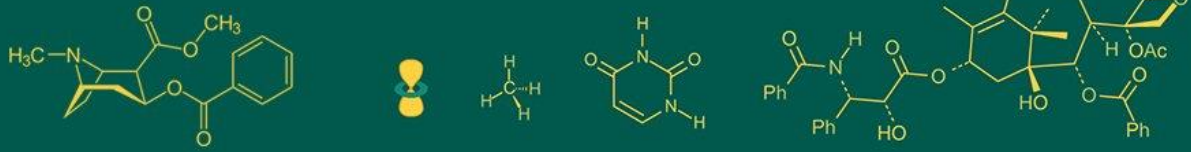


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Risk factors contributing to meat contamination across the production chain

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Abstract

The present study was conducted to assess the hygienic practices followed by the retailers in five different districts of Jammu division namely Jammu, Udhampur, Rajouri, Kathua and Samba. A semi structured questionnaire was administered to know the risk factors of meat contamination. The butchers were randomly chosen and interviewed by visiting the retail shops/outlets. The data were coded, tabulated and analysed using Statistical Package for the Social Science (SPSS) software. Hundred percent meat handlers of Kathua district had not used protective clothing during slaughtering process followed by Udhampur (87.5%) and Rajouri (82.5%). Out of total retail outlets observed 60.5% had cold and hot water supply for cleaning of utensils and washing floor after slaughtering. Majority (77.5%) of the butchers had hoisting facilities before skinning and evisceration. In all the retail outlets studied, only 59% had clear demarcation between dirty and clean area while handling slaughtering and handling.

Keywords: Production chain, questionnaire, risk factors, SPSS, hygiene

Introduction

The production of hygienic meat is a great challenge and major concern for the meat industry in India. Meat handlers play an important role in safe guarding the chain of production, processing, storage and preparation (Abd-Elaleem *et al.*, 2014) ^[1]. Personal hygiene of butchers also marks an important role in preventing the entry of food borne pathogens (Fawzi *et al.*, 2009) ^[9]. Lack of awareness and the conventional practices followed in processing, handling and marketing reflects the poor-quality meat. Poor meat hygiene and sanitation may lead to risk of food borne illness upon consumption (Gurmu *et al.*, 2013) ^[13]. Several factors like poor food handling, inappropriate food safety laws, poor regulatory systems, lack of awareness among the butchers and consumers are some of the other factors that degrade the meat quality in developing countries (Guo *et al.*, 2017) ^[12]. However, in spite of adequate legislations and laws governing the abattoir operation in different countries, compliance with food safety requirements during meat processing and waste disposal are inadequate. Hence, food borne diseases resulting from the consumption of contaminated meat continue to be a public concern in developing countries (Jacob *et al.*, 2010) ^[14]. The presence of microorganisms on post slaughter carcasses is due to the contamination occurring immediately before, during and after slaughter. Microbial status of fresh raw meat depends on animal rearing, transportation, slaughtering, cutting and packaging, besides hygiene and processing condition of the slaughter plant (Biswas *et al.*, 2011) ^[5]. The skin of many meat animals may contain *Micrococci*, *Staphylococci* and *Streptococci* (Biswas *et al.*, 2011) ^[5]. People working in meat processing plants can also act as a vector of many pathogenic bacteria (Frazier and Westhoff, 1983) ^[10]. The main sources of meat contamination include animal source (Borch and Arinder, 2011) ^[6], on farm factors (Galland 1997 and Mtenga *et al.*, 2000) ^[11, 15], transport factors (Galland, 1997) ^[11], abattoir and butcher facilities, (Fasanmi *et al.*, 2010 and Adzitey *et al.*, 2011) ^[8, 3] and abattoir and retail meat outlet workers (Adetunde *et al.*, 2011) ^[2].

Materials and Methods

Study design

The present study was conducted in the five districts of J&K namely Jammu, Udhampur, Rajouri, Kathua and Samba to assess the risk factors at retail poultry outlets. The risk factors related to the hygienic meat production at the retail poultry outlets were also determined by gathering information using a semi structured questionnaire

Study area

The present study was conducted in the five districts of J&K namely Jammu, Udhampur, Rajouri, Kathua and Samba from 2022-2024.

Sampling method and size

Butchers were randomly chosen and interviewed by visiting their retail shops/outlets. The respondents were not compelled to participate in the interview. A total of 200 retail shops/outlet were surveyed.

Data collection and statistical analysis

A semi structured questionnaire was prepared and used for face-to-face interview to evaluate the awareness among butchers. Interview was conducted in local language. The questionnaire included the location of the slaughtering facility, hoisting facilities, adequate light, equipments, facilities for washing hands or sinks, area of slaughtering. Some observations were noted by observing their maintenance of shop, equipment, the level of hygiene (personal and meat), they maintained while selling meat, way of disposal of the waste and the drainage facilities availability. The data were coded, tabulated and analysed by using Statistical Package for the Social Science (SPSS) software.

Results

With regards to the frequency of disinfection and cleaning facilities in the study, more than 50.5% meat handlers had never disinfected their slaughtering facilities against the control of flies and insects in all the districts except Rajouri, whereas 75% meat handlers of Rajouri district disinfected/sterilized their knives after skinning and evisceration followed by Udhampur (57.5%) and Samba (45%). The maximum hoisting facilities for carcass for skinning and evisceration were found available in Rajouri (85%) followed by Jammu (84.6%) and 80% in Samba district, whereas more than 50% butcher's facilities had clear demarcation between dirty and clean area during slaughtering in all the districts. Majority of the butchers in all the districts had removed heads, hides immediately after slaughtering. Most of slaughtering premises in Rajouri district (97.7%) had adequate light for performing proper

operation followed by Udhampur (92.5%) and Samba (90%), whereas 65% slaughtering facilities in Rajouri district did not have disposal pit followed by Jammu (55.38%) and Udhampur (62.5%). The slaughtering premises of Udhampur and Rajouri districts had good drainage system and adequate hot and cold-water facilities for washing used utensils, floor and walls after slaughtering. Hundred percent meat handlers of Kathua district had not used protective clothing during slaughtering process followed by Udhampur (87.5%) and Rajouri (82.5%) (Table.1).

Discussion

The study found significant fly infestation and 39.5% of the retail outlets were carrying out routine control of flies and other insects which serving as a vector for various diseases. Approximately 50.5% of the retail outlets did not sterilize knives after skinning and evisceration. No segregation of solid and liquid waste was observed in all the retail outlets studied. The retail outlets (42.5%) had disposal pit whereas remaining 57.5% dispose of solid waste openly. In 68% of the retail outlets good drainage was observed but in 32% of the retail outlets, there was no drainage system and waste from the retail outlets was discharged into open area. A significant portion of the retail outlets (88%) relied on the natural and artificial light. Out of total retail outlets observed 60.5% had cold and hot water supply for cleaning of utensils and washing floor after slaughtering. The finding of the present study can be correlated with the finding of Taggar and Ahmed, 2021^[17] that carried out assessment of hygienic condition of poultry and slaughtering facility in Pakistan. Protective clothing helps to protect the both food product and meat handler from carcass contamination. In the present study 85% of the handlers were not found wearing any type of protective clothing. This is an agreement with the study conducted by Gurmu *et al.*, (2013)^[13] where none of the studied meat handlers put on hair cover. Another study conducted in Nairobi Isiolo, had also shown similar results that around 82% of the slaughtering workers did not wear protective clothing while slaughtering (Chepkemoi *et al.*, 2015)^[7] and (Taggar and Ahmed, 2021)^[17]. Majority (77.5%) of the butchers had hoisting facilities before skinning and evisceration. In all the retail outlets studied, only 59% had clear demarcation between dirty and clean area while handling slaughtering and handling. According to Roberts and de Jager, (2004)^[16], abattoir is one of the food industries that contribute to many food borne diseases and health hazards associated with food unless principles of food hygiene implemented. This fact is supported by the results of the present finding where there is a gap in the awareness in abattoir and butchers shop workers on meat handling and maintain hygienic status in their working area.

Table 1: Response of meat handlers towards associated risk factors of meat contamination

Question statement	Positive response no (%)						Negative response no (%)					
	Jammu (n=65)	Udhampur (n=40)	Rajouri (n=40)	Kathua (n=35)	Samba (n=20)	Mean	Jammu (n=65)	Udhampur (n=40)	Rajouri (n=40)	Kathua (n=35)	Samba (n=20)	Mean
1. Is there routine control of flies and other insect in the Abattoir	21(32.3)	18(45.0)	22(55.0)	12(34.2)	6(30.0)	39.5	44(67.6)	22(55.0)	18(45)	23(65.7)	14(70)	60.5
2. Do you sterilize your knives after skinning and evisceration	26(40.0)	23(57.5)	30(75)	13(37.1)	9(45.0)	50.5	39(60)	17(42.5)	10(25.0)	22(62.8)	11(55.0)	49.5
3. Are there hoisting facilities before skinning and evisceration?	55(84.6)	25(62.5)	34(85.0)	25(71.4)	16(80.0)	77.5	10(15.3)	15(37.5)	6(15.0)	10(28.5)	4(20.0)	22.5
4. Is there a clear demarcation between the dirty area and a clean area during slaughtering and handling?	35(53.8)	23(57.5)	24(60)	21(60.0)	15(75.0)	59.0	30(46.1)	17(42.5)	16(40)	14(40.0)	5(25.0)	41.0
5. Are heads, hides, skins and legs remove immediately after slaughter?	57(87.6)	34(85.0)	38(95.0)	28(80.0)	16(80.0)	86.5	8(12.3)	6(15.0)	2(5.0)	7(20.0)	4(20.0)	13.5
6. Is there adequate natural and or artificial light to enable proper operations?	52(80.0)	37(92.5)	39(97.75)	30(85.71)	18(90.0)	88.0	13(20.0)	3(7.5)	1(2.5)	5(14.2)	2(10.0)	12.0
7. Do you have a disposal pit for condemns?	29(44.61)	15(37.50)	14(35.0)	18(51.42)	9(45.0)	42.5	36(55.38)	25(62.50)	26(65.0)	17(48.57)	11(55.0)	57.5
8. Is there a good drainage system?	41(63.07)	33(82.50)	33(82.50)	18(51.43)	11(55.0)	68.0	24(36.92)	7(17.50)	7(17.50)	17(20.0)	9(45.0)	32.0
9. Is there adequate cold and hot potable water (82°C) for washing used utensils, floor and walls after slaughter?	31(47.69)	27(67.50)	29(72.50)	22(62.85)	12(60.0)	60.5	34(52.30)	13(32.50)	11(27.50)	13(37.14)	8(40)	39.5
10. Do you ensure that all personnel in the slaughter process have protective and clean covering e.g. aprons, head cap, gumboots, sanitary wears?	14(21.54)	5(7.69)	7(17.50)	0(0.0)	4(20.0)	15.0	51(78.46)	35(87.50)	33(82.50)	35(100.0)	16(80.0)	85.0

Conclusion

Majority of the retail meat shop lack many facilities which are utmost important for maintaining the quality of the meat. Unhygienic meat handling practices, lack of training and poor sanitation of butchers shop are the main factors identified which compromise the quality of meat products. Therefore, food hygiene training and awareness creation for the meat handler should be strengthened. This will help the meat handlers to have better understanding of risks associated with contamination of meat. The present study also concluded that improving the knowledge of the butchers through some trainings by veterinarian and medical health professionals from the government public health departments can provide a way for the production of clean meat and protecting the health of the consumers.

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