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Hygiene Status and Meat Handling Practices in Retail Poultry Meat Shops of Nagpur City of Maharashtra

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ABSTRACT

Poultry retail meat shops are endpoints in the meat chain and can have a determinant role in cross-contamination control. Considering this, a total of 160 retail poultry meat shops in and around Nagpur city of Maharashtra state were assessed for hygienic status and meat handling practices. Meat handlers from poultry meat shops were interviewed through a structural questionnaire. It was found that 83.7% of meat shops had no provision of separate docks for edible and inedible products. In terms of design and facilities, only 27.5% of shops had the facility of flyproof windows. 80.6% of meat shop workers lack training in handling meat and equipment. It was observed that about 83.1% of meat shop workers do not wash their hands properly before entering and leaving the meat shop. About 25% of meat shops do not have any arrangement for the disposal of waste material. Considering the findings to improve the hygienic status and reduce transmission of diseases due to consuming contaminated meat, regular surveillance of poultry meat shops and formal training of butchers are necessary.

Key words: Hygiene status, Retail poultry meat shop, Butchers, Practices, Facilities

INTRODUCTION

Poultry is one of India's fastest-growing segments of the agricultural sector. In India, crop production is growing at 1.5-2% per year, while egg and poultry production is growing at 8-10% per year, gaining the status of the world's eighth-largest producer of broilers. Poultry meat is the fastest-growing component of global meat demand, and India, the world's second-largest developing country, is experiencing rapid growth in its poultry sector (APEDA 2021). The Indian poultry sector today contributes 1.2 lakh crore to India's Gross Domestic Product (GDP) and is one of the significant agriculture sectors providing employment and livelihoods, which produces 25 crore eggs and 1.3 crore birds per day (Sharma, 2020). Poultry meat is the first preferred meat in India, with almost 50 percent (4.06 MMT) of the total meat production in the country (8.11 MMT), followed by buffalo meat (1.54 MMT) and goat (1.09 MMT) during 2019 (GOI 2019).

Chicken is an excellent source of low-fat, high-biological-value animal protein containing all the essential amino acids and unsaturated fatty acids required in the human diet (Takma and Korel, 2019). Although meat is an essential food item, its production and handling sys-

tems have not received the same social recognition and attention as other food industries in India. Retail meat stalls are the shops where meat and edible offals are sold to consumers. It is the terminal end of marketing in the meat trade. The consumer prefers freshly slaughtered chicken in local meat retail shops or butcher shops. In India, meat is mainly marketed as fresh, hot carcass meat through retail shops along with edible offals like liver, heart, kidney, carcass fat, etc.

Diseases originating from animals can spread to humans through indirect environmental contact, direct contact, and/or food consumption (Chlebicz and Sli ˙ Zewska 2018). Several pathogenic microorganisms, such as Salmonella spp., Campylobacter spp., Staphylococcus aureus, Escherichia coli, and Listeria spp., have been found to contaminate poultry (Bhaisare et al. 2014). Different types of microorganisms can contaminate during operations at meat-processing plants (Maharjan, 2019). Contamination can occur during processing, contact with the facility's equipment (e.g., grinders, belts, and saws), contact with food handlers (e.g., hand contact and knives), and exposure to other environmental (e.g., air and water) sources (Kim and Yim, 2016). Many pathogens such as Escherichia coli, Salmonella spp., Listeria monocytogenes, and Staphylococcus aureus have been previously detected worldwide in different types of raw meat products collected from retail markets in India (Sharma et al. 2019).

In many developing countries, fresh meat is primarily distributed through markets or small or medium meat stalls where hygiene is the minor concern and the measures such as licensing, inspection, and supervision are not routine, which makes the hygiene and sanitation status underprivileged. 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 the risk of foodborne illness upon consumption (Gurmu et al. 2013). Several factors, like poor food handling, inappropriate food safety laws, poor regulatory systems, and lack of awareness among butchers and consumers, are other factors that degrade the meat quality in developing countries (Guo et al. 2017). It is also essential to consider the sanitary conditions of meat production and distribution, and this information will assist in designing preventive strategies and control measures. It also serves as baseline data for related research. With the above motives, the objective of this study was to evaluate the status of infrastructure and design facilities, water availability, cleaning and sanitation, personal hygiene, and waste disposal of retail poultry meat shops in Nagpur city of Maharashtra state.

MATERIALS AND METHODS

The study was conducted in Nagpur, the sub-capital city of Maharashtra, India. The town lies on the Deccan Plateau of the Indian subcontinent and has a mean altitude of 310.5 meters above sea level. As of the 2011 census, Nagpur City had a population of 2,405,665 and is the third largest city and the winter capital of Maharashtra as well as an important economic and political center of the Vidarbha region of Maharashtra.

Sample Collection

A total of 160 retail meat shops, 40 from each zone i.e. East, West. North and South zones of Nagpur were selected for the study.

Questionnaire survey

The questionnaire is what the researcher used during the survey. It includes both positive and negative observations. The questionnaire having 25 variables, was distributed among the selected butchers.

Data collection

After explaining the purpose of the study and verbal consent from the retail meat shop owner for using the data for research, a personal interview of the owner/ butcher of the retail meat shop was conducted. The questionnaire includes details about retail meat shop infrastructure and design facilities, cleaning and sanitation, water availability and waste disposal. Photography, interviews, visual observations, and questionnaires were the primary data collection tools.

Statistical Analysis

The data obtained through survey forms were recorded, tabulated, and analysed statistically using IBM Statistical Package for Social Science (SPSS) version 28 and Microsoft Excel. The responses were grouped and presented in the form of frequencies and percentages.

RESULTS AND DISCUSSION

Infrastructure Facilities

Meat has been identified as a significant source of foodborne disease in humans; however, butchers and meat

handlers are unaware of various health hazards due to inadequate infrastructure & sanitary practices (Tagar and Ahmed 2021; Waghmare et al. 2021). The average slaughter of 25-50 birds was observed in 45.6 percent of poultry meat shops, as shown in table 1. The results are well supported by Waghmare et al. (2022), who reported the average slaughter of 50 birds per day in 40.68 percent of retail shops in Maharashtra. It was observed that the floors, walls, and ceilings of 56.2% of poultry retail meat shops were properly plastered with impervious material and only 51.2% of the shops had properly plastered external walls which were free from crevices, holes and dampness. It was also observed that 48.1% of retail meat shops do not have provisions for killing/knocking boxes forcing the butchers to slaughter poultry birds openly.

In the present study, it has been found that only 16.2% of retail poultry meat shops have separate docks for edible and inedible products which is well supported by the findings of Tagar and Ahmed (2021) and Haileselassie et al. (2013) who reported no segregation between clean and waste material in most shops. This fact is also supported by the results of the present finding where there is a gap in the awareness of the butcher shop workers on handling meat and maintaining basic hygienic facilities in their working area.

Table 1. Infrastructure details retail poultry meat shop in Nagpur city

Sr.no	Observation	Options	N (160)	%	'P' Value
1.	Number of poultry birds Slaughtered per day	10-25 25-50 50-100 >100	24 73 41 22	15 45.6 25.6 13.7	<0.05
2.	External walls are properly plastered and free crevices, holes and dampness	Yes No	82 78	51.2 48.7	<0.05
3.	Separate docks for edible and inedible products are provided	Yes No	26 134	16.2 83.7	>0.05
4.	Walls and ceilings are properly white washed/tiled etc.	Yes No	88 72	55 45	<0.001
5.	Floors, walls and ceilings Properly plastered with impervious material	Yes No	90 70	56.2 43.7	<0.01
6.	Provision for killing/ knocking box exists	Yes No	83 77	51.8 48.1	<0.001

Design and facilities

In the present study, 27.5% of the poultry meat shops used fly-proof windows. Jyoti et al. (2019) reported that 44.44% of the meat shop in Guwahati city used glass windows to prevent flies. In the present study, 30.6 % of poultry meat shops provided with exhaust fans and covers with nets to prevent the entering of dust, flies etc. Tagar and Ahmed (2021) also reported that 38% of meat shops had adequate ventilation. So it shows poor ventilation in 70% of poultry meat shops and indicates poor meat quality as the air gets trapped inside and can host pathogens (Bhandare et al. 2007; Omoruyi et al. 2011). Only 13.1 % of poultry meat shops have good foot operated/hands-free faucets with hot and cold water supply with soap. These results were in agreement with Chepkemoi et al. (2015), who reported that 27% and 30% of the butcheries in Nairobi County used cold water with soap or hot water with soap, respectively, during cleaning, while only 4% and 7% of the butcheries in Isiolo County used cold water with soap or hot water with soap, respectively. This observation reflects poor awareness of personal hygiene.

The data indicated that 90.6% of retail poultry meat shops lack good holding areas for poultry which were in agreement with Upadhayaya and Ghimire (2018), who also reported that about 96.84% lack lairage facilities, indicating a poor hygienic environment in the Butwal District of Nepal. Using separate or marked equipment, utensils, and trollies for inedible/waste material will reduce contamination and help provide quality meat. But it has been observed that 84.3% of poultry meat shop equipment, utensils, and trollies used for inedible/waste material are also not properly marked and used for edible meat.

Water supply & Treatment

Clean and potable water is essential for the proper functioning of any slaughterhouse. It must be easily accessible during slaughter to clean and wash slaughtering equipment and workers' hands with adequate disinfection (CDC, 2003). In the present study, it has been found that 90.6% of meat shops have water supply availability which agreed with Upadhayaya and Ghimire (2018) who also reported water availability at 94.74% of meat shops in the Butwal district of Nepal. Similarly, 74.3% of poultry meat shops under study show facilities for washing poultry birds and drinking water. But it was found that only 8.1% of poultry meat shop's water is regularly treated for potability. Reddy et al. (2019) also reported adequate availability of potable drinking water (86.53%) in most butcher shops in the Kadapa district but can be prospected for bacteriological studies to evaluate the contamination levels.

Table 2. Design and facilities in a retail poultry meat shop in Nagpur city

Sr. no	Observation	Options	N (160)	%	'P' Value
1.	Windows are fly proofs	Yes	44	27.5	>0.05
		No	116	72.5	
2.	Adequate lighting arrangement provided in the working area	Yes	145	90.6	>0.05
		No	15	9.3	
3.	Adequate foot operated/hands free faucets with hot and cold water supply provided with soap	Yes	21	13.1	>0.05
		No	139	86.8	
4.	Equipment, utensils, trollies used for inedible/waste material are properly marked so that they are not used for edible meat	Yes	25	15.6	<0.05
		No	135	84.3	
5.	Proper unloading dock/holding area for poultry	Yes	15	9.3	<0.05
		No	145	90.6	
6.	Exhaust fans were provided and covered with nets to prevent entering of dust, files etc.	Yes	49	30.6	>0.05
		No	111	69.3	

Table 3. Water supply and treatment in a retail poultry meat shop in Nagpur city

Sr. no	Observation	Options	N (160)	%	'P' Value
1.	Quantity of water used per day (Litres/day)	0-50	04	2.5	
		50-100	29	18.1	<0.05
		100-200	71	44.4	
		200-500	56	35	
2.	Water supply availability in meat shop	Yes	145	90.6	>0.05
		No	15	9.4	
3.	Facility for washing poultry birds and drinking water	Yes	119	74.3	<0.05
		No	41	25.6	
4.	If water is treated regularly for its portability	Yes	13	8.1	<0.05
		No	147	91.9	

Sanitation and Personal hygiene

Maintaining proper hygiene and sanitation conditions in any slaughterhouse is also essential because most of these facilities are located within the community and can easily affect the residents' health (Devaru et al. 2017). It was observed that only 28.1% of poultry meat shops had washrooms. Nevertheless, 73.7% of poultry meat shops did not provide antiseptic/disinfectant wash as a measure of hygiene. Reddy et al.(2019) reported that only 69.23% and 52.88% of butcher shops in the Kadapa district maintain detergents and disinfectants, respectively, which may reflect the risk of contamination due to higher microbial loads because of unhygienic practices followed in most retail meat shops (Parvin et al. 2017). The above observations should be regarded as the most common cause of contamination which may lead to public health issues.

Careful and frequent hand washing will do much to reduce contamination (Getie et al. 2019). In the present study, 65.6% of poultry meat shops have the provision of water, soap and towels. But only 16.9% of poultry meat shop workers/ butchers wash their hands before entering and leaving. Therefore, hand-washing facilities must be available in meat-cutting areas and workers should be aware of washing their hands before and after meat handling.

Training of meat handlers about the basic concept and requirements of personal hygiene and its environment plays an integral part in safeguarding the safety of products for consumers (Ntanga, 2013). It was found that regular training (Fig. 1) is being given to 19.3%of workers and supervisors on handling meat and equipment. About 80.6 percent of meat handlers had not undergone formal training in meat hygiene and handling practices. The results were in agreement with Upadhayaya and Ghimire (2018) and Waghmare et al. (2022), who reported that 82.45 percent of meat handlers in the Butwal district of Nepal and 77.12 percent of the respondents in

Table 4. Sanitation & personal hygiene in retail poultry meat shop in Nagpur city

Sr. no	Observation	Options	N (160)	%	'P' Value
1.	Washroom provided	Yes	45	28.1	>0.05
		No	115	71.8	
2.	Provision for water, soap, towels etc.	Yes	105	65.6	>0.05
		No	55	34.3	
3.	Antiseptic/disinfectant wash is provided	Yes	42	26.2	<0.05
		No	118	73.7	
4.	Before entering and leaving a worker washes his/her hands properly	Yes	27	16.9	>0.05
		No	133	83.1	
5.	Processing area free from cow webs and spiders	Yes	132	82.5	>0.05
		No	28	17.5	
6.	Regular training is being given to the workers and supervisors on the handling of meat and equipment.	Yes	31	19.3	>0.05
		No	129	80.6	
7.	Information about smoking, stewing and spitting in the the processing area is prohibited	Yes	27	16.8	>0.05
		No	133	83.1	

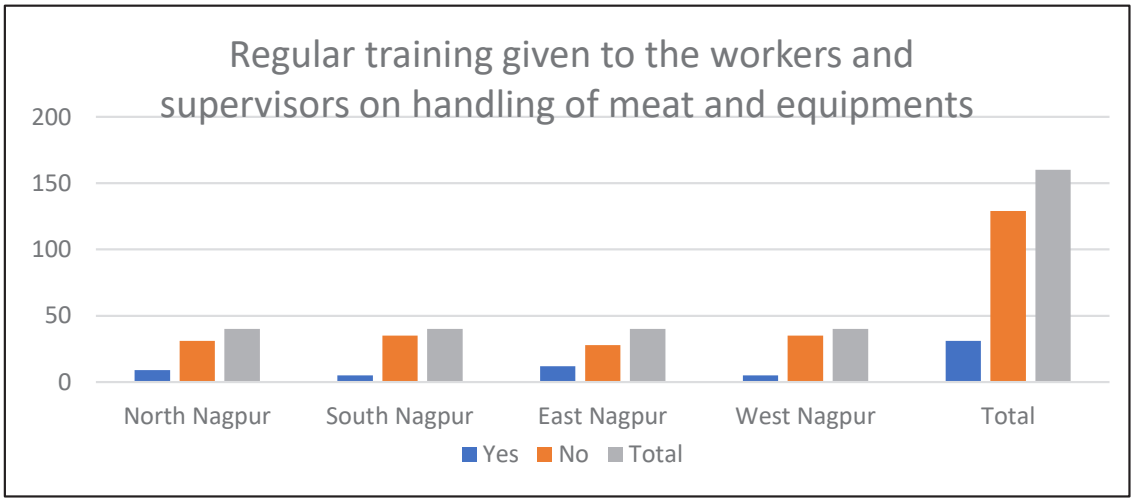

Fig. 1: Training of workers and supervisors in Nagpur city

Maharashtra had not acquired any training regarding meat processing and hygiene, respectively. Moreover, butchers are traditionally trained by fathers (40.38%) and relatives (44.23%), and very few (8.17%) are trained by local vets (Reddy et al.2019). The results indicated no personal and general hygiene measures in place. Hence, more effective training in personal and general hygiene practices is needed.

Waste disposal

It has been found that 31.2% of the poultry meat shops had permanently installed underground drainage systems. About 75% of poultry meat shops have arrangements for the disposal of waste material.Most meat shop retailers sell the by-products generated during the hot processing of live poultry birds to be sold to the fish farmers as fish feed ingredients. Waghmare et al. (2022) found that 61.02% of butcher shops utilized local body facilities to dispose of slaughter waste. Upadhyaya and Ghimire (2018) reported the non-availability of a waste disposal system for 22.11% of meat shops in the Butwal district of Nepal, which might result in the pile-up of paunch contents, other solid wastes, and faeces near the meat shops, serving as the habitation for rodents, cats, and dogs. The meat processing industry's waste disposal may pose environmental protection and sustainability problems.

Table 5. Waste disposal in a retail poultry meat shop in Nagpur city

Sr. no	Observation	Options	N (160)	%	'P' Value
1.	Condition of drainage system whether open or permanently installed underground	Open Underground	110 50	68.7 31.2	<0.001
2.	Arrangement for disposal of waste material is present	Yes No	120 40	75.0 25.0	<0.01

CONCLUSION

Most poultry meat shops in Nagpur city did not adhere to sanitation and hygiene standards, and meat handlers were unaware of various health hazards due to inadequate infrastructure, facilities & sanitary practices. However, few modern poultry meat shops maintain optimum sanitation and hygienic practices. The results of this study indicate the need for adequate training for meat handlers regarding the basic concepts and requirements of personal and general hygiene practices. Regular monitoring and strict vigilance of poultry meat shops from regulatory bodies are also needed. Nevertheless, the scientific community should join regulatory authorities to spread awareness about hygiene principles important for producing clean meat and protecting consumers' health.

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COMPETING INTERESTS

The authors do not have any competing interests among themselves or others related to this research work.

ETHICS STATEMENT

Not applicable

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