewai, 2015). Most (70%) of the butchers did not wear rings. Almost two-third of the respondents did not wash their hands before and after meat handling, the while rest of them did so. It was also found that half of the poultry meat butchers washed their hands after blowing their noses. Majority (88.33%) of them did not wash their hands after smoking, chewing tobacco *etc.* However, 90 per cent of the respondents washed their hands after visiting the restroom. The results of the study also shed light on the fact that most (98.33%) of the respondents did not wash their hands after handling money. Majority (91.67%) of the poultry meat butchers chewed tobacco during meat handling. Spitting was a common practice among the poultry meat butchers in the present study and two-third of respondents reported resorting to spitting during meat handling. Some of the respondents had open cuts on their hands which would also pose risks to meat contamination besides placing the butcher at risks of contracting various meat borne infections. All the practices investigated in this discussion such as the handling of meat without washing hands, washing of hands before and after meat handling and after nose blowing are crucial to ensuring optimum personal hygiene among butchers and are pre-requisites for safe and wholesome meat production. Various factors such as ignorance or lack awareness among the poultry meat butchers could have

contributed to this phenomenon that places the health of consumers at risk. Appropriate intervention by the concerned authorities in this regard through trainings and motivational exercises are crucial in ensuring that the health of customers and consumers and not compromised. It is imperative that constructive action through appropriate interventions such as trainings and awareness building programmes are forthcoming in this regard. Upadhayaya and Ghimire (2020) also observed that most of the meat handlers practiced smoking, eating or drinking while handling meat. Furthermore, majority of them were found wearing jewellery during meat handling. Jewellery was a potential source of micro-organisms, because the skin under the jewellery provided a favourable habitat for contaminating microorganisms to proliferate (Trickett, 1997).

#### ***Maintenance of hygiene of meat shop and equipment***

In the present study it was found that the carcasses were displayed in the open without any protective cover and such a process could provide fertile ground for attracting mosquitoes and flies causing nuisance and compromising meat quality as well. Majority (70%) of the butcheries had no measures to control flies and mosquitoes (Table 4). Moreover, it was revealed that most of the poultry meat butchers did not

follow proper methods for waste disposal. About two-thirds of them threw poultry feathers and poultry meat shop wastes in the nearby open space, which is a major cause of concern from the public health point of view. Stray animals such as dog and wild birds like crow were very common around the poultry meat shops under study. Stray animals in the vicinity of a majority (91.67%) of the butcheries was a routine phenomenon in the present study (Table 4), all of which could be a fall out of improper waste disposal procedures followed by the butchers. Majority (88.33%) of the poultry meat shops had clean and rust-free knives for cutting meat into pieces. Likewise, 61.67 per cent of the butcheries had clean cutting slab. Only 26.67 per cent poultry meat shops had clean cage for keeping live birds. It was revealed that majority (88.33%) of the butchers did not clean knives before and after cutting of meat.

Most (80%) of the respondents did not wash equipment with soap and clean water, and they mostly used same water repeatedly to wash their equipment. The surroundings of the poultry meat butcheries in the study areas were mostly found dirty. The unhygienic surrounding of the poultry meat butcheries might be due to improper disposal of poultry waste.

#### ***Slaughtering practices of poultry meat butcheries***

Halal method of slaughtering was followed by 48.33 per cent, while 51.67 per cent of the respondents followed stunning method for slaughtering of chicken (Table 5). Most (81.67%) of the butchers did not ensure complete drainage of blood from the carcass, which might be due to lack of awareness while, only few (18.33%) ensured complete drainage of blood from the carcass. Complete drainage of blood from carcass could improve the shelf life of meat.

Majority (98.33%) of the respondents spread blood over the carcasses to apparently give an “attractive look” to the meat. However, blood smearing over carcasses could spoil meat due to microbial contamination. Majority (75%) of the butchers did not wash the carcass before and after evisceration. In most (75%) of the cases, it was observed that butchers did

not remove viscera immediately after killing the bird.

#### ***Perception of butchers about hygienic meat production***

Majority (88.33%) of the respondents believed that selection of healthy birds was important for hygienic meat production (Table 6). Majority of the butchers agreed that cleanliness of equipment (71.67%), meat shop and its surrounding (68.33%) and personal hygiene (68.33%) were some of the important factors responsible for wholesome meat production. Most (90.00%) of the respondents were not aware of the fact that diseases that were spread through the process of slaughter or through consuming meat. This might be due to lack of awareness among the butchers under present study which calls for appropriate awareness building exercises. Majority (96.67%) of the butchers were not aware of occupational hazards/ disease from birds (Table 6).

Most (70%) of the butchers studied were aware that refrigerator was required to store meat to prevent microbial spoilage. However, none of the shops could afford the cost of a refrigerator. Devaru *et al.* (2017) also found that the awareness level of the butchers on the health hazards of eating contaminated poultry meat was poor. They also reported that knowledge on the occupational hazards among butchers was low. They further revealed that the most important factors for maintaining hygiene were cleanliness of the shop and cleanliness of the equipment. Present study also revealed that personal hygiene, selection of a healthy bird and disposal of by-products were some of the other factors identified by the butchers to maintain meat hygiene. None of the poultry butchers used any protective equipment like aprons, gloves and gumboots in the present study.

#### **Conclusion**

The present study revealed that there were significant lacunae with respect to the adoption of crucial hygienic meat handling practices among the poultry meat butchers which could be instrumental in leading to higher chances of contamination and cross-



contamination of meat with serious implications for human health. The adoption of such unhygienic handling practices could serve as suitable pathways for meat borne pathogens to enter the food chain. Moreover, lack of awareness among poultry meat butchers about personal hygiene and proper meat handling would further help in multiplication of pathogens in meat. Hence the butchers should be trained properly on food safety to improve hygienic meat handling practices along the poultry supply chain. Improvement of infrastructural facilities and financial assistance in the form of subsidies for ensuring maintenance of cold chain on the meat shops along with measures to strengthen the food quality control system by the government regulatory authorities are also required to ensure that this system operates as per international and national standards. Series of awareness and training programmes should be conducted to improve the knowledge of the butchers on hygienic meat production and handling would further help to provide a pavement for the production of wholesome meat.

### Conflict of interest

The authors declare that they have no conflict of interest.

### References

- Adu-Gyamfi, A., Torgby-Tetteh, W. and Appiah, V. 2012. Microbiological quality of chicken sold in Accra and determination of D10 - value of *E. coli*. *Food Nutri. Sci.* **3** (5):693-698.
- Afnabi, R.B., Nameni, R.P., Kamdem, S.S., Ngwa, V.N. and Ngang, J.J.E. 2014. Typology of the Cameroon traditional slaughterhouses based on hygiene practices. *Adv. Animal and Vet. Sci.* **2** (8):477-478.
- Alhaji, N.B. and Baiwa, M. 2015. Factors affecting employees' delivery of good hygienic and sanitary operations in slaughterhouses in North-Central Nigeria. *Sokoto. J. Vet. Sci.* **13**: 29-37.
- Bogere, P. and Baluka, S.A. 2014. Microbiological quality of meat at the abattoir and butchery levels in Kampala City, Uganda. *Int. J. Food Safety.* **16**:29-35.
- Devaru, J.S., Raju, A. and Puttaswamy, M. 2017. A cross-sectional study on the awareness and hygienic practices among the poultry butchers in urban Bengaluru. *Int. J. Medical Sci. Public Health.* **6** (6):1028-1031.
- Ercolini, D., Russo, F., Torrieri, E., Masi, F. and Villani, F. 2006. Changes in the spoilage-related microbiota of beef during refrigerated storage under different packaging conditions. *Applied Environ. Microbiol.* **72**: 4663-4671.
- FAO. 2019. Technical guidance principles of risk-based meat inspection and their application, FAO: Rome, Italy, 2019.
- FSSAI. 2018. Guidance document Food Safety Management System (FSMS). Food industry guide to implement GMP/GHP requirements. Based on Part IV of Schedule 4 of Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011.
- Gurmu, E.B. and Gebretinsae, H. 2013. Assessment of bacteriological quality of meat cutting surfaces in selected butcher shops of Mekelle city, Ethiopia. *J. Environ. Occupational Sci.* **2** (2):61-66.
- Gutema, F.D., Agga, G.E., Abdi, R.D., Jufare, A., Duchateau, L., De Zutter, L. and Gabriël, S. 2021. Assessment of hygienic practices in beef cattle slaughter houses and retail shops in Bishoftu, Ethiopia: Implications for Public Health. *Int. J. Environ. Res. Public Health.* **18**: 2729. <https://doi.org/10.3390/ijerph18052729>.
- Haileselassie, M., Habtamu, T., Adhana, K. and Kalayou, S. 2013. Food safety knowledge and practices of abattoir and butchery shops and the microbial profile of meat in Mekelle City, Ethiopia. *Asian Pacific J. Trop. Biomed.* **3**:407-412.

- Komba, E.V.G., Komba, E.V., Mkupasi, E.M., Mbyuzi, A.O., Mshamu, S., Mzula, A. and Luwumbra, D. 2012. Sanitary practices and occurrences of zoonotic conditions in cattle at slaughter in Morogoro municipality, Tanzania; Implication for public health. *Tanzania J. Health Res.* **14** (2):1-12.
- Reddy, V.S., Sujitha, C., Maheswara, B., Reddy D and Vani S. 2019. Awareness and practices followed by the butchers in hygienic meat production chain in YSR Kadapa district of Andhra Pradesh. *The Pharma Innov. J.* **8** (10):140-145.
- Salifu, S. and Teye, G. A. 2006. The contribution of the various ruminant species to meat production in the Tamale Metropolis. The savanna farmer promoting local innovation in Northern Ghana. **7** (2):3537. The Association of Church Development Projects (ACDEP). Tamale, Ghana.
- Trickett, J. 1997. Food hygiene for food handlers, London, Macmillan Press.
- Tuneer, K. and Madhavi, T. 2015. A comparative study of hygienic status of butchers and identify bacteria among the slaughters of meat, chicken and fish markets of Jagdalpur city, Chhattisgarh, India. *Int. Res. J. Biol. Sci.* **4** (1):16-24.
- Upadhayaya, M. and Ghimire, B. 2020. Survey on Good Hygiene Practices in Retail Meat Shops in Butwal Municipality, Nepal. *Nepalese Vet. J.* **35**:110-121.
- Wassie, B., Sisay, W., Gashaw, B., Fentahun, M., Lamesgin, B. and Muluken, T. 2017. Assessment of microbiological quality and meat handling practices in butcher shops and abattoir found in Gondar Town, Ethiopia. *Int. J. Microbiol. Res.* **8**: 59–68. ■