



Fish Consumer Behaviour and Constraints in Haryana and Punjab: Empirical Insights from Urban Markets

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Abstract

The current study was conducted to understand fish consumers' behaviour and constraints faced by fish consumers in Haryana and Punjab. The study was conducted during the period of November 2019 to February in 2020. Data were collected using a structured interview schedule from 100 consumers from 10 fish markets of Haryana and Punjab. Descriptive statistics (frequency & percentage analysis; t-test; RBQ) and multiple linear regression model have been used to analyse the data. The analysis revealed that in non-veg food items, mutton was the most preferred non-veg food item in both states, with the highest RBQ scores of 90.5 and 95 in Haryana and Punjab, respectively. Average expenditure on non-veg food items was found high in Punjab (Rs 2,523 per month) compare to Haryana (Rs 2,029.2 per month); It was seen that relative to non-veg food items, expenditure on fish was comparatively lesser, Rs 478.6 per month (23.3% of total non-veg food expenditure) in Haryana and Rs 432 per month (17.1% of total non-veg food expenditure) in Punjab. Rohu was the most preferred fish with an RBQ score 94.18, and in Haryana, while Pangasius was the most preferred fish (RBQ score of 92.36) in Punjab. The t-test results revealed that two groups of consumers (Haryana & Punjab) (n 100) are significantly same except for the family size variable (P value 0.007). Hence a MLR was run with the pooled data and results revealed that the income was not a significant variable affecting the consumer expenditure rather education, occupation (govt. job) and family type (nuclear) were the most significant variables. This indicated that education has a role to play in enhancing the fish consumption in Haryana and Punjab. The constraint analysis revealed that bad smell and unhygienic fish markets' conditions were top ranked by consumers in both states with a RBQ score of 77 and 60.33 in Haryana and Punjab respectively.

Keywords:

Fish consumption, Consumer's preference, Haryana, Punjab

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Introduction

Globally, fish consumption has seen a significant rise, driven by technological advancements, increasing incomes, and growing awareness of the health benefits associated with fish, during 1961 to 2018, per capita fish consumption increased from 9.0 kg to 20.5 kg (FAO, 2020). Despite this global trend, fish consumption in India remains relatively low, with an annual per capita consumption of 5-6 kg for the general population and 8-9 kg for those who regularly consume fish, which is considerably below global averages (Salim, 2016). In India, fish consumption is intricately linked to the country's diverse socio-economic, cultural, and environmental contexts, resulting in significant regional variations.

States like Haryana and Punjab, traditionally dominated by vegetarianism and other protein sources, offer a unique landscape for studying shifts in fish consumption behaviour. Historically, these states have shown limited fish consumption, but recent trends suggest a

growing interest in incorporating fish into their diets. In Punjab, religious beliefs, the distinct flavour and odor of fish, and the presence of spines have historically acted as barriers to fish consumption. However, there is a growing awareness of the nutritional benefits of fish, leading to gradual changes in dietary habits (Kaur *et al.*, 2023). Similar patterns have been observed in other parts of India, such as North Karnataka, where factors like age, family income, and family size significantly influence fish consumption (Kumar *et al.*, 2023). In regions like Andhra Pradesh, accessibility, availability, and affordability are key factors, with over 60% of households regularly consuming fish, particularly species like seer fish, pomfrets, and shrimps (Salim *et al.*, 2021). Urban areas in Kerala also show a strong preference for high-value fish, reflecting the region's deep-rooted reliance on fish as a staple in their diet (Salim *et al.*, 2020).

Comparative studies between cities like Chennai and Bangalore reveal that market access and consumer preferences are significant determinants of fish consumption behaviour. For example, low-income households in Chennai tend to prefer informal markets and specific fish species, while consumers in Bangalore are more inclined toward formal market structures and are less selective about the type of fish consumed (Jyotishi *et al.*, 2021). In coastal regions, despite increased fish production, there has been a noticeable decline in consumption, possibly due to shifts in consumer habits and market dynamics (Ravikanth *et al.*, 2015). This trend is echoed in Kerala's coastal cities, where consumers are willing to pay a premium for high-value fish, underscoring the role of economic factors in shaping consumption choices (Salim *et al.*, 2020).

Cultural and economic factors also play a significant role in regions like Chhattisgarh, where rural households consume more fish than their urban counterparts, with a strong preference for species like Rohu (Devi *et al.*, 2023). Studies from the Northeastern regions and Maharashtra further highlight the influence of traditional dietary practices and the availability of local fish species on consumption habits (Upadhyay *et al.*, 2022; Menon, 2017). Additionally, in urban Kerala, convenience is a critical factor in fish purchasing decisions, with many consumers buying fish while traveling (Salim *et al.*, 2020). The health benefits associated with fish consumption, such as reduced risks of diabetes and improved cognitive development, also enhance its appeal as a dietary choice (Pyne *et al.*, 2021; Kumar *et al.*, 2020).

Given the ongoing socio-economic and cultural shifts in India, particularly in traditionally non-fish-consuming regions like Haryana and Punjab, there is a pressing need to analyze fish consumption patterns, consumer behavior, and the constraints faced by consumers in these areas. This study aims to provide a detailed examination of the factors influencing fish

consumption behavior in Haryana and Punjab, contributing to a broader understanding of dietary transitions in these regions.

Methodology

The study was carried out during the period of November 2019 to February 2020, just before Covid-19, with the help of a well-structured open-ended questionnaire. Since there was no more non-veg. population in both states, no effort was made to select fish consumers, and fish consumers were selected randomly from the 13 different fish markets of Haryana and Punjab.

The state of Haryana is confined within 27-degree 39 min N to 30-degree 35 min N Latitude and between 74-degree 28min and 77-degree 36 min E longitude. Punjab is a state in the Indian sub-continent located at latitude 31°04'18.48" North, longitude 75° 24' 16.92" East.

Data and study area

The study was based on primary data that was gathered from fish consumers using multistage stratified random sampling. The five important fish markets of Haryana were selected are Matsya Fish Mandi of Faridabad, Sikendrapur Fish Market, Fish Market of Rohtak, Fish Market of Sonipat, and Fish Market of Yamunanagar and from Punjab five fish markets selected are Tajpur Fish Market of Ludhiana, Fish Market of Jalandhar, Fish Market of Amritsar, Fish Market of Batala, Fish Market of Patiala (Table.1). Sample Size was 100 consumers (50 from each state), 10 consumers taken from each fish market.

Table 1. Fish markets of Haryana & Punjab

State	Market
Haryana	Matsya Fish Mandi of Faridabad, Sikendrapur Fish Market, Fish Market of Rohtak, Fish Market of Sonipat, Fish Market of Yamunanagar
Punjab	Tajpur Fish Market of Ludhiana, Fish Market of Jalandhar, Fish Market of Amritsar, Fish Market of Batala, Fish Market of Patiala

All consumers who visited markets to buy fish and were willing to participate in the survey were interviewed personally with the help of a pretested specially designed questionnaire for the study.

Tools

Simple statistical tools like frequency, percentage, and mean were used to analyze consumer profiles like age, family size, sex, education, and income, and for constraints analysis the fish purchases were studied using Rank Based Quotient (RBQ). The preferential ranking technique was used to identify constraints faced by the respondent/consumer in fish consumption. The data was quantified by ranking the constraints from Sabarathnam's calculated RBQ (1988).

Rank Based Quotient (RBQ)

$$RBQ = \sum f_i (n+1-i) / N \times n \times 100$$

Where, f_i = Number of consumers reporting a particular constraint under i th rank,

N = Number of consumers/ sample size,

n = Number of constraints identified.

Multiple Linear Regression

Multiple linear regression was run to determine the variables influencing fish expenditures in both states. Multiple regression considers correlations between predictor variables and evaluates the effect of each predictor variable when other variables are removed (Miles and Shevlin, 2000).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon$$

Where, Y = Dependent variable,

β_0 = Intercept,

β_i = Slope for X_i ,

X_i = Independent variable,

ε = Error term

Independent Student t-test

The independent student t-test is an inferential statistical test has been used which determines whether there is a statistically significant difference between the means in two unrelated groups or it is a statistical test for comparing the means of two groups (Yim et al., 2010).

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{SS_1 + SS_2}{n_1 + n_2 - 2} \right] \left[\frac{1}{n_1} + \frac{1}{n_2} \right]}}$$

Where,

$\bar{X}_1$ & $\bar{X}_2$ are the mean of the two different groups,

n_1 = n of Group 1,

n_2 = n of Group 2,

SS = Sum of squares

Results and discussion

Consumer Profile

In Haryana, out of 50 fish consumers, 43 (86%) were found to be male, and 7 (14%) were female. Similarly, in Punjab, out of these 50 consumers, 45 were male, accounting for 90% of the surveyed group.

Table. 2 Consumer Profile of Haryana (a) and Punjab (b)

Particulars	Haryana (a)	Punjab (b)
Sex		
Male	43 (86%)	45 (90%)
Females	7 (14%)	5 (10%)
Age		
<35	29 (58%)	25 (50%)
35-59	18 (36%)	19 (38%)
>59	3 (6%)	6 (12%)
Consumers from		
Rural	7 (14%)	4 (8%)
Urban	43 (86%)	46 (92%)
Family Type		
Joint	11 (22%)	19 (38%)
Nuclear	39 (78%)	31 (62%)
Family size (members)		
<5	19 (38%)	23 (46%)
>5	31 (62%)	27 (54%)

In both Haryana and Punjab, most of the fish consumers belong to the relatively young age group (under 35 years), accounting for 58% in Haryana and 50% in Punjab. It is followed by the 35-59 years age group, representing 36% in Haryana and 38% in Punjab. The older age group (over 59 years) constitutes 6% of fish market visitors in Haryana and 12% in Punjab (Table 2). Mugaonkar *et al.*, (2011) found similar results in their study that the maximum fish consumers were in the age group of 25-30 years (46.4%), followed by the 30-35 years group (27.9%), more than 35 years group (24.3%) and less than 25 years group (1.4%) in Mumbai.

Urban consumers were dominant in both states with 86% in Haryana and 92% in Punjab, it is the region for most consumers live in a nuclear family (78% in Haryana and 62% in Punjab) and the average family size is relatively high in both states (6.2 in Haryana & 7.4 in Punjab). Mugaonkar *et al.*, (2011) also reported that most of the consumers had a family size of 5-7 members (57.1%), followed by 3-4 members (35.7%) in Mumbai.

Religion of fish consumers in Haryana and Punjab

Religion of the fish consumers studied and found that in Haryana, most consumers belong to Hinduism (80%) followed by Muslim (14%), Sikh (4%) and Charitarian (2%) while Punjab has the most consumers belong to Sikh (58 %) followed by Hinduism (34%) and Muslim (4%). Devi *et al.*, (2023) also found that religious beliefs were a significant factor influencing the reluctance to consume fish in Kawardha, Chhattisgarh, India. This indicates that cultural and religious beliefs play a role in shaping dietary habits, particularly in certain regions of India

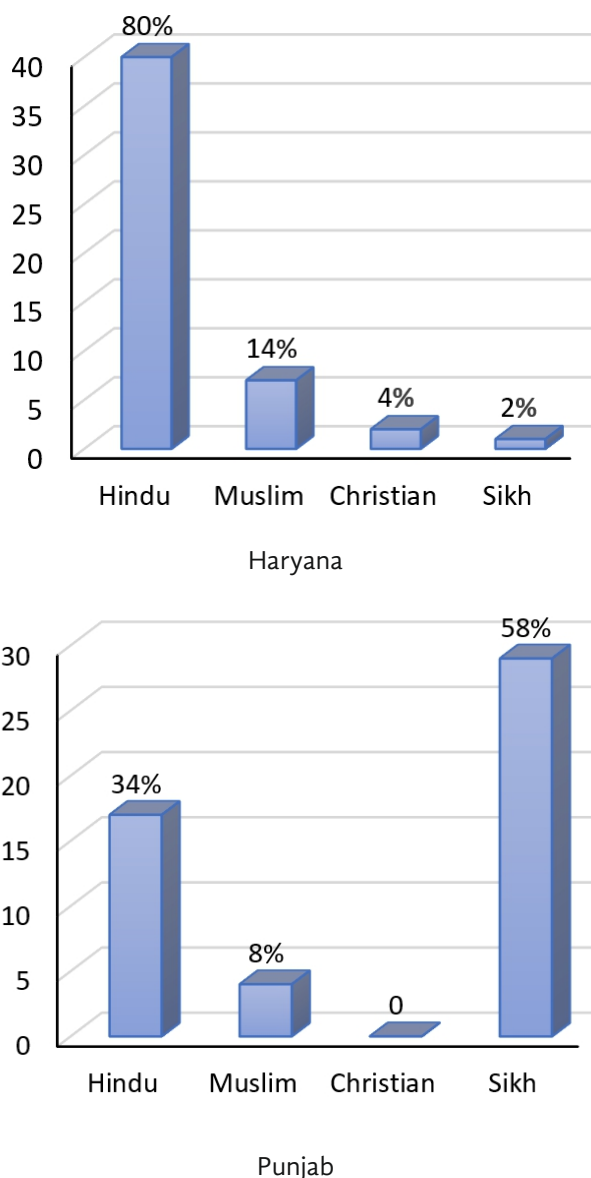


Fig. 1 Religion of fish consumer in Haryana (a) and Punjab (b)

Education of fish consumer in Haryana and Punjab

The educational levels of fish consumers in Haryana and Punjab show distinct patterns. In Haryana, 40% of consumers have completed higher secondary education, compared to 30% in Punjab. Consumers with secondary education account for 26% in Haryana and 32% in Punjab and 18% in Haryana and 22% in Punjab hold a graduate degree or higher, while 6% in Haryana and 10% in Punjab have only primary education (Fig. 2). Ghosh *et al.* (2018), in their study on fish consumers in West Bengal, found that 45.84% of the consumers were graduates, followed by 30.84% who had attained post-graduate degrees, and 15% who had completed education at the intermediate level.

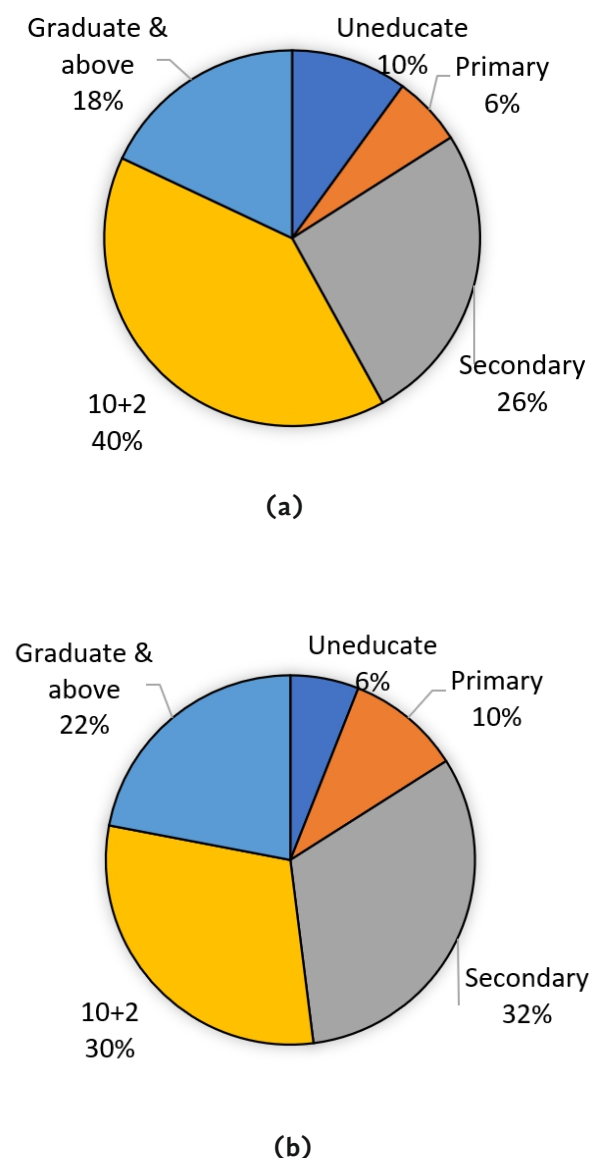


Fig. 2 Education of fish consumers in Haryana (a) and Punjab (b)

Kaur *et al.* (2023) also found a similar education status of fish consumers in Punjab that is 4.6% of consumers have primary-level education, followed by high school (22.8%) and Graduation 44.3%. In Andhra Pradesh, it was observed that 29% of respondents with higher secondary education consistently consumed fish. This suggests a positive correlation between education level and fish consumption habits in the region (Salim *et al.*, 2021)

Consumer preference for non-veg food items in Haryana and Punjab

Table.3 Consumer preference for non-veg food items in Haryana (a) and Punjab(b)

Particulars	RBQ Score for Haryana	RBQ Score for Punjab	Rank in both states
Mutton	90.5	95.0	1
Chicken	76.5	73.0	2
Freshwater Fish	05.0	54.0	3
Marine Fish	06.5	06.5	4

Consumer preference is almost similar in both states; mutton, chicken, freshwater fish, and marine fish have 1st, 2nd, 3rd, and 4th ranks, respectively, in preferred non-veg items. As mutton was the most preferred non-veg food item, with the highest RBQ scores of 90.5 and 95 in Haryana and Punjab, respectively. Followed by chicken, freshwater fish, and marine fish with RBQ scores of 76.5, 5.3, and 6.5, respectively, in Haryana, whereas in Punjab, the RBQ scores for chicken, freshwater fish, and marine fish are 73, 54, and 6.5, respectively (Table 3). It is just the opposite in northeast and south India, where Upadhyay and Pandey (2009) reported that per capita fish consumption is higher than the consumption of chicken and mutton in Tripura. Prasad *et al.* (2014) also observed that fish expenditure dominated the total non-vegetarian expenditure, and households consume fish more frequently than red meat in Andhra Pradesh.

Interestingly, the difference in RBQ values between Mutton & Chicken (first & second most preferred), and chicken & freshwater fish (second & third most preferred) is almost the same (15-20%) in both states (Haryana and Punjab) indicating the rising importance of fish in the food palate of an average urban Haryanvi & Punjabi household.

Occupation of fish consumers in Haryana and Punjab

The occupation of fish consumers in Haryana and Punjab was assessed, revealing that agriculture and private jobs are the most common primary occupations in both states. In Haryana, 32% of consumers work in agriculture, followed by 28% in private jobs, 16% unemployed, 12% in government jobs, and 12% in other occupations while in Punjab, 34% of consumers are in private jobs, 26% in agriculture, 14% in government jobs, 14% in other

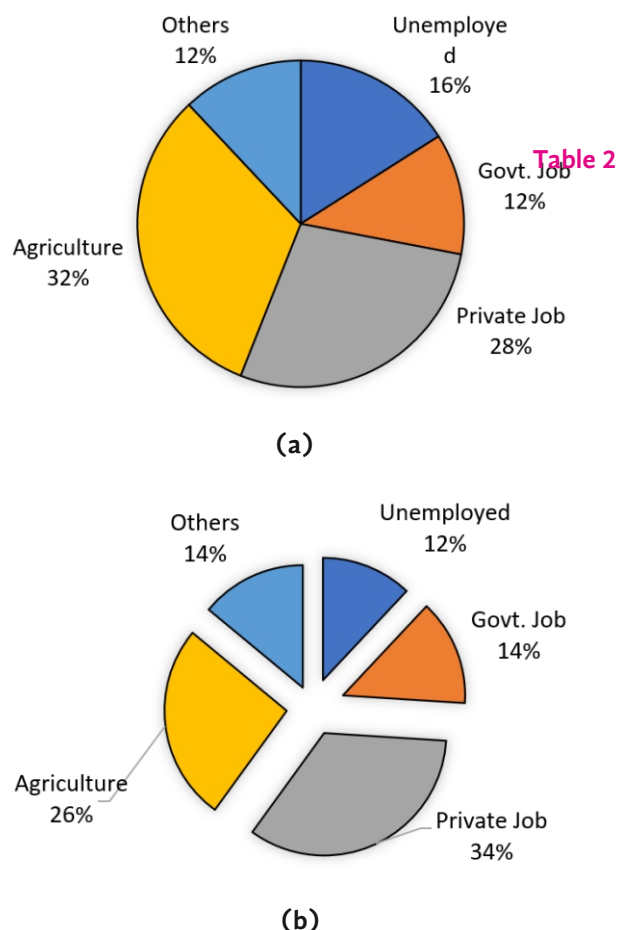


Fig. 3 Occupation of fish consumers in Haryana (a) and Punjab (b)

fields, and 12% are unemployed (Fig. 3). Similarly, Bhat *et al.* (2018) also revealed that the majority of the consumers in Kashmir valley were involved in Business (50.75%), followed by Govt. jobs (23.25%), Agriculture, Private jobs (9%) and 4.75% other. Ghosh *et al.* (2018) reported that 35.83% of consumers have govt. job, and 29.17% of consumers engaged in different business enterprises in West Bengal.

Consumer expenditure in Haryana and Punjab

Table.4. Consumer expenditure in Haryana and Punjab

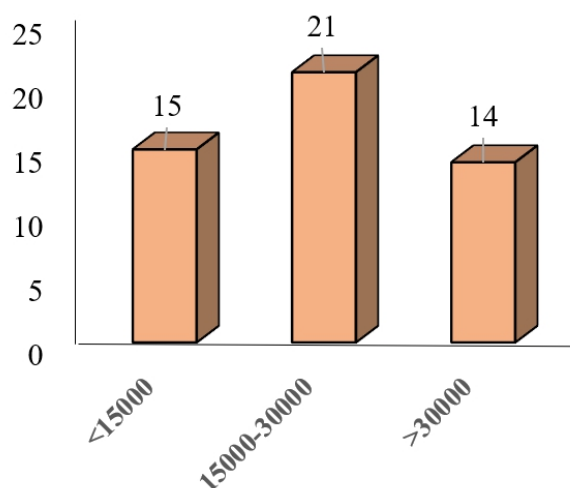
Consumer Expenditure	Haryana	Punjab
Total consumer expenditure in non-veg food item (meat, fish, egg) (Rs/month)	2,029.2	2,523
Average consumer expenditure on fish (Rs/month)	478.6 (23.3%)	432 (17.1%)

The non-veg food expenditure in Punjab was higher (Rs 2,523/ month) than in Haryana (Rs 2029/month) which is 21.6% higher in Punjab than in Haryana. However, expenditure on fish was higher (10.2%) in Haryana than in Punjab. Expenditure on fish was higher in Haryana, Rs 478.6/ month than in Punjab, only Rs 432/ month (Table 4). Compared with Tripura, it is less in both states where Upadhyay *et al.* (2014)

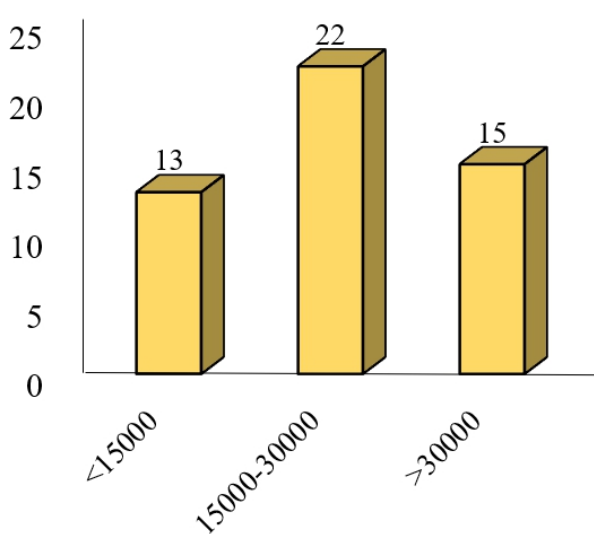
reported that the average monthly expenditure on fish purchase was relatively high Rs. 1,312.16/household.

Household income of consumers in Haryana and Punjab

In Haryana and Punjab, the majority of the population falls into the medium-income group (monthly income between Rs 15,000 and Rs 30,000) comprising 42% and 44% of respondents, respectively. The high-income category (monthly income exceeding Rs 30,000) represents 28% of respondents in Haryana and 30% in Punjab and the low-income category (monthly income below Rs 15,000) includes 26% and 30% of consumers in Haryana and Punjab, respectively (Fig. 4). Indicates that around 43% of the consumers belong to the middle-income category in Haryana and Punjab similar to Das *et al.* (2013) found in their study that 48.75% of the fish consumers belonged to the medium-income group in Tripura.



(a)



(b)

Fig. 4 Household income of consumers in Haryana (a) and Punjab (b)

Consumer preference for fish sp. in Haryana and Punjab

Table. 5 Consumer preference for fish sp. in Haryana and Punjab

Fish	RBQ Score in Haryana	Rank in Haryana	RBQ Score in Punjab	Rank in Punjab
Rohu	94.18	1	56.72	3
Catla	86.18	2	39.45	4
Pangasius	61.27	3	92.36	1
Magur	49.81	4	19.27	7
Mrigal	47.09	5	8.00	10
Common Carp	41.64	6	10.90	8
Shrimp	26.18	7	27.27	6
Bighead Carp	27.82	8	8.36	9
Rupchanda	15.27	9	33.45	5
Wallago attu	13.45	10	6.54	11
Seenghala	10.73	11	61.27	2

In Haryana, Rohu emerged as the most preferred fish species, achieving an RBQ score of 94.18, followed by Catla (86.18), Pangas (61.27), Magur (49.81), Mrigal (47.09), Common carp (41.64), Shrimp (26.18), Bighead (27.82), Rupchanda (15.27), Wallago attu (13.15), and Seenghala as the least preferred, with an RBQ score of 10.73. Conversely, in Punjab, Pangas was the most favored fish, with an RBQ score of 92.36, followed by Seenghala (61.27), Rohu (56.72), Catla (39.45), Rupchanda (33.45), Shrimp (27.27), Sole (19.27), Common carp (10.90), Bighead (8.36), Mrigal (8), and Wallago attu being the least preferred, with an RBQ score of 6.54 (Table 5). Similarly, Das *et al.* (2013) found that Rohu was the most preferred fish species in Tripura, followed by Catla, Carpio, and Hilsa. This highlights that while Rohu and Catla are the most preferred species in both Haryana and Tripura, while Punjabis prefer Pangas and Seenghala.

Frequency of fish purchase in Haryana and Punjab

The frequency of fish consumption varies between the two states. In Punjab, 48% of consumers eat fish fortnightly, compared to 38% in Haryana. Among fish consumers in Haryana, 28% purchase fish weekly, followed by 16% who buy it monthly, 14% two to three times a week, and only 4% daily while in Punjab, 24% monthly, 22% weekly, and 6% buy fish two to three times a week (Fig. 5). Gawa *et al.* (2017) reported that in the Kashmir Valley, 33.33% of consumers bought trout once a month, 28.33% weekly, 16.67% occasionally, 13.33% twice a month, 5% twice a week, 1.67% more than twice a month, and 1.67% once a year.

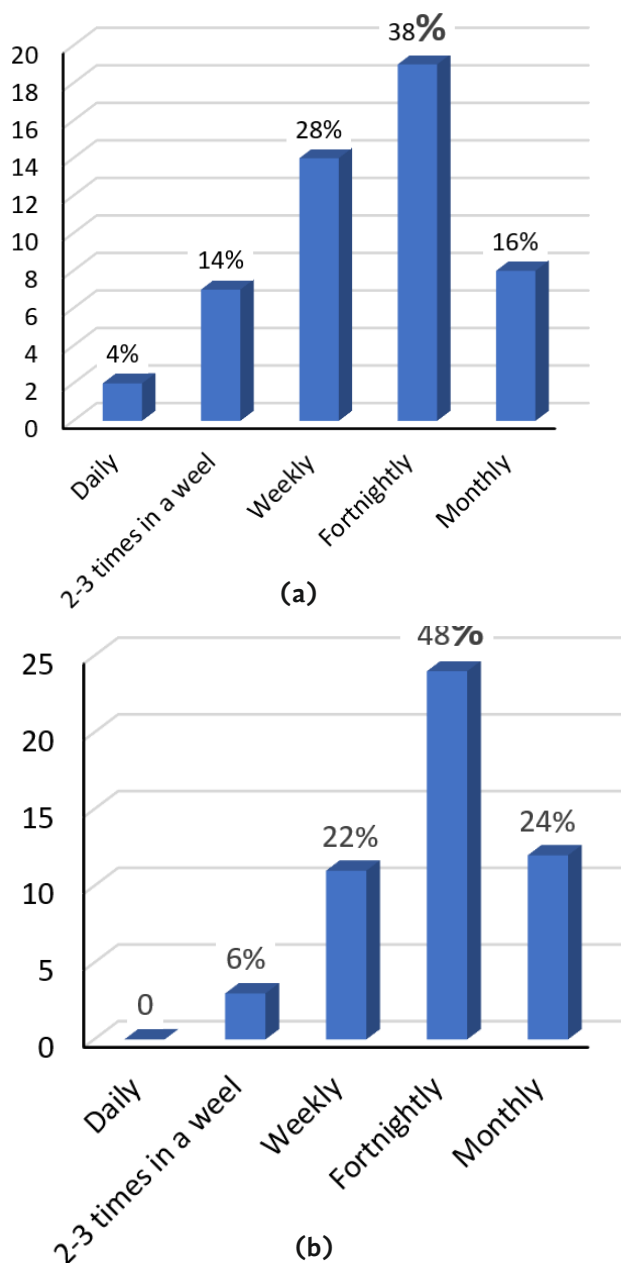


Fig. 5 Frequency of fish purchase in Haryana (a) and Punjab (b)

Attribute for buying fish in Haryana and Punjab

Table. 6 Attribute for buying fish in Haryana and Punjab

Attributes	RBQ Score in Haryana	Rank in Haryana	RBQ Score in Punjab	Rank in Punjab
Freshness	89.66	1	84.66	1
Taste preference	74.33	2	62.66	3
Nutritional/ health benefit	73.00	3	70.33	2
Ease of preparation	35.00	4	28.33	5
Low price	43.66	5	12.33	6
Availability	13.00	6	37.00	4

In both Haryana and Punjab, the freshness of fish emerged as the most critical factor influencing consumer purchasing decisions, with the highest Rank Based Quotient (RBQ) scores of 89.66 and 84.66, respectively. This attribute was ranked first among all other factors considered when buying fish from markets. In Haryana, the preference for freshness was followed by taste preference (RBQ 74.33), nutritional and health benefits (RBQ 73), ease of preparation (RBQ 35), low price (RBQ 43.66), and availability of fish (RBQ 13). In contrast, in Punjab, after freshness, consumers prioritized nutritional and health benefits (RBQ 70.33), followed by taste preference (RBQ 62.67), availability (RBQ 37), ease of preparation (RBQ 28.33), and low price (RBQ 12.33) (Table 6). These findings underscore that freshness is the most important criterion for consumers in both states, while availability and price are considered the least important factors. This emphasis on freshness aligns with previous research by Debnath *et al.* (2014), who identified freshness as a key attribute in the consumption of inter-state carp and non-carp species in Tripura. Similarly, Mugaonkar *et al.* (2011) reported that freshness was a significant preference for approximately 60% of consumers in Mumbai, who prioritized it over price when selecting fish.

Constraints in buying of fish in Haryana and Punjab

In both Haryana and Punjab, consumers identified several key constraints affecting their fish consumption behavior. The most significant issue was the bad smell and unhygienic conditions of fish markets ranked first, with RBQ scores of 77 in Haryana and 60.33 in Punjab.

Table. 7 Constraints in buying of fish in Haryana and Punjab

Constraints	RBQ Score in Haryana	Rank in Haryana	RBQ Score in Punjab	Rank in Punjab
Bad Smell and unhygienic condition of fish market	77.00	1	60.33	1
Higher price	59.00	2	41.00	2
Larger distance to the market	37.67	3	38.00	3
Unavailability of fish at my place	17.67	4	37.67	4
Limited fish species availability at my place	11.67	5	23.67	6
Religious/ social norms against meat/ fish consumption	5.00	6	32.00	5

This was followed by the higher price of fish, which received RBQ scores of 59 in Haryana and 41 in Punjab. The third most significant constraint was the larger distance to fish markets, with RBQ scores of 37.67 in Haryana and 38 in Punjab. Lastly, the unavailability of fish at their place was also a notable concern, scoring 17.67 in Haryana and 37.67 in Punjab (Table 7). Das *et al.* (2013) also reported that the primary constraints faced by consumers in Tripura included fish price (both level and fluctuation), availability, lack of fresh fish, non-availability of preferred species, and poor hygiene in fish markets. Similarly, Bhutia *et al.* (2019) found that the lack of hygiene in fish markets (94.60%) was the major constraint for consumers followed by the lack of vehicle parking facilities (79.40%) in Kolkata, West Bengal.

Fish consumption behaviour in Haryana

Out of the 50 consumers surveyed across Haryana and Punjab, 26 consumers from Haryana and 19 from Punjab reported traveling more than 2 kilometers to purchase fish, highlighting the limited availability of fish markets in these regions. In Haryana, 5 consumers expressed hesitation in disclosing their non-vegetarian consumption in social gatherings, whereas no such hesitation was observed among consumers in Punjab. All 50 consumers agreed that the presence of migrants had influenced a shift in non-vegetarian consumption behavior and expressed willingness to allow their children to consume fish in the future in both states. Furthermore, there was unanimous agreement among consumers in both states that religious and social norms surrounding non-vegetarian consumption are becoming increasingly less restrictive (Table 8).

Table. 8 Fish consumption behaviour in Haryana

Particulars	Consumers' Response (Haryana)	No. of responded consumers out of 50 (Haryana)	Consumers' Response (Punjab)	No. of responded out of 50 (Punjab)
Will you allow your children to consume fish if they wish	Yes No	50 0	Yes No	50 0
Do your parents allow you to consume fish	Yes No	38 12	Yes No	44 6
Religious/ social norms about non veg consumption become less restrictive in future	Yes No	50 0	Yes No	50 0
Do you think creating more awareness about the health benefits of fish will lead to changes in / higher fish consumption	Yes No Can be	25 12 13	Yes No Can be	27 16 7
Do you think increasing fish/ shrimp production in the region will lead to changes in / increase in fish consumption	Yes No Can be	24 23 3	Yes No Can be	26 13 11
Distance travelled to fish market in km	26 people out of 50 travel >2 km for buy fish		30 people out of 50 travel >2 km for buy fish	
Does everyone consume fish in the H.H.	Yes No	11 39	Yes No	15 39
Any changes in demand for fish among consumers in last 10 years	Increase Decrease No change	42 0 8	Increase Decrease No change	50 0 0
Do you hesitate to reveal about your non veg consumption in family / social gatherings	Yes No	5 45	Yes No	0 50
Whether the religious/ social norms about non-veg consumption is changing in recent years?	Yes No	50 0	Yes No	50 0
Has the presence of migrants led to changes in meat/fish consumption behaviour	Yes No	50 0	Yes No	50 0

Independent Student t-test**Table. 9 Independent Student t-test**

Independent variables	Sig.
Age	0.933
Income	0.396
Family size	0.007
No. of schooling year	0.880
Expenditure on fish	0.126
Expenditure on other non-veg	0.574

Student's t-test has been run to examine the differences between consumers in Haryana and Punjab. The analysis revealed no significant differences between the two groups across the variables, except for the family size variable (p-value of 0.007), indicating a statistically significant difference in family size between consumers in Haryana and Punjab (Table 9).

Multiple linear regression analysis (MLR)**Table. 10 Model summary of multiple linear regression analysis**

Model	R	R Square	Adjusted Square	Std. Error of the Estimate
1	0.839 ^a	0.705	0.664	218.033

Dependent variable: Fish expenditure; Predictors: (Constant), Family type, No. of schooling years, others, Age, Private Job, Income, Religion, Expenditure on Non-veg, Others, State, Govt Job, Household size

After determining that there was no significant difference between fish consumers in Haryana and Punjab, the data from both states were pooled for further analysis. Multiple linear regression analysis was conducted, where fish expenditure was the dependent variable. The independent variables included age, income, years of schooling, household size, expenditure on non-vegetarian food, and occupation, which were categorized using dummy variables for government jobs, private jobs, and others, with unemployment as the base category. Religion was also included, with dummy variables for Muslims and others, using Hindu as the base category, along with family type, categorized as nuclear or joint. The model yielded an R-squared value of 0.705 and an adjusted R-squared value of 0.664, indicating that the model provided a good fit for the data (Table 10).

Dependent variable: Fish expenditure

The MLR reveals that income level does not have a statistically significant impact on fish consumption expenditure (p = 0.117), while education level (p = <0.000), occupation, particularly government employment (p = 0.061) @10 % of significance level, and family type, with nuclear families showing a significant effect (p = <0.000). These are the significant factors influencing fish consumption expenditure in Haryana and Punjab (Table 11).

Table. 11 Coefficients of multiple linear regression analysis

Model	Unstandardized Coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-663.97	146.05		-4.54	<0.000
Age	1.49	1.91	.048	0.78	0.43
Income	0.003	0.002	.105	1.58	0.17
No of schooling years	25.38	4.79	.363	5.29	<0.000
House hold size	88.09	10.26	.899	8.58	<0.000
Expenditure on non veg	-0.070	.038	-1.42	-1.83	0.07
Govt. job	149.66	78.78	0.18	1.90	0.06
Private job	51.05	70.57	0.06	0.72	0.47
Others	36.86	83.66	0.03	0.44	0.66
Religion	-98.769	62.794	-0.10	-1.57	0.11
Others	-16.926	63.397	-0.02	-0.26	0.79
State	30.757	55.693	0.04	0.55	0.58
Family	260.122	77.036	0.34	3.63	<0.000

Conclusion

In both the states, the relatively young (<35 age group) were found to visit and purchase fish from fish market (58% in Haryana and 50% in Punjab). Urban consumers were dominant in both the states with 86% in Haryana and 92 % in Punjab. Education level found to be high in both the states, in Haryana, 58% consumers completed 10+2 & in Punjab, 52% consumers completed their 10+2. Consumer preference is almost similar in both states, mutton was the most preferred non-veg food item with the highest RBQ score 90.5 and 95 in Haryana and Punjab respectively. Expenditure on non-veg food items was found higher (21.6%) in Punjab compared to Haryana. Frequency of purchasing fish seems to be different in both the states, 45% Haryanvi consumes fish at least once in a week, while only 28% Punjabi consumes fish at least once in a week. Consumers commonly choice to consume fishes like Rohu, Catla in Haryana while Pangasius in Punjab. The study found that both states' consumer prefers fresh fish for selecting or buying a particular fish. Through t-test found that there is no significant difference among the two groups of consumers (Haryana & Punjab) except the family size variable which has the p value 0.007. Income level does not significantly affect (p value 0.117) fish consumption expenditure whereas education (p value <0.000), occupation, govt. job (p value 0.061) and family type (nuclear, p value <0.000) are affecting fish consumption expenditure significantly

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