



## Consumer Studies on Meat Consumption and Processing Pattern through Contact Survey in Different Zones of Ludhiana City

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### ABSTRACT

The present study was conducted to study consumption pattern, awareness and hygienic practices adopted for meat and its products in different zones of Ludhiana city through contact survey method. A bilingual (Punjabi and English) questionnaire/interview schedule comprising questions related to meat consumption, processing pattern, awareness of consumers regarding type of meat and hygiene was designed. A total sample size of 800 respondents (256 females + 544 males) was taken for the survey by dividing Ludhiana city into four hypothetical zones, namely; Zone I, II, III and IV by using a random sampling method. The effect of zone of sampling revealed that people from Zone I preferred cold processing while those from zones II, III and IV preferred hot processing of meat. People from the entire four zones were not aware of the Food Safety and Standards Act (FSSA) in meat industry. Irrespective of the zones, the people were not aware of the government policies for meat production and export in India. The respondents from zone I were comparatively adopting hygienic practices in meat processing than all other zones. It could be concluded that consumers are still not aware about meat processing and hygienic considerations and there is a dire need to educate them about different food laws.

**Keywords:** Meat consumption, consumer study, contact survey, questionnaire

India is always recognized as a country of diversified population with distinct cultures and traditions. Different food habits of Indian society differ accordingly to their religion, culture, tradition, socio-economic profile, geographical area and so on. The meat consumption has dramatically changed owing to nutritional transition, advancement of lifestyle and increasing purchasing power of people in India (Mehta *et al.*, 2015). Being a rich source of valuable proteins, vitamins and minerals, meat has earned the place as multifaceted nutrient in Indian platter. With advancement in knowledge regarding food they consume, the consumers have become more vigilant regarding quality and health aspects of foods (Selvan *et al.*, 2007). Two major hurdles affecting growth of meat industry in India includes absence of organized slaughter house facility and existence of small retail outlets for hygienic production and dispensing of meat (Kumar *et al.*, 2014). Further, research concerning India's food consumption

continues to be focused on plant based foods, while the demands for foods of animal origin particularly meat, are poorly understood (Devi *et al.*, 2014). The demand for quality meat is associated with willingness to pay for better products. Value added processed meat products are capturing their share in the market. They increase convenience to consumers by decreasing preparation time and minimizing processing steps. The growth of value added processed meat products in India is promising and is providing a vast scope for entrepreneurship development (Kondiah, 2004). The need for hygienic processing and preservation of these processed meat products is highly felt. Major interventions are needed to inspect the place of preparation, utensils for cooking and serving,

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raw materials used, time and temperature for cooking, processing and above all, the personal hygiene of vendors (Rane, 2011). In this regard, some of the quality control measures have been adopted by leading restaurants and hotels but the safety of meat and its products at street level is always in peril. In India, street food vending has become an alarming public health issue and various studies have identified loads of disease causing organisms in street foods belonging to genus *Bacillus*, *Staphylococcus*, *Clostridium*, *Vibrio*, *Campylobacter*, *Listeria* and *Salmonella*. Poultry and poultry meat are often found contaminated with potentially pathogenic microorganisms such as *Salmonella*, *Campylobacter*, *S. aureus*, *E. coli* and *Listeria*. All the above factors have a tremendous influence on meat consumption and processing pattern in an area. The consumer behavior and consumption pattern can be assessed and the industry can be promoted taking into account various responses generated from assessment. Thus, the present study envisages detailed assessment of consumer behavior and preferences, processing pattern and microbiological evaluation of meat and its products in different zones of Ludhiana city through sample survey.

## MATERIALS AND METHODS

A bilingual (Punjabi and English) questionnaire/interview schedule comprising questions related to meat consumption, processing pattern, awareness of consumers regarding type of meat and hygiene was designed. A total sample size of 800 respondents was taken for the survey by dividing Ludhiana city into four hypothetical zones, namely: Zone 1, 2, 3 and 4 (Fig. 1) by using a random sampling method (Yamane, 1967). Three different parameters viz. meat consumption and processing, awareness of consumers and hygienic practices adopted were considered and all the questions were distributed under these three heads for computation and analysis of responses by 800 respondents in all the four zones of Ludhiana city. Further, grading of the awareness about meat consumption and hygiene was done by allotting scores on the basis of number of positive responses obtained per respondent. The percentage for the same was calculated as:

Awareness % =

$$\frac{\text{Total number of positive responses obtained}}{\text{Total number of question in awareness}} \times 100$$

Hygiene % =

$$\frac{\text{Total number of positive responses obtained}}{\text{Total number of question in Hygiene}} \times 100$$

Data obtained through the questionnaires were analyzed using the descriptive statistics and frequency tables in the Statistical Analysis System (SAS). The analysis of the data was done by the chi square, one way ANOVA and 2-way ANOVA test.

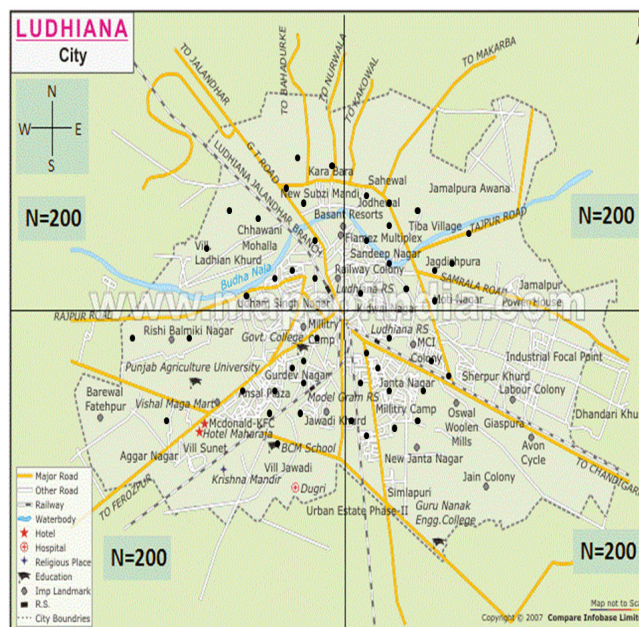


Fig. 1: Ludhiana city map with the 4 hypothetical zones

## RESULTS AND DISCUSSION

### Effect of zone of sampling on consumption and processing pattern of meat and its products

The analyzed data on effect of zone of sampling on meat consumption and processing pattern, has been depicted in Table 1. It was found that the most preferred meat in all the four zones i.e. Zone I, II, III and IV was poultry meat, with the values ranging from 48.00% to 67.50%. However, a significantly ( $p < 0.01$ ) higher value was observed in Zone I as compared to all other zones. Results indicated that majority of the respondents, irrespective of zone of sampling, consume hot served meat (75.50%)

**Table 1:** Effect of zone of sampling on consumption and processing pattern of meat and its products

Question	Options	Zone of Sampling				P- Value
		Zone I	Zone II	Zone III	Zone IV	
Which meat do you prefer to consume?	Red	45 (22.50%)	50 (22.00%)	43 (21.50%)	72 (36.00%)	0.0006
	Poultry	135 (67.50%)	115 (57.50%)	119 (59.50%)	96 (48.00%)	
	Pork	3 (1.50%)	2 (1.00%)	13 (6.50%)	9 (4.50%)	
	All of them	15 (7.50%)	29 (14.50%)	23 (11.50%)	21 (10.50%)	
What do you prefer: Shelf packed/ Hot served meat	None	2 (1.00%)	4 (2.00%)	2 (1.00%)	2 (1.00%)	<.0001
	Shelf-packed	5 (2.50%)	31 (15.50%)	49 (24.50%)	30 (15.00%)	
	Hot served meat	195 (97.50%)	169 (84.50%)	151 (75.50%)	170 (85.00%)	
In Poultry, which Carcass part you prefer?	Whole carcass	97 (48.50%)	65 (32.50%)	37 (18.50%)	35 (17.50%)	<.0001
	Chest	28 (14.00%)	46 (23.00%)	41 (20.50%)	42 (21.00%)	
	Wing	18 (9.00%)	6 (3.00%)	19 (9.50%)	35 (17.50%)	
	Leg	57 (28.50%)	83 (41.50%)	113 (51.50%)	88 (44.00%)	
How often do you consume meat?	Every day	3 (1.50%)	13 (6.50%)	11 (5.50%)	18 (9.00%)	0.0008
	Once in a week	51 (25.50%)	50 (25.00%)	68 (34.00%)	54 (27.00%)	
	1-3 times a week	88 (44.00%)	75 (37.00%)	63 (31.50%)	60 (30.00%)	
	3-5 times a week	37 (18.50%)	32 (16.00%)	19 (9.50%)	30 (15.00%)	
	Once in Month	21 (10.50%)	30 (15.00%)	39 (19.50%)	38 (19.00%)	
Which processed meat product you prefer?	Nugget	70 (35.00%)	62 (31.00%)	51 (25.50%)	34 (17.00%)	<.0001
	Patties	32 (16.00%)	23 (11.50%)	19 (9.50%)	24 (12.00%)	
	Meat Balls	23 (11.50%)	21 (10.50%)	44 (22.00%)	47 (23.50%)	
	Sausages	42 (21.00%)	36 (18.00%)	49 (24.50%)	63 (31.50%)	
	Other	33 (16.50%)	58 (29.00%)	37 (18.50%)	32 (16.00%)	
	Soup	16 (8.00%)	11 (5.50%)	24 (12.00%)	5 (2.50%)	
Which traditional meat you prefer?	Tandoori	134 (67.00%)	114 (57.00%)	97 (48.50%)	85 (42.50%)	<.0001
	Kababs	33 (16.50%)	27 (13.50%)	33 (16.50%)	49 (24.50%)	
	Pickle	9 (4.50%)	11 (5.50%)	31 (15.50%)	35 (17.50%)	
	Any other	8 (4.00%)	37 (18.50%)	15 (7.50%)	26 (13.00%)	
Which meat processing do you prefer	Hot Processing	62 (31.00%)	130 (65.00%)	121 (60.50%)	123 (61.50%)	<.0001
	Cold Processing	138 (69.00%)	70 (35.00%)	79 (39.50%)	77 (38.50%)	
Will you prefer the branded outlets (KFC, McDonalds) over traditional meat market	Yes	117 (58.50%)	100 (50.00%)	136 (68.00%)	128 (64.00%)	0.0017
	No	83 (41.50%)	100 (50.00%)	64 (32.00%)	72 (36.00%)	

to 97.50%) than shelf-packed which could be attributed to cultural conditioning. Similar findings have been reported by Karthikeyan and Nedunchezian (2013) in consumption of poultry meat in India. Respondents from zone II, III and IV showed a significantly ( $p < 0.01$ ) higher preference for leg piece in poultry carcass (41.50% to 51.50%) while from zone I whole carcass (48.50%) was preferred by respondents instead of any specific part. Also, majority of people responded that they usually consume meat 1-3 times a week (30.00% to 44.00%). Regarding the

preference about the processed meat product, respondents from Zone I and II opted for Nuggets whereas Zone III and IV had higher preference for sausages. This could be due to the fact that people in this zone have a little knowledge about processed meat products as sausages are the most common name whereas nuggets are not that popular among masses. This could be correlated with the economic status and purchasing power of respondents from Zone I and II as well. Tandoori (42.50% to 67.00%) was the most preferred traditional meat product irrespective of zone of

sampling. People from Zone I reported significantly ( $p < 0.01$ ) higher preference for cold processing (69.00%) method for meat processing while those from zones II, III and IV opted hot processing (60.50% to 65.00%). This is an indicative of higher acceptability of frozen foods from Zone I which can be attributed to higher affluence of consumers. Branded outlets (50.00% to 68.00%) were preferred in all the four Zones (Zone I, Zone II, Zone III and Zone IV) than traditional meat market.

### Effect of zone of sampling on awareness regarding consumption of meat and its products

When awareness factor was considered with zones of sampling, it was observed that respondents from all the four zones preferred red/poultry/pork meat because of its

taste, affordability and accessibility (51.00%-81.00%) than others (Table 2). 73.5% of Respondents from Zone I reported that red meat/poultry/pork they consume was not hygienically processed whereas those from Zone II, III and IV were of opinion that meat/poultry/pork they consume was hygienically processed (59.50%-77.00%). This could be due to better awareness in people of Zone I. A direct correlation between knowledge about food safety and standard of living has been established by Abdullahi *et al.* (2016). On the question of safety regarding frozen packed meat, the respondents from Zone I and II stated that frozen packed meat was not stale/unsafe (57.50% and 65.50%, respectively) whereas those from Zone III and IV replied that frozen packed meat is stale/unsafe (53.50% and 60.00%, respectively). Majority of respondents from all the four zones were aware about processed (83.00%

**Table 2:** Effect of zone of sampling on awareness regarding consumption of meat and its products

Question	Options	Zone of sampling				P-value
		Zone I	Zone II	Zone III	Zone IV	
Do you think Red Meat/Poultry/Pork you consume is hygienically processed	No	147 (73.50%)	81 (40.50%)	53 (26.50%)	46 (23.00%)	<.0001
	Yes	53 (26.50%)	119 (59.50%)	147 (73.50%)	154 (77.00%)	
Do you think frozen packed meat is stale/unsafe	No	69 (34.50%)	85 (42.50%)	120 (60.00%)	107 (53.50%)	<.0001
	Yes	131 (65.50%)	115 (57.50%)	80 (40.00%)	93 (46.50%)	
Have you heard of processed meat products?	Yes	185 (92.50%)	166 (83.00%)	177 (88.50%)	179 (89.50%)	0.0269
	No	15 (7.50%)	24 (17.00%)	23 (11.50%)	21 (10.50%)	
Have you heard of traditional meat products?	Yes	195 (97.50%)	169 (84.50%)	190 (95.00%)	180 (90.00%)	<.0001
	No	5 (2.50%)	31 (15.50%)	10 (5.00%)	20 (10.00%)	
Do you have any knowledge about age group of poultry affecting taste of meat?	No	117 (58.50%)	125 (62.50%)	120 (60.00%)	136 (68.00%)	0.2171
	Yes	83 (41.50%)	75 (37.50%)	80 (40.00%)	64 (32.00%)	
Can you judge broiler or spent hen meat by tasting it?	No	109 (54.50%)	124 (62.00%)	119 (59.50%)	127 (63.50%)	0.2740
	Yes	91 (45.50%)	76 (38.00%)	81 (40.50%)	73 (36.50%)	
Are you aware of Food Safety and Standards Act (FSSA) in meat production?	No	138 (69.00%)	150 (75.00%)	107 (53.50%)	129 (64.50%)	<.0001
	Yes	62 (31.00%)	50 (25.00%)	93 (46.50%)	71 (35.50%)	
Do you think the shop/ retail outlet from where you purchase meat is FSSAI registered or HACCP Certified?	No	169 (84.50%)	167 (83.50%)	120 (60.00%)	141 (70.50%)	<.0001
	Yes	31 (15.50%)	33 (16.50%)	80 (40.00%)	59 (29.50%)	
Do you think proper cooking at home kills all the pathogens in meat?	No	16 (8.00%)	78 (39.00%)	40 (20.00%)	58 (29.00%)	<.0001
	Yes	184 (92.00%)	122 (61.00%)	160 (80.00%)	142 (71.00%)	
Are you aware of Animal welfare issues for slaughter like humane slaughter	No	114 (57.00%)	109 (54.50%)	93 (46.50%)	100 (50.00%)	0.1545
	Yes	86 (43.00%)	91 (45.50%)	107 (53.50%)	100 (50.00%)	
Are you aware of Government policies for meat production and export in India	No	177 (88.50%)	164 (82.00%)	118 (59.00%)	155 (77.50%)	<.0001
	Yes	23 (11.50%)	36 (18.00%)	82 (41.00%)	45 (22.50%)	
Are you aware of the potent environmental hazards by disposal of untreated slaughter house by products	No	97 (48.50%)	98 (49.00%)	153 (76.50%)	135 (67.50%)	<.0001
	Yes	103 (51.50%)	102 (51.00%)	47 (23.50%)	65 (32.50%)	

to 92.50%) and traditional meat products (84.50% to 97.50%). A significantly higher ( $p < 0.01$ ) number of respondents from the entire four zones were not aware of the Food Safety and Standards Act (FSSAI) in meat industry (53.50% to 75.00%). People from all the four zones stated that the shop/retail outlet from where they purchase meat was not FSSAI registered or HACCP certified (60.00% to 84.50%). On the query regarding whether proper cooking kills all the pathogens in meat, it was observed that participants from all the 4 zones reported that they think proper cooking at home kills all the pathogens (61.00% to 92.00%). Also, respondents reported that they were not aware of the government policies for meat production and export in India (59.00% to 88.50%), irrespective of zone of sampling. The awareness of Participants from Zone I and II about the potent environmental hazards by disposal

of untreated slaughter house by products was significantly higher ( $p < 0.01$ ) than that of zone III and IV. It could be attributed to better educational status and way of living in respondents from zone I and II.

### Effect of zone of sampling on hygienic considerations of meat and its products

As depicted in Table 3, hygiene factor was compared with different zones and it was observed that the major criterion for purchase of raw meat in all the four zones was health disposition (66.50% to 88.00%). Also respondents from all four zones reported that they preferably purchase meat from butcher shop (39.00% to 67.00%). Red meat (43.00% to 68.00%) was given the highest rank when respondents were asked about which meat do they think was healthier.

**Table 3:** Effect of zone of sampling on hygiene considerations regarding consumption of meat and its products

Question	Options	Zone of sampling				P value
		Zone I	Zone II	Zone III	Zone IV	
What are the criteria to purchase raw meat?	Freshness	1 (0.50%)	3 (1.50%)	6 (3.00%)	5 (2.50%)	0.0002
	Cost	12 (6.00%)	11 (5.50%)	24 (12.00%)	21 (10.50%)	
	Health	176 (88.00%)	159 (79.50%)	133 (66.50%)	151 (75.50%)	
	Social issues	11 (5.50%)	27 (13.50%)	37 (18.50%)	23 (11.50%)	
	Butcher shop	134 (67.00%)	113 (56.50%)	78 (39.00%)	88 (44.00%)	
From where do you purchase meat?	Super market	19 (9.50%)	21 (10.50%)	26 (13.00%)	37 (18.50%)	<.0001
	Slaughter at home	6 (3.00%)	3 (1.50%)	28 (14.00%)	14 (7.00%)	
	No preference	41 (21.50%)	63 (31.50%)	68 (34.00%)	61 (30.50%)	
Which one you think is healthier?	Pork	13 (6.50%)	21 (10.50%)	35 (17.50%)	54 (27.00%)	<.0001
	Red meat	136 (68.00%)	117 (58.50%)	111 (55.50%)	86 (43.00%)	
Have you ever encountered stale/unhygienic meat served to you?	Poultry	51 (25.50%)	62 (31.00%)	54 (27.00%)	60 (30.00%)	<.0001
	Yes	159 (79.50%)	154 (77.00%)	118 (59.00%)	135 (67.50%)	
If Yes, has it changed your mindset to consume meat again?	No	41 (20.50%)	46 (23.00%)	82 (41.00%)	65 (32.50%)	<.0001
	Yes	74 (37.00%)	156 (78.00%)	115 (57.50%)	132 (66.00%)	
	No preference	126 (63.00%)	44 (22.00%)	85 (42.50%)	68 (34.00%)	
How do you consume meat?	No preference	02 (1.00%)	37 (18.50%)	06 (3.00%)	8 (4.00%)	<.0001
	Boiled, curry and oven cooked	96 (48.00%)	82 (41.00%)	100 (50.00%)	88 (44.00%)	
Did any of diseases like Avian flu/Swine flu impacts your consumption pattern?	Fried and grilled	102 (51.00%)	81 (40.50%)	94 (47.00%)	104 (52.00%)	<.0001
	No	106 (53.00%)	97 (48.50%)	64 (32.00%)	58 (29.00%)	
Do you prefer to consume meat from road side vendors?	Yes	94 (47.00%)	103 (51.50%)	136 (68.00%)	142 (71.00%)	<.0001
	Yes	23 (11.50%)	37 (18.50%)	67 (33.50%)	79 (39.50%)	
Are you satisfied with the hygiene conditions adopted by them?	No	177 (88.50%)	163 (81.50%)	133 (66.50%)	121 (60.50)	0.0012
	Yes	33 (16.50%)	54 (27.00%)	63 (31.50%)	64 (32.00%)	
	No	167 (83.50%)	146 (73.00%)	137 (68.50%)	136 (68.00%)	



A significantly higher ( $p < 0.01$ ) number of people also reported that they had encountered stale/unhygienic meat served to them (59.00% to 79.50%), however, respondents from Zone I reported that this led to change in their mindset for meat consumption again (63.00%) as compared to respondents from other zones. Similar study had been carried out by Verbeke (2001) wherein he reported that there was a change in behaviour, attitude and beliefs towards fresh meat after Belgian dioxin crisis. A significantly higher ( $p < 0.01$ ) degree of preference for fried and grilled meat was observed amongst respondents from zone I (51.00%) and IV (52.00%), however, higher preference for boiled, curry and oven cooked meat from zone II (41.00%) and III (50.00%) was recorded. Similar findings have been reported by Aloia *et al.* (2013) who conducted studies on perception and fast food eating behaviours in Indians living in high- and low-income neighbourhoods of Chandigarh. They observed that a high-income neighbourhood were more likely to perceive Western -style fast food as fast food, while people from the low-income neighbourhood were more likely to identify food sold by street vendors as fast food ( $p < 0.001$ ). Grilling and frying is mostly adopted by high end consumers and Zone I of Ludhiana comprises area with high-income groups. The impact of avian flu/swine flu on meat consumption pattern was not recorded in Zone I, whereas, in zone II, III and IV, the influence of the disease spread on consumption pattern was observed amongst respondents. In zone IV, 71.00% of respondents replied that swine flu or avian flu incidence impacted their meat consumption pattern. This could be attributed to poor awareness in the zones other than Zone I. Respondents from Zone I and II also had a significantly ( $p < 0.01$ ) negative preference for meat from the road side vendors (88.50 and 81.50%, respectively) which could be correlated to their answer for the query no. 24 wherein they reported that they were not satisfied with the hygienic conditions adopted by them (83.50 and 73.00%, respectively).

## CONCLUSION

It can be concluded from the study that irrespective of zone of sampling, consumers preferred poultry meat over other meats. Trend for hot served meat was maximum rather than shelf packed. Overall, consumers preferred tandoori chicken in traditional meat food basket and they were of opinion that frozen meat is not as safe as

freshly slaughtered one. Maximum people were unaware of food laws and Food Safety Act in meat production. Zone I of Ludhiana was significantly better in hygienic considerations, processing and was highly aware about the safe meat production than other zones. It can be concluded that there is a great need to educate consumers regarding issues related to meat quality and hygiene through trainings and awareness programmes.

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## CONFLICT OF INTEREST

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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