Original Research Article

Assessment of knowledge, attitude and practice regarding hygiene among meat handlers in Vijayapura city, North Karnataka

Fyroose Eariyaden, M. C. Yadavannavar*, Chandrika Doddihal

Department of Community Medicine, Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka, India

*Correspondence:
Dr. M. C. Yadavannavar,
E-mail: mallikarjun.y@bldedu.ac.in

ABSTRACT

Background: Food-borne diseases are a significant health concern globally, particularly in meat-related cases, due to unhygienic handling and inadequate sanitation. Challenges such as inadequate food safety regulations, weak regulatory frameworks and insufficient awareness among food handlers contribute in exacerbating the issue. The aim of this study was to evaluate knowledge, attitudes, and practices of hygiene among slaughterhouse workers in Vijayapura, north Karnataka. Objective was to evaluate the sociodemographic characteristics of meat handlers and their correlation with knowledge, attitudes, and practices related to meat hygiene in in Vijayapura, north Karnataka.
Methods: This descriptive, cross-sectional study was conducted in Vijayapura city from July to September 2023, involving meat handlers from various shops. 79 participants were selected from 200 shops using a lottery method, anticipating a 71% knowledge level of meat hygiene. Informed consent was taken, and data collection was done using a pretested, semi-structured questionnaire.
Results: Among the 79 participants, 86.1% were male and 13.9% female, with 64.5% having over five years of experience. Most (96.2%) had good knowledge of meat hygiene, while 3.8% had poor knowledge. Significant associations were found between gender (p=0.00), religion (p=0.00), educational status (p=0.013), and meat hygiene practices.
Conclusions: The study reveals satisfactory knowledge, attitudes, and practices regarding meat hygiene among meat handlers in Vijayapura. It is highly advisable to emphasize public health education, develop policies, and implement consistent training programs for meat handlers focused on safe meat handling practices, as well as maintaining high standards of personal and general hygiene.

Keywords: Food safety, Meat handlers, Meat hygiene

INTRODUCTION

In both developed and underdeveloped countries, food-borne diseases are known to be a major human health concern, which is attributed to the unhygienic handling of food and improper sanitation practices. In humans, the majority of food-borne diseases are related to meat.[1] Challenges such as inadequate food safety regulations, weak regulatory frameworks and insufficient awareness among food handlers contribute in exacerbating the issue.[1]

Meat hygiene necessitates the enforcement of precise standards, codes of practice, and regulatory measures by the competent authority to guarantee the safety and suitability of meat. According to the World Health

Organization (2015), about one out of 10 people get disease, and over 400,000 people die every year as a result of intaking unhygienic food.[2]

India boasts the world's largest population of livestock and ranks as the largest producer of buffalo meat, as well as the second-largest producer of goat meat globally.[3] 89% of India's animal product exports consist of buffalo meat. Poultry meat accounts for 50% of the country's total meat production.[4] It is known that about 71% of the Indian population consumes meat. It constitutes a well-balanced composition of essential amino acids, good source of proteins, all B complex vitamins and minerals.[5]

The meat sector's operations can be categorized into three stages: slaughtering, meat cutting, and additional processing. Though each stage involves completely different technical operations, these stages have significant interactions between them and therefore shortcomings at one stage can have a serious negative impact on the product finally. Hygiene standards must be adhered to at every stage, ensuring cleanliness among personnel, maintaining hygiene of slaughter and meat processing equipment, and sustaining a clean environment.[6]

The microbiological contamination occurs during cutting and processing the meat at slaughter houses. The animals may harbour a variety of microorganisms on their body, flesh and blood, which may get transmitted to the butcher and their surroundings during meat processing.[7] The causes for microbial contamination include: slaughtering directly on the floor without suspending the carcass; suspending carcasses too low, causing them to be in direct contact with the floor; placing carcasses with and without skin in overly close proximity; negligent evisceration practices leading to the spread of intestinal contents onto the meat; and performing carcass splitting, cutting etc in the same contaminated area where slaughtering occurred.[5]

Foreign matter contamination is completely avoidable and includes contamination of meat with materials such as metals from machinery, clips, knife blades, wood splinters, dust, dirt, plastic, hair, glass/bone splinters or dead insects.[5]

Cross contamination may occur due to poor practices codes and self-hygiene and like contaminated packaging material, disruption in refrigeration, keeping spoiled and fresh meat together, inadequate cleaning of containers, improperly sanitised containers or transport vehicle, improper storage and handling of slaughter waste.[5]

The proper handling of meat, from the moment of animal slaughter to its consumption by humans, is essential due to its significant value as a livestock product.[5] Current recommendations for handling the meat products include always keeping the meat chilled, clean, and shielded, which is required to maintain the quality and to protect from food borne.[8]

There are very few such studies conducted in this part of northern Karnataka and also very sparse knowledge, attitude and practice regarding hygiene among people working in slaughter house. This study aimed to know the hygiene practices carried out by slaughter men of Vijayapura, north Karnataka.

Objective

To evaluate the sociodemographic characteristics of meat handlers and their correlation with knowledge, attitudes, and practices related to meat hygiene in in Vijayapura, north Karnataka.

METHODS

Study area and period

The current study was a descriptive, cross sectional study done in Vijayapura city. This study was done for a period of three months (July 2023 to September 2023).

Study population

The study population consisted of meat handlers working in various meat shops across Vijayapura city. Out of a total of 200 meat handlers, a sample of 79 individuals was selected through a lottery method.

Ethical clearance

After obtaining the ethical clearance from institutional ethical committee and taking informed consent from all the participants of the study, using a pre designed questionnaire data was collected.

Inclusion criteria

Individuals actively involved in slaughtering, cutting, processing in meat shops. Participants should have at least six months of working experience in meat handling at the time of data collection.

Exclusion criteria

Meat handlers working outside the Vijayapura city limits or those temporarily employed in Vijayapura. Individuals who refuse to provide informed consent or withdraw from the study at any point.

Sampling procedure

A lottery system was used to conduct a simple random sampling to select 79 meat handlers among 200 total meat handlers present in Vijayapura.

Sample size determination

With anticipated proportion of knowledge of meat hygiene among meat handlers 71%.[1] The study would require a sample size of minimum 79 with 95% level of confidence and 10% absolute precision.

Participant recruitment

Within each selected meat shop by lottery method, all eligible meat handlers were invited to participate voluntarily in the study. Prior to data collection, informed consent was gathered from all participants before collecting data.

Survey questionnaire

A pretested and semi-structured questionnaire was developed to collect data on participants' knowledge, attitudes, and practices regarding hygiene in meat handling.

Data collection period

Data collection was conducted for a period of 3 months (from July 2023 to September 2023), to obtain the required sample size and ensure representation from various meat shops in Vijayapura.

Scoring and grading

Meat hygiene knowledge was assessed using 10 questions, with participants earning one point for each correct response, while incorrect answers scored 0 points. A total score greater than 5 was classified as good knowledge, whereas a score of 5 or less indicated poor knowledge.

Participants in the study were given ten statements that reflected positive attitudes of slaughtermen towards meat hygiene. The rating scale used was: agree, indifferent, and disagree, giving points as 3, 2, and 1 respectively with the total possible scores ranged from 10 to 30. Each participant's scores were summed up, and the mean scores were calculated. The overall mean score was 28, which served as the threshold for classification: scores of 28-30 indicated a good attitude, while scores of 10-27 indicated a poor attitude.

The assessment of meat hygiene practices in the workplace was conducted using eight questions. One point was given for every correct answer and no points for incorrect ones. A total score greater than 5 was deemed indicative of good practice, while a score of 5 or less was considered indicative of poor practice.

Statistical analysis

With SPSS version 26 data analysis was performed. Chi-square statistics were employed to examine the associations between variables, with a p value of less than 0.05 considered statistically significant.

RESULTS

The study showed that out of the 79 participants, 68 (86.1%) were males, while 11 (13.9%) were females. The complete sociodemographic findings of the participants are shown in Table 1. It was analysed that most (36.7%) of the study participants belonged to the 20-29-year-old age group and majority (72.2%) of the participants were married. It was found in this study that most (51.9%) of the participants had primary level of education and majority (39.4%) of the study population were from Muslim religion. Majority of the meat handlers had greater than 5 years of experience 64.5%.

Table 1: Sociodemographic profile of the study participants.

Variables	Frequency	Percentage
Age group (years)		
<20	8	10.1
20-29	29	36.7
30-39	14	17.7
40-49	18	22.8
50-59	7	8.9
>60	3	3.8
Gender		
Male	68	86.1
Female	11	13.9
Marital status		
Single	22	27.8
Married	57	72.2
Religion		
Hindu	27	34.2
Muslim	52	65.8
Educational status		
No formal	23	29.1
Primary	41	51.9
Secondary	11	13.9
Tertiary	4	5.1

Among the study population, most (34%) of the meat handlers were involved in handling only chicken, 30% were involved in handling only fish and the least were handling only beef (4%).

Knowledge

Table 2 presents a summary of respondents' knowledge assessments and their respective responses. A significant majority of respondents (86.1%) understood that frequent hand washing decreases the likelihood of meat contamination. Approximately 96.2% were aware that carcasses can become contaminated in unclean environments. Furthermore, 89.9% of respondents correctly identified the sources of meat contamination,

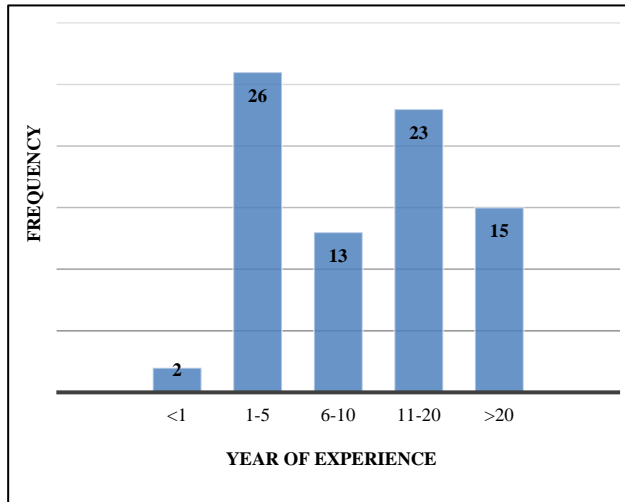whereas only 40.5% knew the causes of foodborne illnesses.

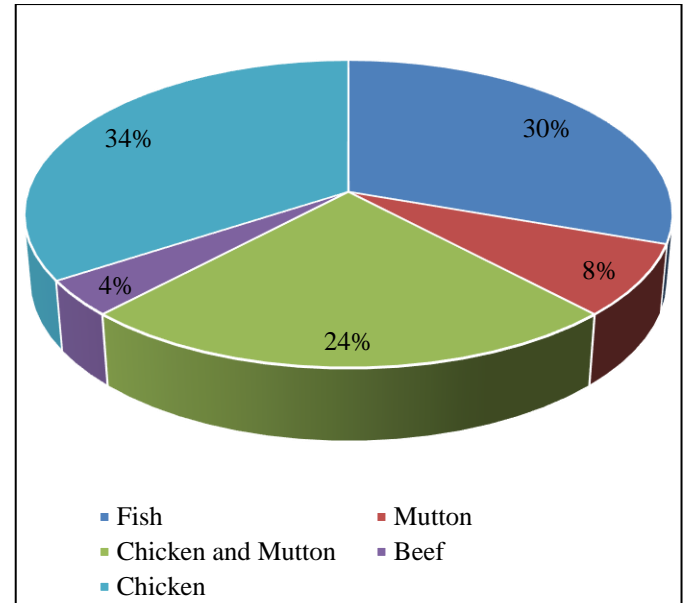**Figure 1: The distribution of meat handlers according to year of experience.**

Figure 2: The distribution of handling different meats.

Table 2: Respondents' knowledge assessment.

Variables		Frequency	Percentage (%)
Regular washing of hands reduces the risk of meat contamination	No	11	13.9
	Yes	68	86.1
	I don't know	0	0
Using appropriate gloves reduces contamination	No	40	50.6
	Yes	39	49.4
	I don't know	0	
Meat inspection to rule out infection is important	No	3	3.8
	Yes	76	96.2
	I don't know	0	
Refrigeration of meat is important for preservation	No	9	11.4
	Yes	70	88.6
	I don't know	0	
Cleanliness of the facility is important for meat processing facility	No	0	0
	Yes	79	100
Washing of live animals is important before slaughter	No	41	51.9
	Yes	38	48.1
	I don't know		
Carcass can be contaminated in dirty environment	No	3	3.8
	Yes	76	96.2
	I don't know		
The clean and dirty part of meat should be processed separately	No	3	3.8
	Yes	76	96.2
	I don't know		
Proper knowledge of potential contamination sources	No	8	10.1
	Yes	71	89.9
Knowledge of cause of foodborne illness	No	47	59.5
	Yes	32	40.5
Total knowledge scoring	Poor knowledge (0-5)	3	3.8
	Good knowledge (6-10)	76	96.2

While assessing the overall knowledge score, it was found that majority (96.2%) of the respondents had good knowledge and rest of them (3.8%) had poor knowledge.

Attitude

Table 3 shows participants attitude towards meat hygiene. A significant majority (98.7%) believe that professional training could improve practices in the food industry, with 84.8% acknowledging that such training provides valuable information for their work. Additionally, 93.7% of respondents agree that the practice of rubbing meat with fresh blood to enhance freshness should be discouraged due to its negative impact on meat processing hygiene. Furthermore, 89.9% acknowledge the importance of using clean water to clean work surfaces and instruments.

Table 3: Respondents' attitude towards meat hygiene.

Variables	Response to statements		
	Disagree N (%)	Indifferent N (%)	Agree N (%)
I think training provides useful information for the work	5 (6.3)	7 (8.9)	67 (84.8)
I think wearing of clean protective overall at work improves meat hygiene	0 (0)	20 (25.3)	59 (74.7)
I think eating and drinking in the slaughter area should be disallowed	16 (20.3)	3 (3.8)	60 (75.9)
Antemortem and postmortem meat inspection is essential to hygienic meat production	0 (0)	1 (1.3)	78 (98.7)
Professional training could help improve good practices in food industry	0(0)	1 (1.3)	78 (98.7)
It is important to use clean water to wash working surfaces and instrument after disinfection	0 (0)	8 (10.1)	71 (89.9)
Meat handlers can contaminate meat when they are ill with contagious diseases	8 (10.1)	9 (11.4)	62 (78.5)
Rubbing of meat with fresh blood to make it look good should be discouraged as it reduces good hygiene in meat processing	5 (6.3)	0 (0)	74 (93.7)
There is need to change or sterilize your knives after each processing	10 (12.7)	14 (17.7)	55 (69.6)
Slaughtering and processing of meat on clean slaughter floor is comparable to that of the slaughter line	3 (3.8)	1 (1.3)	75 (94.9)
Total attitude scoring	Poor attitude (10-27)	25	31.6
	Good attitude (28-30)	54	68.4

Table 4: Assessment of the practice among study participants.

	Variables	Frequency	Percentage
Do you wash your clothes daily after work?	No	15	19.0
	Yes	64	81.0
Do you process carcass and offal/ intestine together in the same place?	No	29	36.7
	Yes	50	63.3
Do you wash your hands regularly during a work day?	At the beginning only	19	24
	At the beginning, in between, and at the end	55	69.6
	At the end only	5	6.4
Do you use enough clean water to process your meat?	No	0	0
	Yes	79	100.0
Do you wash the animals before slaughtering?	No	46	58.2
	Yes	32	40.5
Do you rub meat with blood after processing to make it look fresh?	No	78	98.7
	Yes	1	1.3
Do you refrigerate your meat after processing?	No	23	29.1
	Yes	56	70.9
Do you inspect your animals before	No	5	6.3

	Variables	Frequency	Percentage
slaughtering?	Yes	74	93.7
Total practice scoring	Poor practice (0-5)	51	64.6
	Good practice (6-10)	28	35.4

Practice

Table 4 provides a summary of respondents' practices regarding meat hygiene. All respondents (100%) reported using clean water for meat processing. Eighty-one percent maintained personal hygiene by washing clothes daily. Regular hand washing at work was observed by 69.6% of respondents, and 93.7% inspected meat before slaughtering. However, a small percentage engaged in undesirable practices such as rubbing meat with blood to enhance freshness (1.3%) and processing meat and offal together (36.7%).

In terms of overall meat hygiene practices, 64.6% of respondents demonstrated good practices, while 35.4% exhibited poor practices.

Associated factors

There was no significant link identified between knowledge and attitude of meat hygiene with any of the sociodemographic characteristics. Majority of respondents in Hindu religion had good practice (74%). In our study, all female respondents had good practice (100%) were as only 25% of male respondents had good practice. It was found that respondents with secondary (90%) or tertiary (75%) level of education had good practice.

Table 5 summarizes the association of participants year of experience with their knowledge, attitude, and practice of meat hygiene.

Table 5: Association between year of experience with knowledge, attitude and practice.

Range of scores	Year of experience (%)						Chi square test	P value
	<1	1-5	6-10	11-20	>20	Total		
knowledge								
0-5	0 (0)	1 (33.3)	0 (0)	2 (66.7)	0 (0)	3 (100)	2.695	0.610
6-10	2 (2.6)	25 (32.9)	13 (17.1)	21 (27.6)	15 (19.7)	76 (100)		
Attitude								
10-27	1 (4)	7 (28)	3 (12)	6 (24)	8 (32)	25 (100)	4.611	0.330
28-30	1 (1.9)	19 (35.2)	10 (18.5)	17 (31.5)	7 (13)	54 (100)		
Practice								
0-5	0 (0)	19 (37.3)	6 (11.8)	16 (31.4)	10 (19.6)	51 (100)	6.673	0.154
6-8	2 (7.1)	7 (25)	7 (25)	7 (25)	5 (17.9)	28 (100)		
Total	2 (2.5)	26 (32.9)	13 (16.5)	23 (29.1)	15 (19)	79 (100)		

Table 6: Association between practice with sociodemographic features.

	Practice			Chi square test	P value
	0-5	6-8	Total		
Age group (years)					
<20	5	3	8	8.49	0.13
20-29	19	10	29		
30-39	12	2	14		
40-49	11	7	18		
50-59	4	3	7		
>60	0	3	3		
Marital status					
Married	34	23	57	2.15	0.14
Single	17	5	22		
Gender					
Male	51	17	68	23.27	0.00*
Female	0	11	11		
Religion					

	Practice			Chi square test	P value
	0-5	6-8	Total		
Hindu	7	20	27	26.75	0.00*
Muslim	44	8	52		
Educational status					
No formal	9	14	23		
Primary	29	12	41	10.71	0.013*
Secondary	10	1	11		
Tertiary	3	1	4		

*Statistically significant.

Significant relationships were observed between gender (p=0.00), religion (p=0.00), and educational status (p=0.013) and their adherence to meat hygiene practices (Table 6). Table 7 illustrates the relationship between meat handlers' practice of meat hygiene and their knowledge and attitude towards it. The analysis indicated that there was no significant relationship between knowledge (p=0.938) and the implementation of meat hygiene practices by meat handlers. Likewise, there was no statistically significant association observed between respondents' attitude and their meat hygiene practices (p=0.148).

Table 7: Association between respondent's knowledge and attitude with practice of meat hygiene.

Variables	Practice			Statistics (χ^2)	P value
	Good practice	Poor practice	Total		
Knowledge					
Good knowledge	27	49	76	0.006	0.938
Poor knowledge	1	2	3		
Attitude					
Good attitude	22	32	54	2.093	0.148
Poor attitude	6	19	25		

DISCUSSION

The sociodemographic profile of participants in this study mirrors that of a study among meat handlers in Lagos, Nigeria, where the majority are male and identify as Islamic.[1] This trend may be due to the demanding and hazardous nature of butchery and religious factors.

In terms of education, 52% of respondents in this study had primary education and 13% secondary, compared to 36% and 43% respectively in the Lagos study.[1] A study in Chhattisgarh found 76% of meat handlers lacked primary education. These differences might be due to the urbanized environment of Lagos. The mean age of participants here (33.86 years) was lower than in Lagos (39.09±12.17 years) and Assam (39.95±8.64 years) but higher than in Yaoundé, Cameroon (30 years).[10]

A significant 96.2% of respondents had good knowledge of meat hygiene, higher than the 71.70% in Lagos[1]. However, hand washing practices were lower (86%) compared to Lagos (95.28%).[11] In Jigjiga, Ethiopia, 91% knew regular hand washing reduces contamination risk.[12] Sani and Siow reported 92% of their respondents knew the importance of hand washing.[13] These findings highlight the critical role of hand hygiene in preventing foodborne diseases. Despite this, inadequate knowledge of foodborne illness causes was noted, likely due to a lack of consistent training. Many participants believed professional training could improve industry practices, suggesting the need for regular, updated training sessions to address knowledge gaps.

No statistically significant association was observed between the age group of respondents and their meat hygiene knowledge, contrary to findings from Lagos and Olumakaiye and Bakare, which suggested older meat handlers had better knowledge.[14] Conversely, a study in Ibadan found younger handlers had greater knowledge, possibly due to a greater inclination to learn.[15] These variations may be influenced by the small sample size in this study. Similarly, no significant difference was found between years of experience of respondents and their knowledge of meat hygiene, unlike the Lagos study which did find a significant association.

Overall, 68% of respondents had a positive attitude towards meat hygiene, showing a strong sense of hygiene and proper hand and personal sanitation practices. Respondents also had positive attitudes towards washing and disinfecting instruments, with 30% agreeing on the need to sterilize knives after each use. Additionally, 78.5% showed a good attitude towards meat handling when ill. According to Codex Alimentarius guidelines, individuals with infectious conditions should not handle meat.[14] In contrast, 56% of respondents in Tegegne and

Phyo's study admitted to handling meat while sick, posing a significant risk of food contamination and disease transmission.[12]

One of the main limitations of our study is its small sample size which restricts how broadly the findings can be applied, and its regional concentration on Vijayapura, which might not accurately represent practices in other areas.

The use of self-reported data raises the possibility of social desirability bias, which could inflate the importance of good hygiene habits.

Furthermore, the study does not take into consideration outside variables like infrastructure or regulatory limitations, nor does it include direct behavioural observation.

CONCLUSION

This study laid the groundwork for future policy development aimed at enhancing food safety, thereby contributing to overall public health improvement. It indicates a satisfactory level of knowledge, reasonable attitudes, and acceptable practices regarding meat hygiene, albeit highlighting the need for ongoing improvements within abattoir settings. Notably, the study did not find significant associations between knowledge, attitude, or practices. Additionally, it reveals that female respondents and those with secondary or tertiary education levels tended to demonstrate better practices. While the overall state of meat hygiene knowledge, attitudes, and practices is positive, sustained enhancement is essential through initiatives such as training and capacity building, consistent stakeholder engagement, mentorship programs pairing educated and uneducated meat handlers.

This study emphasizes the value of ongoing education and training for improving meat hygiene knowledge and practices among meat handlers. Regular training sessions are crucial to address gaps in knowledge and ensure the implementation of proper hygiene practices, ultimately reducing the risk of foodborne illnesses.

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