FISH CONSUMPTION PREFERENCES AND CONTRIBUTING FACTORS AMONG RESIDENTS OF MPWAPWA DISTRICT, DODOMA REGION, TANZANIA

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ABSTRACT

Socioeconomic aspects mainly drive fish consumption preferences among consumers. A study was carried out to assess the fish preference, quantity of fish consumed, frequency and socioeconomic characteristics of consumers in Mpwapwa District in 2023. Factors affecting fish consumption by the residents of Mpwapwa District were also explored. A sample size of 150 individuals from various villages of Mpwapwa District was randomly selected to ensure representation across diverse socioeconomic backgrounds. An open-ended structured questionnaire was employed in data collection. Results indicated that 44.00% of the respondents favoured eating tilapia, 37.33% preferred catfish and 18.67% ate other fishes. Most respondents ate fish once per week (41.00%), while few ate fish more than once per week (23.00%). A significant (p<0.05) positive correlation between fish consumption frequency and income and education level was observed. Fish consumption among age groups, marital status, gender, education level and season were observed to vary significantly (p<0.05). The amount and frequency of fish consumption in Mpwapwa District is below that of Tanzania and the worldwide average, particularly for lower socioeconomic groups. Fish consumption in Mpwapwa can be increased by providing education and training to the community on the importance of fish consumption and improved sanitation in the fish marketplace. Concurrently, fish availability and consumption should be dispersed throughout the year instead of being consumed seasonally. This study provides useful information for increasing fish consumption in Mpwapwa District.

Keywords: Mpwapwa, Tanzania, Fish, Consumer, Consumption, Socioeconomic, Preference

INTRODUCTION

Fish are considered to be the second main source of animal protein after meat, rich in essential nutrients and trace elements (Roos *et al.*, 2003). Fish protein is mostly preferred not only for its clinical value but also for its beta oils, which are crucial in intelligent development (Verbeke and Vackier, 2005; Pieniak *et al.*, 2010; Can *et al.*, 2015; Esilaba *et al.*, 2017). Fish are easily digestible due to the absence of hard tissue in their fillets (Burger *et al.*, 1999; Can *et al.*, 2015). Based on these clues, fish have been considered a healthy meal (Verbeke and Vackier, 2005; Brunsø *et al.*, 2009; Pieniak *et al.*, 2010; Birch *et al.*, 2012; Can *et al.*, 2015; Esilaba *et al.*, 2017). Some scholars have highlighted the importance of fish consumption to increased brain and nervous system development in children. Also,

they associated it with reduced threats of cardiovascular disorders, high blood pressure and numerous forms of cancers in elders (Can *et al.*, 2015).

Fisheries and the aquaculture production sector have been reported to grow significantly in recent years worldwide (Can *et al.*, 2015). Aquaculture production has grown, while capture fisheries production has been relatively stable. Fish consumption has been reported to increase worldwide from 9.9 kg in 1960 to 14.4 kg in 2013 annual per capita, while a report by FAO of 2022 showed that average annual fish consumption has increased from 17.0 kg in the 2000s and 19.6 kg in the 2010s, with a record high of 20.5 kg in 2019 (FAO, 2022). An increase in fish consumption has been associated with an increase in fish production in captive and wild (Esilaba *et al.*, 2017; FAO, 2022). However, worldwide fish consumption per capita varies enormously based on numerous factors, such as socioeconomic status, gender, and age (FAO, 2022). For example, in South and East Asian countries, fish consumption annual per capita has been reported to increase significantly from 10.8 kg in 1961 to 39.2 kg in 2013 and from 13.1 kg to 33.6 kg, respectively. In Northern African countries, the annual per capita consumption has tremendously increased from 2.8 to 16.4 kg in 2013 (World Fish Center, 2009; FAO, 2022). While it seems to be increasing in other parts of the world, it has been the opposite in Sub-Saharan countries. In Kenya, the trend of fish consumption tends to decrease from 6.0 kg in 2000 to 4.5 kg in 2011 (Esilaba *et al.*, 2017), however, in Tanzania report shows a slight increase in annual per capita fish consumption from 7.4 to 7.7 kg between 2012 and 2015 (URT, 2020). In the sub-Saharan region over 90% of fish and fish products consumed come from inland fisheries, while marine fish are not intended for internal consumption rather than for export to generate income. Fishes from inland water are little and do not meet the demand of the growing population in the region (World Fish Center, 2009). Other scholars have associated variation in fish consumption with various factors

such as affordability, accessibility, taste, smell, and freshness of the fish which can determine the level of fish consumption and consumer preference in a given area (Honkanen *et al.*, 2005; Brunsø *et al.*, 2009; Birch *et al.*, 2012; Can *et al.*, 2015).

Geographical settings and sociocultural behaviour can influence fish consumption frequencies and preferences by consumers (Pieniak *et al.*, 2011; Can and Altuğ, 2014; Cantillo *et al.*, 2021). A study by Feng *et al.* (2009) in China reported that fish consumption preference can be influenced by increased population, abundant availability of fish and fishery products, income level, and educational levels. Meanwhile, age and ethnicity have been found to significantly influence the consumption of fish and fish products by Malaysian customers (Boniface and Umberger, 2012). In Kenya, consumption preferences are influenced by the overall quality, accessibility and taste of fish and fishery products (Obiero *et al.*, 2014). Furthermore, a study by Can *et al.* (2015) in Antakya City, Turkey on fish consumption preferences portrayed that the majority of consumers ate fish once per month, while other studies in various parts of the world reported that fish consumption was determined by various associated risks factors (Leek *et al.*, 2000; Ruffle *et al.*, 2019; Wu *et al.*, 2021; Rezaeizadeh *et al.*, 2022).

In Tanzania, fish consumption preference has received less consideration compared to other countries particularly European and Asian countries (Wenaty *et al.*, 2018). Most studies in Tanzania have concentrated on fish production and the assessment of chemical and microbial contaminants in fish (Wenaty *et al.*, 2018; Peart *et al.*, 2021). Little is known about fish consumption preferences in Tanzania. Among the few studies carried out in Tanzania is a study by Peart *et al.* (2021) which assessed fish consumption and preference around Lake Victoria. Therefore, this study aimed to evaluate the quantity of fish consumed, frequency of fish consumption, consumers' preferences, types of fish favoured and the aspects influencing fish consumption.

MATERIAL AND METHODS

Data Collection: The survey was carried out between April and June 2023 through the use of an open-ended semi-structured questionnaire completed by 150 randomly selected participants with diverse socioeconomic and social characteristics from the Mpwapwa District in the Dodoma region in the central part of Tanzania. The data gathered included household characteristics, respondents' occupation, age, sex, level of education, income, fish consumption frequency, price of fish, source and availability of fish, types of fish and preference. The questionnaire was face-validated, pretested and post-tested for reliability before administration (Jenn, 2006). Participation of respondents and key informants in the study was anonymous and with informed consent. Interviews were conducted with individual household members above the age of 18 years (Rodríguez del Águila and González-Ramírez, 2014; Aydın and Bashimov, 2020). During data collection, ten villages were involved in the study and for each village, fifteen individuals were interviewed. The villages included Berege, Chitemo, Gulwe, Namba 3, Vinghawe, Mpwapwa Centre, Idilo, Kisima, Mtera and Chipogoro.

Mpwapwa is among the seven districts of Dodoma region located at coordinates of 6° 20' 52.062" S and 36° 29' 6.432" E (Figure 1). Mpwapwa has one main source of fish called the Mtera Dam which is shared by the Iringa region in the southern part.
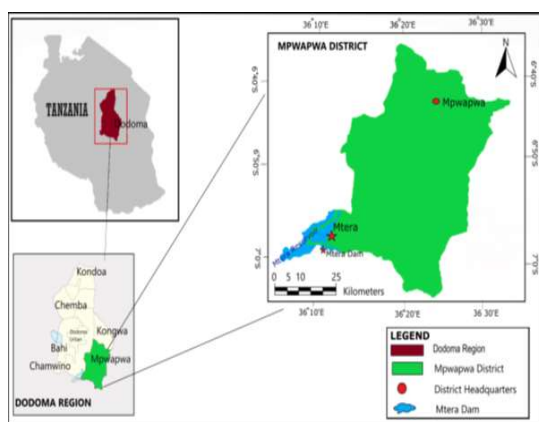

Figure 1: Map of Dodoma region, showing Mpwapwa District, Tanzania

Statistical Analyses: Data were analysed by using a Statistical Package for Social Science (SPSS) Version 18.1. Means, standard deviations, percentages and frequency distributions were computed by using descriptive analysis. A chi-square test was employed to analyse inferential data and all data analysed were considered significant at $p < 0.05$. The quantity of fish consumed was reported as the mean (kg) ± standard error of the mean (SEM). The associations between consumers' fish consumption level and socioeconomic variations were determined by using the Pearson correlation coefficient (Rahman and Islam, 2020; Widihastuti and Arthatiani, 2020).

RESULTS

The main fish consumed in the Mpwapwa District are tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*). Between the two species, tilapia was relatively preferred compared to catfish, although the preference was not significant ($p > 0.05$) (Table 1).

Table 1: Fish consumption preferences in Mpwapwa district

Species	Consumption (acceptability) level		P-value
	Number	**Percentage (%)**	
Catfish	56	37.33	>0.05
Tilapia	66	44.00	
Others	28	18.67	
Total	150	100.00	

According to this study, 44.00% of the respondents preferred tilapia, 37.33% preferred catfish, and 18.67% preferred other types of fish such as sardine and Indian mackerel (*Rastrelliger kanagurta*). These percentages indicate the proportion of consumers who expressed a positive acceptance or preference for each species.

Fish consumption levels based on various socioeconomic variables such as age, gender, income level, education level and occupation indicated substantial variations in consumers' fish consumption levels were observed between the age, gender, income and education classes. The fish consumption level between ages was observed to be higher in the age group between 18 and 30, followed by the age group between

41 and 50, while other age groups indicated low fish consumption levels (Table 2).

Table 2: Fish consumption based on consumer socioeconomic characteristics in Mpwapwa district

Questions	Responses	N	%	Mean ± SEM	P-value
Age	18 – 30	48	32.00	7.4 ± 0.46	<0.05
	31 – 40	30	20.00	1.6 ± 0.84	
	41 – 50	36	24.00	3.4 ± 0.62	
	51 – 60	18	12.00	4.6 ± 0.23	
	61+	18	12.00	4.6 ± 0.23	
Occupation	Peasant	65	43.33	10.0 ± 0.51	<0.05
	Employed	35	23.33	1.5 ± 0.49	
	Unemployed	26	17.33	3.4 ± 0.50	
	Businessman/woman	24	16.00	5.6 ± 0.48	
Education	Primary school	72	48.00	10.4 ± 0.24	>0.05
	Secondary school	66	44.00	12.0 ± 0.56	
	College/University	12	8.00	19.6 ± 0.54	
Economic level	Low income	80	53.33	12.0 ± 0.04	<0.05
	Middle income	56	37.33	3.0 ± 0.32	
	High income	14	9.33	1.0 ± 0.27	
Price (TZS)*	500 – 1000	52	34.67	12.1 ± 0.31	<0.05
	1100 – 2000	42	28.00	10.1 ± 0.28	
	2100 – 3000	24	16.00	1.1 ± 0.34	
	3100 – 4000	12	8.00	3.9 ± 0.18	
	4100 – 5000	10	6.67	4.9 ± 0.26	
	5100 – 6000	6	4.00	2.9 ± 0.32	
	Above 6100	4	2.67	1.9 ± 0.16	

*2500 TZS is equal to 1 $US in 2024. Source: Bank of Tanzania (BOT)

Generally, fish consumption was high between 18 and 50 years old and decreased above the age of 51 years old. Table 2 also revealed a significant variation ($p<0.05$) in consumption levels between each education subcategory and income level. Additionally, the male fish consumption level was higher than the female consumption level (Table 2). Occupation and fish price revealed significant differences between subcategories. Peasants were observed to have a higher rate of fish consumption than other occupation groups. The price of fish significantly impacted ($p<0.05$) the fish consumption rate among the consumers (Table 2).

Table 3 validates consumer preferences and behaviours for fish consumption in the Mpwapwa District. During this study, respondents said that the price of fish plays a critical part in choosing fish to consume. Preferred fish types were smoked and fresh fish, which are available all seasons around the year. The majority of fish consumers preferred the local fish market for fish product purchases. The dry season was the most preferred season by

consumers to consume fish. The majority of respondents consume fish once per week per year. A relationship between consumption levels and consumer characteristics is outlined by the Pearson correlation coefficient (Table 4). The following had a significant ($p<0.05$) positive relationship; fish consumption level and income (0.681), fish consumption level and education (0.417), and fish consumption and occupation (0.239), while fish consumption level and age of consumer (-0.342) had a significant ($p<0.05$) negative correlation.

Table 5 shows the average daily fish consumption per person. The amount of consumption showed that catfish was consumed in large amounts compared to tilapia and other species.

Table 3: Preference and customs of fish consumers in Mpwapwa district

Questions	Responses	%
Primary reason for fish consumption	Affordable	40
	Healthy	35
	Attributes	25
Preferred fish type	Fresh (raw)	38
	Fried	22
	Smoked	40
Preferred fish market	Individual seller	29.5
	Local market	41
	Middlemen	29.5
Preferred season for fish consumption	Dry	62
	Wet	30
	All-season	8
Consumption frequency	Daily	23
	Weekly	41
	Every 2 weeks	19
	Monthly	8
	Never	4

Consumers' Opinion on Fish Consumption:
Figures 2 – 4 illustrate the opinions regarding fish consumption, market price of fish and related problems mentioned by customers in Mpwapwa District. Also, it stipulates some strategies which can be employed to improve consumption in

Mpwapwa. A large number of participants said that fish consumption is on average followed by satisfactory (good) (Figure 2).

Table 4: Association between fish consumption level and consumer characteristics

Characteristics	Coefficient	P-value
Income level of consumer	0.681	<0.05
Age of consumer	-0.342	>0.05
Education level of consumer	0.417	<0.05
Occupation	0.239	<0.05

A significant difference was considered at p<0.05.

Table 5: Individual fish mean consumption per day (in Kg)

Species	Mean ± SEM	df	P-value
Tilapia	0.29 ± 0.03	2	<0.05
Catfish	0.52 ± 0.03		
Other fish	0.20 ± 0.02		

Figure 2: Fish consumers' opinions on fish consumption level in Mpwapwa District, Tanzania

The majority of the consumers (more than half) responded that the price of fish is too expensive and should be lowered (Figure 3). Likewise, 26.00% of respondents answered that fish consumption could be improved if illegal fishing were to be controlled. Additionally, it was found that the provision of loans for aquaculture activities can increase the production of fish and hence enhance fish consumption levels.

Furthermore, 49.00, 27.00 and 24.00% of the respondents revealed that poor fish storage, an unhygienic environment and lack of consumer information, respectively, were the main problems in the fish market (Figure 4).

Factors Associated with Increase Fish Consumption in Mpwapwa District: Figure 5 highlights some of the strategies to be considered to increase fish consumption in Mpwapwa District. These consumer suggestions highlighted various areas that can be targeted for intervention to increase fish consumption in Mpwapwa District.
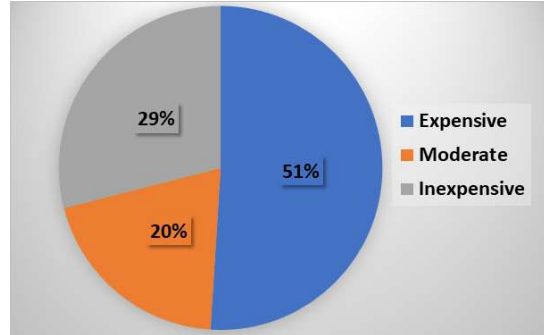

Figure 3: Fish consumers' opinions on the price of fish in Mpwapwa district, Tanzania
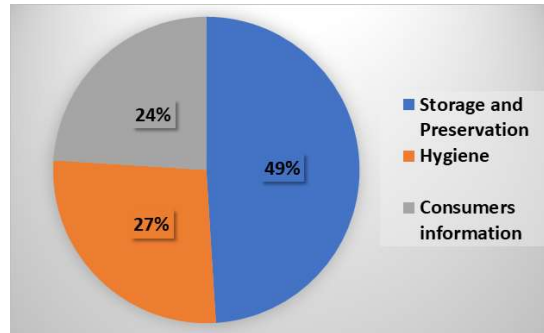

Figure 4: Fish consumers' opinions on the problems at the fish market in Mpwapwa District, Tanzania
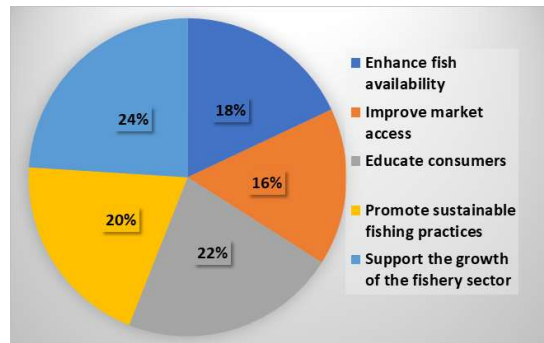

Figure 5: Suggestions provided by consumers to increase fish consumption level in Mpwapwa District, Tanzania

It can be achieved by implementing the following measures: enhance fish availability, improve market access, educate consumers, promote sustainable fishing practices, and support the growth of the fishery sector.

DISCUSSION

Mpwapwa District is among the seven districts of Dodoma region in the central zone of Tanzania. Although the district is bordered by the Mtera Dam, the level of fish consumption is moderately low on an international level. The main reason was that this district is rich in livestock, including cattle, goats, sheep and poultry. Meat products from livestock offer the best choices for consumers due to their low price compared to the high price of fish in Mpwapwa District. On average, the price of meat/beef (cow, goat and sheep) is approximately Tanzanian shillings (TZS) 7,000/kg (USD 2.92), tilapia is sold at TZS 12,000/kg (5 USD), and catfish is sold at TZS 10,000/kg (4.12 USD) (1 USD = TZS 2500). Thus, price plays a vital role in consumption preference and frequency by consumers in Mpwapwa. These findings are different from the study by Wenaty *et al.* (2018) around Lake Victoria, who reported high fish consumption levels due to the availability of fish in the community living near the lake. While findings by other scholars in Bangladesh reported that consumers prefer meat and chicken over fish (Toufique, 2015; Ara *et al.*, 2020; Rahman and Islam, 2020). Participants' average fish consumption was 2.9 g/day and 5.2 g/day for tilapia and catfish, respectively, which implies low consumption of fish in Mpwapwa District. The consumption level observed in Mpwapwa District was low compared to studies by other scholars in different parts of the world. Studies by Wenaty *et al.* (2018) around Lake Victoria, Tanzania reported 5.9 g/day, while Can *et al.* (2015) reported a consumption rate of 8.12 g/day in Antakya, Turkey, and Rahman and Islam (2020) reported a consumption rate of 12 g/day in Rangpur City Corporation, Bangladesh, which were higher than the consumption in Mpwapwa District. The reasons behind the variations in the consumption level can be attributed to various factors such as purchasing power, availability, preference, taste, and knowledge of the nutritional effects of fish.

Tilapia and catfish were reported to be the main fish consumed in the Mpwapwa District due to their easy availability but the price was a hindrance to many. Other fish species were not common to consumers and thus less preferred. The good taste of tilapia makes them the most preferred fish compared to other fish species available to the marketplace, while catfish was preferred due to its low price and availability throughout the year. On the other hand, tilapia was not affordable for lower-income families because it is relatively expensive, thus most high-income families can afford tilapia. Lower-income families opted for catfish and other low-quality fish products as an alternative since they are affordable. Such findings have been also reported by other scholars in different parts of the world (Mohan Dey *et al.*, 2005; Dalhatu and Ala, 2011; Wenaty *et al.*, 2018).

Season plays a major role in fish consumption. During this study, 62% of the respondents consumed fish during the dry season. This may be due to the scarcity of natural vegetables during the dry period. Few participants reported consuming fish year-round, which is important for well-being (Rahman and Islam, 2020). A study by Wake and Geleto (2019) in Ethiopia, observed that fish demand is impacted by season, while Erdal and Esengün (2008) in Turkey reported an increase in fish consumption during the winter season. 21.00% of the participants in this study ate fish daily, 41.00% ate fish once per week, and 8.00% ate fish once per month. Rahman and Islam (2020) in Bangladesh found that 29.63% consumed fish more than once a week, and the same results were reported by Pieniak *et al.* (2008), who observed that 25.00% of consumers in some European countries (Belgium, Denmark, and the Netherlands) ate fish more than once a week. These previous findings are similar to the results of this study. Education and income levels may have an impact on the fish-eating frequency and amount (Burger *et al.*, 1999; Hicks *et al.*, 2008; Rahman and Islam, 2020). Educated individuals know the importance of fish consumption, while high-income families can purchase fish with little limitation.

Additionally, in the present study, a noteworthy positive correlation was observed between consumption and income, consumption and education, consumption and occupation. Previous studies by other scholars in different parts of the world portrayed a positive correlation

between education level and fish consumption (Can and Altuğ, 2014; Can *et al.*, 2015; Sari and Muflikhati, 2018; Uddin *et al.*, 2019). During this study, it was observed that there was a strong positive relationship between consumption level and the respondents of middle age and public sector consumers which constituted a large number of respondents. The quantity of fish consumed tends to increase when the level of income increases (Hansen *et al.*, 2014). Low-income consumers are limited by financial hampers that limit their choices, whereas high-income consumers can buy their choices with less limitation. Another interesting observation during this study was that fish consumption and age showed a negative correlation. This means that when age increases, fish consumption decreases due to a decrease in accessibility, change in preference due to taste, and elderly diseases which limits fish consumption. Studies by Kaimakoudi *et al.* (2013) and Myrland *et al.* (2000) reported that young people ate more fish than elders due to health problems associated with elders. Another study by Ahmed *et al.* (2020) in Bangladesh reported that highly educated people prefer diets with fish to less educated individuals. In contrast to the present study, Burger *et al.* (1999) observed an inverse correlation between fish-eating and education level and income classes in the USA. Meanwhile, Verbeke and Vackier (2005) reported that in Belgium, low-income earners tend to consume less fish than high-income earners. In Mpwapwa District, educated people tend to consume more fish than less educated because educated people are aware and more conscious about their health concerns than less educated persons (Rahman and Islam, 2020). No relationship was observed between education and fish consumption frequency (Çolakoğlu *et al.*, 2006), which contradicts the findings of the present study. During this study, 4.00% of the respondents reported that they do not eat fish for various reasons, such as bone, thorn, and smell. Moreover, fish consumption between men and women showed a significant difference between sexes in this study. This finding is contrary to a study by Lucky *et al.* (2004) who reported that women consume more fish than males in Bangladesh, while Rahman and Islam (2020)

reported that males consume more fish than females. The reason behind this is that males are more involved in fishing and purchasing fish, which makes them eat more fish than females. In addition, males are involved in various production activities, including fishing, which is why they eat more fish than females (Dasgupta *et al.*, 2021).

This study also observed a remarkable disparity in fish consumption between consumers of various ages and income levels. In Tanzania, consumers regard fish as an expensive food in comparison with other types of meat. Such observations have also been reported by different scholars worldwide. For example, studies by Haque *et al.* (2019) and Rahman and Islam (2020) in Bangladesh showed that fish are much more expensive than other types of food. Although fish price seems to be the key obstacle to the majority of consumers due to high prices, other factors play a part in limiting fish consumption. Apart from price, fish consumption is also linked with cultural and geographical distribution (Rahman and Islam, 2020). However, further investigations are needed on the effects of sociocultural, economic, and demographic factors on fish consumption in Mpwapwa District and Tanzania at large. In this study, the majority of participants believed that if the price of fish can be lowered, fish consumption will increase in Mpwapwa District. The majority of fish consumed in Mpwapwa are harvested from the Mtera Dam, thus making the fish available throughout the year, although most fish are consumed during the dry season.

In Mpwapwa District, the majority of fish consumers prefer fresh and smoked fish over fried fish and other types. Fish quality is very important in the selection of fish to consume. Respondents in this study preferred smoked fish (40%); this can be attributed to inadequate fish storage facilities for fresh fish. Most of the participants lived in rural areas where there was no electricity or freezing facilities for fresh fish. This makes most consumers prefer smoked fish over other fish types. Therefore, the government should plan to supply electricity in rural areas so that the community can preserve and consume fresh fish. Fish consumption is also affected by other factors, such as bone, taste, and nutrition

(Pieniak *et al.*, 2008)]. Fishbones have been reported to affect fish consumption frequency because they make cooking and preparation difficult, thus reducing fish consumption (Leek *et al.,* 2000). In addition, fish smell, taste, texture and bone have also been found to negatively affect fish consumption (Birch *et al*, 2018).

Thirty-five per cent of the participants reported consuming fish for a healthy and balanced diet. This is substantiated by those educated because they know the importance of a meal with fish in a balanced diet. As the results indicated, healthy grounds play a fundamental role in making choices among consumers, especially among the highly educated ones.

The local fish market was the main place to purchase fish in Mpwapwa District. Participants claimed that at the local market, there is a wide chance to select the types and sizes of fish you want. In addition, prices can be negotiated at the local market which is the common practice in Tanzania in local markets, while in fish shops/ butcheries, the price is fixed. Although the local market was the most preferred place to purchase fish, it faced the problem of unhygienic conditions. Respondents advised that the health sector and other responsible authorities should monitor local markets to ensure a clean and hygienic environment. Food safety, environmental friendliness, and cleanliness influence consumers' fish purchasing decisions (Santeramo *et al.*, 2017).

The fishery sector should take responsibility for educating people on the benefits of fish consumption. Additionally, awareness should be created to enhance healthy fish consumption. This can be accomplished through providing education and field training to the community. The benefits of consuming fish should be explained to the community to create awareness and understanding of the importance of consuming fish. Knowledge of fish as dietary food can increase the level of fish consumption in the community. Other important issues to be considered in fish consumption should include structural matters such as fish handling, packing, supplying, transport and preservation.

Conclusion: Quantities of fish consumed, frequency and preference in association with feasible factors affecting fish consumption in Mpwapwa District were assessed in this study. The notable factors influencing fish consumption were price, availability, accessibility and health of consumers. The average amount of fish consumption per day in Mpwapwa District was 0.29 and 0.52 kg for tilapia and catfish, respectively. This was relatively low compared to the average fish consumption nationwide and worldwide. The study recommends strict measures to be taken to enhance and increase fish consumption in the Mpwapwa District. The measures should include establishing aquaculture farming, controlling illegal fishing, provision of educational and technical training, campaigns on the importance of fish consumption, and improving the hygienic status of the local fish marketer. These measures can increase the fish consumption rate in Mpwapwa District and Tanzania at large.

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