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Fish consumers preferences, quantities of fish consumed and factors affecting fish eating habits: A case of lake Victoria in Tanzania

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Abstract

This study was conducted to assess fish consumers' preferences, quantities of fish consumed and factors affecting fish eating habits in Lake Victoria. A total of 122 fish consumers were included in a questionnaire survey. Results indicated that Nile perch, Tilapia and Silver sardines were widely consumed fish species. The average fish consumption per day was estimated to be 0.37 kg. This is higher than the national, worldwide and per capita fish consumption of a Great fish Consumer. The main factors affecting fish consumption were reported to be price, convenience, accessibility, availability and healthy concerns. During human health risk assessments the actual per capita fish consumption of 0.37 kg need to be used rather than the hypothetical per capita fish consumption of 0.02 kg reported in literature so as to attain the actual risks.

Keywords: Fish consumers, species, per capita fish consumption, preferences, Lake Victoria

1. Introduction

Fish is a principal source of animal derived protein, essential nutrients as well as trace elements [1-4]. It is reported to have low fat content and being easily digestible since it lacks connective tissues [3, 4]. These reasons have therefore promoted fish as an important component of a healthy meal [1-6]. Some previous studies have highlighted the health and nutritional benefits associated with fish consumption such as increased intelligence and cognitive development in children, reduced risks of cardiovascular disorders, reduced risks of high blood pressure and reduced risks of various forms of cancers [3, 7].

In the recent years, studies have also reported a significant growth in the fisheries and aquaculture production sector [8]. This gradual increase in fish production has resulted into increase in the worldwide annual per capita fish consumption from an average of 9.9 kg in 1960 to 14.4 kg in 1990s and 19.7 kg in 2013, with the FAO approximations showing that in 2015 the average annual per capita fish consumption exceeded 20.0 kg [4, 8]. However, the increase in per capita fish consumption has not been the same across all the regions of the world [8] due to various factors. Studies also show further that; In East Asia, the annual per capita fish consumption has increased substantially from 10.8 kg in 1961 to 39.2 kg in 2013, South Asia, from 13.1 kg to 33.6 kg, North Africa, from 2.8 kg to 16.4 kg in 2013 [8, 9]. In Kenya, the annual per capita fish consumption has decreased from 6.0 kg in 2000 to 4.5 kg in 2011 [4]. In Tanzania, annual per capita fish consumption between 2012 and 2015 has ranged from 7.4 to 7.7 kg [10]. The possible reason for this contrast in the Sub- Saharan Africa is that almost 90% of fish products consumed within Sub- Saharan countries is from Inland fisheries as marine catches are mainly for export, thus playing significantly very little role in meeting the fish consumers demand in the continent [9].

Likewise, different studies have also documented that high price, convenience, cooking skills eating habits, accessibility, availability, healthy concerns, sensory attributes such as smell and taste, consumers' knowledge and socio- demographic characteristics [3, 5, 6] as the main factors affecting fish consumption. In Tanzania, fish consumption habit has received very little research attention compared to European countries [4, 6] and the great fish users such as China [4]. A literature review on fisheries and aquaculture development in Tanzania indicates a strong focus on production and assessment of contaminants like chemical and microbial hazards [11, 12, 13].

The objective of this study was therefore to assess fish consumers' preferences, quantities and types of fish consumed and factors affecting the fish consumption pattern for further consideration in human health risk assessment and in the fight against hunger and malnutrition.

2. Materials and Methods

A questionnaire based consumer survey was designed and conducted between April and July 2017 to assess the fish consumers eating habits. A multistage purposive sampling technique was used to obtain a survey population with the main sampling units being the fish markets in three old administrative regions constituting the Tanzanian side of Lake Victoria; Mwanza, Mara and Kagera. Three major fish markets (Kirumba International Fish Market in Mwanza, Bukoba market in Kagera and Musoma market in Mara) and two medium sized fish markets of Kayenze and Igombe landing sites in Mwanza were selected for this study.

Random sampling was conducted to select 122 fish consumers from these markets (78 consumers in Mwanza, 22 in both Kagera and Mara regions) to participate in the study. Before administering the questionnaires to fish consumers, they were pre-tested on 30 consumers selected from fish markets other than those identified to participate in the actual study. The accuracy and reliability of the data was enhanced by making sure that the participants were willing and available to participate in the survey. Data were analyzed using SPSS Version 16.1. Descriptive analysis was performed using means, standard deviations, percentages and frequency distribution. Inferential analysis was done using Chi-square test and all data analyzed were considered significant at $p < 0.05$. The per capita fish consumption was reported as Mean \pm Standard Error of the Mean (SEM).

3. Results and Discussion

3.1 Socio demographic characteristics of the respondents

Table 1 shows the socio demographic characteristics of fish consumers participated in the study. The demographic variables were categorized into four groups; sex (gender), age, marital status and family size. The study revealed slightly

higher proportion of male fish consumers (54.1%) than female fish consumers (45.9%). The reason for higher fish consumption among males observed in this study could be that males usually eat outside their homes usually better meals than home meals. A study in Kenya to assess urban consumers' fish preferences and determinants influencing fish selection and consumption and another one in India that assessed consumer behavior at organized fish retail outlet reported a similar trend [4, 14]. However, the difference between sexes in the current study was not significant ($\chi^2 = 1.216$; DF = 2 and P = 0.544). Earlier studies have also indicated that gender does not affect the fish consumption levels within the household [15, 16]. This study also revealed further that, in the study area fish are mostly consumed by the adults aged above 45 years (36.9%) compared to other age groups; 18 – 35 years (28.7%) and 36 – 45 years (34.4%). It appears therefore that fish consumption increases with age. The results of this study support the findings of Erdogan *et al.* (2011) and Storey and Forshee, (2007) [16, 17] who reported a strong positive relationship between fish consumption and age. This is probably because of knowledge and health reasons. It is clearly known that older people are more conscious when it comes to health compared to younger people; they therefore tend to eat less and select diets containing fish to reduce cardiac and other related diseases [16, 18, 19]. However, the differences between age groups were not significant at all ($\chi^2 = 9.369$; DF = 4 and P = 0.053). Previous studies on fish consumption habits in USA, Norway, Taiwan and Denmark have also revealed that older people prefer fish than younger people [16, 20, 21, 22, 23]. The findings also indicate that 86.9% of the respondents were married while only 13.1% were single and a significant difference was observed ($\chi^2 = 7.299$; DF = 2 and P = 0.026). With regards to family size, the findings of the study reports that majority of the respondents (78.7%) came from small to medium sized families of 1 – 6 members whereas 21.3% contained more than 6 members (a significant difference was also observed; $\chi^2 = 15.223$; DF = 4 and P = 0.004). This observation was also noted in the Kenyan study [4].

Table 1: Socio demographic characteristics of the respondents

Variable	Mwanza (n=78)		Mara (n=22)		Kagera (n=22)		Total (n=122)		χ^2	df	P value
Sex	n	%	n	%	n	%	n	%			
Male	45	57.7	11	50	10	45.5	66	54.1	1.216	2	0.544
Female	33	42.3	11	50	12	54.5	56	45.9			
Age categories											
18 – 35	28	35.9	4	18.2	3	13.6	35	28.7	9.369	4	0.053
36 – 45	28	35.9	8	36.4	6	27.3	42	34.4			
> 45	22	28.2	10	45.4	13	59.1	45	36.9			
Marital status											
Married	63	80.8	22	100	21	95.5	106	86.9	7.299	2	0.026
Single	15	19.2	0	0	1	4.5	16	13.1			
Family size											
1 – 3	12	15.4	5	22.7	6	27.3	23	18.9	15.223	4	0.004
4 – 6	41	52.6	16	72.8	16	72.7	73	59.8			
> 6	25	32.0	1	4.5	0	0.0	26	21.3			

3.2 Fish Consumption and Human Health

A considerable proportion, 74.6% of interviewed consumers indicated that they often eat fish as a healthy diet; 63.1% indicated that they sometimes feel bad for not eating fish as a healthy diet; 78.7% of interviewed consumers said that they often and/or sometimes encourage fishing and eating fish as

part of health diet; 76.2% of interviewees who participated in the survey indicated that they often encourage buying and eating fish as a healthy diet and with regards to willingness of household members to eat fish as part of healthy diet; 95.0% of respondents indicated strong willingness (Table 2).

This study revealed further that, 98.4% of the fish consumers interviewed indicated the importance of fish inclusion in daily diets in providing health to consumers. The respondents agreed that they normally eat fish because they are beneficial to their health. This positive attitude towards fish consumption may be contributed by community nutrition or consumer awareness campaigns/ education to alleviate malnutrition by various organizations around the lake zone, for example Smart fish project, Clean Fish Better Life and Educative Cinema Show; the campaigns which have been educating fish consumers in Lake Victoria on nutritional and health benefits of fish eating, hygiene, fish quality, safe consumption of fish and how to cook properly fish and fish products. The findings are consistently similar to a previous study in Turkey that showed 84.47% of consumers ate fish and other seafood because of their beneficial effects to human health [16]. Similarly, a study carried out by Verbeke *et al.* (2007) [24] showed that the general attitude toward eating fish was strongly positive and consumers were most strongly

convinced that fish consumption is healthy and nutritious. In another study undertaken in USA, 35% of fish consumers indicated that they had increased fish consumption during the past few years and their main reasons being primarily related to health [16, 25]. In the study area it is believed that fish is important for health and it is one of the most important factors influencing fish consumption. The observed consumer perception is similar to other earlier observation reported by Trondsen *et al.* (2004) [26]. The perception of most consumers in the current study is that fish consumption is healthier than beef and pork consumption and the increased health awareness towards consumption of red meat has led many consumers to turn to fish consumption. This is in agreement with some previous findings carried out in Spain and Norway [26, 27]. It is well known that fish contains high amounts of omega 3 and omega 6 fatty acids, low amounts of cholesterol and digestibility. They are also principle sources of proteins of animal origin and other essential nutrients [16, 28].

Table 2: Fish consumption and human health

	Mwanza (n=78)		Mara (n=22)		Kagera (n=22)		Total (n=122)		χ^2	df	P value
Attempt to eat fish as a healthy diet											
	n	%	n	%	n	%	n	%			
Often	47	60.3	22	100	22	100	91	74.7	23.444	6	0.001
Sometimes	27	34.6	0	0.0	0	0.0	27	22.1			
Seldom	2	2.6	0	0.0	0	0.0	2	1.6			
Never	2	2.6	0	0.0	0	0.0	2	1.6			
Feel bad for not eating fish as a healthy diet											
Often	15	19.2	0	0.0	1	4.5	16	13.3			
Sometimes	35	44.9	22	100	20	90.9	77	63.6	30.986	6	0.000
Seldom	12	15.4	0	0.0	1	4.5	13	10.7			
Never	15	19.2	0	0.0	0	0.0	15	12.4			
Encourage fishing and eating fish											
Often	30	38.5	0	0	2	9.1	32	26.2	30.972	6	0.000
Sometimes	30	38.5	21	95.5	13	59.1	64	52.5			
Seldom	7	9.0	0	0.0	5	22.7	12	9.8			
Never	11	14.1	1	4.5	2	9.1	14	11.5			
Encourage buying and eating fish											
Often	49	62.8	22	100	22	100	93	76.9	20.817	6	0.002
Sometimes	18	23.1	0	0.0	0	0.0	18	14.9			
Seldom	8	10.3	0	0.0	0	0.0	8	6.6			
Never	2	2.6	0	0.0	0	0.0	2	1.6			
Willingness of household members to eat fish as part of healthy diet											
Very willing	49	62.8	15	68.2	4	18.2	68	55.7	35.833	6	0.000
Willing	23	29.5	7	31.8	18	81.8	48	39.4			
Slightly willing	5	6.4	0	0.0	0	0.0	5	4.1			
Not at willing	1	1.3	0	0.0	0	0.0	1	0.8			
Important to include fish diet in proving health diet											
Very important	65	83.3	19	86.4	6	27.3	90	73.8	34.309	4	0.000
Important	11	14.1	3	13.6	16	72.7	30	24.6			
Not important	2	2.6	0	0.0	0	0.0	2	1.6			

3.3 Fish consumption servings in Lake Victoria zone, Tanzania

Table 3 shows the frequencies of fish consumption in terms of number of servings per day in the studied population in Lake Victoria. The results in this study indicate that majority of the consumers; 83.6% participants reported to have been taking 1

– 2 servings of fish per day whereas 15.6% reported consumption of 3 – 4 servings of fish per day. It was further noted that, 74.6% of the studied population said that they have been consuming 1 – 2 servings of fish per day for more than 6 months while only 13.9% reported to have been consuming 1 – 2 servings of fish per day for less than one month with a

significant difference being observed ($\chi^2 = 23.444$; DF = 6 and P = 0.001) in this case. The survey revealed further that considerable large proportions (85.2%) of the household members are seriously thinking of increasing the number of daily servings of fish for improvement of their health. Only 13.1% of the consumers said that they are not thinking of increasing the number of daily servings of fish because of economic reasons. There was no statistical significant difference ($\chi^2 = 2.517$; DF = 2 and P = 0.284) between

household members who said yes and those who said no. Moreover, it was shown that 54.1% of the studied population suggested that for health reasons a person should eat 3 – 4 servings of fish per day while 42.6% said they better maintain 1 – 2 servings because the price of fish is higher compared to other alternatives. Other studies elsewhere have also reported fish and fish products being of higher prices compared to other alternative sources of animal protein [4].

Table 3: Frequencies of fish consumption in the study area

	Mwanza		Mara		Kagera		Total		χ^2	Df	P value
	(n=78)		(n=22)		(n=22)		(n=122)				
Servings consumed per day											
	n	%	n	%	n	%	n	%			
1 – 2	61	78.2	21	95.5	20	90.9	102	83.6	4.295	2	0.117
3 – 4	16	20.5	1	4.5	2	9.1	19	15.6			
How long does the household have been eating this number of daily servings of fish											
Less than one month	17	21.8	0	0.0	0	0.0	17	13.9	23.444	6	0.001
1 - 3 month	9	11.5	0	0.0	0	0.0	9	7.4			
4 - 6 months	5	6.4	0	0.0	0	0.0	5	4.1			
Longer than 6 months	47	60.3	22	100	22	100	91	74.6			
Are the members of household seriously thinking about eating more servings of fish											
Yes	64	82.1	20	90.9	20	90.9	104	85.2	2.517	2	0.284
No	13	16.7	1	4.5	2	9.1	16	13.1			
How many servings of fish do the members of household think a person should eat/day for good health											
1 – 2	51	65.4	1	4.5	0	0.0	52	42.6	52.855	4	0.000
3 – 4	23	29.5	21	95.5	22	100	66	54.1			
5 – 6	4	5.1	0	0.0	0	0.0	4	3.3			

3.4 Assessment of dietary fish consumption in the studied population

The consumption frequencies of the most commonly consumed fish species in Lake Victoria are given in Tables 4 and 5. The number of consumers who can afford to buy Nile perch and its products reduced from 122 to 115 (Table 4). A large number of consumers (56.5%) reported that they can afford to have a meal containing Nile perch for 2 – 4 times per week while 23.5% said they can be able to buy Nile perch for at least 5 – 6 times per week. The reasons for the reduced Nile perch consumption frequency were said to be high price and the form of Nile perch product available. Nile perch is mainly for international markets and therefore it is available in a form of fillets which are very expensive. The smoked and deep fried Nile perch products available in different markets are also expensive for most consumers to afford. The results herein are in line with the previous findings by Hicks *et al.* (2008) [29] where 45% consumers in a survey believed that fish and other seafood are too expensive.

For Nile tilapia (Table 5), the number of consumers declined from the initial 122 to only 61 who can manage to buy the fish products. Out of this number, 69.6% of the respondents reported that they can afford buying Nile tilapia products at least once per week, 8.7% at least 2 – 4 times per week, 8.7% (5 – 6 times per week) and 6.5% said they can manage to have Nile tilapia for more than six times per week. Despite the fact that in Tanzania, Nile tilapia is reserved for domestic consumption, still people are not getting much of it because of high prices. Erdogan *et al.* (2011) [16] also reported price being one of the factors that affects fish consumption in Turkey and 39.30% of fish consumers suggested one of the possible ways to increase fish consumption is to lower the market prices.

Many consumers have therefore shifted from consuming Nile

perch and Nile tilapia to other fish products such as silver sardines commonly known as *dagaa*. This is regarded as the best and cheap source of protein of animal origin and other essential nutrients to the majority of the population in Lake Victoria region because of the availability, easy of accessibility and affordable in terms of price. Similar findings were reported in a study carried out in Kenya. In this study it was reported that, Tilapia (*O. niloticus*), Nile perch (*L. niloticus*) and Silver sardines (*R. argentea*) were the most consumed fish species in the studied area. Those who preferred Tilapia stated that its good taste compared to other fish species available in the market was the main reason for their preference. Consumers of Nile perch stated that it is normally sold as fillets making it easy to prepare and consume while those who consumed silver sardines stated that it was affordable and readily available being sold in many different markets such as food stalls located close to where they reside [4]. Consumers reported further that Nile perch fillets are very expensive, an observation similar to another study that reported the same [30]. Studies indicate also that fish and fishery products are generally perceived by consumers to be more expensive [5]. In this study, consumers who opted for *dagaa* instead of other fish species were in agreement with other previous studies that reported that this fish species is a cheap alternative to other fish varieties available in the market and other protein food products of animal origin such as beef and poultry [31, 32, 33]. On the other hand, Nile tilapia and Nile perch species were reported by most fish consumers to be very expensive and that most of the lower income families can't afford to purchase them. The findings which are consistent with other previous findings in literature which found that lower income families consumed significantly lower quantities of high priced fish products [1, 34, 35].

Table 4: Frequencies of consumption of Nile perch in Lake Victoria, Tanzania

Nile perch	Mwanza (n=72)		Mara (n=22)		Kagera (n=21)		Total (n=115)		χ^2	df	P value
	n	%	n	%	n	%	n	%			
Once/month	3	4.2	0	0.0	0	0.0	3	2.6	33.255	16	0.007
1-3/ month	4	5.6	0	0.0	0	0.0	4	3.5			
1 /week	6	8.3	0	0.0	0	0.0	6	5.2			
2-4 /week	35	48.6	20	95.2	10	45.5	65	56.5			
5-6/ week	14	19.4	1	4.8	12	54.5	27	23.5			
1 /day	1	1.4	0	0.0	0	0.0	1	0.9			
2-3/ day	3	4.2	0	0.0	0	0.0	3	2.6			
4-5/ day	1	1.4	0	0.0	0	0.0	1	0.9			
>6/ day	5	6.9	0	0.0	0	0.0	5	4.3			

Table 5: Frequencies of consumption of Nile tilapia in Lake Victoria, Tanzania

Nile Tilapia	Mwanza (n=18)		Mara (n=22)		Kagera (n=21)		Total (n=61)		χ^2	df	P value
	n	%	n	%	n	%	n	%			
Once/month	1	5.6	0	0.0	0	0.0	1	2.2	27.225	10	0.002
1-3 /month	0	0.0	1	4.5	1	16.7	2	4.3			
1/week	6	33.3	21	95.5	5	83.3	32	69.6			
2-4/week	4	22.2	0	0.0	0	0.0	4	8.7			
5-6/week	4	22.2	0	0.0	0	0.0	4	8.7			
>6/week	3	16.7	0	0.0	0	0.0	3	6.5			

3.5 Average fish consumption in Lake Victoria, Tanzania

The average quantities of fish consumed per day per person in the three regions that were considered in this study is shown in Table 6. The results indicated higher mean levels of fish consumed in Mara (0.52 ± 0.03 kg) and Kagera (0.49 ± 0.06 kg) per person per day. Mwanza region had the lowest mean level of fish eaten per day per person (0.29 ± 0.03 kg). The differences in quantities consumed are probably due to differences in cultures and the types of food that are eaten together with fish, economic reasons and knowledge on health and nutritional effects of fish. The amount of fish consumed in Mwanza was significantly different ($p < 0.05$) from the amounts consumed in other two regions. The average per capita fish consumption per day for the three regions was found to be 0.37 ± 0.02 kg. This implies that the annual per capita fish consumption is approximately 135 kg. This value is by far higher than the national wise annual per capita fish consumption reported by URT, (2016) [10]. According to United Republic of Tanzania, Ministry of Agriculture, Livestock and Fisheries Development Report of 2016, the annual per capita fish consumption by years is 2012 (7.57 kg), 2013 (7.70 kg), 2014 (7.40 kg) and 2015 (7.60 kg). Likewise, the value is far higher than the annual worldwide per capita fish consumption of about 20.0 kg reported in previous studies [8]. According to data reported by Joint FAO/WHO Expert Committee, a Great Consumer of fish ingests at least 150 g daily [8, 36] (approximately 55 kg per year). This value multiplied by the total average concentration of a given chemical toxicant in fish equals the Daily Intake of Great Consumer of fish (DIGC) of this compound [36]. The daily fish consumption established in this study is almost 2.5 times higher than that of a Great Consumer of fish. High consumption of fish in Lake Victoria region may be attributed to easy accessibility and availability of fish and adequate knowledge that consumers have on the health and nutritional effects that fish have on human beings.

Table 6: Regional wise per capita fish consumption per day (in kg)

Region	Mean+SEM
Mwanza	0.29 ± 0.03^b
Mara	0.52 ± 0.03^a
Kagera	0.49 ± 0.06^a
Total	0.37 ± 0.02

4. Conclusion and Recommendations

This study assessed fish consumers' preferences, quantities and species of fish frequently consumed and probable factors affecting fish consumption for communities dotted around Lake Victoria in Tanzania. Nile perch, Nile tilapia and Silver sardines (commonly known as *dagaa*) were mostly preferred fish species in the study area. The factors affecting consumption of the identified fish species were noted to be price, convenience, availability, accessibility and healthy concerns. The average per capita fish consumption per day in Lake Victoria region was found to be 0.37 kg. This is higher than the national wise, worldwide and great fish consumer per capita fish consumption. It is therefore recommended that this actual per capita fish consumption need to be used during the computation of risks associated with consumption of fish species from the study area rather than the hypothetical ingestion rate of 0.02 kg (20g) reported in literatures. This will give a more realistic risk associated with consumption of fish species from Lake Victoria.

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