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Hygiene Rating of Retail Poultry Meat Shops in Nagpur

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ABSTRACT

With the rapidly increasing growth in meat production and consumption, hygiene aspects have become a significant concern in India. Consumers are at risk of various health problems due to substandard facilities and unhygienic practices at poultry meat shops. The current study aims to assess hygienic conditions and meat handling practices at retail poultry meat shops by using a hygiene rating scheme. A survey-based study was conducted among 160 retail poultry meat shops in Nagpur to assess sanitary status. A hygiene rating assessment checklist from the Food Safety and Standard Authority of India (FSSAI) was used for interviews, which contained various domains of design & facilities, control of the operation, maintenance and sanitation, personal hygiene, training, and record keeping. Each of the domains was scored as per replies of respondents and personal observations. The study indicated that 56.3 percent of poultry meat shops in Nagpur need improvement with B grade hygiene rating, while 26.9 percent of poultry meat shops show non-compliance with C grade hygiene rating. Results show that regular monitoring and formal training of meat handlers is necessary to improve knowledge of hygienic practices of meat handlers and sanitary levels of poultry meat shops.

HIGHLIGHTS

- The hygiene status of poultry meat shops has become a significant concern in major cities in India.
- Need for improvement in most poultry meat shops regarding facilities.
- The study was conducted to assess hygienic conditions and meat handling practices at retail poultry meat shops by using a hygiene rating scheme.

Keywords: Facilities, Hygiene rating, Meat handlers, Poultry meat shop, Sanitary status

As per the current scenario, India hosts 535.8 million livestock population and 851.8 million poultry, indicating that there is a 4.64 percent increase in livestock and a 16.8 percent increase in poultry population compared to the previous census (Panda *et al.,* 2022). In the year 2018-19, India produced a total of 8.11 MT of meat. The meat and poultry sector contributed ₹ 2,51,384.0 crore, which is 24.08% of the total livestock sector output (BAHS, 2019). The Indian poultry sector today contributes 1.2 lakh crore to India's Gross Domestic Product (GDP) and is one of the major sectors in agriculture, providing employment and livelihoods, which produces 25 crore eggs and 1.3 crore birds per day (Kumar *et al.,* 2020). It is estimated that during the calendar year of 2019, about 3.8 million tonnes of poultry meat were consumed in the country, which is valued at about ₹ 85,000 crores in terms of retail price (Biswal *et al.,* 2020). The average meat consumption in the world is 35 kg/capita/annum, while in India, it is 5.2 kg/capita/annum (OECD-FAO, 2021). Meat constitutes the major portion of Indian non-vegetarian meals and always signifies a symbol of prestige, but its availability in India is only about 15 g/person/day against the ICMR recommendation of 30 g/person/day (Islam *et al.,* 2016).

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Retail meat outlets are endpoints in the meat chain, and they can have a determinant role in cross-contamination control (Santos *et al.,* 2017). The traditional methods of handling, processing, and marketing meat undermine-meat quality. There is also a risk of food-borne illnesses from meat consumption due to poor sanitation and hygiene. Retail meat workers are the largest contamination source, and the workers who do not follow sanitary practices contaminate the meat while handling it, which results in spoilage due to microorganisms (Joyti *et al.,* 2019). Poultry meat can be contaminated by different types of microorganisms during operations at the meat processing plant. Contamination can occur during processing, contact with equipment, contact with food handlers (e.g., hand contact and knives), and exposure to other environmental (e.g., air and water) sources (Wardhana *et al.,* 2021). Contamination from these sources may also include pathogens such as *Salmonella*, *Escherichia coli* and *Listeria* species which could cause severe health problems for consumers. Meat has been identified as a major source of food-borne disease in humans; however, butchers and meat handlers are unaware of various health hazards occurring due to inadequate infrastructure & sanitary practices (Tagar and Ahmed, 2021). Therefore it is also crucial to address the hygienic status of meat production and distribution, as such information will be beneficial in designing any 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 design and facilities, control of the operation, maintenance & sanitation, personal hygiene, training and record keeping and waste disposal of retail poultry meat shops in Nagpur city, Maharashtra state of India.

MATERIALS AND METHODS

The study was conducted in Nagpur, the sub-capital city of Maharashtra state, India. For the study, Nagpur city was divided into four zones, and quota sampling was conducted to have a sample size of 160 retail poultry meat shops. Meat shops were selected by proportionate random sampling method, and among 160 retail meat shops, 40 shops each were selected from each zone i.e. East, West, North, and South of Nagpur city. The study was conducted from September 2021 to February 2022. A hygiene rating assessment checklist was used for the survey through personal dialogues with the respondents. A hygiene rating scheme is a certification system for food service and retail establishments providing food directly to consumers. A hygiene rating was scored based on a self-assessment checklist for compliance with food hygiene and safety procedures and standard requirements, followed by the verification of the hygiene rating by physical inspection. A questionnaire based on a hygiene rating assessment checklist of the food hygiene and safety requirement stated in schedule 4 of the food safety and standards (Licensing and Registration of Food Businesses) Regulation, 2011 issued for the study. Each of the domains consists of specific observations, and each of the observations was scored in a quantising from 0 to 4. The overall lowest score (below 50) is considered non-compliance, the average score (50-79) means needs improvement, and the highest score (80-90 and above) is considered compliance satisfactory/exemplary.

The questionnaire included 38 variables, which were in English. Still, during the interview, the researcher explained them in the local languages of the retail shop owner or butcher, i.e., Hindi and Marathi. The questionnaire includes details about retail meat shop infrastructure and design facilities, control of the operation, maintenance & sanitation, personal hygiene, training and record keeping, and waste disposal of retail poultry meat shop. Photography, interviews, visual observations, and questionnaires were the primary data collection tools. 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 with the owner or butcher of the retail meat shop was taken. The data obtained through survey forms were grouped and presented as frequencies and percentages.

RESULTS AND DISCUSSION

As per the Foods Safety Act 2006, Schedule IV of FSSAI, retail meat shops slaughtering birds below 50 per day must be registered with FSSAI. The registration status of poultry meat shops in Nagpur city is shown in Table 1. The study indicates that 74.4 percent of respondents had registered their shop to their local authorities like Municipal Corporation and other government agencies, (77.5%) of respondents had not registered their shop to the FSSAI. The results are in agreement with Waghmare *et al.* (2022), wherein they found that 80.51 per cent of respondents had registered their shop to their local authorities like the

Municipal Corporation and Village Panchayat, and 68.64 percent of respondents had not registered their shop with the FSSAI. Strict vigilance from FSSAI and Local bodies is necessary to control unauthorized meat businesses. FSSAI authorities need to undertake promotional activities and encourage retail poultry meat shop owners to register by organizing special campaigns.

Training and record keeping at poultry meat shops in Nagpur city is presented in Table 1. The training enables the participants to do their jobs much more agile and help them possession of new skill, knowledge and attitudes (Jaiswal *et al.,* 2019).

Table 1: Registration status, training, and record-keeping

Sl. No.	Observation	Options	Result
1	Register with Local authority/ other government agencies	Yes	119 (74.4%)
		No	41 (25.6%)
2	Register with FSSAI	Yes	36 (22.5%)
		No	124 (77.5%)
3	The personnel engaged in the meat shop shall undergo training for basic hygiene	Non-Compliance	124 (77.5%)
		Needs Improvement	29 (18.1%)
		Compliance	7 (4.4%)
4	Appropriate documentation and records are maintained	Non-Compliance	69 (43.1%)
		Needs Improvement	69 (43.1%)
		Compliance	22 (13.8%)

It was found that 95.6 percent of butchers had no formal training in basic hygiene. Similar findings were reported by Jagdish *et al.* (2017) and Khanal and Poudel (2017), who reiterated that 96.5 and 98 percent of butchers had not received formal training on butchering practices in Chitwan, Nepal, and Bangalore city, respectively. In the present study, butchers (18.1%) and supervisors have been given meat handling training other than formal training for basic hygiene. Rayees *et al.* (2017) and Tuneer and Madhavi (2015) reported that personnel engaged in the meat business lack knowledge and training regarding scientific operations in slaughterhouses. Therefore, skill development and capacity building amongst the butcher community is very essential to promote a hygienic meat business. It was found that meat handlers (77.5%) had not undergone training in basic hygiene and handling practices. The results were in agreement with Joyti *et al.* (2019) and Waghmare *et al.* (2022), who reported that respondents (77.12%) and (63.89%) had not acquired any formal training regarding meat hygiene and handling practices at meat shops in Maharashtra and Guwahati, respectively. It is recommended that butcher shop operating licenses should be issued to people undergoing basic training on meat handling hygiene and practices (Chepkemoi *et al.,* 2015).

Design and facilities, control of operations

Retail poultry meat shops are places where there is a high chance of meat contamination. Maintenance of proper hygienic practices at the shop while handling is essential to provide fresh and healthy meat for public consumption (Khanal and Poudel, 2017). The details of the design and facilities status at poultry meat shops in Nagpur city has been presented in Table 2.

Table 2: Design & facilities at a poultry meat shop in Nagpur city

Sl. No.	Observation	Options	Result N (160)
1	Located away from an environmentally polluted area	Non-Compliance	5(3.1%)
		Needs Improvement	68 (42.5%)
		Compliance	87(54.4%)
2	Premises should be of appropriate size with adequate working space 45spac	Non-Compliance	13(8.1%)
		Needs Improvement	75 (46.9%)
		Compliance	72 (45%)
3	Premises shall be such that there is a unidirectional flow of men and material to avoid cross-contamination	Non-Compliance	15 (9.4%)
		Needs Improvement	82 (51.2%)
		Compliance	63 (39.4%)
4	Internal structure & fitting are made of non-toxic, cleanable and impermeable	Non-Compliance	17 (10.6%)
		Needs Improvement	91 (56.9%)
		Compliance	52 (32.5%)
5	Floors are impervious, non-slippery, clean/ washable	Non-Compliance	12(7.5%)
		Needs Improvement	85(53.1%)
		Compliance	63(39.4%)

6	Walls are paved with imperious glazed	Non-Compliance	41(25.6%)
		Needs Improvement	61(38.1%)
		Compliance	58(36.3%)
7	Windows & other openings are free from accumulated dirt and insect-proof screen	Non-Compliance	21(13.1%)
		Needs Improvement	110(62.5%)
		Compliance	39(24.4%)
8	Doors are smooth, non-absorbent surface, close fitted	Non-Compliance	37(23.1%)
		Needs Improvement	88(55%)
		Compliance	35(21.9%)
9	Premises is well ventilated and properly lighted	Non-Compliance	3(1.9%)
		Needs Improvement	28(17.5%)
		Compliance	129(80.6%)
10	Adequate space for the handling, slaughtering/ dressing of the poultry birds	Non-Compliance	22(13.8%)
		Needs Improvement	0(0%)
		Compliance	138(86.2%)
11	The chopping block should be made of food grade synthetic material.	Non-Compliance	2(1.2%)
		Needs Improvement	72(45%)
		Compliance	86(53.8%)
12	Facility of hot and cold water for cleaning/ sanitation and sterilization of equipment and premises	Non-Compliance	3(1.9%)
		Needs Improvement	104(65%)
		Compliance	53(33.1%)
13	The premises is well equipped with chilling/ freezing equipment for keeping the poultry meat/ carcasses	Non-Compliance	110(68.7%)
		Needs Improvement	0(0%)
		Compliance	50(31.3%)

It was found that poultry meat shops (39.4%) had non-slippery, easy-to-clean/washable, and impervious floors. The present results do not agree with Upadhayaya and Ghimire (2018), who reported that wall surfaces, partitions, and floors (3.16 %) were impervious at poultry meat shops in the Butwal district of Nepal. Meat-cutting blocks are commonly used in butcher shops. In the present study, 46.3 percent of the meat wood-cutting blocks used by the poultry meat shops were in a poor hygienic condition, while Jyoti *et al.* (2019) reported that wood-cutting blocks (77.78%) present in the meat shops of Guwahati city were in poor hygienic condition. Due to the continuous use of meat wood cutting blocks for cutting meats, the surface may become absorptive in nature, providing a favorable environment for the growth and multiplication of microorganisms. Proper cleaning and washing of wood-cutting blocks with appropriate disinfectants is of the utmost importance to ensure good hygienic conditions (Jyoti *et al.* 2019).

Poultry meat shops (27.5 %) used fly-proof windows. Jyoti *et al.* (2019) reported that meat shops (44.44%) in Guwahati city used glass windows to prevent flies. As flies play important roles in the transmission of various disease-causing agents with potential for cases such as enteric infection use of glass windows or fly-proof windows to control, flies are essential. Cold storage facilities are necessary to keep the meat fresh and safe for an extended period of time. But in the present study, the poultry meat shop (68.1%) premises were not equipped with chilling/ freezing facilities. Similar observations were also made by Jyoti *et al.* (2019), Upadhayaya and Ghimire (2018), who reported the non-availability of refrigerators in 78.95 percent and 75.00 percent of butcher shops in Butwal district, Nepal, and Guwahati city, respectively.

The poultry meat shops should have separate docks for edible and inedible products. It was found that only 19.4 percent of poultry meat shops having containers used for storing inedible parts, cleaning chemicals & other hazardous substances are clearly identified and kept separately from meat or its products. The details of control of operations at the poultry meat shop in Nagpur city are depicted in Table 3.

Table 3: Control of operation in a poultry meat shop in Nagpur city

Sl. No.	Observation	Options	Result N (160)
1	The duly stamped meat /live poultry birds procured from a MNC slaughterhouse and poultry market respectively	Non-Compliance	27 (16.9%)
		Needs Improvement	0 (0%)
		Compliance	1133 (83.1%)
2	The live poultry birds or carcasses transported in appropriate temperature controlled vehicle	Non-Compliance	1 (0.6%)
		Needs Improvement	130 (81.3%)
		Compliance	29 (18.1%)
3	The temperature of the premises for dressing/ Needs Improvement minor processing is controlled	Non-Compliance	9 (5.6%)
		Needs Improvement	117(73.1%)
		Compliance	34(21.3%)

4	Area used for packing or other handling of meat is equipped with adequate facilities for cleaning	Non-Compliance Needs Improvement Compliance	11 (6.9%) 112 (70%) 37(23.1%)
5	Inedible parts, cleaning Non-Compliance chemicals are clearly identified; kept separately from meat or its products	Non-Compliance Needs Improvement Compliance	24 (15%) 105(65.6%) 31(9.4%)
6	Knives and sharpeners are made of stainless steel sanitized and sterilized before use	Non-Compliance Needs Improvement Compliance	6(3.7%) 119(74.4%) 35(21.9%)
7	Poultry meat packed/ dispensed using food-grade materials in a hygienic manner	Non-Compliance Needs Improvement Compliance	2(1.3%) 64(40%) 94(58.8%)

Haileselassie *et al.* (2013) and Tagar and Ahmed (2021) also reported that most meat shops do not segregate between clean and waste material. This fact is also supported by the results of the present finding where there is a gap in the awareness of the meat shop workers in the handling of meat and maintaining basic hygienic facilities in their working area.

Maintenance, sanitation and personal hygiene

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). The details of maintenance and sanitation at various poultry meat shops in Nagpur city are presented in Table 4. In the present study, it was found that 88.8 percent of poultry meat shops had clean potable water as well as a supply of hot water. The results were in agreement with Upadhayaya and Ghimire (2018), who reported that 94.74 percent of meat shops had water availability. Venkata *et al.* (2019) also reported adequate availability of potable drinking water (86.53%) in most butcher shops in the YSR Kadapa district of Andhra Pradesh which can be prospected for bacteriological studies to evaluate the levels of contamination. Failure to appropriately clean and sanitize equipment could lead to the harbourage of pathogenic microorganisms that may cause foodborne infection (Waghmare *et al.,* 2022). It was found that poultry meat shops (17.5%) in Nagpur had availability of hot water maintaining temperature not less than 82 degrees Celsius, which is used for cleaning/sterilization of equipment e.g. butchers knife/cleavers, hooks etc. on a daily basis.

Table 4: Maintenance and sanitation status of a poultry meat shop in Nagpur city

Sl. No.	Observation	Options	Result N (160)
1	Clean potable water/ supply of hot water for dressing	Non-Compliance Needs Improvement Compliance	18(11.2%) 0(0%) 142(88.8%)
2	Cleaning/sterilization of equipment with hot water not less than 82 degrees Celsius	Non-Compliance Needs Improvement Compliance	14(8.8%) 118(73.8%) 28(17.5%)
3	Floorings are washed daily with Disinfectant	Non-Compliance Needs Improvement Compliance	11(6.9%) 121(75.6%) 28(17.5%)
4	Maintenance of Equipment and machinery is carried out regularly	Non-Compliance Needs Improvement Compliance	13(8.1%) 103(64.4%) 44(27.5%)
5	Effective pest management	Non-Compliance Needs Improvement Compliance	7(4.4%) 64(40%) 89(55.6%)
6	Entry of animal's dog, cats into the premises should be prohibited	Non-Compliance Needs Improvement Compliance	6(3.8%) 24(15%) 130(81.2%)
7	Efficient drainage System and all drains and gutters are properly installed/ fitted with traps and screens	Non-Compliance Needs Improvement Compliance	13(8.1%) 102(63.8%) 45(28.1%)
8	Liquid waste should be drained Immediately	Non-Compliance Needs Improvement Compliance	31(19.4%) 100(62.5%) 29(18.1%)
9	Covered garbage bins with foot-operated pedals for waste disposal	Non-Compliance Needs Improvement Compliance	44(27.5%) 96(60%) 20(12.5%)
10	Proper arrangement for disposal of feathers, skin, offals or waste tissue through local agency/ Municipality	Non-Compliance Needs Improvement Compliance	19(11.9%) 0(0%) 141(88.1%)

It was found that the floorings of poultry meat shops (17.5%) are washed daily with a disinfectant. The results do not agree with Venkata *et al.* (2019) who reported that 52.88 percent of butchers' shops washed daily with disinfectant, which may reflect the risk of contamination due to higher microbial loads due to unhygienic practices followed in most retail meat shops. Ali *et al.* (2010) showed that using disinfecting and sanitizing agents for the daily cleaning of butcher shops could elevate the hygienic status. Poultry meat shops (55.6%) showed compliance with effective pest control management, and about 18.8 percent of poultry meat shops had stray animals like dogs and cats on the premises. Tagar and Ahmed (2021) and Upadhayaya and Ghimire (2018) reported 30 and 50 percent presence of stray animals around poultry shops, respectively.

Poultry meat shops (63.7%) in Nagpur showed insufficient drainage systems where all drains and gutters were not correctly installed/fitted with traps and screens. Poultry meat shops (88.1%) had arrangements to dispose of waste material. The by-product generated by most meat shop retailers during the hot processing of live poultry birds were being sold to the fish farmers as fish feed ingredients. However, Waghmare *et al.* (2022) reported that butcher's shops (61.02%) utilized local authorities/facilities to dispose of slaughter waste. In contrast to this, Upadhayaya and Ghimire (2018) reported that only 22.11 percent of the meat shops responded regarding the availability of a municipal system for the disposal of waste materials. Such non-availability of a waste disposal system might result in the pile-up of paunch contents, other solid wastes, and feces near the meat shops, which may serve as the habitation for rodents, cats, and dogs, leading to problems in the areas of environmental protection, sustainability and a potential sources of zoonoses.

Personal hygiene of those who come in direct or indirect contact with meat is an essential part of meat hygiene; butchers are required to maintain a high level of personal hygiene (Tagar and Ahmed, 2021). Personal hygiene at poultry meat shops in Nagpur city has been presented in Table 5. Meat handlers (76.9%) from poultry meat shops had health certificates with the completion of COVID-19 vaccination. The higher percentage of health certificates and vaccination might be due to COVID-19 preventive norms, which were continuously informed and encouraged to take vaccines by various media. Similar findings were reported by Haileselassie *et al.* (2013), wherein 84.6 percent of meat handlers in Mekelle city, Ethiopia had a health certificate. Practices like wearing unhygienic dirty clothes and uncovered hairs during operation in the butcher shops could lead to cross-contamination with pathogenic microbes making the meat unsafe to the consumer (Jyoti *et al.,* 2019).

Table 5: Personal hygiene of meat handlers at a poultry meat shop in Nagpur city

Sl. No.	Observation	Options	Result N (160)
1	Free from any infectious/ contagious disease with regular updation of health cards	Non-Compliance	37(23.1%)
		Needs Improvement	0 (0%)
		Compliance	123(76.9%)
2	Maintain personal hygiene regular trimming nails, hairs and shave for meat handlers	Non-Compliance	2(1.3%)
		Needs Improvement	49(30.6%)
		Compliance	109(68.1%)
3	Meat handlers should wear clean protective clothing, beard/hair net during cutting of meat	Non-Compliance	5(3.1%)
		Needs Improvement	139(86.9%)
		Compliance	16(16%)
4	Use of tobacco, chewing, spitting shall be prohibited	Non-Compliance	2(1.3%)
		Needs Improvement	105(65.6%)
		Compliance	53(33.1%)
5	Hand washing facility be fitted on the premises. Hands should be washed regularly during work.	Non-Compliance	22(13.7%)
		Needs Improvement	110(68.8%)
		Compliance	28(17.5%)

About 68.1 percent of meat handlers from poultry meat shops in Nagpur city maintain personal hygiene like regularly trimming their nails, but 90 percent of meat handlers found without protective clothing, beard/hair net during cutting/handling of meat, and with the watch, rings, chains, and other loose jewellery during the work. The results agreed with Chepkemoi *et al.* (2015), wherein they found that 82 percent of slaughtering workers did not wear protective clothing while slaughtering. Haileselassie *et al.* (2013) and Upadhayaya and Ghimire (2018) found that 84.21 and 78.90 percent of the butcher shop workers had worn jewellery during butchering operations, respectively. Jewellery during butchering operations can become a favourable breeding site for microorganisms and, in turn, a source of meat contamination (Jyoti *et al.,* 2019). It was

revealed that meat handlers from 66.9 percent of poultry meat shops had a habit of eating, chewing tobacco, and spitting on the premises. The results were in agreement with Upadhayaya and Ghimire (2018) who found that meat shop workers (60.53%) had smoking or eating habits during meat handling in the Butwal district of Nepal. Careful and frequent hand washing will do much to reduce contamination (Getie *et al.,* 2019). The present study has shown that 86.3 percent of butchers from poultry meat shops had habits of washing their hands with water and soap. The results agreed with Jyoti *et al.* (2019) and Yenealem (2020), who observed that 91.6 and 86.11 percent of workers at meat shops in Gondar town and Guwahati had habits of washing their hands with water and soap before handling meat, respectively.

Table 6: Hygiene rating of poultry meat shops in Nagpur city

Poultry Meat Shops	Grade	Remarks
2 (1.2%)	A+	Compliance- exemplar
25 (15.6%)	A	Compliance-satisfactory
90 (56.3%)	B	Needs improvement
43 (26.9%)	C	Non-compliance

From Table 6, it was clear that 56.3 percent of poultry meat shops in Nagpur need improvement, while 26.9 percent of poultry meat shops had poor hygiene ratings, which did not comply with FSSAI norms.

CONCLUSION

The retail poultry sector contributes to employment and income generation and helps to achieve nutritional security. The present investigation and study concluded that there is a need for improvement in most poultry meat shops in Nagpur city regarding infrastructure facilities, sanitation, and personal hygiene of meat handlers of poultry meat shops. Regular monitoring and strict vigilance of poultry meat shops from regulatory bodies are needed. Formal education for meat handlers is an essential factor in promoting hygienic practices, thereby improving the quality standard of poultry meat shops. The information gained from the study can be utilized to formulate essential safety measures to improve the quality of meat; hence overall upgradation in this unorganized sector is essential for the food safety of the consumers.

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