A CASE STUDY ON FISH AFFORDABILITY AS MAIN PROTEIN DIET OF LOW-INCOME PEOPLE IN DHAKA SOUTH, BANGLADESH

Bioresearch Communications
Volume 9, Issue 1, January 2023

DOI:
doi.org/10.3329/brc.v9i1.63602

Papia Sultana[1], Md. Arafat Rahman Khan[1], Nur Islam[1] and Rumana Tasmin[1]*

[1]Department of Zoology, Faculty of Life and Earth Sciences. Jagannath University, Dhaka-1100

ABSTRACT

The low-income population in the study area consumes fish in a selective manner. They prefer frequently purchase fish at lower price. Study revealed that 16 fish species under 6 orders were highly consumed by the targeted group. Order Cypriniformes was the most dominant (46%) group according to their fish consumption pattern. Rui, *Labeo rohita* was the highly prioritized fish, rather than this, telapia, pungus, koi and prawn were also in their priority list due to availability and low prices in the market. Among all types of fishes, 85% were culture and 15% were capture fishes respectively. Fish consumption rate in low-income people varies significantly on the basis of their income and age group. Fish day of low-income people ranging from 4-17 days per month. Most of the respondents (89%) were aware of nutritional value of fish but considering the prices of fishes and low wages most of the time they were not able to meet their daily requirement of fish protein. Thus, this finding will provide the real scenario of fish protein intake of that targeted economic group and help policy makers, NGOs, national and international donors for better understand to cope up malnutrition for future generation.

KEYWORDS: Fish consumption, Low-income people, Fish day, Fish protein.

Received: 18 August 2022, Accepted: 27 November 2022

Type: Original Research

***Corresponding Author: Dr. Rumana Tasmin, Department of Zoology, Jagannath University, Dhaka 1100, Bangladesh.**
Email: rumana.tasmin@zool.jnu.ac.bd

Introduction

Fish is the most important dietary protein source for human being. It is rich in amino acids, unsaturated fatty acids, vitamins, and other trace elements[1,2,3]. Fish also contains a higher amount of Omega-3, which helps in reduction of low density cholesterol from human body[4]. Low density cholesterol causes high blood pressure. With consumption of fish protein helps to maintain a regular balance of blood pressure. Fish consumption helps prevent cardiovascular diseases, high blood pressure, cholesterol, Alzheimer's disease, and various types of cancer[5,6,7].

Bangladesh is one of the major fish producing countries in the world. About 42.77 metric tons of fish has been produced during the fiscal year 2017-2018 and fisheries contributed about 3.57% to our national GDP[8]. Bangladesh prides itself on being very rich in fish diversity. Its numerous and diverse inland waterbodies such as rivers, haors, baors, beels, canals, ponds, ditches and many coastal paddy fields, are home to over 267 freshwater fish species[9]. In terms of the geographical location and centuries of social behavior, fish play a crucial role in the Bangladeshi diet, providing more than 60% of animal protein rich food and micronutrients to mitigate their every day's necessary nutrients requirement[10]. The culture and consumption of fishes, therefore has important implications for national food and nutrition security, poverty and growth.

The population is increasing in Dhaka city. It is considered as one of the crowded cities in the world. About 11.875 million of people live congested in this city[11]. The urbanization of Bangladesh is interlinked with the intense development of Dhaka City which has developed as a political and administrative Centre, having gained and then lost its position through the political development of the country. Due to the concentration of both domestic and foreign investment Dhaka City has experienced massive migration from the rural population of Bangladesh in recent decades but a critical downside to this has been the dramatic rise in poverty and practice of poor nutritious diet. In addition, the state of Dhaka's infrastructure is inadequate and unable to keep up with growing urban pressures. Significant portions of the city's population are living in slums and squatter settlements and are experiencing extremely low living standards, low productivity and unemployment. The slum population mostly live below the poverty line in terms of both calorie intake and the cost of basic needs. River fishes are costly and readily unaffordable due to their high prices for the low income people. Thus, cultured fishes are abundant in fish markets and has a demand in all classes. In Bangladesh, annually average fish uptake of each person is 24.08 kg where demand is 24.74 kg[12]. In order to mitigate the continuous demand of fish for the growing population of the country and to reduce the pressure

of capture fisheries from natural resources people are focusing on culture fisheries[13,14,15].

This study aims to know the fish affordability of low-income people's considering their profile, preferences on species selection and fish consumption days per month as their main protein diet.

Materials and Methods

Study Period

This survey was conducted between October 2019 to February 2020 in the Dhaka South City Corporation (DSCC) area.

Study Area

The study area covers within Dhaka South City Corporation (DSCC) area. DSCC consists of 57 wards. From those areas only major sites were selected for collecting data. Kotwali, Sutrapur, Wari, Azimpur, New Market, Dhanmondi, Sadarghat, Luxmibazar, Islampur, Narinda, and Shahbag areas were covered in the survey (Figure 1). A map of the study area is prepared using Arc Map 10.1. Geo-references were also collected during data collection.

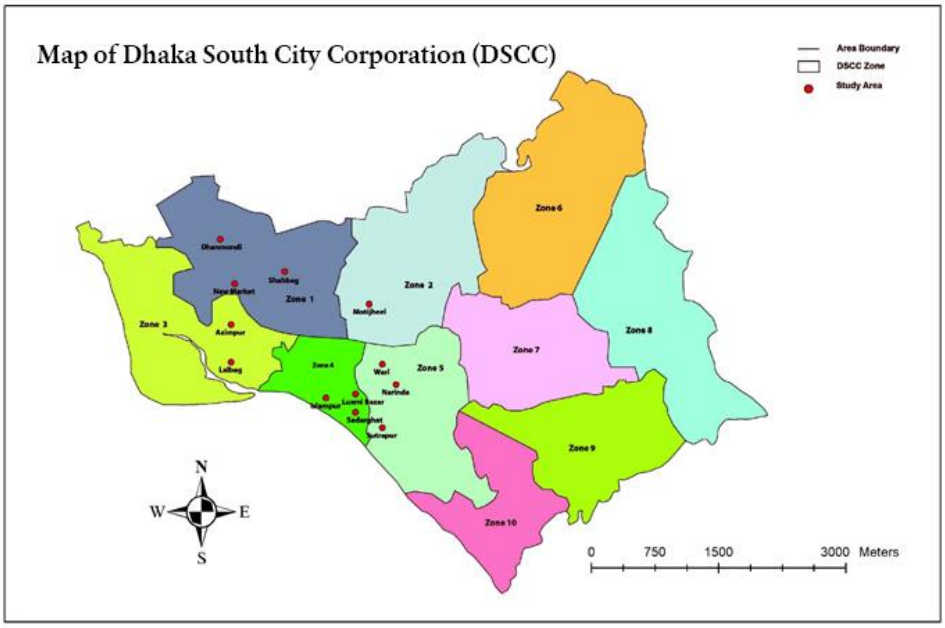

Figure 1. Map of the study area from Dhaka South city

Questionnaire survey and data collection

A questionnaire was developed on survey method to collect data considering low-income people. A total 76 respondents were participated for this survey. Questionnaire data included age, monthly income, educational background, types of fish, fish day per month and knowledge on fish nutritional value of low-income people. Data collection was based on face to face interview. Opportunistic methods were followed while collecting data. A several categories of occupation has been recorded during survey. Necessary secondary data were assembled from the relevant literatures, publications and books via internet, seminar library of Department of Zoology and central library of Jagannath University to know the amount of protein in different fishes.

Statistical Analysis

The obtained data from the questionnaire survey (opportunistic interview) and secondary sources were examined carefully, edited and finalized for analyses. All the statistical analysis; one tailed t-test, data frequencies, regression analysis were done by Microsoft Excel and statistical software SPSS; version 25. Tables and graphs were prepared according to the objectives of present study.

Results and Discussion

Consumer Profile

Age Structure

Age of population ranged between 18 to 65 years. The average age structure was revealed 37 years. People were categorized into three age groups: young (15–30), middle-aged (31–45), and old (46-70) years (Figure 2). There is an insignificant difference in the working ages. Study found that 24 out of 76 respondents are categorized under older aged group, 31 was found middle aged and the rest 21 was young aged. When taking the work types into account, age variation is also observed. The young and middle aged group were observed to engage in more laborious jobs while older groups prefer less tedious jobs. Many young people appear to be working in labor-intensive jobs like driving vans and pulling rickshaws, which comparatively needs a lot of energy.

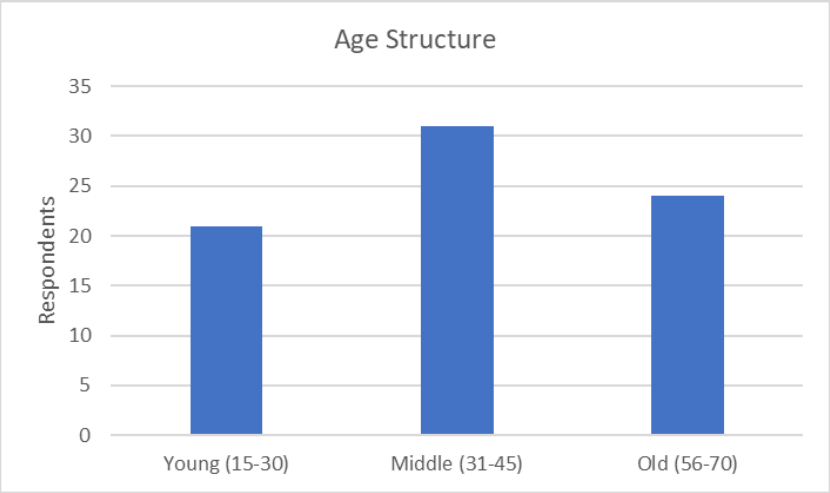

Figure 2. Age structure of the respondents.

According to Ayubi (2017), most working-class residents of rural areas were in middle aged group[16].

Education

Four categories were used to evaluate each person's academic background. People who have finished class 1 to 5 are obligated to participate in the primary education; 6 to10 grade at secondary education; between 11 and 12 are considered higher secondarily education. Present study revealed that out of 76 respondents 34 completed their primary education, 25 have completed their secondary education and 17 have never attended any school (Figure 3). None of them were found in higher secondary category. Previous study was conducted on 50 village people in Islamnagar, Savar, Dhaka and found that 40% of the villagers terminated their education at primary level, 26% at secondary level, 16% at higher secondary level, 8% were illiterate and only 10% were found as well-educated (Graduated)[16] and study also found strong correlation between fish consumption and education. Present study revealed that educational background may be helpful to make people understand the nutritional value of fish and fishery products.

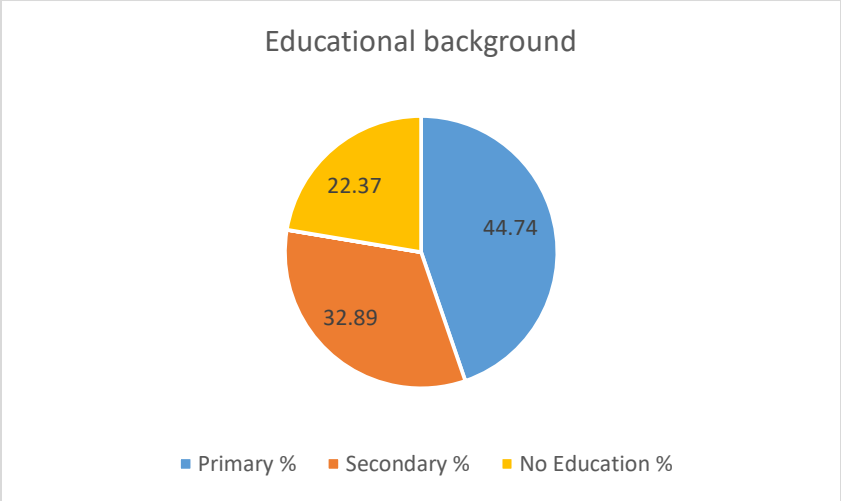

Figure 3. Educational background of low-income people.

Occupation

A variety of low-income generating people were recorded during the survey period. About 36.28% of the data was obtained from street hawkers. These street hawkers group covers a wide variety of street foods, handkerchief, mobile cover, headphone, sandal, or shoe, fruits, juice or lemon water and newspaper seller. Day laborers (18.42%), rickshaw pullers (17.11%), shopkeepers (11.84%), hotel boys (6.58%), tailors (3.95%), van driver (3.95%) and electronic mechanics (1.32%) make up a large portion of the recorded data (Figure 4). A study was conducted on 128 randomly selected respondents from the Rangpur City Corporation (RPCC), Bangladesh where most of the respondents were self-employed. and there was no association between the profession and fish consumption value ($r = 0.163$, $p > 0.05$) [17]. Present study also didn't found any significant correlation between occupation and fish consumption days per month.

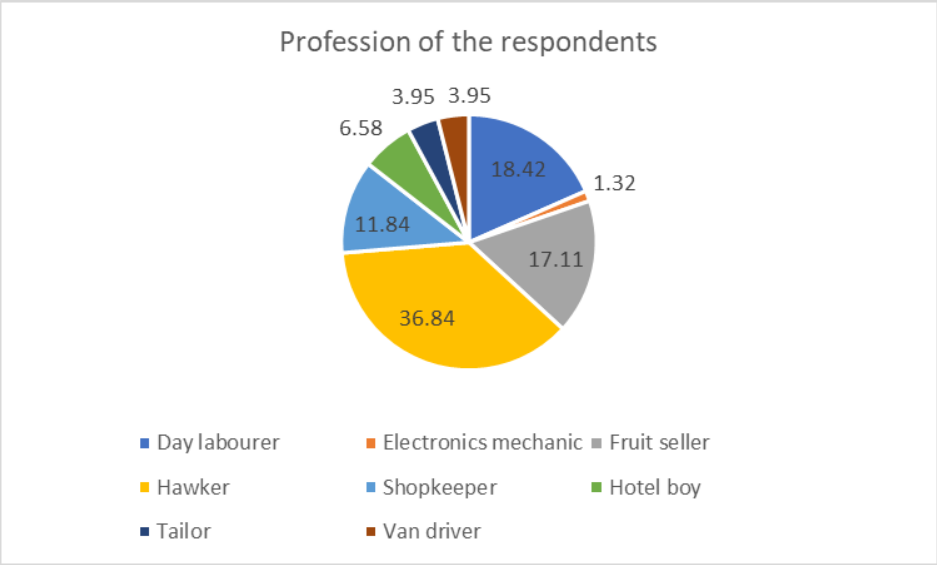

Figure 4. Profession of low-income people in the study area.

Income of respondents

The respondents earning is represented in four categories as their monthly income varies quite significantly. Monthly income from the data ranged from 6000 to 30,000 BDT. The estimated average monthly income was 12794.87 BDT. A significant portion 37 respondents (48.68%) earn between 11,000 to15,000 BDT; 25 respondents (32.90%) between 6000 to 10,000 BDT;12 respondents (15.79%) between 16000 to 20,000 BDT; 2 respondents (2.63%) earn between 21000 and 30000 BDT per month respectively (Figure 5). A previous study also found that the monthly income of most of the villagers and randomly selected respondents were below BDT 25000[17]. A sudden increase in the cost of basic goods has a direct impact on their decision making in choosing daily goods and their amount. People with lower income are more likely to avoid purchasing products with increased prices.

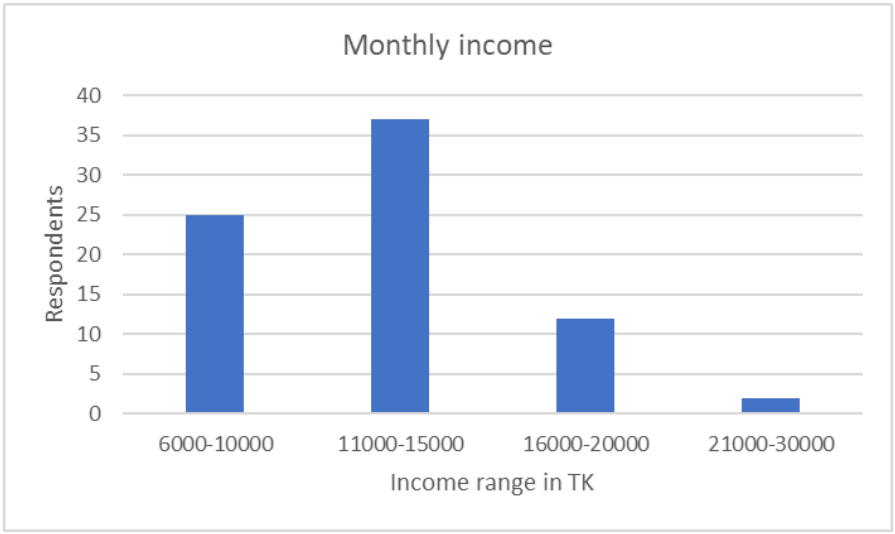

Figure 5. Monthly income ranges of the respondents.

Consumer Preferences

Fish consumption

The findings of this study demonstrate that this interest group consumed 16 species of fish, the majority of which belonged to the order Cypriniformes (46%). Orders such as Perciformes (20%), Anabantiformes (11%), Siluriformes (10%), Clupeiformes (6%), and Decapoda (7%) were recorded (Figure 6). No marine fish were reported in their fish diet; all fish orders recorded were freshwater species. According to Ayubi et al., 2017, 20 species of fishes were discovered under the order Cypriniformes (55.21%), Perciformes (22.69%), Siluriformes (13.49%), Clupeiformes (7.97%) and Osteoglossiformes (0.61%) and Rahman et al., 2020 also found Rui (*Labeo rohita*), Pangas (*Pangasius sp.*), Hilsha (*Tenualosa ilisha*) and Tilapia (*Oreochromis mossambicus*) were the most frequently consumed fish species in their diet which is quite resemble to the findings of present study[16,17].

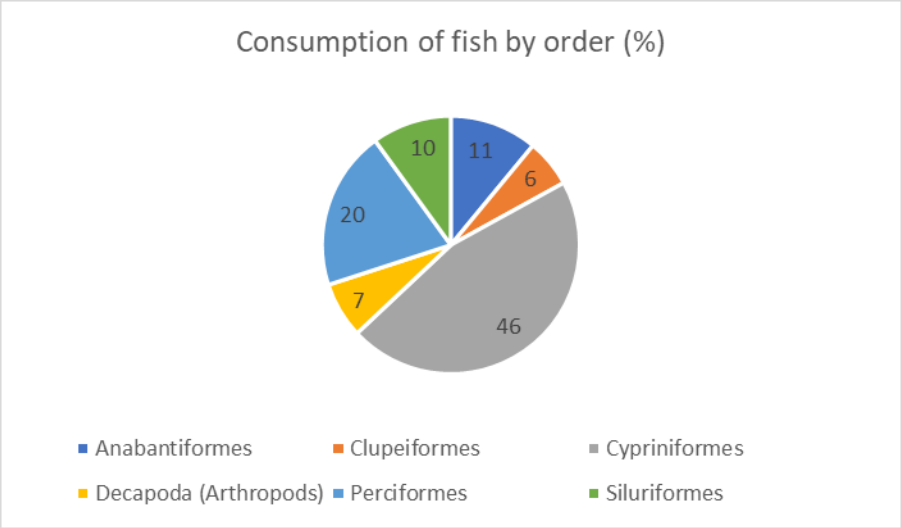

Figure 6. Consumption of fish from major groups by low-income people

Knowledge on health benefits of fish

This study revealed that 68 of the respondents (89.47%) were aware of the nutritional importance of fish and their byproducts, while the remaining 8 respondents (10.53%) were totally unaware (Figure 7). In contrast to Madhabi & Kusuma's (2014) finding of an alarming knowledge condition in the households of two areas of Andhra Pradesh about the nutritional importance and byproducts of fish[18]. The study found that the majority of the respondents were aware of the nutritional importance of fish and their byproducts. This fact can be used to conclude that while most of the people in the study area have good primary knowledge about the importance of fish consumption, not all of them are financially capable of purchasing their required amount of fish on a regular basis. Previous studies also found that most of the people from different regions of Bangladesh are aware of the nutritional value of fish, and this phenomenon was quite common in all studies including the present study. This may be the result of different awareness programs organized by government, NGOs and media professionals.

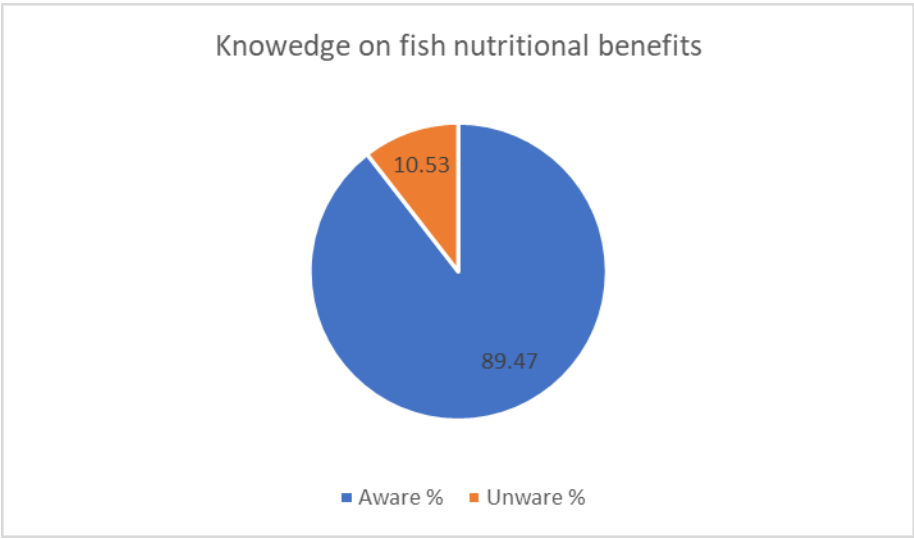

Figure 7. Knowledge on health benefits by consumption of fishes

Frequency of fish consumption

Rui, *Labeo rohita*, locally called "Nola" was highly prioritized, and it was about 23.37%. Other fish includes *Anabas testudineus* (7.79%), *Channa punctatus* (2.59%), *Cyprinus sp*. (3.89%), *Gibelion catla* (2.59%), *Heteropneustes fossilis* (2.59%), *Labeo bata* (5.19%), *Mastacembelus sp.* (3.89%), *Mystus sp.* (2.59%), *Ompok* sp. (2.59%), *Oreochromis* sp. (14.28%), *Pangasius* sp. (6.49%), *Macrobrachium* sp. (6.49%), *Tenualosa sp.* (5.19%) and *Ambypharyngodon mola* (2.59%) (Figure 8). Price of fishes have influence in fish consumption by low-income people. People with low-incomes do not expend much money. A

correlation was conducted between the 16 consumed species and their average market prices. This correlation states a slight negative relationship between the fish market price and the consumption rate. The pearson correlation result is -0.304. According to Rahman and Islam (2020) also found the same as present study, where the most of the respondent prefer to consume fish Rui *(Labeo rohita)*. After Rui *(Labeo rohita)*, Magur, Pangas *(Pangasius sp.)*, Hilsha (*Tenualosa ilisha*) and Telapia *(Oreochromis mossambicus)* was stated to be the most consumed and preferred fish species, respectively, in Rangpur, Bangladesh[17]. In the present study, though respondents were able to buy only fish with low prices considering their monthly income, their most desired fish was Hilsha, which comprises the fish with high prices (Table 1).

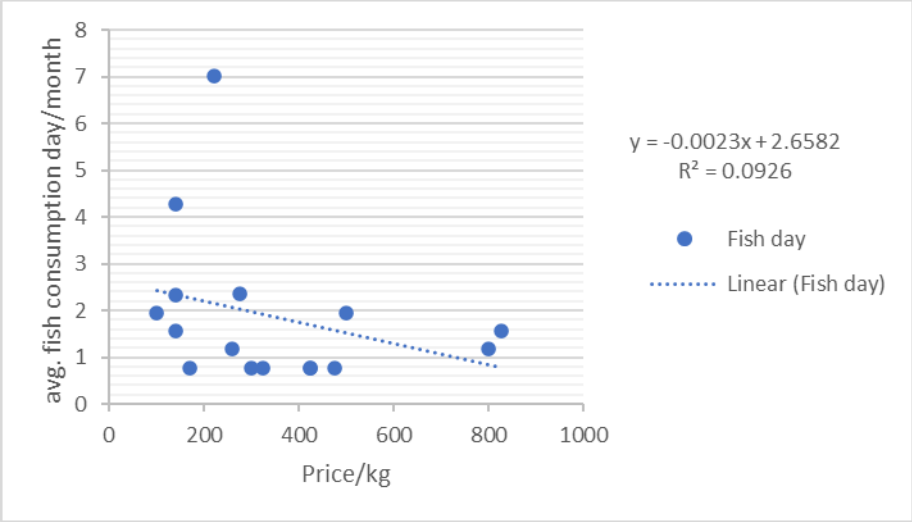

Figure 8. Correlation between the average fish price and consumption day per month

Table 1. Price ranges of major 16 fish species consumed by the low-income people of Dhaka south.

Species Name	Price range/kg
Anabas testudineus	120-160
Amblypharyngodon mola	200-400
Cyprinus sp.	240-280
Gibelion catla	300-350
Heteropneustes fossilis	400-450
Labeo bata	120-160
Labeo rohita	180-260
Mastacembelus sp.	750-850
Mystus sp.	350-500
Ompok sp.	450-500
Oreochromis sp.	100-180
Pangasius sp.	80-120
Puntius sp.	200-350
Macrobrachium sp.	450-550
Tenualosa sp.	650-1000

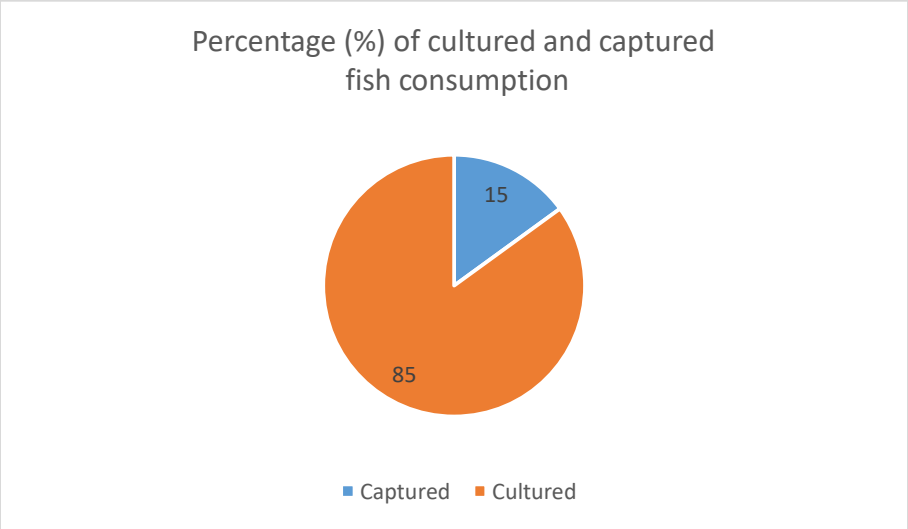

Figure 9. Percentage of consumption preferences between captured and cultured fishes

A large number of low-income people depended on cultured fish for their diet. According to their consumption of 16 different fish species, approximately 85% were cultured fish and the remaining 15% were captured fish (Figure 9). Considering the market prices (fish/kg), culture and exotic fishes were more affordable to low income people compare to captured fishes.

Fish consumption rate

The consumption of fish by low-income varies significantly ranging from 4 to 17 days. The average fish day per month is 11, and the standard deviation is calculated at 3.79 for the sample size (Figure 10). Fish day is set at 10 ($H_a > 10$), to identify the statistical significance of at least 10 days of fish consumption by low-income people per month in the DSCC area. The t-critical value of a one-sample t-test is 1.66, and the t-stat value is 1.96 (> t-critical value). The P-value was found to be 0.02 (<0.05) indicating that low-income people in DSCC area have more fish days than predicted by the hypothesis. When fish day is set to 15, P-value is 11.08 (>0.05), indicating that the fish day is less than 15 days.

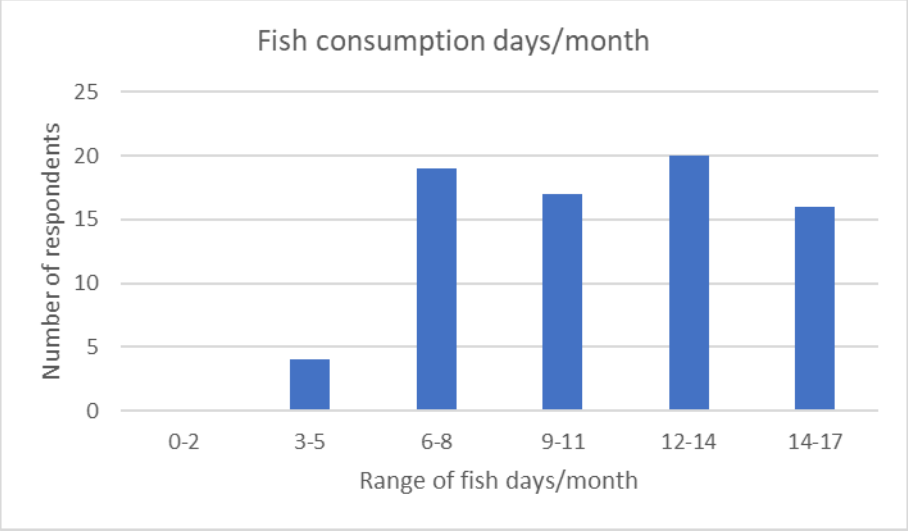

Figure 10. Fish consumption days per month of respondents

Protein composition of some selective fishes

Secondary data was accumulated to know the amount of protein (g/100g raw edible part) in selective 16 species of fishes which were highly preferred by targeted group of respondents in this study (Table 2). It was observed that protein content was varied from 14.84 to 24.72 g/100g raw edible part in the fishes consumed by low-income people of Dhaka south city corporation area [19,20]. Hilsha was reported to have the highest amount of protein and mola has the least protein content reported among the 16 consumed species (Table 2). A study was conducted on 55 fish, shrimp and prawn species from inland capture, aquaculture and marine capture fisheries where protein content was varied from 11.9 to 20.6 g/100g raw edible part. The potential contribution of each species to recommended nutrient intakes (RNIs) for pregnant and lactating women (PLW) and infants was calculated. Seven species for PLW and six species for infants, all from inland capture, and all typically consumed whole with head and bones, could potentially contribute ≥25% of RNIs for three or more of these nutrients, simultaneously, from a standard portion [25]. It was also observed that the protein content also not significantly varied between culture and capture species. Therefore, considering the life standard pattern of low income people, they are vigorously depending on culture species now a day and this phenomenon is very common not only in Dhaka city but also all over Bangladesh [16, 17].

Table 2. Number of fish species consumed in study area, their order and protein amount from secondary sources.

Common name	Scientific name	Order	Protein (g/100g raw edible part)
Thai Koi	*Anabas testudineus*	Anabantiformes	15.2-16.3 (Ara and Nabi, 2018)[19]
Taki	*Channa punctatus*		15.23±1.89 (Zaman et al., 2014)[20]
Hilsha	*Tenualosa sp.*	Clupeiformes	16.4 -24.7 (Alam, 2012; Bogard et al., 2015)[21.25]
Carp	*Cyrinus sp.*	Cypriniformes	15.1-17.1 (Ljubojević et al., 2017)[22]
Catla	*Gibelion catla*		16.9 (Shakir et al., 2013)[23]
Bata	*Labeo bata*		18.51±0.31 (Sarower et al., 2014)[24]
Rui	*Labeo rohita*		16.82±0.20 (Zaman et al., 2014)[20]
Mola	*Amblypharyngodon mola*		14.84±0.13 (Zaman et al., 2014)[20]
Puti	*Puntius sp.*		17.5±0.05 (Zaman et al., 2014)[20]
Baim	*Mastacembelus sp.*	Perciformes	17.9 (Bogard et al., 2015)[25]
African Tilapia	*Orechromis sp.*		15.4±0.97 (Zaman et al., 2014)[20]
Shing	*Heteropneustes fossilis*	Siluriformes	19.1 (Bogard et al., 2015)[25]
Tengra	*Mystus sp.*		15.1 (Bogard et al., 2015)[25]
Pabda	*Ompok sp.*		16.3 (Hossain et al., 1999)[26]
Thai Pangus	*Pangasianodon hypopthalmus*		15.02±2.76 (Zaman et al., 2014)[20]
Chingri	*Macrobrachium sp.*	Decapoda	15.7 (Bogard et al., 2015)[25]

Conclusion

The prices of basic food items had gone beyond the reach of ordinary citizens because of high inflation. With their low wages, many working-class people, particularly those with low-income, could not even afford a 'compromised diet', let alone a protein-rich diet like fish. This article presents the fish consumption status of a poorer section of the community in Dhaka, Bangladesh, and it was observed that fish consumption days were significantly correlated with monthly income and the prices of fish in the local market. It is clear that there is a huge gap in fish consumption between the national average and different levels of society. Many studies found that poverty and malnutrition are common phenomenon in Bangladesh, and huge discrepancies exist across economic groups and gender. Certain groups of poor people are vulnerable to certain diseases due to a lack of fish protein. Therefore, open water fisheries require some measures to protect the rich biodiversity as well as the rights of the poor to access those water bodies so that they can eat fish regularly. On the other hand, culture systems also need to flourish more with new adaptive technology to maintain consistency in fish production. These steps will ensure the availability of fish to the poor and vulnerable for household consumption. The country's policymakers, national and international NGOs should take the necessary actions to make the fish available for consumption by those people who are economically vulnerable in city area. In addition, we need to ensure females and girl children having the equal rights to the males in poor income society.

References

1. Burger, J. Stephens, W. L. Boring, C. S. Kuklinski, M., Gibbons, J. W. & Gochfeld, M. (1999). Factors in Exposure Assessment: Ethnic and Socioeconomic Differences in Fishing and Consumption of Fish Caught along the Savannah River. Risk Analysis, 19(3): 427–438. https://doi.org/10.1111/j.1539-6924.1999.tb00418.x

2. Kızılaslan, H. and Nalıncı, S. (2013). The fish meat consumption habits of households and the factors affecting their fish meat consumption in the province of Amasya. Gaziosmanpaşa Bilimsel Araştırma Dergisi, 5: 61-75.

3. Turan, H. Kaya, Y. and Sönmez, G. (2006). Position in human health and food value of fish meat. Journal of Fisheries and Aquatic Sciences, 23: 505-508.

4. Coates P.M. Betz J.M. Blackman M.R., et al. (2010). Encyclopedia of Dietary Supplements. London and New York: Informa Healthcare; 2: 577-86.

5. Barberger-Gateau, P. Letenneur, L. Deschamps, V. Pérès, K., Dartigues, J. F. and Renaud, S. (2002). Fish, meat, and risk of dementia: cohort study. BMJ. 325: 932-933.

6. McNaughton, S. A. Ball, K. Mishra, G. D. & Crawford, D. A. (2008). Dietary Patterns of Adolescents and Risk of Obesity and Hypertension. The Journal of Nutrition, 138(2), 364–370. https://doi.org/10.1093/jn/138.2.364

7. Verbeke, W. & Vackier, I. (2005). Individual determinants of fish consumption: application of the theory of planned behaviour. Appetite, 44(1), 67–82. https://doi.org/10.1016/j.appet.2004.08.006

8. DoF. (2018). Yearbook of Fisheries Statistics of Bangladesh,2017-18. Fisheries Resources Survey System (FRSS), Department of Fisheries. Bangladesh: Ministry of Fisheries, 2018. Volume 35: pp. 129.

9. Rahman, A.K.A. (2005). Freshwater fishes of Bangladesh, 2nd ed., Zoological Society of Bangladesh, Dhaka. pp. 394.

10. Belton, B. Haque, M. M. Little, D. C. & Sinh, L. X. (2011). Certifying catfish in Vietnam and Bangladesh: Who will make the grade and will it matter? Food Policy, 36(2), 289–299. https://doi.org/10.1016/j.foodpol.2010.11.027

11. BBS. (2011). Socio-Economic and Demographic Report. Bangladesh Population and Housing Census 2011, Statistics and Information Division. Bangladesh: Ministry of Planning, 4: 356.

12. DoF. National Fish Week 2017 Compendium. (2017). Department of Fisheries (DoF), Ministry of Fisheries and Livestock, Bangladesh, 160.

13. Ahmed, S. Rahman, A.A. Mustafa, M.G. Hossain, M.B. Nahar N. (2012). Nutrient composition of indigenous and exotic fishes of rainfed waterlogged paddy fields in Lakshmipur, Bangladesh. World Journal of Zoology. 7(2):135-140.

14. Ali, M.M. Hossain, M.B. Rahman, M. Rahman, S. (2014). Post Stocking Management Practices by the Pond Fish Farmers in Barisal District, Bangladesh. Global Veterinaria. 13(2):196-201.

15. Azim, M.A. Islam, M.R. Hossain, M.B. Minar, M.H. (2012). Seasonal variations in the proximate composition of Gangetic Sillago, Sillaginopsis panijus(Perciformes: Sillaginidae). Middle-East Journal of Scientific Res. 11(5):559-562.

16. Ayubi, M. M. & Ara, I. (2017). Fish consumption and socio-economic status of the rural people: a case study on Islamnagar village, Savar, Dhaka. Jahangirnagar University Journal of Biological Sciences, 6(2): 39-46.

17. Rahman, M. N. & Islam, A. R. M. T. (2020). Consumer fish consumption preferences and contributing factors: empirical evidence from Rangpur city corporation, Bangladesh. Heliyon, 6(12), e05864. https://doi.org/10.1016/j.heliyon.2020.e05864

18. Madhavi, D. and Kusuma, D.L. 2014. Status of Fish Consumption among Selected Regions of Andhra Pradesh.International Journal of Science and Research. 3(5): 443-446.

19. Ara, I. & Nabi, M. R. (2018). Proximate analysis of local and Thai climbing perch, Anabas testudineus. International Journal of Fauna and Biological Studies, 5(4): 93-97.

20. Zaman, M. Naser, M. N. Abdullah, A. T. M. & Khan, N. (2014). Nutrient contents of some popular freshwater and marine fish species of Bangladesh. *Bangladesh Journal of Zoology*, *42*(2): 251-259.

21. Alam, A. K. M. N. Mohanty, B. P. Hoq, M. E. & Thilshed, S. (2012). Nutritional values, consumption and utilization of Hilsa *Tenualosa ilisha* (Hamilton 1822). In Proceedings of the Regional Workshop on Hilsa: potential for aquaculture, 16-17.

22. Ljubojević, D. Đorđević, V. & Ćirković, M. (2017). Evaluation of nutritive quality of common carp, *Cyprinus carpio* L. In IOP Conference Series: Earth and Environmental Science, 85: 012013

23. Shakir, H. A. Qazi, J. I. Chaudhry, A. S. Hussain, A. & Ali, A. (2013). Nutritional comparison of three fish species co-cultured in an earthen pond. Biologia (Pakistan), 59(2): 353-356.

24. Sarower-E-Mahfuj, M. Hossain, M. B. & Minar, M. H. (2012). Biochemical composition of an endangered fish, Labeo bata (Hamilton, 1822) from Bangladesh Waters. American Journal of Food Technology, 7: 633-641.

25. Bogard, J. R. Thilsted, S. H. Marks, G. C. Wahab, M. A. Hossain, M. A. Jakobsen, J. & Stangoulis, J. (2015). Nutrient composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes. Journal of Food Composition and Analysis, 42:120-133.

26. Hossain, M. A. Afsana, K. & Azad Shah, A. K. M. (1999). Nutritional value of some small indigenous fish species (SIS) of Bangladesh. Bangladesh Journal of Fisheries Research, 3(1): 77-85.