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Evaluation of sanitary conditions and meat handling practices in retail chevon meat shops using FSSAI hygiene rating system

¹Rathod Rohit Kailasrao, ¹Kishor Sheshrao Rathod, ¹Shekhar Ramesh Badhe, ²Suman Talukder, ²Pooja Rani and ³Shubham Mandhale

¹Division of Livestock Products Technology, Nagpur Veterinary College, Seminary Hills, Nagpur, Maharashtra, India

²Division of Livestock Products Technology, ICAR-Indian Veterinary Research Institute, Izzatnagar, Bareilly, Uttar Pradesh, India

³Division of Animal Physiology, Nagpur Veterinary College, Seminary Hills, Nagpur, Maharashtra, India

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Corresponding Author: Kishor Sheshrao Rathod

Abstract

With the tremendous expansion of meat production and consumption in India, hygiene has become a major concern. Consumers face various health risks due to poor facilities and unsanitary procedures at goat meat outlets. The current study uses a hygiene rating scheme to evaluate sanitary conditions and meat handling practices in retail Chevon meat shops. To examine sanitary conditions, a survey of 100 retail chevon meat stores in Nagpur was done. Interviews were conducted using a hygiene rating evaluation checklist from the Food Safety and Standard Authority of India (FSSAI), which included categories such as design and facilities, operational control, maintenance and sanitation, personal hygiene, training, and record keeping. Each domain was assessed based on the responses of respondents and personal observations. According to the study, 54.0% of Chevon meat shops in Nagpur require improvement in terms of hygiene, with a B grade rating, while 44.0% are non-compliant with a C grade. The findings indicate that regular monitoring and formal training of meat handlers are required to increase understanding of hygienic practices and sanitary levels in chevon meat businesses.

Keywords: Compliance, design and facility, food safety and standard, hygiene rating, non-compliance

1. Introduction

India hosts 535.8 million livestock population and 148.8 million Goats, indicating a 4.64 percent increase in livestock and a 10.14 per cent increase in goat population compared to the previous census (DAHD, 2019). According to the statistical yearbook of FAO (2025), India holds the fourth position globally in total meat production. Reaching to 10.50 million tonnes, reflecting a 2.46% increase, which rose the per capita meat availability to 7.39 Kg/Annum (BAHS 2025). India is one of the countries where customers prefer chevon to other meat types. Goat contributes 15% of the country's total meat production (BAHS 2025). During 2024-25, the nation exported 11,581.07 MT of sheep and goat meat to other countries, earning \$84.94 million. The principal exporting nations (2024-25) were UAE, Qatar, Kuwait, Bahrain, and Oman (APEDA, 2025).

Although goat meat contributes to long-term food security and possesses health benefits (Ivanović *et al.*, 2016) [12], several industry-related issues need to be addressed, especially in developed countries. The Food Safety and Standards Regulations (2011), part 4 of Schedule 4, governs meat safety in India. It aims to promote meat safety and the safety of animal products, regulate the importation and exportation of meat, and establish meat safety within India. However, despite regulations, India has poor food handling and sanitation practices, possibly due to a lack of financial

resources to invest in food safety and a lack of education and training for food handlers (Tessema *et al.*, 2014) [19]. Butchers are unaware of various health hazards arising due to inadequate infrastructure and sanitary practices (Tagar & Ahmed, 2021) [18]. Retail meat shops are the largest source of contamination, and the workers who do not follow sanitary practices contaminate the meat while handling resulting in early spoilage due to microorganisms (Jyoti *et al.*, 2019) [13]. Contamination can occur during processing, contact with equipment, contact with food handlers and exposure to other environmental sources (Wardhana *et al.*, 2021) [25].

Meat hygiene refers to a set of activities that need the implementation of specific standards, codes of practice, and regulatory action by the regulatory body to ensure the safety of the meat for consumers to eat. At different stages of production, processing, and transportation, slaughter and meat processing equipment, and the environment, hygiene regulations must be followed along with developing adequate personal hygiene activity among food handlers. (Bhandari R *et al.*, 2022 and Thornton L. N. 1966) [5, 20]. Moreover, the knowledge, attitudes, and practices of meat handlers regarding food safety are a major source of concern. Therefore, addressing the hygienic status of meat production and distribution is crucial; 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, this study was planned to evaluate the status of design and facilities, control of the operation, maintenance and sanitation, personal hygiene, training and record keeping and waste disposal of retail chevon 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 during September 2023 to February 2024. For the study, Nagpur city was categorized into five different zones, and quota sampling was conducted to have a sample size of 100 retail chevon/goat meat shops. Meat shops were selected by proportionate random sampling method, and among 100 retail meat shops, 20 shops each were selected from each zone, i.e. East, West, North, South and Central Nagpur city.

A hygiene rating assessment checklist (FSSAI) was used for the survey through personal dialogues with the butchers. A hygiene rating assessment checklist was based assessment of retail shops for compliance with food hygiene and safety procedures and standard, followed by the verification by physical inspection. 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 40) is considered non-compliance, the average score (41-60) means needs improvement and the highest score (61-80 and above) is considered compliance satisfactory/exemplary.

The questionnaire included 35 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 included details about retail meat shop registration and design facilities, control of the operation, maintenance & sanitation, personal hygiene, training and record keeping, and waste disposal of retail goat meat shop. The primary data collection tools were photography, interviews, visual observations, and questionnaires. 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 was conducted with the owner or butcher of the retail meat shop. The data obtained through survey forms were grouped and presented as percentages.

Results and Discussion

Registration/License of FSSAI/Local authority

As per the Foods Safety Act 2006, Schedule IV of FSSAI, retail meat shops slaughtering animals must be registered with FSSAI. The current study indicates that 76.0% of respondents registered their shop with local authorities like municipal corporations and other government agencies. Nevertheless, 24% of Chevon shops neither registered with FSSAI nor with local government authorities. These findings aligned with Mundhe *et al.*, (2022) ^[16], who reported 74.4% of meat shops had formally registered with local authorities.

Table 1: The registration/licence of FSSAI or local authority for the Chevon shop in Nagpur city

Parameters	FSSAI Norms	Percentage
Registration with local authority	Compliance	76.0%
	Non- compliance	24.0%

Design and facilities

The details of the design and facilities status of Chevon meat shops in Nagpur city have been presented in Table 2. It was documented that 95.0% of Chevon shops had separate provision for the slaughter of different species, which help control cross-contamination during processing. Table 4.2 indicated that 71.0% of shops had space for lairage; which corroborate the findings of Bafanda *et al.*, (2017) ^[3], who reported the availability of lairage facilities at most of the meat shops in the Jammu district. The internal structure and fittings were such that they prevent the entry of dirt, dust, and pests into the shop. Moreover, 76.0% of Chevon shops indicated compliance with FSSAI norms concerning internal structure and fittings. These findings align with Khanal and Poudel's (2017) ^[14] report, highlighting the temporary and partial construction of 50% of butcher shops in Chitwan, Nepal.

As far as impervious, non-slippery, easy-to-clean floors are

concerned, 71.0% of Chevon shops complied with FSSAI norm, which was supported by Santos *et al.*, (2017) ^[17] who reported 63% of butcher shops maintaining clean floors in Portugal. Results indicated that 44.0% of meat shops had compliance regarding walls paved with glazed tiles (at least 1 meter in height), as it will be accessible for cleaning and washing purposes. Bafanda *et al.*, (2017) ^[3], reported similar results where they found that the walls & flooring in most of the meat shops in the Jammu district were in a poor state. 74.0% of the shops need improvement regarding Windows and other openings fitted with an insect-proof screen. The results aligned with the studies conducted by Jyoti *et al.*, (2019) ^[13] where 44.44% of meat shops in Guwahati City employed with glass windows to prevent flies. The doors of Chevon shops need to be smooth with non-absorbent surfaces, close-fitted and self-closing. However, only 6.0% of Chevon shops in Nagpur city complied with this FSSAI norm.

Table 2: The design and facilities available at Chevon shops in Nagpur city

Sr. no.	Parameters	FSSAI Norms	percentage
I	separate provisions for the slaughter of different species	Compliance	(95.0%)
		Non- compliance	5.0%
II	Facility of lairage	Compliance	(71.0%)
		Non- compliance	(29.0%)
III	Internal structure made of non-toxic, impermeable materials	Compliance	(76.0%)
		Non- compliance	(24.0%)

IV	Floors are impervious, epoxy-coated and non-slippery.	Compliance	(71.0%)
		Non- compliance	(29.0%)
V	Walls are paved with imperious glazed tiles up to 1 meter in height	Compliance	(44.0%)
		Non- compliance	(56.0%)
VI	Windows are free from dirt and fitted with insect-proof screens.	Compliance	(26.0%)
		Non- compliance	(74.0%)
VII	Doors are smooth, non-absorbent surface, close fitted & self-closing	Compliance	(6.0%)
		Non- compliance	(94.0%)
VIII	Premises have sufficient lighting.	Compliance	(100.0%)
		Non- compliance	00
IX	Adequate ventilation is provided within the premises.	Compliance	(100.0%)
		Non- compliance	00
X	Adequate number of toilets and hand-washing facilities.	Compliance	14.0%
		Non- compliance	86.0%
XI	Clean potable cold & hot water with pressure hose pipes	Compliance	(12.0%)
		Non- compliance	(88.0%)
XII	An equipped laboratory is available with a qualified chemist/analyst & veterinary microbiologist	Compliance	00
		Non- compliance	(100.0%)
XIII	Equipment & containers are durable and made of corrosion-resistant material	Compliance	(99.0%)
		Non- compliance	(1.0%)

All Chevron shops (100%) exhibited compliance with well-ventilated and adequate lighting in the dressing or working areas; This result could be attributed to most shops being situated on footpaths, roadsides, or under flyovers, often with temporary shelters, ensuring ample direct light and ventilation availability. These findings were well supported by Mundhe *et al.*, (2022) ^[16], who reported sufficient lighting and ventilation in 80.6% of poultry meat shops. There were inadequate personnel hygiene facilities, including adequate toilets, hand washing facilities and changing rooms in most Chevron shops (86.0%), Bafanda *et al.*, (2017) ^[3] observed analogous findings in their study, revealing a deficiency in essential amenities across meat shops in the Jammu district. It was found that only 12.0% of

Chevon meat shops had a proper supply of clean, potable water with pressure hosepipes and hot water. Most Chevron shops (88.0%) do not have hot water (82°C) facilities for daily cleaning/sterilizing equipment. The results comply with those (Upadhyaya and Ghimire, 2020) ^[22], who reported availability of water in 94.74% of meat shops.

Control of operation at Chevron Shops

It was observed from the table 3 that 55% of shop owners are procuring live animals from goat farms, which are disease-free by visual examination and perform practices like segregating and separating animals suspected of infectious diseases.

Table 3: The control of the operation at a Chevron shop in Nagpur city

Sr. no.	Parameters	FSSAI Norms	percentage
I	Animals suspected of infectious diseases are segregated and kept in separation.	Compliance	(55.0%)
		Non- compliance	(45.0%)
II	Humane methods are used for slaughtering	Compliance	(99.0%)
		Non- compliance	(01.0%)
III	Equipment used for stunning is maintained in good working condition	Compliance	00
		Non- compliance	(100.0%)
IV	The dressing of the carcasses is done on the suitable hoists	Compliance	(95.0%)
		Non- compliance	(05.0%)
V	Knives and sharpners are of stainless steel and sterilised/sanitised before use	Compliance	(96.0%)
		Non- compliance	(04.0%)
VI	Dressed meat has to store for storage is maintained at 0°C to 2°C	Compliance	(21.0%)
		Non- compliance	(79.0%)

Mundhe *et al.*, (2022) ^[16] also reported similar findings, stating that 83.0% of butchers procured live poultry birds from the poultry market. However, it is noteworthy that none of the shops in Nagpur performs stunning operations, as they lack the necessary equipment and machinery. About 95.0% perform dressing of the carcasses on suitable hoists, which complies with the FSSAI norm. Bhandari *et al.* (2022) ^[6] found that most retail meat shops overhang the carcasses for the whole day and sell their meat, reported similar results. Knives should be made of stainless steel and sterilized before use about 96.0% of Chevron shops in Nagpur comply with norms. In contrast to this Adzitey *et*

al., (2011) ^[1] reported that 35% of the butchery operators wiped butchery utensils with pieces of cloth, and 10% used hot water with soap in Ghana. The results indicated that 79.0% of Chevron shops from Nagpur did not have well-equipped chilling/freezing facilities for meat storage, Upadhyaya and Ghimire (2018) ^[26], reported non-availability of refrigerators in 78.95% of butcher shops in Bhutwal.

Sanitation, maintenance & waste disposal

The data on maintenance and sanitation at a Chevron shop in Nagpur has been presented in Table 4. It shows that 74.0%

of Chevron shops had facilities to wash their floors daily with disinfectant, complying with the FSSAI norm. These findings agreed with Bhattarai *et al.*, (2017)^[6], who reported that 74.12% of the shops used water and soap for cleaning.

Only 2% of Chevron shops had regular pest control activity, which is crucial in controlling the zoonotic transfer of pathogens from animals to foods.

Table 4: The maintenance and sanitation at a Chevron shop in Nagpur city.

Sr. No.	Parameters	FSSAI Norms	Percentage
I	Cleaning of equipment food premises is done as per cleaning schedule & cleaning programme	Compliance	(74.0%)
		Non- compliance	(26.0%)
II	Per the manufacturer's instructions, preventive maintenance of stunning equipment is carried out	Compliance	(00.0%)
		Non- compliance	(100%)
III	Pest control activities are carried out by trained and experienced personnel	Compliance	(02.0%)
		Non- compliance	(98.0%)
IV	No signs of pest activity or infestation on-premises (eggs, larvae, faeces, etc.)	Compliance	(81.0%)
		Non- compliance	(19.0%)
V	The drainage system and, all drains, and gutters are correctly installed fitted with traps and screens	Compliance	(65.0%)
		Non- compliance	(35.0%)
VI	Storage of condemned carcasses & Destruction of condemned carcasses carried out	Compliance	(02.0%)
		Non- compliance	(98.0%)
VII	Meat shops reuse waste material in processing to prepare animal by-products.	Compliance	00
		Non- compliance	(100.0%)

Similar findings were also documented by Mensah *et al.*, (2002)^[15] and Ghana & Reddy *et al.*, (2019)^[23], who reported the presence of flies and insects at 35.0% and 65.38% of meat shops, respectively. About 65.0% of Chevron shops had proper drainage systems fitted with traps and screens. They generally put condemned carcasses, skin, offal or waste tissues and trimmings together in gunny bags, and sold to fisherman to use as fish feed. These results are supported by the findings of Mundhe *et al.*, (2022)^[16], wherein 87.5% of poultry meat shops do not have sufficient space to separate and store condemned carcasses. None of the Chevron shops was found to adhere to the practice of reusing processed waste material to create animal by-products. These results were in contrast with the findings of Waghmare *et al.*, (2022)^[24], who reported that 61.02% of butcher shops utilized local facilities provided by municipal

bodies for disposing of slaughter waste.

Personal Hygiene of workers/butchers at the Chevron shop:

The analysed data on the personal hygiene of workers/butchers at the Chevron shop in Nagpur city has been depicted in Table 5. It was observed that 98.0% of meat handlers in Nagpur city do not have medical health certificate/vaccination certificate against infectious diseases. The results agreed with the findings of Chepkemai *et al.*, (2015)^[7], who reported that 94% and 88% of meat handlers in Nairobi and Isiolo counties did not have medical certificates. The study indicated that 100% of meat handlers did not have any open wounds, burns, or skin infections. However, the results were in contrast to Reddy *et al.*, (2019)^[23], who reported that 15.38% of meat handlers had open cuts on the hands and legs.

Table 5: The personal hygiene of workers/butchers at a Chevron shop in Nagpur city

Sr. No.	Parameters	FSSAI Norms	percentage
I	Annual medical examination & inoculation of food handlers with vaccine	Compliance	(02.0%)
		Non- compliance	(98.0%)
II	No person suffering from a disease or illness or with open wounds or burns is involved in handling meat or materials that come in contact with meat	Compliance	(100%)
		Non- compliance	00
III	Food handlers maintain personal cleanliness (clean clothes, trimmed nails,) and personal behaviour (hand washing, no loose jewellery, no smoking, no spitting etc)	Compliance	(90.0%)
		Non- compliance	(10.0%)
IV	Food handlers are equipped with suitable aprons, gloves, headgear, shoe covers, etc.	Compliance	(51.0%)
		Non- compliance	(49.0%)

It was found that the meat handlers from 90% of Chevron shops have maintained personal hygiene, like regularly trimming their nails and hair and had proper shave, which complied with the FSSAI norms. In contrast, Tagar and Ahmed (2021)^[18] reported that only 8% of butchers from meat shops had trimmed nails in Hyderabad and Jamshoro, Pakistan. As per norms, meat handlers should wear clean protective clothing, including a mask or hair net, and should refrain from wearing personal items such as watches, rings, and loose jewellery. However, the study indicated that, 49% of meat handlers were wearing jewellery and watches, and some were either not wearing masks or hair caps or were wearing unclean clothing, which needs to be improved to

comply with the FSSAI norm. Non-wearing of protective clothing, hair cap, gloves, footwear, etc., were also reported by Haileselassie *et al.*, (2013)^[11], Chepkemai *et al.*, (2015)^[7], Tuneer and Madhavi (2015)^[21], Upadhyaya and Ghimire (2018)^[26], Jyoti *et al.*, (2019)^[13].

Training and Record-keeping

The data analysed on the training and record keeping at the Chevron shop in Nagpur city has been depicted in Table 6. None of the meat shops performs Internal / External audits regularly. Moreover, 98% of meat shops did not have a compelling mechanism for redressing consumer complaints. It was found that the butchers in 99% of Chevron shops did

not undergo training in basic hygiene and practices to be followed during the slaughtering of animals and meat handling. The results agreed with Waghmare *et al.*, (2022) [24] and Joyti *et al.*, (2019) [13], who reported that 77.12 % of meat handlers in Maharashtra and 63.89 % of meat handlers in Guwahati city had not acquired any formal training

regarding meat hygiene and handling practices. The data recorded by this study indicated that there was no proper documentation regarding the source of animals and shelf life of the products. Concenco *et al.*, (2018) [8], also reported about improper documentation and records in butcher shops in Navirai, Brazil.

Table 6. The training and record keeping at Chevron shop in Nagpur city

Sr. No.	Parameters	FSSAI Norms	Percentage
I	Internal / External audit of the system is done periodically. Check for records.	Compliance	(00.0%)
		Non- compliance	(100.0%)
II	The Food Business has an effective mechanism for redressing consumer complaints.	Compliance	(02.0%)
		Non- compliance	(98.0%)
III	Food handlers have the necessary knowledge and skills & trained to handle food safely.	Compliance	(01.0%)
		Non- compliance	(99.0%)
IV	Appropriate documentation & records are available and retained for one year or the product's shelf-life.	Compliance	(01.0%)
		Non- compliance	(99.0%)

Overall Grading of Chevron Shops in Nagpur City

Based on the scores obtained the Chevron shops in various domains like design and facilities, control of the operation, maintenance and sanitation, as well as training and record keeping as per the hygiene rating checklist of FSSAI, the meat shops were graded as A+, A, B and C (Table 7). The study indicated that none of the Chevron shops in Nagpur were graded A+ (Compliance exemplar). Only 2.0% of Chevron meat shops had satisfactory compliance (Grade A) in the city. In all, 54.0% of Chevron meat shops in Nagpur city were in grade B, which needed improvement. 44.0% of Chevron meat shops in Nagpur city do not comply with FSSAI norms and were graded as 'C' and need serious attention to improve the quality of meat sold from these shops.

Table 7: The overall scoring in the above parameters obtained from Chevron shops in Nagpur city.

Chevron Meat Shops	Grade	Remarks
2 (2.0%)	A	Compliance-satisfactory
54 (54.0%)	B	Needs improvement
44 (44.0%)	C	Non-compliance

Conclusion

The retail Goat meat 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 Chevron meat shops in Nagpur city regarding design and facilities, control of the operation, maintenance and sanitation, as well as training, record keeping and personal hygiene of meat handlers of Chevron meat shops. Regular monitoring and strict vigilance of Chevron 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 Chevron 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.

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