



Fish Consumption Patterns, Preferences and Challenges: Insights from SKUAST Kashmir Students

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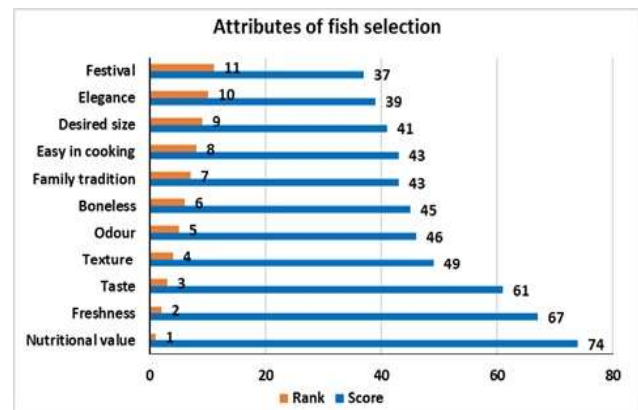
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HIGHLIGHTS

- Rainbow trout (48%) and Schizothorax species (30%) were the most preferred fish among students, chosen for their nutritional value, freshness, and taste.
- The key challenges students faced were a lack of freshness, unavailability of desired fish, and price fluctuations.
- Resolving these issues could enhance fish accessibility and support sustainable aquaculture development in line with regional health and nutrition priorities.

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor:

Dr. Manjushree Singh
Dr. Kiran U. Chandravadia

Key words:

Fish consumption Agriculture, Behaviour, Trout fish, Schizothorax, SKUAST Kashmir

Received : 05.09.2024

Accepted : 24.09.2024

Online published : 01.10.2024

doi:10.54986/irjee/2024/oct_dec/105-112

IRJEE METRICS

Google citations - 9424
h-index - 44
i10-index - 304
NAAS rating - 4.99

ABSTRACT

Context: Fish consumption patterns, preferences, and the challenges related to access and affordability are critical issues in Kashmir, especially among students, who represent a significant portion of the population with rising health and nutrition awareness. The region's potential for aquaculture development further highlights the need to understand consumer behaviour.

Objective: This study aims to investigate the fish consumption behaviour, preferences, and constraints faced by 120 students from SKUAST, Kashmir

Methodology: Using purposive sampling, data were collected from students across horticulture, agriculture, fisheries, and veterinary sciences faculties between April 1 and May 15, 2022. The data were analyzed using percentage analysis, the Garrett Ranking and regression methods.

Results and Discussion: The findings show that rainbow trout (*Oncorhynchus mykiss*) was the most preferred fish, selected by 48% of respondents, followed by *Schizothorax species* (Kashir gad) at 30%. Most students came from nuclear families (70.8%) and prioritized fish based on nutritional value, freshness, and taste. Major constraints identified included a lack of freshness, unavailability of the desired fish, and significant price fluctuations. Most students consumed fish monthly or fortnightly, preferring to purchase up to 3 kilograms at a time. The household size and income are the primary drivers of fish consumption behavior among the students

Significance: This study identifies key factors influencing fish consumption among agricultural students. Addressing the key issues, freshness, availability, and cost, could provide valuable insights for policymakers, academic administrators, and industry stakeholders to improve fish accessibility and affordability. This would enhance food security and support the region's sustainable livelihoods and aquaculture development.

Fisheries sector play a crucial role in food production, and providing nutritional security, rural livelihood support, and employment opportunities for over 18 million individuals over the world (FAOSTAT, 2022; Chandegara *et al.*, 2024; Kumar *et al.*, 2024). Due to the high concentration of vital proteins, vitamins, and omega-3 fatty acids in fish, eating it plays a crucial role in worldwide nutrition and contributes significantly to balanced diets (Badoni *et al.*, 2021; Maulu *et al.*, 2021). Globally, fish consumption is predicted to be about 20.5 kg per person annually; for billions, fish is a major source of animal protein (Belton *et al.*, 2018; Action, 2020). India's annual per capita fish consumption is 8.89 kg, with notable regional differences resulting from cultural, geographic, and economic variables (NFDB, 2021; Panemangalore *et al.*, 2024). Among all the states in India, Jammu and Kashmir saw the highest increase in fish consumption, with a 20.9 per cent rise from 2005 to 2019. Currently, 81.6 per cent of the population in Jammu and Kashmir consumes fish, and 25.15 per cent of the population eats fish every week (Panemangalore *et al.*, 2024).

Although fish has long been a mainstay of Kashmiri diets, little is known about the factors influencing consumers' choices and the obstacles they confront when purchasing fish. Gaining insight into the preferences and obstacles related to fish consumption, especially among university students specializing in agriculture and allied sciences, can be very helpful in promoting sustainable eating habits, strengthening food security, and improving supply chains.

This study evaluates the habits of fish intake and the difficulties faced by students at the Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST) in Kashmir. The students at SKUAST are a distinct group of people pursuing degrees in related agriculture, horticulture, veterinary and fisheries. Although these students are probably aware of the health advantages of fish, a variety of socioeconomic and market-related factors influence how they consume the food.

Fish consumption has been studied previously at larger regional levels (Jyotishi *et al.*, 2021; Panemangalore *et al.*, 2024). However, no such research focuses on the behaviour and challenges faced by SKUAST Kashmir students from both rural and urban areas of Jammu and Kashmir (Gul *et al.*, 2024a). The results of this study may offer valuable insights

for legislators, academic administrators, and industry stakeholders seeking to improve the accessibility, cost, and quality of fish. Improving fish consumption habits in the Kashmir valley would support sustainable livelihoods and food security by addressing rising health and nutrition awareness as well as the region's potential for aquaculture development.

METHODOLOGY

A survey was conducted among 120 agricultural students of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (located at 34°5'N 74°47'E). These students were from various faculties, including horticulture, agriculture, fisheries, and veterinary sciences, with 30 students from each group. This was done to know their fish consumption behaviour, preferred fish, and the constraints they face while purchasing it.

Data were collected from April 1 to May 15, 2022, using purposive sampling from the four faculties of Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST) Kashmir. For interpretation, percentage analysis was performed (Chauhan *et al.*, 2022; Meena *et al.*, 2022; Pauline *et al.*, 2022; Randhave *et al.*, 2022) to determine the frequency of fish purchased and the quantity consumed. The Garrett Ranking method was used (Reddy *et al.*, 2021; Aneesha *et al.*, 2023; Manisha *et al.*, 2024; Priyanka *et al.*, 2024) to know the attributes of fish selection that are taken into consideration when agricultural students purchase fish. The method was also employed to identify and prioritize the constraints (Nirmala *et al.*, 2009; Swathi *et al.*, 2013; Noopur *et al.*, 2023; Singh *et al.*, 2023; Devi *et al.*, 2023) faced by students, with rankings ranging from the highest constraint assigned the number 1 to the least significant constraint assigned the number 10. The technique was used because it converts the order of targeted attributes or constraints into numerical scores. This method's benefit lies in its ability to arrange the attributes or constraints based on their importance or severity from the respondents' perspective.

The formula utilized for the Garrett Ranking method is provided below.

$$\text{Percent position} = \frac{(R_{ij} - 0.5)}{N_{ij}} 100$$

Where,

R_{ij} = Rank given for the i^{th} variable by j^{th} student

N_{ij} = Number of variables ranked by j^{th} student

The percentage position of each rank was converted into scores using tables provided by Garrett and Woodworth

(1969). For each factor, the total scores assigned by individual students were summed and then averaged by dividing the total by the number of students. The mean scores for all attributes and constraint factors were then ranked in descending order based on their averages.

Regression analysis was performed to determine the factors affecting students' monthly fish consumption. The regression equation is given below:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_p X_{ip} + \epsilon_i$$

Where,

Y = Dependent variable or monthly fish quantity

X₁₁, X₁₂, ... X_{ip} = Independent variables, like age, education, family type, household size, household location and monthly income

β₀ = intercept

β₁ (I = 1, 2... p) = regression coefficients

ε = random error term

β₁ = average change in Y per unit change in X₁ keeping other X's constant

RESULTS

The respondents, aged 21-25, comprised 49.2 per cent (59) from rural areas and 50.8 per cent (61) from urban areas, all studying at SKUAST Kashmir. The average monthly household income of the students' families was ₹66,150, with an average family size of 6.05 members. Family size distribution showed that 23.3 per cent (28) of the students came from families with 2-4 members and more than 7 members, respectively and 53.3 per cent (64) from families with 5-7 members. The gender distribution was slightly skewed towards females, with 54.2 per cent (65) female and 45.8 per cent (55) male. Most of the students, 85 (70.8%), came from nuclear families, while 35 (29.2%) were from joint families.

Based on the Garrett scores, the students' rankings of the fish selection attributes offer insights into their purchasing preferences (Table 1). Nutritional value, which ranked first (score of 74), likely reflects the students' awareness of the health benefits of consuming fish, especially given their educational backgrounds in agriculture and related sciences. Freshness was ranked second (67), indicating its importance in ensuring quality and safety, as fresher fish are generally more nutritious and palatable. Taste, ranked third (61), plays a key role in their food choices, as flavour preferences strongly influence purchasing decisions. Texture, ranked fourth (49), is an important factor in the overall eating experience, while odour, ranked fifth (46), relates to the fish's freshness and appeal. The preference for

Table 1. Ranking of fish selection attributes based on Garrett scores

Attributes of selection	Score	Rank
Nutritive value	74	I
Freshness	67	II
Taste	61	III
Texture	49	IV
Odour	46	V
Boneless	45	VI
Family tradition	43	VII
Easy in cooking	43	VIII
Desired size	41	IX
Elegance while serving guests	39	X
Festival	37	XI

boneless fish, ranked sixth (45), is possibly due to the convenience and ease of consumption, especially for students who may not want to deal with bones while eating. Family tradition, ranked seventh (43), reflects the influence of cultural practices and long-standing preferences in their households, while ease of cooking, also scoring 43, ranks eighth, indicating the students' need for quick and simple meal preparation amid busy academic schedules. The desired size of the fish, ranked ninth (41), shows that while size is considered, it is not a primary concern for most students. Elegance while serving guests, ranked tenth (39), and festivals, ranked eleventh (37), were lower-ranked attributes, likely because students may not frequently host formal meals or participate in festival-related fish consumption due to their academic commitments and limited budgets. These rankings reflect the practical considerations students prioritize, focusing on health, freshness, and convenience.

The lack of freshness was the most significant constraint, ranked first with a Garrett score 57 (Table 2). It indicates that students place a high value on fresh fish but frequently encounter issues with its availability. The second most pressing constraint was the non-availability of the desired fish (56), suggesting that students often face difficulties finding the specific types of fish they prefer. High price and price fluctuations were ranked third (52), indicating that the cost of fish or its variability poses a considerable barrier for many students, potentially due to budget constraints. Market distance and location ranked fourth (49), pointing to accessibility issues, particularly for those living in more remote areas. The fifth-ranked constraint, irregular supply (47), highlights the inconsistency in fish availability, which can disrupt students' purchasing

Table 2. Ranking of constraints faced by students in fish consumption

Constraints	Score	Rank
Lack of freshness	57	I
Non availability of desired fish	56	II
High price / Price fluctuations	52	III
Market distance / location	49	IV
Irregular supply	47	V
Lack of hygiene / cleanliness	46	VI
Highly perishable	41	VII

habits. Lack of hygiene and cleanliness in fish markets was ranked sixth (46), reflecting concerns about the sanitary conditions in which fish are sold. The highly perishable nature of fish, ranked seventh (41), represents challenges in storing and maintaining fish quality after purchase. These results demonstrate that the constraints faced by students are largely related to fish quality, availability, cost, accessibility, and hygiene.

The students were also asked about the frequency of their fish consumption, and the results showed a diverse range of eating habits. The most common response, with 45 students (37.5%), was that they consumed fish once a month, indicating that fish is not a staple in their diet but is eaten occasionally. Following closely, 41 students (34.2%) reported eating fish fortnightly, suggesting a moderate consumption pattern. A smaller percentage, 21 students (17.5%), consumed fish once a week, while only 4 students (3.3%) ate fish twice weekly, and 6 students (5%) ate it more than twice a week. On the less frequent end of the spectrum, 3 students (2.5%) reported consuming fish once in six months.

When asked about the quantity of fish consumed per purchase, the majority of students, 49 respondents (40.8%), reported consuming 3 kilograms of fish, making it the most common quantity. This was followed by 38 students (31.7%) who consumed 2 kilograms of fish. Smaller quantities were less frequently consumed, with 13 students (10.8%) purchasing 2.5 kilograms, 10 students (8.3%) consuming 1 kilogram, and 6 students (5%) opting for 1.5 kilograms. Only 4 students (3.3%) reported consuming 0.5 kilograms of fish per purchase.

When asked about their preferred fish species, the students showed a clear preference for trout, including rainbow trout (*Oncorhynchus mykiss*), with 40 respondents (48%) indicating it as their most liked fish. Schizothorax species (Kashir gad) was the second most favoured species, chosen by 25 students (30%).

The common carp (Punjab gad) was preferred by 20 students (24%), while catfish (Pangas) was the least favoured among the options, with 15 students (18%) expressing a preference for it.

Factors influencing quantity of fish consumption among students at SKUAST Kashmir : The regression analysis showed that household size has a positive and significant effect on monthly quantity of fish consumed ($\beta = 0.255, p = <0.00*$), meaning that for each unit increase in household size, there is a 25.5 per cent increase in monthly fish consumption quantity (Table 3). Monthly average income had the strongest positive effect on fish consumption ($\beta = 0.794, p < 0.001*$), implying that an increase in income is associated with a 79.4 per cent rise in spending on fish, indicating that higher-income households tend to consume more fish. Other variables like age, gender, family type, and household location do not have significant impacts. Specifically, age has a negative but non-significant relationship, while gender (females compared to males), family type (joint vs nuclear), and household location (rural vs urban) also show non-significant relationships with fish consumption. The regression model demonstrated strong explanatory power (F-value = 44.272, $p < 0.001$). suggesting that the model is statistically significant and provides a good fit for the data. Additionally, the Adjusted R² value of 0.686 indicates that approximately 68.6 per cent of the

Table 3. Regression analysis of factors influencing quantity of fish consumption

	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value
	B	SE	Beta		
Intercept	3.079	2.427		1.269	0.207
Age	-0.153	0.109	-0.074	-1.404	0.163
Household size	0.168	0.047	0.255	3.549	0.001*
Monthly income	2.54E-05	0	0.794	14.595	0*
Gender (male)	-0.156	0.149	-0.061	-1.05	0.296
Family type (nuclear)	0.09	0.202	0.032	0.445	0.657
Llocation (urban)	-0.119	0.143	-0.047	-0.834	0.406
Adjusted R ²			0.686		
F-Statistic			44.272 (p < 0.001)		

* = significant at 5% level

variance in the dependent variable could be explained by the independent variables in the model.

DISCUSSION

The study's findings provide critical insights into fish consumption behaviour, preferences, and challenges faced by students at SKUAST Kashmir. The findings reveal a strong preference for rainbow trout (*Oncorhynchus mykiss*) as the most favoured fish species, followed by *Schizothorax* species (Kashir gad), underscoring a clear inclination toward locally available and nutritionally rich fish. Similar trends were observed in studies by Sajeev *et al.*, (2021) in Kerala, Rahman *et al.*, (2020) in Bangladesh, and Menozzi *et al.*, (2020) across five European countries, where locally sourced fish were also preferred for their perceived higher nutritional value. This is likely influenced by the student's awareness of the health benefits of fish consumption, particularly in an academic environment centred around agriculture and related sciences (Herath and Radampola, 2016; Adeli and Mirbagheri, 2019; Qadhi *et al.*, 2019; Utri and Głabska, 2023). The prioritization of attributes such as nutritional value, freshness, and taste reflects a well-informed consumer base that values quality and safety in food choices (Farah *et al.*, 2010; Menozzi *et al.*, 2020; Castro *et al.*, 2021).

Constraints such as lack of freshness, unavailability of preferred fish, and price fluctuations pose significant barriers to fish consumption, as noted by Carlucci *et al.*, (2015) and Grema *et al.*, (2020). These challenges are particularly pronounced due to the perishable nature of fish, logistical difficulties in fish distribution across Kashmir, and the region's socioeconomic conditions, as further highlighted by Siddique *et al.*, (2022). For students from nuclear families, issues such as market access, irregular supply, and fluctuating prices exacerbate their challenges in maintaining a regular fish diet. Similar results were observed by Can *et al.*, (2015) among Antakya Turkey students and Desbouys *et al.*, (2020) among Greek students.

The regression analysis further underscores the significant role of household income and size as key determinants of fish consumption, with larger and wealthier student families consuming more fish per month. These findings align with the results of studies conducted by Trondsen *et al.*, (2004), Can *et al.*, (2015), Thorne *et al.* (2017), Belton *et al.*, (2018), Qasim *et al.*, (2020), Oyibo *et al.*, (2020), Cantillo *et al.*, (2021), Pal *et al.*, (2024) and Utri *et al.*, (2024), all of which

highlight the influence of economic and household sizes on fish consumption patterns. The constraints related to hygiene, cleanliness, and market location further emphasize the need for improved infrastructure in fish markets. This inference is consistent with the findings of studies by Upadhyay *et al.*, (2015), Chowdhury *et al.*, (2019), Uttej *et al.*, (2023), and Gul *et al.*, (2024b) all of which highlight the importance of infrastructure improvements to address such challenges in fish markets. For instance, improved cold chain logistics and better market management could address the lack of proper storage facilities and inconsistent fish supply (Chaudhuri *et al.*, 2018). Additionally, the findings indicate that convenience and affordability significantly influence students' purchasing decisions, with a preference for boneless fish and ease of cooking being key factors. Similar conclusions were drawn by Farah *et al.*, (2010), Hu *et al.*, (2014), and Zahara *et al.*, (2024), who observed these trends across various regions worldwide. These findings suggest that students at SKUAST Kashmir, despite having a strong preference for fish, are constrained by external factors such as price, availability, and market conditions. Addressing these challenges could encourage higher fish consumption, which would benefit their nutritional intake and support the growth of the local fisheries and aquaculture sectors (Islam, 2020; Habib, 2020).

CONCLUSION

The results of this study emphasize the importance of addressing the constraints that hinder fish consumption among students at SKUAST Kashmir. The findings suggest that while students clearly prefer rainbow trout and other locally available species, factors such as freshness, availability, and price fluctuations significantly impact their ability to access fish regularly. Policy implications of these findings are crucial for regional development. First, improving the supply chain, particularly in ensuring fish's freshness and consistent availability, could directly enhance fish consumption patterns. Policymakers could focus on establishing efficient cold chain systems and better market infrastructure to reduce fish spoilage and increase access to quality fish. Additionally, regulating fish prices and minimizing price volatility would make fish more affordable, particularly for students and lower-income households.

Aquaculture development in Kashmir also presents a strategic opportunity. Investing in local

fisheries, particularly rainbow trout farming, could address supply constraints and create employment opportunities, contributing to sustainable livelihoods. Government interventions in expanding aquaculture infrastructure, providing financial incentives to fish farmers and ensuring environmental sustainability could strengthen the local fishery economy.

Funding: This research received no financial support from any funding agency.

Declaration of competing interest: The author declares no conflicts of interest related to this study.

Data availability: The data supporting this research can be provided upon request.

Acknowledgements: The author wish to extend his heartfelt thanks to the students of SKUAST Kashmir for their participation and cooperation in this study.

Author's contribution: The author of this study conceptualized and operationalized the research, interpreted the data, visualized the findings, and drafted the manuscript. The author was responsible for planning, analyzing, writing, reviewing, and executing this research.

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