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Health Benefits, Quality and Safety of Fish in Kerala: Consumer Perception and Implications for Extension System

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ABSTRACT

Knowledge about consumer perceptions on health benefits, quality and safety of fish is important for the development of targeted government interventions. The study conducted between December 2018 and March, 2020 explored and identified differences among consumers in Kerala, India according to their perceptions of nutritional and health benefits, quality and safety associated with fish consumption. By adopting purposive random sampling method,400 fish consumers from 2 coastal districts (Ernakulam and Kozhikode) and 2 inland districts (Kottayam and Palakkad) of Kerala was surveyed. While consumers had strong perception about the nutritional benefits of fish consumption, lower awareness was reported on specific health benefits from eating fish. Consumers had a very strong perception that fish quality is influenced by the mode of transport and local fish is having better quality than the fish brought from other states. Cleanliness of market was another concern. More than half of the consumers expressed their concern about absence of certification system to convey the freshness of fish. Majority of the consumers were having a medium perception about safety of fish. Significant difference was observed within perceptional statements about safety of fish and case of underestimating significant risks while overestimating others was also observed. Re-directing Government efforts in supply chain management of fish and in ensuring quality and safety of fish in every stage of the chain emerged as key concerns.

INTRODUCTION

Fisheries and aquaculture play an important role in alleviating poverty, hunger and malnutrition, in addition to its role in economic growth and natural resource utilization (FAO, 2020). Fish has always been recommended for consumption as one of the highly nutritious food which is an important source of animal protein, n-3 PUFA, minerals and vitamins. As compared to other animal protein foods, fish is one of the available and affordable sources (Mohanty et al., 2015). During the last five and half decades, global fish consumption in the form of food has increased at an average annual rate of 3.1 per cent which is higher than the consumption growth rate of all other animal protein foods. During the same period, global per capita fish consumption has increased at an average annual rate of 1.5 per cent per year (FAO, 2020). Thus, fishery sector contributes to the nutritional security of people in a better way. Kerala is one of the Indian states with high per capita rate of monthly fish consumption (2.26 kg in rural and 2.21 kg in urban areas) compared to other Indian states (NSSO, 2010). Even though fish consumption in the state is showing an upward trend, increasing cases of adulteration in fish has created a mounting concern over quality and safety of fish among the consumers. Monitoring studies has proved the cases of adulteration of fish with unapproved chemicals and additives (FSSAI, 2018). Consumers are

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exposed to the positive information on nutritional benefit of eating fish and while on the other hand they are exposed to negative news of health risk due to adulteration and unscientific post-harvest management of fish. Consumers thus often face difficulties in their food choice in order to balance conflicting forces of health benefit versus safety risks (Verbeke et al., 2004). The fish purchasing behaviour of consumers were found to be predominantly influenced by quality, nutritional value and price (Mugaonkar et al., 2011). With other issues also to be considered, the economics of food is mainly dependent on food quality and safety (Grunert, 2005). It is important to know what actually people perceive about the conflicting information of health risks and benefits related to fish consumption (Dijk et al., 2011). Psychological factors like early perception and learning has got important role in developing basic and enduring food choices (Koster and Mojet, 2007). Research gap has been reported in systematic analysis of perceived constraints of fish farmers (Dutta et al., 2019).

Consumer perception about food quality changes over time and is presently linked with nutrition, well-being and health. It is the responsibility of Governments to respond to consumers' concerns and expectations through its food safety assurance or health departments. In doing so, science and innovation has a key role (Troy and Kerry, 2010). Literature has revealed a gap in current knowledge on consumer perception about health benefit, quality and safety of fish available for consumption. The study explored the consumers' perception with respect to nutrition, health benefits, quality and safety of fish and to suggest actions to be taken public health system in Kerala state with the objective to recommend policy measures for supply chain management of fish and ensure quality and safety of fish in every stage of the chain.

METHODOLOGY

Purposive random sampling method was adopted for the present study. Districts of Kerala state were classified into two; coastal and inland districts and two coastal districts; Kozhikode and Ernakulam and two inland districts, Palakkad and Kottayam were selected for survey. From each district, 100 fish consuming households were selected randomly, making a final sample size of 400. Based on review of literature, field interactions and expert opinion, a structured interview schedule was developed for gathering primary data. The schedule was having questions about fish consumption behavior and items on consumer perception. The perception statements were developed under three conceptual dimensions of nutritional- health benefits of fish, quality concerns and safety issues in fish consumption. Each household was visited and one adult respondent most involved in fish purchase and cooking was personally interviewed. The respondent was asked to assess the perception statements on a 5-pointcontinuum ranging from 'strongly agree' to 'strongly disagree'. Strongly Disagree was given score 1; Disagree was given score 2; Undecided was given score 3; Agree was given score 4; and Strongly Agree was given score 5. Personal interviews were conducted between December 2018 and March, 2020. Frequency analysis, bi-variate correlation, t test, non-parametric tests for several related samples (Friedman's test) were used for analyzing the data. The data analysis was done using Microsoft Excel 2017 and SPSS Ver. 21.0

RESULTS AND DISCUSSION

Profile of the fish consumers

The present study covered a representative sample of fish consuming households from Kerala in terms of socio-demographic characteristics such as gender, age, family size, education, occupation and place of residence. Out of the 400 respondents, 136 were men (34.1%) and 263 of them were women (65.9%). Age of the consumers varied from 19 to 77 with an average age of 40 years. Education level varied from primary education (13.8%) to post graduates (21%). About 32 per cent consumers had education up to secondary level and another 32 per cent of them were graduates. Mean family size reported was 4. Various occupational categories like farming, fishing, labour, fish vending, self-employment, private casual, private salaried and Government service were observed among the consumers. Regional representativeness was achieved through the presence of rural (48.8%), semi-urban (20.3%) and urban (31%) consumers.

Consumer perception about quality, safety, nutritional and health benefits of fish consumption

Majority (81.5%) of the fish consumers were having a medium perception about nutritional-health benefits of fish consumption. About 11.3 per cent of the consumers had high perception while only 7.3 per cent of them belonged to low perception category. Within the perceptional statements highest score was obtained for the statement "fish is a highly nutritious food". Consumers had a very strong perception that 'eating fish is recommended for all age groups' ($\bar{x}$ = 4.36) with 91.7 per cent consumers agreeing with this statement.

Table 1. Distribution of respondents on perception score on health benefit and safety

Category based on perception about health benefit of fish	Per cent
Low (score less than 16.43)	7.3
Medium (score between 16.43 and 29.99)	81.5
High (score greater than 29.99)	11.3
Category based on perception about safety of fish	
Low (score less than 15.958)	8.5
Medium (score between 15.958 and 27.842)	82.5
High (score greater than 27.842)	9.0

Consumers strongly perceived that fish is healthier than red meat (mean score of 4.28) with 82.1 per cent consumers recording agreement with this statement. About 74.23 per cent of consumers perceived that fatty fish consumption can improve the development of bones ($\bar{X}$= 4.02). Large majority of (69.5%) consumers also agreed upon the statement: "regular fish consumption stimulates brain development" ($\bar{X}$=3.97). Surprisingly, the lowest mean score was obtained for the statement: "Fish consumption reduces the risk of cardiovascular diseases". Non parametric Friedman test revealed that there existed significant difference within perceptions about nutritional and health benefit of fish (χ^2 = 204.68, p=0.000). The results indicate that as far as Kerala is concerned people distinguish fish as a highly nutritious food which is good for all age groups.

Table 2. Consumer perception about health, quality and safety benefits of fish consumption

S.No.	Perception about health benefit of fish	Mean	SD
	Perception about health benefits		
1	Fish is a highly nutritious food	4.37	.758
2	Eating fish is recommended for all age groups	4.36	.706
3	Fish is healthier than red meat	4.28	.844
4	Fatty Fish consumption can improve the development of bones	4.02	.872
5	Regular fish consumption stimulates brain development	3.97	.930
6	Fish consumption reduces the risk of cardiovascular diseases	3.91	.868
	Perception about quality of fish		
7	Fish quality is influenced by time taken to reach market after capture	4.05	.821
8	Local fish is having better quality than the fish brought from other states	3.98	.999
9	Cleanliness of market contributes to quality of fish	3.86	.869
10	There is no quality certification system to convey the freshness of fish	3.76	.887
11	Consumers are unable to properly assess the fish quality in market	3.73	.971
	Perception about safety of fish	3.59	.948
12	There is no certification system to convey the safety of fish	3.49	.963
13	Government machinery is not effective in ensuring safe fish to consumers	3.94	.867
14	Spoilt fish from other states is widely sold in Kerala markets	3.93	.797
15	Fish in our markets contain adulterants	3.85	.730
16	Eating some fishes causes allergy in many people	3.84	1.057
17	Fish contain heavy metals and many harmful contaminants	3.65	.899

Results also imply that while consumers have strong perception about the nutritional benefits of fish consumption, they were comparatively less aware about the health benefits which can be availed by eating fish. Similar result was obtained in a fish consumer survey in peri-urban areas of Bhubaneswar where half of the consumers (46.67%) were aware that fish is a good source of quality protein, while only 30% were of the opinion that fish is rich in omega 3 fatty acids and is good for neonatal brain development (Tanuja et al., 2020). Reviews also show that there was less effective application of scientific evidences generated through nutritional research within the programs which were planned and implemented to overcome problem of under-nutrition in our country (Asha et al., 2020). The lower level of awareness about specific health benefit from fish imply that, future health awareness programs in Kerala should focus more on scientific data generated about specific health benefits of fish consumption. In the present scenario of ever-increasing life style diseases, people can benefit from scientific dietary information, given more publicity and more access to such information through public system of health extension.

Consumers had a very strong perception that fish quality is influenced by the mode of transport to the market and 75.6 per cent of them agreed upon this perception statement. Consumers strongly perceived that local fish is having better quality than the fish brought from other states and 72.8 per cent consumers agreed upon this statement. Cleanliness of market was another concern with 69.6 per cent consumers agreeing that cleanliness of market contributes to quality of fish. More than half of the consumers (59%) agreed that "there is no quality certification system to convey the freshness of fish" in Kerala while about 35.1 per cent of them were undecided or had no opinion about this. Comparatively lower mean score (3.73) was obtained for the statement "consumers are unable to properly assess the fish quality in market". Similarly, lower mean score (3.59) was obtained for the statement: "authorities have left consumers to be duped by vendor's w.r.t fish quality". Lowest mean score of 3.49 was obtained for the statement 'farmed fish is of lower general quality than wild captured fish' with majority (51.6%) of the consumers against this belief. Non parametric Friedman test revealed that there existed significant difference within various perception about quality of fish ($\chi^2 = 131.799$, $p = 0.00$). Results on fish quality perception indicate that fish consumers in the state were having strong apprehensions about quality of fish coming from other states and about maintenance of fish quality during transport. They are not satisfied with the cleanliness of markets and expressed their inability to properly assess the fish quality in market. Recent review reports state that inadequate cold storage and transportation facilities at retail level result in poor quality fish sold to the consumers (CII and Yes Bank, 2020). Another study conducted in Palakkad district of Kerala had also revealed that quality is the most important attribute influencing consumer behaviour and there exists willingness to pay 10-15 per cent more for best quality fish (Geethlakshmi et al., 2013).

As a response to the consumer's concerns about fish quality in Kerala, Government should bring about strict regulatory measures for quality assurance of fish during transportation, storage and marketing. The concept of hygienic fish market should be re-enforced and implemented in the domestic fish markets of Kerala. Awareness should me made among all stakeholders to consider fish as a food which can be properly packed and certified for its freshness and quality. To achieve this goal research and development activities must be strengthened along with post-harvest infrastructure development in the state

Majority (82.5%) of the consumers in Kerala were having only a medium perception about safety of fish available table 1. Consumers are highly concerned about the fact that there is no certification system to convey the safety of fish and that Government machinery is not effective in ensuring safe fish to consumers (Table 2). Consumers also believed that spoilt fish from other states are widely sold in Kerala markets (73.4%) and fish in our markets contain adulterants (72.5%). Consumers in general (74.2%) believed that eating some fishes causes allergy in many people. Lowest mean score (3.65) was obtained for the statement

fish contain heavy metals and many harmful contaminants indicating less awareness about heavy metal contamination in fish. Only 58.4 per cent consumers had agreed upon this statement. Friedman test results revealed that there exists significant difference within perceptional statements about safety of fish ($\chi^2 = 50.99$, $p = 0.000$). Highest mean rank (3.67) was obtained for the statement "Eating some fishes causes allergy in many people" and lowest mean rank (3.06) was obtained for the statement "Fish contain heavy metals and many harmful contaminants". This can be a case of underestimating significant risks while overestimating others. People sometime underestimate significant risks while overestimating others (Joanna Burger et al., 1993). Awareness programmes on specific safety risk should be organized such that unnecessary apprehensions are removed and necessary cautioning is conveyed regarding possible risks.

Consumers should be given their rights and they must have confidence in food production (Fox et al., 2018). Similarly in a study conducted, Gupta et al., *(*2020) had concluded that agricultural policies and programmes need to be more nutrition-sensitive to impact the health and productivity of families. As a long-term vision Governments should initiate decentralized system for assessing fish safety by using scientific methods in harbors, landing centers and markets. Consumers should be empowered to assess the possible adulterants in fish by themselves. As an initial step, technologies like CIF Test, the Rapid Detection Kit to identify adulteration of formaldehyde and ammonia in fresh fish developed by ICAR CIFT should be made more available for public use.

CONCLUSION

Majority of the people consume fish and it is an inseparable part of diet for Keralites. Majority of the consumers were convinced offish as a highly nutritious food. Consumers had strong perception about the nutritional benefits of fish consumption, but, lower level of awareness was observed on specific health benefits of eating fish. Consumers strongly believed that fish quality is influenced by the mode of transport and local fish is having better quality than the fish brought from other states. Consumers tend to underestimate some significant safety risks while overestimating others. It may be recommended that Government should bring about strict regulatory measures for quality assurance of fish during transportation, storage and marketing, decentralized system for assessing fish safety by using scientific methods in harbors, landing centers and markets. Consumers should be empowered to assess the possible adulterants in fish by themselves. As an initial step, technologies like CIF Test, the Rapid Detection Kit to identify adulteration of formaldehyde and ammonia in fresh fish developed by ICAR CIFT should be made more available for public use.

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