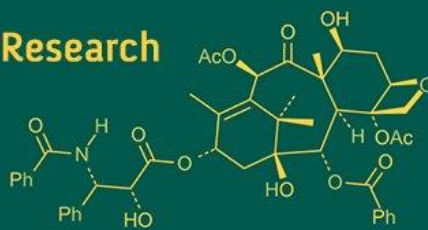
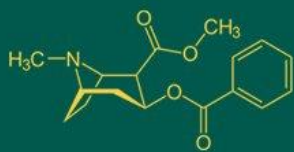


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Determinants of marine fish consumption patterns among households in Nellore town, Andhra Pradesh

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Abstract

The present study was undertaken to assess the consumption behaviour of households towards marine fish and to identify the factors influencing consumer preference and the major constraints affecting its purchase and consumption in Nellore town of Andhra Pradesh. Primary data were collected from 100 respondents selected randomly from ten retail fish outlets using a structured interview schedule. Descriptive statistics, Chi-square test, weighted mean scoring, Garrett's ranking technique and multiple-response analysis were employed for data analysis. The results revealed that women constituted 62.0 per cent of the respondents and the majority belonged to the 26-40 years age group (47.0%). Marine fish was preferred by 58.0 per cent of respondents, compared with 42.0 per cent preferring pond fish. Local markets were the major source of fish purchase (64.0%), while weekly purchasing was predominant (60.0%). Taste was the principal reason for fish consumption (52.0%) and 82.0 per cent of respondents were aware of the nutritional value of fish. Age was significantly associated with the type of fish consumed and the preferred place of fish consumption outside the home, while gender showed a marginally significant association only with awareness of the nutritional benefits of fish, which was higher among female consumers (87.1%) than male consumers (73.7%); no other consumption characteristics showed a significant association with gender. Among the factors influencing marine fish preference, taste ranked first (weighted mean score 4.48), followed by nutritional value (4.06) and freshness (3.94), whereas price ranked tenth (3.60). Lack of freshness emerged as the most important barrier to marine fish consumption (Garrett mean score 72.74), followed by high price (66.23) and long distance to the market (62.19). The major suggestions of respondents included regular supply of fresh fish (95.0%), improved cold-storage facilities (93.0%), better market hygiene (90.0%), reduction in fish prices (87.0%) and wider availability of cleaned or ready-to-cook fish (83.0%). The study concludes that strengthening cold-chain infrastructure, ensuring regular supply of fresh fish, improving market hygiene and accessibility, promoting value-added fish products and enhancing affordability could improve consumer satisfaction and encourage marine fish consumption in Nellore town.

Keywords: Marine fish, fish consumption, consumer preference, consumer behaviour

Introduction

Fish is an important source of high-quality protein, essential amino acids, omega-3 fatty acids, vitamins and minerals and contributes substantially to food and nutritional security. Marine fish is particularly valued for its taste and nutritional quality. Increasing health awareness, urbanization, changing lifestyles and evolving dietary preferences have influenced household fish consumption and purchasing behaviour.

India is one of the leading fish-producing countries and the fisheries sector contributes significantly to food security, employment, livelihoods and economic development. Andhra Pradesh is a major fish-producing state with substantial marine and inland fishery resources. Nellore district, owing to its coastal location and established fisheries infrastructure, is an important region for fish production and marketing. Nellore town provides consumers with access to marine fish through local markets, retail outlets and vendors.

Fish consumption behaviour is influenced by socio-economic, demographic and market-related factors. Age, gender, education, occupation, income and family characteristics may influence consumption patterns, while taste, nutritional value, freshness, price, availability, accessibility, hygiene and convenience influence purchasing decisions. The perishable nature

of fish further makes freshness, storage and transportation important considerations in consumer choice.

Previous Studies and Research Gap

Previous studies have established the influence of socio-economic characteristics on fish consumption. Upadhyay *et al.* (2014) ^[12] and Viswanatha *et al.* (2014) ^[13] reported associations between consumer characteristics and fish purchasing behaviour, while Chandravathany *et al.* (2015) ^[3] observed significant differences in fish consumption across age groups. In Andhra Pradesh, Madhavi and Kusuma (2013) ^[8] reported differences in fish consumption patterns between households in Tirupati and Nellore, while Devi Prasad and Madhavi (2014) ^[4] identified freshness as an important factor influencing fish purchase decisions.

Economic and household factors also influence fish demand. Sunil *et al.* (2008) ^[10] identified price, family income, family size and supply conditions as important determinants of fish demand. Ferit *et al.* (2015) reported positive associations between fish consumption, education and income, while Kumar *et al.* (2023) ^[7] found that income, age and family size positively influenced consumption and that higher fish prices reduced demand.

Consumer preference studies consistently emphasize product quality and sensory attributes. Kreider *et al.* (1993) ^[6] identified freshness, taste, appearance and safety as important attributes, whereas Ahmed *et al.* (2011) ^[1] reported significant influences of quality, price, nutritional value and taste on fish purchasing decisions. Thong *et al.* (2012) ^[11] highlighted the importance of quality, price, cooking convenience and availability, while Ostojić *et al.* (2017) ^[9] identified freshness as the most important purchase attribute. In coastal Andhra Pradesh, Kotni (2020) ^[5] reported that product quality, price, fish species, retail outlet characteristics and type of catch influenced consumer buying behaviour.

Overall, the literature indicates that fish consumption is shaped by an interaction of consumer characteristics, product attributes and market conditions. However, recent location-specific evidence on household marine fish consumption, consumer preferences and constraints in Nellore town is limited. In particular, there is a need to assess the relative importance of factors influencing marine fish preference and the major constraints affecting its purchase and consumption.

The present study therefore examines household fish consumption patterns in Nellore town, assesses the socio-economic factors associated with consumption, identifies the major factors influencing consumer preference for marine fish and documents the constraints faced by consumers. The findings are expected to provide useful insights for improving marine fish marketing, quality, accessibility and consumer satisfaction in the study area.

Objectives

1. To study the socio-economic factors associated with fish consumption in Nellore town.
2. To examine the fish consumption pattern among households in Nellore town.
3. To identify the factors influencing consumer preference for marine fish.

Materials and Methods

Study Area and Sampling Design

The study was conducted in Nellore town of Andhra Pradesh, which was purposively selected considering the

importance of the region in marine fisheries and aquaculture. A purposive-cum-random sampling design was adopted. Ten fish retail outlets, comprising local fish markets and modern retail stores, were randomly selected to represent different marketing channels. From each selected outlet, 10 consumers were randomly selected, resulting in a total sample of 100 consumers.

Data Collection

Primary data were collected from the selected consumers through personal interviews using a structured interview schedule. Information was obtained on socio-economic characteristics, fish consumption and purchasing patterns, consumer preferences and constraints related to the purchase and consumption of marine fish. Secondary information relevant to the study was obtained from the Department of Fisheries, Government of Andhra Pradesh, Nellore District.

Analytical Techniques

The collected data were analysed using frequency and percentage analysis, cross-tabulation, Chi-square test and Garrett's ranking technique. Frequency and percentage analysis were used to describe the socio-economic characteristics, consumption patterns and consumer preferences. Cross-tabulation was employed to examine the distribution of consumer characteristics across different categories of fish consumption and purchasing behaviour.

The Chi-square test was used to assess the association between selected socio-economic characteristics and categorical variables related to fish consumption, preferences and purchasing behaviour. The test statistic was calculated as:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where, χ^2 = Chi-square value, O_i = Observed frequency and E_i = Expected frequency

Garrett's ranking technique was used to determine the relative importance of factors influencing the purchase and consumption of marine fish. The ranks assigned by respondents were converted into percent positions and corresponding Garrett scores using the conversion procedure of Garrett and Woodworth (1969). Mean scores were calculated for each factor and the factors were ranked in descending order of their scores.

Operational Definitions

Fish consumption pattern refers to the frequency, quantity and type of fish consumed by households. Consumer preference refers to the degree of liking or choice towards fish based on attributes such as taste, freshness, quality, price, availability and nutritional value. Purchase behaviour includes the type, quantity, frequency, place and expenditure associated with fish purchases. Marine fish refers to fish harvested from marine and coastal waters and consumed by households.

Results and Discussion

Socio-economic Characteristics of Respondents

A total of 100 consumers were selected from ten fish retail outlets, with 10 respondents from each outlet. Females constituted the majority of the sample (62.0%), while males accounted for 38.0%. The largest proportion of respondents

belonged to the 26-40 years age group (47.0%), followed by those below 25 years (34.0%), 41-60 years (15.0%) and above 60 years (4.0%). Thus, the sample was predominantly represented by young and middle-aged consumers.

With respect to education, high-school educated respondents constituted the largest group (32.0%), followed by graduates (25.0%), postgraduates (21.0%), primary educated respondents (14.0%) and illiterate respondents (8.0%). Overall, 78.0% had attained at least secondary-level education. Private-sector employees constituted the largest occupational group (36.0%), followed by government employees (22.0%). Unmarried respondents accounted for 68.0%, while 32.0% were married. Nuclear families constituted 81.0% of the sample and 54.0% of households had up to four members. Monthly household income was mainly concentrated in the ₹10,001-25,000 category (38.0%), while 77.0% of respondents resided in urban areas.

Fish Consumption Pattern

The fish consumption pattern was assessed based on type, frequency and quantity of fish consumption, expenditure, purchase source, preferred fish form, reasons for consumption, commonly consumed species, cooking method and consumption of fish outside the home. These parameters were considered to assess the overall fish consumption and purchasing behaviour of respondents.

This result suggests a clear age-related difference in eating-out preferences, with younger consumers favouring relatively convenient and informal outlets, while middle-aged and older consumers showed greater preference for hotels and restaurants.

Fish consumption was predominantly weekly (60.0%), followed by occasional (27.0%) and daily consumption (13.0%). The quantity consumed was mainly 0.51-1.00 kg per week (31.0%), followed by 1.1-2.0 kg (28.0%) and less than 0.5 kg (24.0%), while monthly expenditure was mainly ₹501-1,000 (33.0%), followed by less than ₹500 (28.0%).

The local market was the major purchase source (64.0%), followed by vendors (26.0%), supermarkets (6.0%) and online channels (4.0%). Taste was the principal reason for fish consumption (52.0%), followed by nutrition (29.0%), health benefits (11.0%) and habit (8.0%). Dressed fish was the most preferred form. Fish consumption outside the home was frequent for 51.0% of respondents, occasional for 29.0% and absent for 20.0%. Curry was the preferred cooking method (46.0%), followed by frying (36.0%), grilling (11.0%) and other methods (7.0%).

Age-wise influence on fish consumption pattern

The influence of age on selected aspects of fish consumption behaviour was examined to identify whether consumption preferences varied across different age groups. Among the factors considered, age significantly influenced only the *type of fish mostly consumed and the preferred place for consuming fish outside the home*. The age-wise distribution for these two significant factors is presented in Tables 1 and 2, respectively and the corresponding patterns are discussed below. The remaining factors did not show a significant association with age and are therefore presented briefly in the text.

Table 1: Age-wise distribution of respondents according to type of fish mostly consumed

Age group	Pond fish (%)	Marine fish (%)	Both (%)	Total
<25 years	41.2	38.2	20.6	34
26-40 years	29.8	21.3	48.9	47
41-60 years	53.3	33.3	13.3	15
>60 years	75.0	0.0	25.0	4
Total	39.0	28.0	33.0	100

$\chi^2 = 13.527$; $p = 0.035$ (significant at 5% level).

Overall, 39.0% of respondents mainly consumed pond fish, 28.0% marine fish and 33.0% both pond and marine fish. A statistically significant association was observed between age and the type of fish consumed ($\chi^2 = 13.527$, $p = 0.035$). Consumers aged 26-40 years showed the highest proportion

consuming both pond and marine fish (48.9%), whereas pond fish was predominant among the 41-60 years (53.3%) and above 60 years (75.0%) groups. Among those below 25 years, 41.2% consumed pond fish, 38.2% marine fish and 20.6% both types.

Table 2: Age-wise distribution of respondents according to preferred place for consuming fish outside home

Age group	Hotel (%)	Restaurant (%)	Street-food stall (%)	Fast-food centre (%)
<25 years	11.8	14.7	29.4	44.1
26-40 years	51.1	19.1	14.9	14.9
41-60 years	40.0	33.3	13.3	13.3
>60 years	50.0	50.0	0.0	0.0
Total	36.0	21.0	19.0	24.0

$\chi^2 = 24.600$; $p = 0.003$ (significant at 1% level).

A highly significant association was observed between age and the preferred place for consuming fish outside the home ($\chi^2 = 24.600$, $p = 0.003$). Consumers below 25 years predominantly preferred fast-food centres (44.1%) and street-food stalls (29.4%), whereas the 26-40 years group mainly preferred hotels (51.1%). Respondents aged 41-60 years showed greater preference for hotels (40.0%) and restaurants (33.3%), while those above 60 years equally preferred hotels and restaurants (50.0% each).

Household Fish Consumption Behaviour

Age-wise influence on Household Fish Consumption Behaviour

Age is an important socio-demographic factor influencing food preferences, purchasing behaviour, nutritional awareness and household fish consumption practices. The respondents were classified into four age groups, namely below 25 years, 26-40 years, 41-60 years and above 60 years to examine the influence of age on household fish

consumption behaviour. The association between age groups of consumers and nine household fish consumption behaviour variables, namely *Most Preferred Type of Fish*, *Preferred Time of Fish Consumption*, *Family Member Responsible for Fish Purchase Decisions*, *Source of Information on Fish Quality*, *Changes in Fish Consumption Over the Years*, *Problems Encountered While Purchasing Fish*, *Fish Storage Method at Home*, *Awareness of the Nutritional Benefits of Fish* and *Frequency of Purchasing Ready-to-Cook Fish Products*, was analyzed using the Chi-square test. The results revealed that none of the household consumption behaviour variables showed a statistically significant association with age groups of consumers ($p > 0.05$). This indicates that age did not significantly influence the household fish consumption behaviour of respondents.

Gender and Household Fish Consumption Behaviour

The gender-wise analysis revealed that gender had a limited influence on household fish consumption behaviour. Marine fish was preferred by 60.5 per cent of male and 56.5 per cent of female consumers, while pond fish was preferred by 39.5 and 43.5 per cent, respectively. Lunch was the most preferred time of fish consumption among both males (50.0%) and females (58.1%), followed by consumption during both lunch and dinner (31.6% and 22.6%, respectively). Regarding fish purchase decisions, joint decision-making was reported by 47.4 per cent of males, while among females, wife involvement and joint decision-making each accounted for 35.5 per cent. Vendors were the major source of information on fish quality for both males (50.0%) and females (58.1%). Fish consumption had increased over the years for 47.4 per cent of males and 50.0

per cent of females, while 34.2 and 27.4 per cent, respectively, reported no change.

Regarding problems encountered while purchasing fish, price was the major concern among both males (31.6%) and females (38.7%), followed by freshness (26.3% and 29.0%, respectively). Refrigeration was the most commonly used fish storage method among males (50.0%) and females (56.5%), followed by freezer storage at 18.4 and 27.4 per cent, respectively. With respect to ready-to-cook fish products, 50.0 per cent of males and 43.5 per cent of females reported never purchasing them, whereas 39.5 and 33.9 per cent purchased them occasionally. Awareness of the nutritional benefits of fish was the only variable that showed a marginally significant association with gender at the 10 per cent level ($\chi^2 = 2.872$, $p = 0.090$), with awareness being higher among female consumers (87.1%) than male consumers (73.7%). No other variables showed a significant association with gender. Overall, male and female consumers exhibited largely similar patterns of fish preference, consumption, purchasing and storage behaviour, although female consumers demonstrated comparatively higher awareness of the nutritional benefits of fish.

Factors Influencing Preference for Marine Fish

The weighted mean analysis showed that taste was the most important factor influencing marine fish preference, with a mean score of 4.48, followed by nutritional value (4.06) and freshness (3.94). Family preference (3.89) and seasonal availability (3.86) occupied the fourth and fifth ranks, respectively. Fish size and appearance (3.81), availability (3.79), ease of cooking (3.78) and market hygiene (3.77) followed. Price ranked last, with a mean score of 3.60.

Table 3: Factors influencing preference for marine fish

Factor	Weighted mean score	Rank
Better taste	4.48	I
High nutritional value	4.06	II
Freshness	3.94	III
Family preference	3.89	IV
Seasonal availability	3.86	V
Fish size and appearance	3.81	VI
Availability	3.79	VII
Ease of cooking	3.78	VIII
Market hygiene	3.77	IX
Price	3.60	X

Overall, consumers attached greater importance to intrinsic product attributes—particularly taste, nutritional value and freshness—than to price and other market-related attributes.

Barriers to Marine Fish Purchase and Consumption

Garrett's ranking revealed that lack of freshness was the most important barrier, with a mean score of 72.74,

followed by high price (66.23) and long distance to the market (62.19). Difficulty in cleaning/preparation (55.90), unpleasant smell (54.14) and seasonal non-availability (51.55) occupied the subsequent ranks. Presence of bones (40.32), poor market hygiene (37.81), preference for pond fish (35.40) and lack of storage facilities (21.72) were relatively less important constraints.

Table 4: Major barriers to marine fish purchase and consumption

Barrier	Garrett mean score	Rank
Lack of freshness	72.74	I
High price	66.23	II
Long distance to market	62.19	III
Difficulty in cleaning/preparation	55.90	IV
Unpleasant smell	54.14	V
Seasonal non-availability	51.55	VI
Presence of bones	40.32	VII
Poor market hygiene	37.81	VIII
Preference towards pond fish	35.40	IX
Lack of storage facilities	21.72	X

The findings indicate that freshness, affordability and accessibility are the three principal constraints affecting marine fish consumption, emphasizing the need for

improved cold-chain facilities, regular supply and accessible markets.

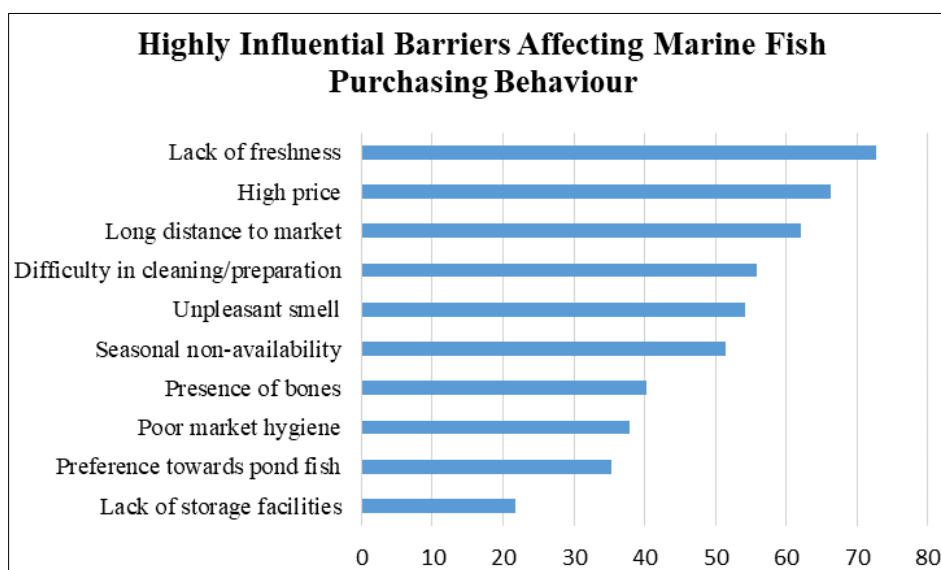


Fig 1: Barriers in Purchase and Consumption of Marine Fish

3.7 Suggestions for Improving Marine Fish Marketing

Respondents strongly supported measures aimed at improving freshness, quality and accessibility. The most frequently suggested measure was regular supply of fresh

fish (95.0%), followed by improved cold-storage facilities (93.0%), better market hygiene (90.0%), reduction in fish prices (87.0%) and availability of cleaned/processed fish (83.0%).

Table 5: Consumer suggestions for improving marine fish marketing

Suggestion	Frequency	Percentage
Regular supply of fresh fish	95	95.0
Improved cold-storage facilities	93	93.0
Better hygiene in fish markets	90	90.0
Reduction in fish prices	87	87.0
Availability of cleaned/processed fish	83	83.0

These suggestions closely correspond with the major constraints identified through Garrett ranking and indicate that improvements in freshness, cold-chain infrastructure,

hygiene, affordability and convenience are likely to strengthen consumer acceptance of marine fish.

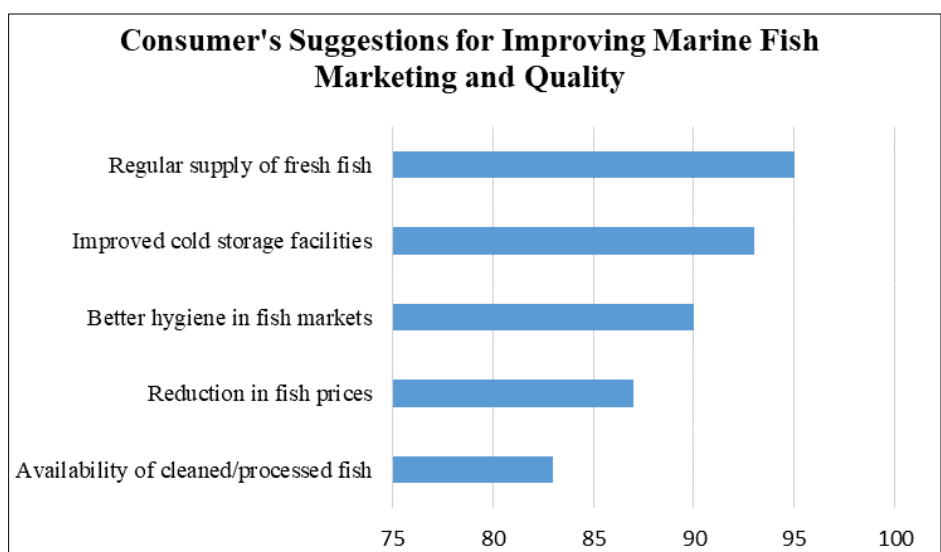


Fig 2: Suggestions for Improving Marine Fish Marketing and Quality

Conclusion

The study revealed that age and gender had limited influence on fish consumption behaviour. Age significantly influenced only the type of fish consumed and the preferred place for consuming fish outside the home, while gender showed a significant influence only on awareness of the nutritional benefits of fish, which was higher among female consumers. The major factors influencing marine fish preference were taste, nutritional value and freshness, with fish consumption being predominantly weekly and local markets being the major source of purchase.

The major constraints were lack of freshness, high price and distance to the market. Consumers suggested regular supply of fresh fish, improved cold-storage facilities, better market hygiene, affordable prices and availability of cleaned/processed fish. Overall, improving freshness, accessibility, affordability, hygiene and convenience would strengthen marine fish marketing and enhance consumer satisfaction in Nellore town.

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