UNDER PEER REVIEW

Original Research Article

Meat Hygiene and Associated Health Hazards Awareness among Butchers and Meat Retailers in Jammu District of Jammu and Kashmir

ABSTRACT

The present study was conducted in Jammu district of Jammu and Kashmir state to access the meat hygiene and associated health hazard awareness among butchers and meat retailers in Jammu district of Jammu and Kashmir. Three slaughter houses of Jammu district situated at Nagrota, Old Rehari and Gujjar Nagar were selected for the study. Ten butchers from each slaughter house were selected. After preparing the comprehensive list of meat markets operating in Jammu district, three meat markets were selected, and from each selected meat market ten retail meat shops were randomly chosen. From each randomly selected retail meat shop, one person was selected purposively who was actively involved in animal slaughter and sale of meat at retail meat shop. Thus, a total of thirty butchers and thirty meat retailers were selected for the study. Data were collected through interview schedule as well as through observations. The data was coded, classified, tabulated and analyzed using the software; Statistical Package for the Social Science (SPSS 16.0). The presentation of data was done to give pertinent, valid and reliable answer to the specific objectives. Frequencies, percentage, mean and standard deviation were worked out for meaningful interpretation. It was found that contact with infected person and improper meat handling was considered as a major risk for transmission of diseases by most of meat handlers. Majority of meat handlers were aware of the public health significance of their business. Few had limited knowledge about cross contamination and presence of microorganisms in meat. Poor awareness was found regarding different zoonotic diseases (except bird flu), which can be transmitted through meat handling. Meat handlers avoided the meat handling work only when suffered major diseases. They were frequently wrong in judging the condition/diseases in which animals should not be slaughtered. The finding indicates that lapses exit between meat handlers' decision and the scientifically correct decision and thus final decision about the fitness of carcass and offal's must rest only with the veterinarian.

KEY WORDS: *Awareness, butchers, health hazards, meat retailers, zoonotic diseases.*

1. INTRODUCTION

Meat is a perishable commodity and therefore from production till consumption it needs to be good enough. Many pathogenic micro-organisms grow in the meat if hygienic procedures are not followed. Meat acts as a vehicle for disease transmission mainly bacterial, protozoan and helminthic. It is observed that along with meat, water used for meat processing also carries some diseases (c*ampylobacteriosis*, *amoebiasis*, and *ascariasis*) to human being during unhygienic handling of meat and its products, particularly in unorganized sector in developing countries like India. Globally, food borne illness is a growing public health problem because of increasing global trade in food, changes in the way food is produced and changes in the consumer's requirements. These changing pattern cause new challenges in the way of food safety management. About 75 percent of the new communicable diseases that have

UNDER PEER REVIEW

affected humans over the past 10 years have been caused by pathogens originating from animals or from products of animal origin. Many of these new human diseases are called zoonotic diseases which are associated with handling of diseased domestic and wild animal, slaughtering, meat cutting, retailing and processing. Although developing countries face increasingly strict sanitary and phytosanitary standards in their export markets, they can maintain and improve market access and improve domestic food safety and agricultural productivity by adopting a strategic approach to food safety, public health and trade [18]. International organizations like Food and Agriculture Organization (FAO) and World Health Organization (WHO) of United Nations are concerned with the prevention and transmission of human diseases through contaminated food, and with improvement of hygienic production, processing and distribution. An important development is the establishment of joint FAO/WHO food standards programme whose main responsibility is to prepare the “Codex Alimentarius”, a collection of internationally adopted standards for food and food products. The Codex Alimentarius Code of Hygienic Practice for Meat (CHPM) constitutes the primary international standard for meat hygiene and incorporates a risk-based approach to application of sanitary measure throughout meat production chain

Consumer preference for freshly cut birds/animals along with poor refrigeration facilities are probable factors for existence of retail meat shops in India. The shops are managed by meat sellers/butchers, who form an integral part of meat selling activity in India. In fact, butchers act as system nodes in meat selling as entire meat trade passes through butchers till selling [12]. Rapid increase in the household income, urbanization and changing lifestyle have combined to shift consumption towards non-traditional cereals and value added products, including many derived from livestock. Access to good quality, safe and nutritious food is considered as basic right of the people, and illness resulting from the consumption of food has been a basic problem for consumers. Even more recently, despite a continuous increase in demand, the image of animal products has been tarnished by the risk of meat borne diseases. Now days, economic lifestyle and consumer’s attitudes to food regarding quality are tending to be more and more consistent in the world. As income rise in relation to the cost of living, consumers generally tend to spend more on protein products of animal origin than before, thus quality of food of animal origin especially meat and meat products is now a days a predominant key for everyone in society [1]. The demand concerns nutritious, tasteful, safe, healthy and affordable food, either fresh or processed. Quality of animals’ products could be roughly classified by specialist of animal production into nutritional, technological, sensory, hygienic and sanitary aspect.

The entire gamut of meat production, processing and marketing is neglected one in India. The major constraints for the meat industry are lack of scientific approach to rearing of meat animals, unorganized nature of meat production and marketing, socio-economic taboos associated with meat eating, inadequate infrastructure facilities and poor post-harvest management. In the country the current state of affairs is forcing the consumer to shift towards other nutritive and hygienic products. Rapid increase in the household income, urbanization and changing lifestyle have combined to shift consumption towards non-traditional cereals and value added products, including many derived from

UNDER PEER REVIEW

livestock. This study was undertaken to assess the meat hygiene and associated health hazard awareness among butchers and meat retailers with the following objectives.

Objectives of investigation:

- To study the level of awareness regarding meat hygiene among butchers and meat retailers.
- To study level of awareness regarding meat associated health hazards among butchers and meat retailers.

2. MATERIALS AND METHODS

The present study was conducted in Jammu district of Jammu and Kashmir state to access the meat hygiene and associated health hazard awareness among butchers and meat retailers in Jammu district of Jammu and Kashmir. Three slaughter houses of Jammu district situated at Nagrota, Old Rehari and Gujjar Nagar were selected for the study. Ten butchers from each slaughter house were selected. After preparing the comprehensive list of meat markets operating in Jammu district, three meat markets were selected, and from each selected meat market ten retail meat shops were randomly chosen. From each randomly selected retail meat shop, one person was selected purposively who was actively involved in animal slaughter and sale of meat at retail meat shop. Thus, a total of thirty butchers and thirty meat retailers were selected for the study. Data were collected through interview schedule as well as through observations. The data was coded, classified, tabulated and analyzed using the software; Statistical Package for the Social Science (SPSS 16.0). The presentation of data was done to give pertinent, valid and reliable answer to the specific objectives. Frequencies, percentage, mean and standard deviation were worked out for meaningful interpretation.

3. Results

3.1 AWARENESS REGARDING MEAT HYGIENE AMONG BUTCHERS AND MEAT RETAILERS

3.1.1 Awareness about importance of personal hygiene

Meat handlers do not maintain appropriate degree of personal cleanliness. Those who have certain illness or who behave inappropriately, can contaminate meat and transmit illness to consumers. Moreover, personal hygiene is an important component of meat hygiene. A perusal of table 3.1.1 shows that importance of personal hygiene was felt by 76.66% respondents. The unawareness about this signifies the need to educate them for importance of personal hygiene .

UNDER PEER REVIEW

Table 3.1.1: Distribution of respondents according to their response to statement 1: Personal hygiene is important

Statement-1	Butchers (n=30)	Meat retailers (n=30)	Total (N=60)
Agree	24 (80.00)	22 (73.30)	46 (76.66)
Disagree	04 (13.30)	03 (10.00)	07 (11.66)
Do not know	02 (6.70)	05 (16.7)	07 (11.66)

(Values in parenthesis indicate percentage)

3.1.2 Awareness about public health significance

Table 3.1.2 unfolds that majority (46.66%) of meat handlers agreed to the public health importance of their work/business, while 38.33% disagreed its importance and, 15% of meat handlers do not know. Further analysis of table shows 50% of butchers agreed regarding its importance which highlights their better awareness compared to retailers.

Table 3.1.2: Distribution of respondents according to their response to statement 2: This work has public health significance

Statement-2	Butchers (n=30)	Meat retailers (n=30)	Total (N=60)
Agree	15 (50.00)	13 (43.30)	28 (46.66)
Disagree	11 (36.70)	12 (40.0)	23 (38.33)
Do not know	04 (13.30)	05 (16.70)	09 (15.00)

(Values in parenthesis indicate percentage)

UNDER PEER REVIEW

3.1.3 Awareness about importance of hand washing

Good personal habits, such as washing hands properly with soap and water before and after handling meat are important for meat hygiene. Table 3.1.3 exhibits that majority (56.66%) of respondents agreed that hand washing is important. During the course of study, it was observed that proper hand washing facilities were not available at both slaughter houses and retail meat shops.

Table 3.1.3: Distribution of respondents according to their response to statement 3: Hand washing is important

Statement-3	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	21 (70.00)	13 (43.30)	34 (56.66)
Disagree	06 (20.00)	05 (16.70)	11 (18.33)
Do not know	03 (10.00)	12 (40.00)	15 (25.00)

(Values in parenthesis indicate percentage)

3.1.4 Awareness about cross contamination

Cross contamination from one carcass to another carcass is possible when carcasses are stacked tighter during storage, transportation or sale. Majority of meat handlers (46.66%) disagreed to it, and only 30% agreed. This unawareness can be probable reason for continued poor handling of carcasses (Fig.1).

UNDER PEER REVIEW

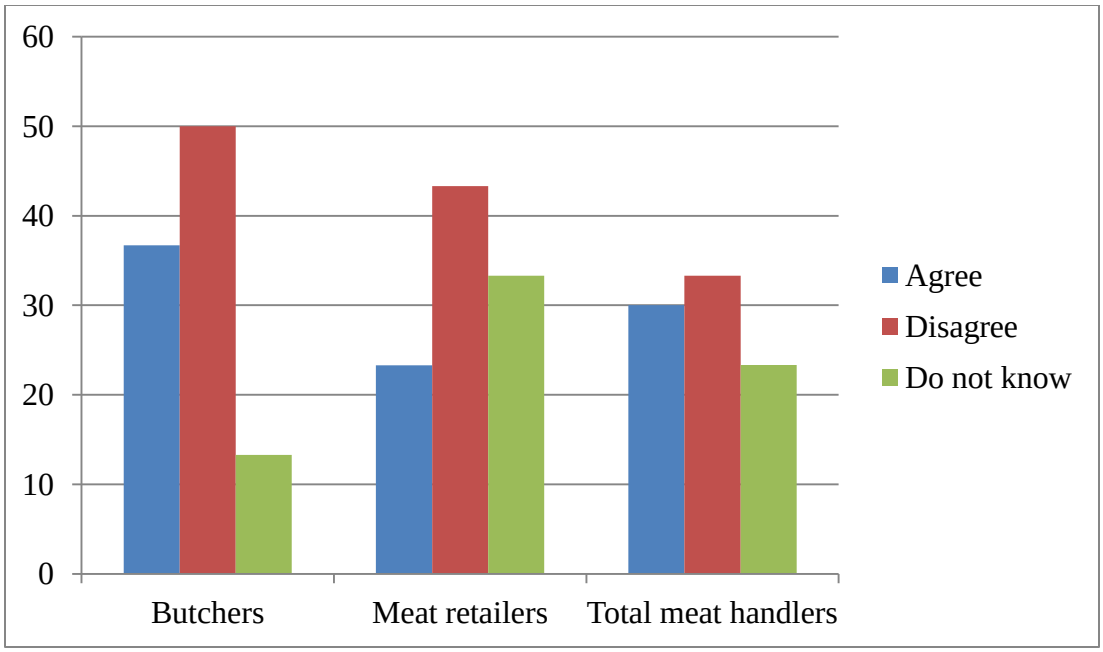

Fig.1: Distribution of respondents according to their response to statement 4: Cross contamination can happen from one carcass to another

3.1.5 Awareness about environmental impact on meat hygiene/quality

Environment is the sum total of all external conditions and influences affecting the life and development of any living being. Good environment facilitates good working practices. Table 3.1.4. reveals that the importance of environment and its impact on meat hygiene/quality was felt by 38.33% while 18.33% of respondents disagreed its important and 43.33% do not know .

Table 3.1.4: Distribution of respondents according to their response to statement 5: Environment has impact on meat hygiene/quality

Statement-5	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	13 (43.30)	10 (33.30)	23 (38.33)
Disagree	03 (10.00)	08 (26.66)	11 (18.33)

UNDER PEER REVIEW

Do not know	14 (46.70)	12 (40.00)	26 (43.33)

(Values in parenthesis indicate percentage)

3.1.6 Awareness about microorganism in meat

Meat is a perishable food item and utmost precaution must be taken to safeguard it right from bleeding of slaughter animals till final consumption. Though muscle tissue of living animal is free of microorganisms in most cases, it gets contaminated by the body surface and visceral organ contamination during slaughtering and dressing operation if due precautions are not taken. The finding of table 3.1.5 point out that only 26.66 responded were agreed ,whereas 40.00% of meat handlers disagreed and 33.00% of respondents were not aware regarding the growth of microorganism in meat if not properly handled. It was felt that education in this direction should be provided to meat handlers to improve the hygienic status of meat.

Table 3.1.5: Distribution of respondents according to their response to statement 6: Meat can carry microorganisms

Statement-6	**Butchers** **(n=30)**	**Meat retailers** **(n=30)**	**Total** **(N=60)**
Agree	11 (36.70)	05 (16.70)	16 (26.66)
Disagree	10 (33.30)	14 (46.70)	24 (40.00)
Do not know	09 (30.00)	11 (36.70)	20 (33.33)

(Values in parenthesis indicate percentage)

3.1.7 Awareness about presence of pathogen and their growth in meat

Microbial activity plays a major role in deterioration and spoilage of meat and safety of meat is compromised. Bacteria multiply rapidly between 40 ^{0}F to 140 ^{0}F It is clear from the Fig. 2 that a merely 20% respondents agreed, whereas 40% of respondents were not aware about presence of pathogen and their growth in meat.

UNDER PEER REVIEW

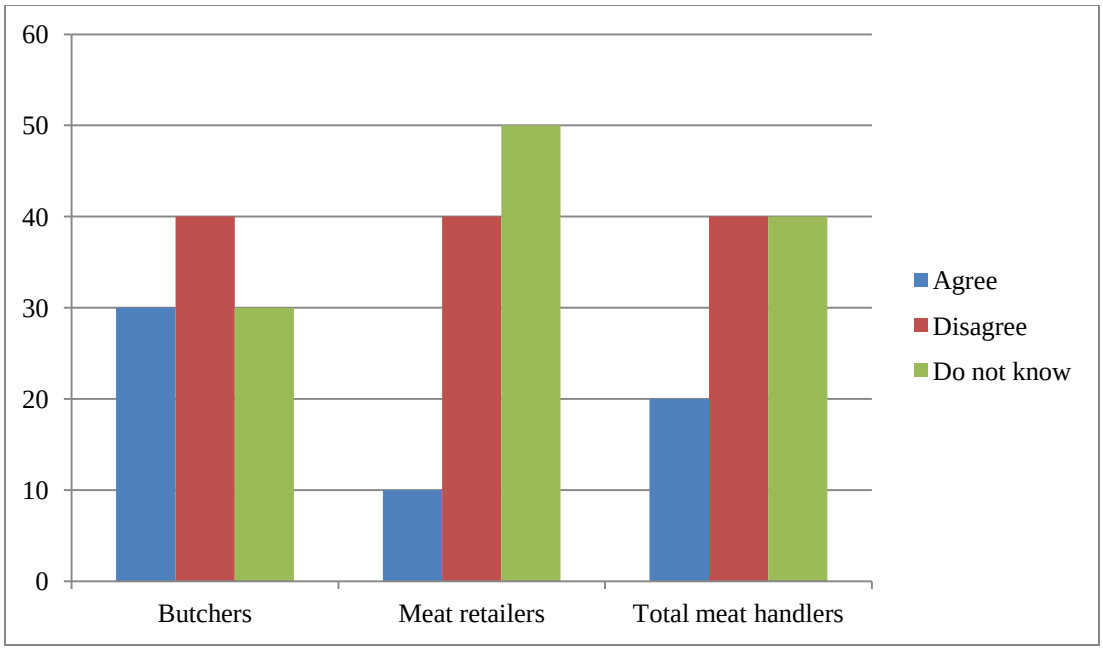

Fig.2: Distribution of respondents according to their response to statement 7: Meat permits survival/multiplication of pathogens/toxin formation

3.1. 8 Awareness about importance of meat inspection

Many diseased and abnormal conditions can be identified during meat inspection and thus inspection of meat by veterinarians/ meat inspectors is must. It is obvious from the table that majority of the respondents (43.33%) disagreed whereas only 38.33% of respondents agreed to it. Negative opinion regarding meat inspection should be changed by proper education.

Table 3.1.6: Distribution of respondents according to their response to statement 8: Inspection of meat by meat inspectors/veterinarians is important

Statement-8	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	14 (46.70)	09 (30.00)	23 (38.33)
Disagree	14 (46.70)	12 (40.00)	26 (43.33)
Do not know	02 (6.70)	09 (30.00)	11 (18.33)

(Values in parenthesis indicate percentage)

UNDER PEER REVIEW

3.1.9 Awareness about risk of producing unsafe and unhygienic meat

Due care should always be taken to minimize the risk of producing unsafe and unhygienic meat by adopting good production practices. Table 3.1.7 reveals that majority (41.66%) of the respondents were not aware and only 36.66% of respondents agreed to it .

Table 3.1.7: Distribution of respondents according to their response to statement 9: Care should be taken to minimize the risk of producing unsafe and unhygienic meat

Statement-9	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	13 (43.30)	09 (30.00)	22 (36.66)
Disagree	08 (26.70)	05 (16.70)	13 (21.66)
Do not know	09 (30.00)	16 (53.30)	25 (41.66)

(Values in parenthesis indicate percentage)

3.1.10 Awareness about corrective measures

The Fig.3 shows that the majority of meat handlers (50%) agreed that it is not proper to sell meat when gross abnormality is detected to it. In these conditions corrective measures towards an abnormality of carcass or meat can either full condemnation of carcass or an infected organ or sale with an instruction that meat should be cooked properly before consumption .

UNDER PEER REVIEW

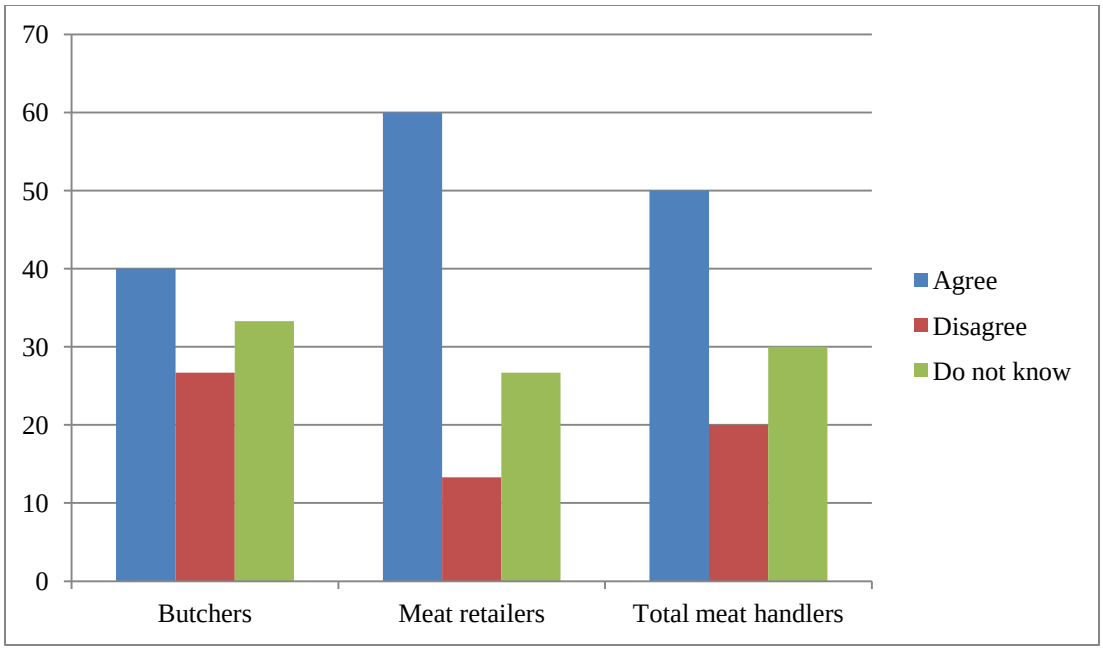

Fig.3: Distribution of respondents according to their response to statement 10: Corrective measure should be taken when anything unusual with the meat is noticed

3.1.11 Awareness about cross contamination through hands

Unhygienic Slaughtering, dressing, handling and faulty inspection of meat present many opportunities for cross contamination. It is established that dirty hands can lead undue cross contamination that may cause meat borne diseases. A look over the table 3.1.8 reveals that majority of meat handlers (40.00%) agreed that hand can be greatest risk for cross contamination.

Table 3.1.8: Distribution of respondents according to their response to statement 11: Hands are great risk for cross contamination

Statement-11	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	13 (43.30)	11 (36.70)	24 (40.00)
Disagree	09 (30.00)	10 (33.30)	19 (31.66)
Do not know	08 (26.70)	09 (30.00)	17 (28.33)

(Values in parenthesis indicate percentage)

UNDER PEER REVIEW

3.1.12 Awareness about time required for hygienic meat production

Production of wholesome meat that is safe and suitable for human consumption required detailed attention to be paid to different aspect of slaughter and dressing of animals as well as transportation, display and sale of meat. Table 3.1.9 indicates that 40% of respondents expressed that hygienic meat production would take too much time; whereas majority of meat retailer (50%) reported that they do not know how much time it will take for hygienic meat production. Labour intensive meat handling practices may be reason behind it.

Table 3.1.9: Distribution of respondents according to their response to statement 12: Hygienic meat production will take too much time

Statement-12	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Agree	13 (43.30)	11 (36.70)	24 (40.00)
Disagree	11 (36.70)	04 (13.30)	15 (25.00)
Do not know	06 (20.00)	15 (50.00)	21 (35.00)

(Values in parenthesis indicate percentage)

3.1.13 Awareness about applying meat hygiene practice in present situation

A perusal of fig.4 clearly indicates that majority (50.00%) of respondents agreed that present situation was not proper to apply meat hygiene practices, while only, 21.66% of respondents reported that applying meat hygiene practices in present condition were not difficult .

UNDER PEER REVIEW

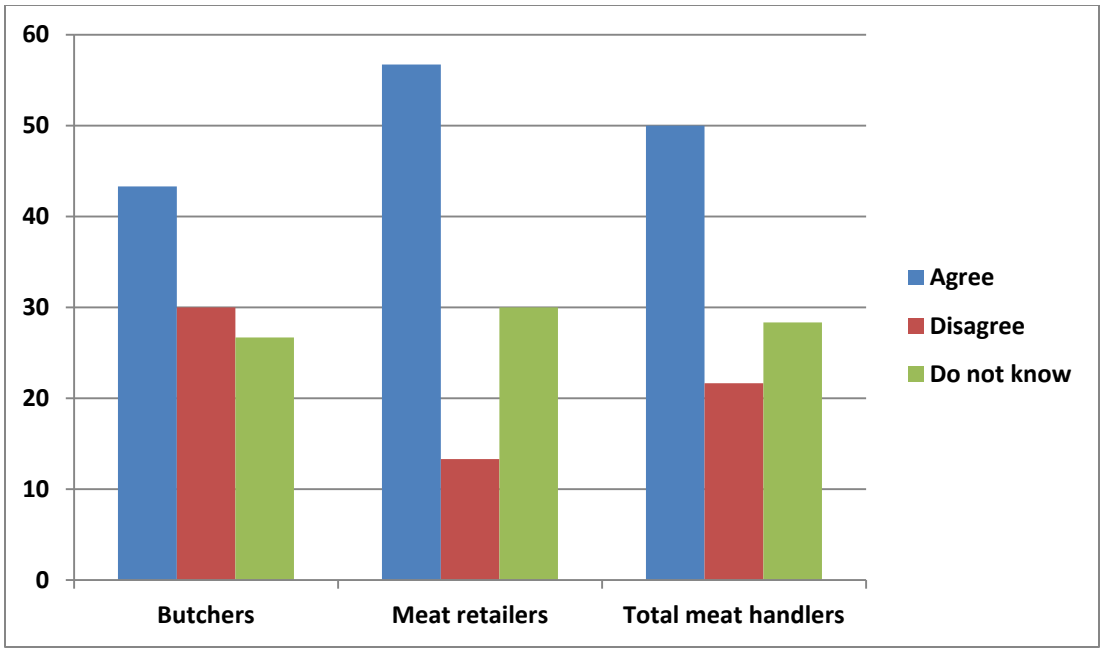

Fig.4: Distribution of respondents according to their response to statement 13: It is difficult to apply meat hygiene practice in present situation

3.1.14 Retailers opinion on display, storage and sale of meat

The display, storage and sale of carcass/meat should be perfect from hygienic point of view. An analysis of table 3.1.10 reveals that majority of meat retailers (73.30%) agreed that they should maintain separate areas for sale and meat production, whereas (70%) agreed for storage of leftover meat in deep freezer or refrigeration. An overwhelming proportion (73.30%) of meat handlers agreed that maintaing hygiene in slaughtering, dressing and display of carcass would help to attract more customers. It is also clear from table 3.1.10 that a considerable proportion (60%) agreed that arrangements and maintaince required for hygienic meat would not affect their business. It was further found that 36.70% of meat retailers agreed that there were chances of improvement in the status of meat hygiene at their shops.

Table 3.1.10: Distribution of respondents according to their opinion on display, storage and sale of meat.

Statements	**Meat retailers (N=30)**		
	Opinion	**Frequency**	**Percent**
Having separate areas for sale and meat processing is important.	Do not know	03	10.00
	Disagree	05	16.70
	Agree	22	73.30
Leftover meat should	Do not know	04	13.30

UNDER PEER REVIEW

be stored properly in ice boxes or refrigerator	Disagree	05	16.70
	Agree	21	70.00
Sale of hygienic meat will enable the business to win more consumers	Do not know	05	16.70
	Disagree	03	10.00
	Agree	22	73.30
Maintaince of meat hygiene has little impact on daily running of business	Do not know	04	13.30
	Disagree	08	26.70
	Agree	18	60.00
Status of meat hygiene at your shop can be better than now	Do not know	16	53.30
	Disagree	03	10.00
	Agree	11	36.70

3.2 AWARENESS OF BUTCHERS AND MEAT RETAILERS ABOUT MEAT ASSOCIATED HEALTH HAZARDS

3.2.1 Awareness about different modes of transfer of diseases

Communicable disease can spread through various modes and an awareness of such modes is prerequisite to prevent the spread of such diseases. As evident from the table 3.2.1 that majority of respondents (86.66%) know that contact with infected person is the mode of disease transmission whereas disease transmission through meat handling and meat consumption was known by 46.66% and 31.66% of meat handlers, respectively.

Table 3.2.1: Distribution of respondents according to their awareness about different modes of transfer of diseases*

Mode	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Contact with infected person	26 (86.70)	26 (86.70)	52 (86.66)
Drinking water	20 (66.70)	21 (70.00)	41 (68.33)

UNDER PEER REVIEW

Food	13 (43.30)	11 (36.70)	24 (40.00)
Meat handling	17 (56.70)	11 (36.70)	28 (46.66)
Meat consumption	12 (40.00)	07 (23.30)	19 (31.66)
Inhalation	06 (20.00)	04 (13.30)	10 (16.66)

(Values in parenthesis indicate percentage)

* Multiple responses

3.2.2 Awareness about animal diseases of zoonotic significance

Zoonotic diseases constitute unique group of infectious diseases that affect man as well as animals. The joint expert committee of WHO and FAO (1959) has defined zoonoses as those diseases which are naturally transmitted between vertebrate animals and man. As evident from the table 3.2.2 that majority of the respondents (90%) were aware of bird flu, whereas rabies, tuberculosis and tetanus were known to 70%, 61.66% and 43.33% respectively. Further the result indicates that brucellosis (10%), anthrax (20%), salmonellosis (16.66%), taeniasis (15%) and fasciolosis (26.66%) were some diseases with comparatively less awareness among meat handlers. While none of the meat handlers were aware of Leptospirosis and Campylobacteriosis.

Table 3.2.2: Distribution of respondents according to their awareness about animal disease of zoonotic significance*

Disease	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Bird flu	28 (93.30)	26 (86.70)	54 (90.00)
Rabies	15 (50.00)	17 (56.70)	42 (70.00)
Brucellosis	03 (10.00)	02 (6.70)	05 (8.33)
Tuberculosis	18	19	37

UNDER PEER REVIEW

	(60.00)	(63.30)	(61.66)
Anthrax	02 (6.70)	03 (10.00)	05 (8.33)
Tetanus	11 (36.70)	09 (30.00)	20 (33.33)
Salmonellosis	03 (10.00)	04 (13.30)	07 (11.66)
Taeniasis/cysticercosis	03 (10.00)	05 (16.70)	08 (13.33)
Fasciolosis	04 (13.30)	04 (13.30)	08 (13.33)
Campylobacteriosis	0 (0.00)	0 (0.00)	0 (0.00)
Leptospirosis	0 (0.00)	0 (0.00)	0 (0.00)

(Values in parenthesis indicate percentage)

* Multiple responses

3.2.3. Awareness about transfer of certain diseases from animals/meat handling

Meat handlers constitute a unique group of individuals with immense public health significance because they can not only contract the diseases from animals/meat but also transmit it through improper handling of meat. As evident from table 3.2.3 that significant proportions of meat handlers (78.33%) were aware that bird flu could be transmitted through handling of infected bird whereas tuberculosis (43.33%), tetanus (25.00%) and fasciolosis (25.00%), are another such diseases of meat handlers were awared that these could be transmitted through animal/meat handling.

Table 3.2.3: Distribution of respondents according to their awareness about transfer of certain diseases from animals/meat handling*

Disease	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Bird flu	26 (86.70)	21 (70.0)	47 (78.33)
Rabies	08 (26.70)	06 (20.00)	14 (23.33)
Brucellosis	02	0	02

UNDER PEER REVIEW

	(6.70)	(0.00)	(3.33)
Tuberculosis	13 (43.30)	13 (43.30)	26 (43.33)
Anthrax	04 (13.30)	02 (6.70)	06 (10.00)
Tetanus	03 (10.00)	08 (26.70)	11 (18.33)
Salmonellosis	04 (13.30)	01 (3.30)	05 (8.33)
Taeniasis/cysticercosis	03 (10.00)	01 (3.30)	04 (6.66)
Fasciolosis	04 (13.3)	03 (10.0)	07 (11.66)
Campylobacteriosis	0 (0.00)	0 (0.00)	0 (0.00)
Leptospirosis	0 (0.00)	0 (0.00)	0 (0.00)

(Values in parenthesis indicate percentage)

* Multiple responses

3.2.4 Opinion on continuation of meat production operations by meat handlers after encountering certain disorders / diseases

An analysis of table 3.2.4 displays that cent percent of meat handlers considered jaundice and leprosy to be diseased in which one should not work whereas 88.33%, 60%, 41.66%, 51.66% and 68.33% of meat handlers opinioned that they should continue their work when encountered with corresponding disordered or diseases like eye, ear or nasal discharge, tonsillitis, conjunctivitis, eczema and diarrhoea, respectively. It was observed during course of study that physical fitness to continue meat production operation was given more importance by meat handlers than disease transmission while soliciting their opinion.

Table 3.2.4: Distribution of respondents according to their opinion on continuation of meat production operations after encountering certain disorders / diseases

Disordered/Disease	**Opinion**	**Butchers (n=30)**	**Meat retailers (n=30)**	**Total (N=60)**
Discharge from eye, ear or nose	Continue	28 (93.30)	25 (83.30)	53 (88.33)
	Continue after	02	03	05

UNDER PEER REVIEW

	recovery	(6.70)	(10.00)	(8.33)
	Should not continue	0 (0.00)	02 (6.70)	02 (3.33)
Inflammation of tonsil	Continue	30 (100.00)	30 (100.00)	60 (100.00)
	Continue after recovery	0 (0.00)	0 (0.00)	0 (0.00)
	Should not continue	0 (0.00)	0 (0.00)	0 (0.00)
Conjunctivitis	Continue	15 (50.00)	10 (33.3)	25 (41.66)
	Continue after recovery	13 (43.30)	16 (53.30)	29 (48.33)
	Should not continue	02 (6.70)	04 (13.30)	06 (10.00)
Eczema on hands, forearms or face	Continue	12 (40.00)	19 (63.30)	31 (51.66)
	Continue after recovery	01 (3.30)	0 (0.00)	01 (1.66)
	Should not continue	17 (56.70)	11 (36.70)	28 (46.66)
Diarrhoea	Continue	19 (63.30)	22 (73.30)	41 (68.33)
	Continue after recovery	09 (30.00)	06 (20.00)	15 (25.00)
	Should not continue	02 (6.70)	02 (6.70)	04 (6.66)
Diarrhoea and vomiting	Continue	05 (16.70)	0 (0.00)	05 (8.33)
	Continue after recovery	19 (63.30)	20 (66.70)	39 (65.00)
	Should not continue	06 (20.00)	10 (33.30)	16 (26.66)

UNDER PEER REVIEW

Fever	Continue	21 (70.00)	24 (80.00)	45 (75.00)
	Continue after recovery	06 (20.00)	0 (0.00)	06 (10.00)
	Should not continue	03 (10.00)	06 (20.00)	09 (15.00)
Jaundice	Continue	0 (0.00)	0 (0.00)	0 (0.00)
	Continue after recovery	0 (0.00)	0 (0.00)	0 (0.00)
	Should not continue	30 (100.00)	30 (100.00)	60 (100.00)
Leprosy	Continue	0 (0.00)	0 (0.00)	0 (0.00)
	Continue after recovery	0 (0.00)	0 (0.00)	0 (0.00)
	Should not continue	30 (100.00)	30 (100.00)	60 (100.00)

(Values in parenthesis indicate percentage)

3.2.5 Opinion about various ailments encountered in animals or carcasses

Animals to be slaughtered are not always free from diseases. Provision of ante-mortem and post-mortem inspection confirms that the meat passed for human consumption is safe and suitable. Partially condemned meat relates to the conditions of carcass which are not served. These are mostly non-infectious or mild infectious. Non-infectious conditions include fractures, bruises, non-suppurative wounds, localized burns, hematoma etc. Infectious condition includes abscess, suppurative wound and hydatid cyst which require laboratory diagnosis. Such meat can be passed for human consumption after trimming /removing affected portions. Carcass of animal along with its blood and offal is said to be unsound or condemned totally when affected with following conditions viz. anthrax, black quarter, tetanus, tuberculosis, salmonellosis, fowl typhoid, blue tongue, rabies, sarcocystis, multiple hydatid cyst, emaciation, malignant or multiple tumors etc.

An analysis of table 3.2.5 reveals that 50%, 58.33%, 55%, 95%, 83.33% and 100% of meat handlers opinioned that either they should not slaughter the animals or condemned the whole carcasses when encountered with corresponding aliments like fracture, wounds, fever, jaundices, multiple tumor and abnormal odour from carcass, respectively whereas 53.33%,45%, 5% and 10% of meat handlers

UNDER PEER REVIEW

opinioned that either they should condemned the affected part or no action is required when animals or carcasses encountered with corresponding aliments like emaciation, fever, fracture and wounds, respectively. The finding indicates that lapses exit between meat handlers' decision and the scientifically correct decision. Final decision about the fitness of carcass and offal's must rest only with the veterinarian.

Table 3.2.5: Distribution of respondents according to their opinion on various ailments encountered in animals or carcasses.

Aliment	Opinion	Butchers (n=30)	Meat retailers (n=30)	Total (N=60)
Fracture	Do not slaughter	16 (53.30)	14 (46.70)	30 (50.00)
	Condemn the affected part	14 (46.7)	13 (43.3)	27 (45.00)
	Condemn the whole carcass	0 (0.00)	0 (0.00)	0 (0.00)
	No action required	0 (0.00)	03 (10.00)	03 (5.00)
wounds	Do not slaughter	12 (40.00)	07 (23.30)	19 (31.66)
	Condemn the affected part	14 (46.70)	21 (70.00)	35 (58.33)
	Condemn the whole carcass	0 (0.00)	0 (0.00)	0 (0.00)
	No action required	04 (13.30)	02 (6.70)	06 (10.00)
Emaciation	Do not slaughter	18 (60.00)	10 (33.30)	28 (46.66)
	Condemn the affected part	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the whole carcass	0 (0.00)	0 (0.00)	0 (0.00)
	No action required	12 (40.00)	20 (66.70)	32 (53.33)

UNDER PEER REVIEW

Fever	Do not slaughter	16 (53.3)	17 (56.70)	33 (55.00)
	Condemn the affected part	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the whole carcass	0 (0.00)	0 (0.00)	0 (0.00)
	No action required	14 (46.70)	13 (43.30)	27 (45.00)
Jaundices	Do not slaughter	30 (100.00)	27 (90.00)	57 (95.00)
	Condemn the affected part	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the whole carcass	0 (0.00)	03 (10.00)	03 (5.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Multiple tumors visible on carcass	Do not slaughter	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the affected part	02 (6.70)	08 (26.70)	10 (16.66)
	Condemn the whole carcass	28 (93.30)	22 (73.30)	50 (83.33)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Abnormal odour from body	Do not slaughter	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the affected part	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn the whole carcass	30 (100.00)	30 (100.00)	60 (100.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)

(Values in parenthesis indicate percentage)

UNDER PEER REVIEW

3.2.6 Opinion about condemnation of various diseased organs

During dressing and examination of carcass and offal's, a number of lesions suggestive of different diseases are encountered. A decision can be taken to either trim the affected part or condemn whole organ as per scientific norms. An analysis of table 3.2.6 reveals that 100%, 93%, 90%,81.66%,75.%, 73.33% and 66.66% of meat handlers opinioned that they should condem the whole organ when an organ affected with following diseases /disordered like,(tumor on liver, parasite inside, tumor of lymph node and pus in kidney), (enlarged spleen), (septic condition of lung and nodules on lungs), (swelling and oedema of lymph node),(fluid in pleural cavity around lung), (cyst on lung) and (cyst on liver),respectively whereas 10%, 25%,18.33% and 6.66% of meat handlers opinioned that no action is required when an organ affected with following diseases /disordered like septic condition of lung, fluid in pleural cavity around lung, swelling and oedema of lymph node and enlarged spleen, respectively. The finding indicates that lapses exit between meat handlers' decision and the scientifically correct decision. Final decision about the fitness of carcass and offal's must rest only with the veterinarian.

Table 3.2.6: Distribution of respondents according to their opinion regarding condemnation of various diseased organs

Aliment	Opinion	Butchers (n=30)	Meat retailers (n=30)	Total (N=60)
Cyst on liver	Trimming of affected parts	16 (53.30)	04 (13.30)	20 (33.33)
	Condemn whole organ	14 (46.70)	26 (86.70)	40 (66.66)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Tumors on liver	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	30 (100.00)	30 (100.0)	60 (100.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Parasite inside liver	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole	30	30	60

UNDER PEER REVIEW

	organ	(100.00)	(100.0)	(100.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00))
Septic or gangrenous condition of lung	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	30 (100.00)	24 (80.0)	54 (90.00)
	No action required	0 (0.00)	06 (20.00)	06 (10.00)
Nodules on lungs	Trimming of affected parts	06 (20.00)	0 (0.00)	06 (10.00)
	Condemn whole organ	24 (80.00)	30 (100.00)	54 (90.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Cyst on lungs	Trimming of affected parts	10 (33.30)	06 (20.00)	16 (26.66)
	Condemn whole organ	20 (66.70)	24 (80.0)	44 (73.33)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Fluid in plural cavity around lung	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	21 (70.00)	24 (80.00)	45 (75.00)
	No action required	09 (30.00)	06 (20.00)	15 (25.00)
Swelling and oedema of lymph node	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	26 (86.70)	23 (76.7)	49 (81.66)
	No action required	04	07	11

UNDER PEER REVIEW

		(13.30)	(23.3)	(18.33)
Tumor of lymph node	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	30 (100.00)	30 (100.0)	60 (100.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)
Enlarged spleen	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	28 (93.30)	28 (93.3)	56 (93.33)
	No action required	02 (6.70)	02 (6.70)	04 (6.66)
Pus in kidney	Trimming of affected parts	0 (0.00)	0 (0.00)	0 (0.00)
	Condemn whole organ	30 (100.00)	30 (100.0)	60 (100.00)
	No action required	0 (0.00)	0 (0.00)	0 (0.00)

(Values in parenthesis indicate percentage)

4 DISCUSSION

4.1 AWARENESS REGARDING MEAT HYGIENE AMONG BUTCHERS AND MEAT RETAILERS

Importance of personal hygiene was felt by majority of respondents and an overwhelming proportion of meat handlers were agreed to the public health importance of their work/business, while very few respondents disagreed regarding its importance and very less proportion of respondents of meat handlers were unaware. Most of respondents agreed that hand washing is important as far personal hygiene is concerned. The findings were in agreement with the result of Junaidu *et al.* [10] and Sneed *et al.*[19] who reported that that personal hygiene plays an integral part in ensuring safe products to the consumer if meat handlers take serious note on the cleanliness of their hands, body and clothing. The importance of environment and its impact on meat hygiene/quality was felt by little number of respondents while very less proportion of respondents disagreed its importance and majority were unaware. Significant proportions of meat handlers were not aware about growth of microorganism in meat if not properly

UNDER PEER REVIEW

handled. Kebede *et al* [11] reported that meat contains an abundance of nutrients required for the growth of bacteria in adequate quantity. Careless handling of meat at the slaughtering places and butcher shops affect the quality of meat which indicated as the presence of contamination. Most of the respondents disagreed that inspection of meat by veterinarian will improve meat quality and prevent from various meat associated hazards and only few respondents did agree to it. On the contrary Davies *et al. [5]* and Hathaway [9] reported that *ante-mortem* and *post-mortem* inspection of carcass enable the detection of observable abnormalities and also have the potential to detect new diseases which may be of direct public health significance, thereby ensuring good quality meat and safety to the consumers. Negative opinion regarding meat inspection may be due to low education of meat handlers. Majority of meat handlers agreed that hands can be greatest risk for cross contamination; whereas significant proportions of respondents expressed that hygienic meat production would take too much time. Fifty percent of meat retailer reported that they do not know how much time it will take for hygienic meat production and labour intensive meat handling practices may be reason behind it. Half of respondents agreed that present situation was not proper to apply meat hygiene practices. The findings were also in agreement with the results of Oluwafemi *et al.* [15] who reported that the current slaughtering, processing and marketing in many places are not in compliance with the standard quality and hygiene practices. It may act as source of contamination and ill health for consumers and takes lot of expenditure and duration of time to produce hygiene meat.

A significant proportion of meat retailers agreed that they should maintain separate areas for sale in order to produce hygienic, good quality meat and also prevent from cross contamination. The findings were in agreement with Bolton [13] and Upadhyaya *et al*. [20] who reported that contamination levels can be decreased by keeping more than two kinds of meat in a shop with proper separation of meat areas in the shops. Majority of the respondents also agreed that storage of leftover meat in deep freezer or refrigeration will reduces the growth of microorganism and prevent spoilage of meat. Similar finding have been earlier reported by Oluwafemi *et al* [15] that maintaining an effective sanitation protocol and proper storage will limit possible contamination of the meat through dirty equipment and contact surfaces, and prevent spoilage and food poisoning among consumers. Similarly, Junaidu *et al*. [10] reported that almost all the respondents agreed that improper storage of meat might be harmful to health. An overwhelming proportion of meat handlers agreed that maintaing hygiene in slaughtering, dressing and display of carcass would help win more customers. The finding were in agreement with Ruban *et al.* [16] who reported that the maintenance of strict hygiene during slaughter and processing is of prime importance to produce meat with good microbial quality and better shelf life, thereby ensuring safety to the consumers and they will prefer the meat with good microbial quality, hygienically slaughtered and processed.

UNDER PEER REVIEW

4.2 AWARENESS OF BUTCHERS AND MEAT RETAILERS ABOUT MEAT ASSOCIATED HEALTH HAZARDS

Contact with infected person was the most awared mode of disease transmission by majority of respondents while meat handling as a mode of transmission was known to very few number of meat handlers. Similar finding have been earlier reported by Sneed *et al*. [19] who reported that if meat handlers take serious note on the cleanliness of their hands, body and clothing, this will help in preventing incidence of cross-contamination and thereby, reducing transmission of various zoonotic diseases. Very less number of meat handlers considered meat consumption as likely source of disease transmission. Similarly Labie [13], Mbata [14and Bradeeba *[3]* observed that contaminated and raw meat consumption act as source of various infectious and zoonotic diseases**.** Majority of respondents were aware of bird flu followed by rabies, whereas tuberculosis, tetanus and anthrax were known to less numbers of meat handlers. While none of the meat handlers were aware of leptospirosis and campylobacteriosis. The findings were in agreement with the result of Ghimire *et al.* [8] who reported that majority of pork handlers in Nepal were unaware of zoonotic diseases like Campylobacteriosis as they were either illiterate or having low level of education. Similarly Brown *et al.* [4] studied the leptospirosis awareness among butchers and reported that majority of butchers were aware of leptospirosis

A significant proportion of meat handlers were aware that bird flu could be transmitted through handling of infected birds whereas very few respondents were aware that tuberculosis, tetanus and fasciolosis are another such diseases of meat handlers that these could transmitted through animal/meat handling. Jaundice and leprosy were considered the diseases, in which one should not work, by cent percent of retailers. A significant proportion of meat handlers opinioned that they should continue their work when encountered with corresponding disorders or diseases like eye, ear or nasal discharge, tonsillitis, conjunctivitis, eczema and diarrhoea, respectively. Majority of meat handlers opinioned that either they should not slaughter the animals or condemned the whole carcasses when encountered with corresponding aliments like fracture ,wounds, fever , jaundices , multiple tumor and abnormal odour from carcass, respectively whereas very few number of meat handlers opinioned that either they should condemn the affected part or no action is required when animals or carcasses encountered with corresponding aliments like emaciation, fever, fracture and wounds, respectively. This finding indicates that lapses exit between meat handlers' decision and the scientifically correct decision. Most of that respondents of meat handlers opinioned that they should condemn the whole organ when an organ is affected with following diseases /disordered like, (tumor on liver, parasite inside, tumor of lymph node and pus in kidney), (enlarged spleen), (septic condition of lung and nodules on lungs), (swelling and oedema of lymph node), (fluid in pleural cavity around lung), (cyst on lung) and (cyst on liver),respectively whereas only few of meat handlers opinioned that no action is required when an organ affected with following diseases /disordered like septic condition of lung, fluid in pleural cavity around lung, swelling and oedema of lymph node and enlarged spleen, respectively. These findings were in agreement with the finding of Sahay *et al*. [17].

UNDER PEER REVIEW

5 CONCLUSION:

Meat is a perishable commodity and therefore from production till consumption it needs to be good enough. Many pathogenic micro-organisms grow in the meat if hygienic procedures are not followed. Meat acts as a vehicle for disease transmission mainly bacterial, protozoan and helminthic. Contact with infected person and improper meat handling was considered as a major risk for transmission of diseases by most of meat handlers. Poor awareness was found regarding different zoonotic diseases (except bird flu), which can be transmitted through meat handling. Meat handlers avoided the meat handling work only when suffered major diseases. They were frequently wrong in judging the condition/diseases in which animals should not be slaughtered. About, 75 percent of the new communicable diseases that affected humans over the past 10 years have been caused by pathogens originating from animal or from products of animal origin. Many of these new human diseases are called zoonotic diseases which are associated with handling of diseased domestic and wild animal, slaughtering, meat cutting, retailing and processing. Hence, considering the present situation, there was a need to study and understand the importance and awareness of meat hygiene and associated health hazard among butchers, meat retailers and consumers in Jammu district.

References

1. Aumaitre A. Quality and safety of animal products. Livestock Production Science. 1991; 59(3): 113-124

2. Bolton FJ, Crozier L, Williamson LK. Isolation of *E. coli* 0157 from raw meat products. Letters in Applied Microbiology. 1996; 23: 317-321.

3. Bradeeba K Sivakumaar PKAssessment of microbiological quality of beef, mutton and pork and its impact on consumers health. International Journal of Plant, Animal and Environmental Science. . 2013; 3(1):91-97.

4. Brown PD, Pinnock M, Growder DM. Environmental risk factors associated with leptospirosis among butchers and their associates in Jamaica. Internet Journal of Food Safety. 2011; 2(1):47-57.

UNDER PEER REVIEW

5. Davies R, Cook P, Bolton D, Butaye P. Scientific Opinion on the public health hazards to be covered by inspection of meat from sheep and goats. *European* Food Safety Authority Journal. 2013; 11(6): 181-186.

6. FAO Draft code of hygienic practice for meat. Alinorm.(2004.

7. FAO FAO STAT data. Food and Agriculture Organization, Rome. 2012.

8. Ghimire L, Dhakal S, Mahato BR, Singh DK. Assessment of pork handlers knowledge and hygienic status of pig meat shops of Chitwan district focusing campylobacteriosis risk factors. International Journal of Infectious Diseases and Microbiology. 2013; 2(1): 17-21.

9. Hathaway SC. Risk analysis and meat hygiene. Revue scientifque et technique office International Des Epizooties. 1993.;12 (4): 1265-1290.

10. Junaidu MMY, Bhagavandas M, Yusha, Umar U. Study of knowledge, attitude and practices regarding hygiene among abattoir workers in Kano state metropolitan, Nigeria. International Journal of Science and Research. 2015.;4(1): 2474-2478.

11. Kebede T, Afera B, Taddele H, Bsrat A. Assessment of bacteriological quality of sold meat in the butcher shops of Adigrat, Tigray, Ethiopia. Applied Journal of Hygiene. 2014; 3 (3): 38-44.

12. Kumar K, and Kaul PN. Operational enviroment in a slaughter house: a macro level case study. Indian Journal Animal Research. 2000;34(1): 1-10.

13. Labie C.. Parasitic diseases transmitted by butchers meat shop. Annales Pharmaceutiques Francaises. 1979; 37(1):1-10.

14. Mbata TI. Poultry meat pathogens and its control. International Journal of Food Safety. 2001;7: 20-28.

15. Oluwafemi A R, Edugbo MO, Solanke OE, Akinyeye AJ. Meat quality, nutrition security and public health: A review of beef processing practices in Nigeria. African Journal of Food Science and Technology. 2013: 4(5) : 96-99.

UNDER PEER REVIEW

16. Ruban W, Prabhu N, Kumar N. Prevalence of food borne pathogens in market samples of chicken meat in Bangalore. International Food Research Journal. 2012; 19(4): 1763-1765.

17. Sahay A, Tiwari R, Roy R, Sharma MC. Study on meat associated health hazards among butchers and meat retailers. Journal of Veterinary Public Health. 2010;8(1):33-36.

18. Simeon M. Sanitary and phytosanitary measures and food safety; challenges and opportunities for developing countries. Revue scientifque et technique office International Des Epizooties. 2006; **25**(2): 701- 702

19. Sneed J, Strohbehn C, Gilmore SA , Mendonca A. Microbiological evaluation of foodservice contact surfaces in Iowa assisted-living facilities. Journal of American Dietitians Associations. 2004; 104: 1722- 1724

20. Upadhyaya M, Poosaran N, Fries R. Prevalence and predictors of salmonella spp. in retail meat shops in Kathmandu. *Journal of Agricultural Science and Technology*. 2012; 2 : 1094-1106.