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RESEARCH ARTICLE

Factors affecting fish consumption of traditional subsistence fishers in Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Subsistence inland fisheries are underreported in developing countries like Pakistan. This study attempted to find out fish consumption determinants of traditional subsistence fishers in Charsadda district of Khyber Pakhtunkhwa (KP) Province of Pakistan. Data were collected between March and December 2019 through 36 predetermined questions applied to 286 randomly selected households. The data were analyzed through multiple linear regression model. Study found that average fish consumption of the sample households was 3.3 kg per capita per annum, which is higher than Pakistan's national average of 1.9 kg per capita per annum. The most viable reasons of fish consumption among the sample households were that most of them were; subsistence fishers, lived closed to water bodies and had easy access to fishing grounds. Majority of them consumed fish once a month in summer season but consumption increased in winter season. The regression results indicated that fish price, proximity to rivers, and family size have negative, whereas number of fishing equipment's, education and family income have positive effect on fish consumption. Actions are needed to improve fish production in local rivers through hatcheries development and aquaculture encouragement, so that fish meat become affordable to other areas located far away from water bodies.

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Introduction

Inland subsistence fisheries are vital as food and nutritional security in developing countries. It supports the prosperity of millions of poor families worldwide (Kawarazuka, 2010; Moreau and Garaway, 2018; Mohanty et al., 2019). Subsistence inland fisheries provides high quality cheap and accessible animal protein and nutrients (Bennett et al., 2018) for checking hunger and supporting rural development in food insecure communities (Corvalan et al., 2005; Kwasek et al., 2020). However, besides being vital to human nourishment, the per head fish intake in Pakistan is 1.9 kg (Baldwin and Hamstead, 2014) in contrast to the global average of 20.1 kg per capita (Belton et al., 2018). This low per capita fish intake in Pakistan becomes more critical when other means of protein are also inadequate. However, there is remarkable difference in per capita fish intake within Pakistan (Wasim, 2007). In 1975-1976, per capita per annum fish consumption was 0.04, 0.12, 4.25 and 6.80 kg in KP, Punjab, Sindh and Baluchistan provinces of Pakistan, respectively. It increased to 1.00 and 0.71 kg per capita in 2002-2003 in Punjab and KP. However, per head fish intake in the rest of the two provinces i.e. Sindh and Baluchistan further declined to 2.98 and 5.28 kg in 2002-2003, respectively (Wasim, 2007). Besides these variations in data regarding fish consumption, catch from inland fisheries is believed to be greatly underreported especially in the case of Pakistan. Pakistan produced an estimated 185,000 metric tonnes during 2018-2019 and 180,000 metric tonnes during 2017-2018 (Ministry of Finance, 2019). However, production and consumption of the traditional subsistence fishery workers is underreported and is not accounted towards Gross Domestic Product in Pakistan. On the other hand, the surge in global fish production during the last fifty years has improved people's capability to consume healthy and diverse foods (FAO, 2019). Advancement in technology, information and communication has also changed people's perception from traditional yields to essential and nutritious fish meat. But the remarkable differences in fish consumption in different regions making the job of protein provision to low income people in developing countries more challenging.

Numerous research investigations has been undertaken regarding the role of fish in the provision of high quality protein and nutritional security, to low income people particularly in less developed countries. Majority of research studies on fish consumption have based their investigation on the nutritional importance of fish meat (Belton et al., 2018; Bennett et al., 2018; Moreau and Garaway, 2018; Akuffo and Quagrainie, 2019; Mohanty et al., 2019; Kwasek et al., 2020). Some studies have investigated the impact of socioeconomic and demographical factors on people's fish intake (Oliveira et al., 2010; Perez-Cueto et al., 2011; Onurlubas, 2013; Can et al., 2015; Zhou et al., 2015; Kızıloğlu and Kızılaslan, 2016; Wenaty et al., 2018). There is tremendous research gap with respect to fish consumption pattern and preferences of subsistence fishers, especially in the case of Pakistan. Therefore, the basic objective of this investigation is to acquire information on the level of fish intake in this region and study the impact of socioeconomic and demographic features on fish consumption practices of households residing near the vicinity of rivers in district Charsadda, Pakistan. It is presumed that the results of this study will help decision makers regarding planning of nutrition policies for the poor segment of the society.

Material and Methods

Study Area

Charsadda District lies between 34° 3' to 34°28' North and 71° 28' to 71°53' East (Figure 1) with a total area of 996 km^2. It has extreme weather, and summer season continues from May to September. The monsoon period persists from July to September. The district has very old and comprehensive irrigation system and about 80 percent of the area is irrigated through canals. Farmers of Charsadda mostly grow wheat, barley, sugarcane, rice, maize and vegetables. A very distinctive feature of this area is the three major rivers flowing through this land, which has made its terrain very fertile. Agriculture accounts for the major source of employment for the people. Many people combine farming and fishery due to the seasonal character of fishing occupation. People residing near the vicinity of rivers carry out fishing throughout the year in this area. However, there are two key spells with abundant catch. The fish breeding season locally known as "*mainchal*" starts in February and continues till late April, attract large numbers of local people and fishermen (Qasim et al., 2019). The second spell starts in July and continues till October. The common fishing practices include use of hooks, spears, cast and drag nets, spears, and rods.

Data Collection

Primary data were gathered through household survey. In the beginning, a preliminary survey was carried out to investigate fishery related activities. The exploratory survey assisted us in the pre-testing of the questionnaire. After this initial survey, study sites were carefully selected. For the collection of needed information a questionnaire was developed. Considering the exploratory survey and local realities the questionnaire was modified. Prepared interview schedule with the households and female interviewers were

recruited. Field observation were also undertaken in order to examine diverse fishery related events, including the use of variety of fishing devices, areas fished, meetings with fishery monitors and kinds and quantity of fish caught. Data so collected were analyzed through regression analysis and descriptive statistics. The data were analyzed using SPSS v20.0 and findings and conclusions were reached.

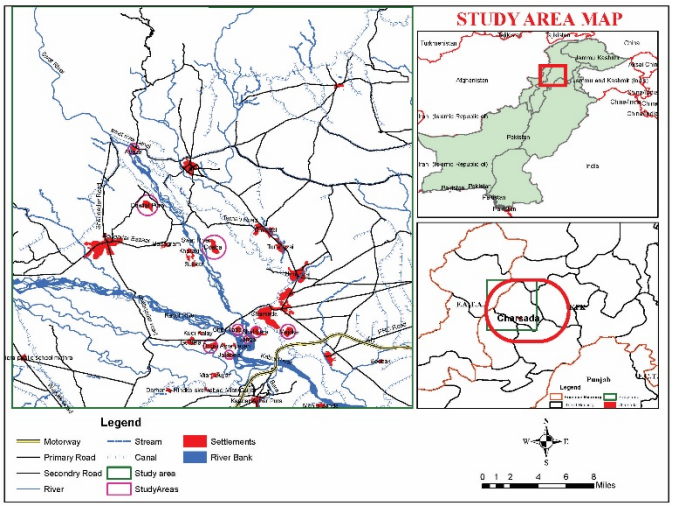

Figure 1. Study area

Sampling Techniques

Primary data were gathered between March and December 2019 through household survey questionnaire and observations. Data were collected from both male and female households. Female interviewers were recruited to collect data from female respondents while respecting cultural considerations. To select a representative sample of respondents two stage cluster sampling was used. Firstly, fishing communities with distinct fishing features, like nearness to water bodies, intensive fishing and presence of large number of fishermen labor were purposively selected. Secondly, sample households were selected from those fishing communities. Targeted villages near the vicinity of River *Swat*, *Kabul* and *Jindi* were selected. The population of Charsadda was 1,616,198 (GoP, 2017) as stated by the Population Census Organization of Pakistan. We used formula in the Eq. (1) suggested by Yamane (1967) for sample size calculation, where n is the sample size, N is population size and level of precision (e) is 6 percent, which presented a sample of 277. However, owing to calculation convenience 286 was taken as a sample size.

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Data Processing and Analysis

Fish consumption pattern and preferences are affected by socioeconomic, natural, physical and environmental condition of respondents. Many factors including family income, age, household size, access to market, price, health, gender, literacy, marital status, existence of children in a family, employment, consumption season, urbanization etc. have an impact on people's fish intake. However, data were collected from respondents residing proximate to rivers, having higher access to fishery resources than other people. Therefore, we assume that fish intake of current respondents may be higher than the per head fish consumption in Pakistan.

Considering respondents socioeconomic and attitudinal determinants, seven explanatory variables were carefully chosen for the multiple linear regression model;

$$FC = \alpha + \beta_1 Hi_1 + \beta_2 W_{b2} + \beta_3 Fp_3 + \beta_4 S_{h4} + \beta_5 Ag_5 + \beta_6 Ed_6 + \beta_7 Fg_7 + \varepsilon \quad (2)$$

Whereas FC is the outcome variable i.e. quantity of fish intake per year per household (kg), α stands for the intercept, and β's are the coefficients of the predictor variables. Hi_1 is the explanatory variable for income (in PKR.), W_{b2} for proximity to water sources (Km), Fp_3 for fish price per kg (PKR.), S_{h4} for family size (number), Ag_5 for respondent's age (years), Ed_6 for education and Fg_7 for number of fishing gears.

Results

Understanding socioeconomic features of the selected subsistence fishing households is necessary as it affect their fish consumption preferences. The overall socioeconomic features of the sample respondents are presented in Table 2.

The quantity of fish consumed show total quantity consumed per family per year. Therefore, to find out the average per capita fish consumption, we divide the total amount of fish consumed by average number of persons per family. This gave the value of 3.3 kg per head per annum, which is greater than 1.9 kg per capita, the national average for Pakistan.

Majority of respondents in the study area practice fishing as a subsistence activity, which plays an important role in their protein intake. About 34 percent (Figure 2) of respondents responded that they consume fish because they reside near the vicinity of rivers and fish for self-consumption. The reason for this high response is that most of them occasionally fish and using small and inefficient gears. Therefore, they catch such a small quantity which they cannot sell in the market. More than 20 percent replied that they consume fish as it is easily available. Lower price was not much important as only about 6 percent responded that they eat fish due to lower price. About 15 percent replied that they eat fish due to its availability in fresh form, whereas 13 consume fish due to being nutritious. Results revealed that 38.8 percent of the respondents eat fish once a month, 32 percent of them eat fish 2 to 3 times a month, 20.6%

Table 1. Justification of variables for fish consumption

Variables	Unit used	Effects on fish consumption	Sources
Household income	Amount in different currencies in different range	Family income affects fish consumption positively (+)	Ahmed et al. (1993) Burger et al. (1999) Barberger-Gateau et al. (2005) Onurlubas (2013) Can et al. (2015) Nguyen and Kinnucan (2018) Akuffo and Quagrainie (2019)
Proximity to water bodies	Scoring method	The lesser the distance the more the fish catch and consumption (-)	Tol (2006) Oliveira et al. (2010) Qasim et al. (2019)
Price	Price of fish per kg	A decrease in price, increase in fish intake (-)	Lebiedzińska et al. (2006) Herath and Radampola (2016)
Age	20-21 22-23 24-25 >25	Age affects fish consumption positively (+)	Watanabe et al. (2004) Kull et al. (2006) Perez-Cueto et al. (2011) Onurlubas (2013) Can et al. (2015)
Education	Different Levels or Uneducated Educated	Education and awareness increase fish consumption (+)	Myrland et al. (2000) Barberger-Gateau et al. (2005) Verbeke and Vackier (2005) Shimshack et al. (2007) Onurlubas (2013) Can et al. (2015)
Family size	Range of family members	Higher the family size higher the level of consumption (+)	Trondsen et al. (2003) Verbeke and Vackier (2005) Onurlubas (2013)
Fishing gears / technology	Number of fishing gears	Number of gears is positively associated with fish consumption (+)	Odada et al. (2004) Lampe et al. (2017)

Note: Source: Literature Survey, 2019

Table 2. Socioeconomic characteristics of respondents

S. No.	Respondents characteristics	Respondents (n=286)		
		Mean St. Deviation	t-test	p-value
1	Average total household income (Rs.)	26,3391±16,934	-5.44	0.000
2	Average family size (number)	9.42±4.43	-5.97	0.000
3	Average number of species caught	3.25±1.88	29.91	0.000
4	Average age of the respondent (years)	40.96±8.60		
5	Fishing experience (years)	19.47±7.06		
6	Average years of formal education	7.74±6.17		
7	No. of fishing gears	3.92±1.76		
8	Amount of fish consumed (Kg)	30.84±27.71		
9	Land holding size	4.6±1.8		

Note: 95% confidence level, Income is measured in PKR, average exchange for the period of January 2020 was approximately $1=PKR.150

four times a month and 8.03 percent more than four times a month. The Indus garua, locally known as Shermai (*Clupisoma naziri, Cluoisoma garua*), a famous indigenous fish of River Kabul is considered as the most delicious fish, however its production is insufficient to fulfill the rising demand. So, majority of people in KP choose to consume common carp (*Cyprinus carpio)*. Secondly, most plentiful and easily captured fish in the rivers of Charsadda is an inexpensive fish locally called "Marmahe", with the common name zig-zag eel (*Mastacembelus armatus*)**.** Due to the taste, and availability in local rivers, 17.80 percent of the selected households want to consume this fish (Figure 2).

Our results showed that six variables were correlated with the outcome variables (Table 3). Thus, the final regression was run with only six variables. Results also indicated that these six variables have high degree correlation with the outcome variable. Of the total six explanatory variables, three were negatively and three positively correlated with the outcome variable. The correlation between fish price, proximity to water sources and the dependent variable was highly negative. Whereas, the correlation between numbers of fishing gears, education and the dependent variable were positive. Family income was moderately correlated with fish consumption. Low correlation was found between family size and quantity of fish intake. A very low correlation was found between age of the respondent and the dependent variable, by reason of which this variable was not entered in the final regression.

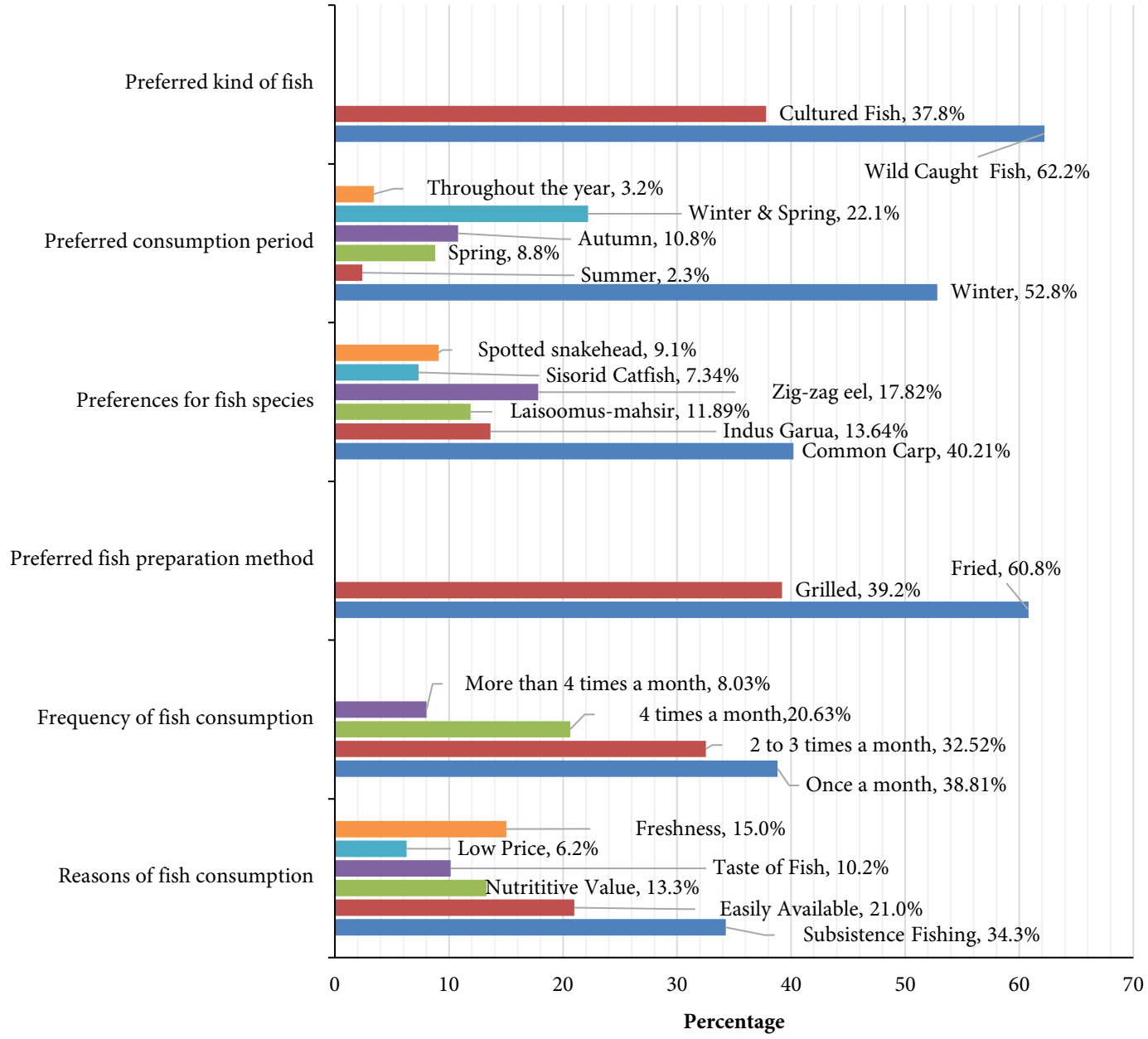

Figure 2. Reasons, frequency and preferences of fish consumption (Source: Field survey, 2019)

The Pearson correlation helped in the selection of variables for the final regression. Before running the regression, we checked the data for the assumptions of multiple linear regression i.e. the existence of linear relationship between dependent and explanatory variables using scatterplots. We checked correlation between independent variables using Variance Inflation Factor. The constant variance of residuals has been checked using scatterplot, the existence of autocorrelation has been checked using Durbin Watson test, and the normality of data has been checked using histograms with superimposed normal curve. Results revealed that all of the predictor variables have significant impact on the dependent variable. Table 4 indicated that about 66 percent of the variation in outcome variable was explained by predictor variables and is evident of R^2 values. Similarly, all the predictor variables have high degree of explanatory power on the dependent variable, evident from the adjusted R square value of more than 60 percent. Precision of the model predictions can similarly be seen from the lower standard errors of the regression. The F-ratio of the predictor variables indicates a better fit to the data model.

The regression output disclosed that of the total six explanatory variables three variables including, fish price, proximity to water sources, and family size have negative impact on the outcome variable. However, number of fishing gears, education and family income have positive impact on fish intake. The magnitude of "t" values also showed greater evidence of a significant difference. Overall, the predictor variables are helpful in explaining the variation in fish consumption, which is evident of the low standard errors.

Table 3. Correlation and other features of independent variables

Variable and description	Variable type	Mean	Pearson correlation value (r)
Fish price (in Kg)	Continuous	218.62±48.30	- 0.712**
Proximity to water bodies (Km)	-do-	3.02±3.20	-0.426**
Number of fishing gears	-do-	3.91±1.77	0.415**
Education (Years)	-do-	7.73±6.16	0.406**
Family size	-do-	9.41±4.42	- 0.277*
Family income (Rs.)	-do-	26,3390±16933	0.353*
Age (Years)	-do-	40.95±8.61	-0.023

Note: *, **, Correlation is significant by 99% & 95% confidence levels, respectively. Fish price was taken at the retail level rather than wholesale.

Table 4. Summary and ANOVA of the regression model

Summary of the Model

R	R^2	Adjusted R^2	Standard error of the estimate	Durbin Watson
0.814[a]	0.663	0.66	33.59	1.255

ANOVA of the Regression

Model	Sum of squares	Degree of freedom	Mean square	F ratio	Significance
Regression	620761	7	88680	78.550	0.000[a]
Residual	313850	278	1129		
Total	934612	285			

Note: a. Predictors: (Constant), Family Income, Proximity to water bodies (km), Number of family members, Education, Price of fish (kg), and Number of fishing gears: b. Dependent Variable, Quantity of fish intake

Table 5. Coefficients of the model explanatory variables

Coefficients	Unstandardized coefficients		Standardized coefficients	t	Significance
	B	Standard error			
(Constant)	183.44	14.39		12.74	0.000
Fish price (Kg)	-0.609	0.047	-0.514	-12.86	0.000
Proximity to water sources (Km)	-3.69	0.66	-0.205	-5.56	0.000
Fishing gears (Number)	2.542	1.39	0.109	2.55	0.011
Education (Years)	1.98	0.34	0.213	5.81	0.000
Family income (PKR)	2.990	0.00	0.095	2.46	0.015
Family size (Number)	-1.72	0.42	-0.133	-3.73	0.000

Discussion

Fisheries and aquaculture production has increased substantially over the last fifty years (FAO, 2016), which has boosted consumer's capability to eat healthy and diversified food worldwide. Though, per head fish intake is not the same worldwide. The results of this study revealed that average annual fish intake in district Charsadda was 3.3 kg per capita, which was higher than 1.9 kg per capita per annum i.e. the national average of Pakistan (Baldwin and Hamstead, 2014). However, this is much lower than the global average of 20.1 kg per capita per annum (Belton et al., 2018). This higher average annual fish consumption shows the importance of the nutritious fish meat in overall protein consumption and food security of traditional subsistence fishers in this region. This could be because of two major reasons; firstly, they live near the vicinity of water bodies and secondly, majority of them can fish which is also because of the first reason.

The study revealed that about 34 percent (Table 4) of respondents consume fish because they reside near the vicinity of rivers and fish for self-consumption. Similar results were recorded in a study conducted by Oliveira et al. (2010) to identify fish consumption of traditional subsistence villagers in Rio Madeira. Moreau and Garaway (2018) also reported that location and season affect fish consumption pattern, especially of poor consumers. This was also evident from the regression results (Table 5), showing a negative relation between proximity to water bodies and fish intake. However, most of them occasionally fish and use small and inefficient gears, due to which their catch was low. This low catch could also be the result of destructive fishing practices (Qasim et al., 2019). Another factor that has contributed to fish consumption was easy access and availability. About twenty one percent (Figure 2) replied that they consume fish as it was easily available. This ease of access to fisheries did not mean that it was easily available in the market but it mean that rivers are open access and they reside near water bodies, which enable them to fish whenever they need. This was also supported by the results indicating lower price as not an important factor in determining fish consumption because majority of them did not purchase fish in the market but consume the wild caught.

A study conducted by Lebiedzińska et al. (2006) reported that the most significant factors of consuming fish were taste and freshness. Herath and Radampola (2016) also find out positive relationship between nutritional value of fish and its consumption. Akuffo and Quagrainie (2019) revealed that fishing have positive effect on households' nutritional quality. However, results of the current study revealed that freshness and nutritional value of fish meat were not much important among subsistence fishers, as only 15 percent like to eat fish due to its freshness and 13 percent due to its nutritional value. This could be due to the low level of education and poverty of these subsistence fishers.

The study also discovered that family income have positive impact on fish intake. In a study carried out by Moreau and Garaway (2018), it was found that rich households consume larger quantities of fish than poor households. In another study, Verbeke and Vackier (2005) stated that poor income group have low fish consumption frequency. However, opposing results were found by Onurlubas (2013), showing a negative relationship between fish consumption and family income.

A study conducted by Herath and Radampola (2016), and Lebiedzińska et al. (2006) revealed that when fish price rise, consumers prefer not to eat fish. Results of the current study also show a negative relation between fish price and consumption, however being subsistence fishers' price was not much important in determining fish consumption.

Can et al. (2015) and Verbeke and Vackier (2005) investigated that higher education indicated higher level of fish

consumption, which was confirmed by the current study. Lampe et al. (2017) and Odada et al. (2004) reported positive relationship between number of fishing gears and technology on fish consumption. Results of the current study have also revealed that the number of fishing gears, and fish consumption of subsistence fishers are positively related.

Conclusion

An inland fishery is an essential source of protein, nutrition and well-being for numerous people around the world. This paper is the first attempt to study determinants of fish consumption of traditional subsistence fishers in Charsadda district of Khyber Pakhtunkhwa (KP) Province of Pakistan. However, there is tremendous research gap and much needs to be explored in the future. Fish consumption of traditional subsistence fishers is more than the national average of Pakistan but much lower than the global average and needs to be improved. However, subsistence fishers shall be educated regarding the rational use of fisheries resources.

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Compliance with Ethical Standards

Authors' Contributions

MQ designed and wrote the first draft of the manuscript, SQ performed and managed statistical analysis, NN revised the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

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