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Fish Consumption, Dietary Diversity and Nutritional Status of Reproductive Age Women of Fishing and Non-Fishing Households in Hawassa, Ethiopia: *Comparative Cross Sectional Study*

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Abstract Malnutrition is one of the public health problems in Ethiopia. Households relying on fishing for their livelihoods are assumed to consume more fish than none fish producing households. Thus, fish producing households are expected to have better nutritional status compared to none fish producing households. However, this assumption is not well studied and there is limited evidence about the consumption and the nutritional outcomes of fishing in and around Hawassa city. Therefore, the aim of this study was to determine and compare fish consumption, dietary diversity and nutritional status of reproductive aged women from fishing and non-fishing households in Hawassa. A comparative cross-sectional study was conducted among 804 reproductive age women both from fishing and non-fishing households. Women from fishing households were selected by purposive sampling technique and from non-fishing households' simple random sampling were used. Data were collected by personal interview using structured and pre-tested questionnaire. Levels of fish consumption were determined from reported frequency by the participants. Household food security status was assessed using the Food Insecurity Experience Scale (FIES). Minimum dietary diversity and Body Mass Index (BMI) were determined to assess nutritional status. Data were entered, cleaned and analyzed by using SPSS version 22. Statistical significance was declared at p=0.05. The result shows that women in fishing households were consuming fish more frequently than from none fishing households ($p<0.001$). In addition, women in the fishing households had better household food security status compared with non fishing households ($p <0.001$). There was no statistical significant difference in terms of Body Mass Index (p=0.571) among reproductive age women of fishing and non-fishing households. However, the reproductive age women in the fishing households had greater minimum dietary diversity score than non fishing households ($p <0.001$). The finding indicated that reproductive age women from fishing households had better fish consumption; household food security and minimum dietary diversity. This shows that fishing contributed to food and nutrition security. Thus, it is important to promote fish production and consumption in the study area.

Keywords Fish consumption, Household food security, Livelihood, Nutritional status, Reproductive age women

1. Introduction

Fish is an excellent source of high quality animal protein and essential fatty acids, especially long-chain polyunsaturated fatty acids (LCPUFA) and micronutrients, which are much greater in fishes than in terrestrial animal-source foods. Thus, promoting fish consumption can be one of the very good strategies to tackle problems of malnutrition. The most obvious signs of under nutrition are mortality, morbidity, stunting, underweight and wasting. Less immediately apparent are the effects on immune function, cognitive ability and work productivity, with profound effects at individual, family and societal levels [1-3]. It is estimated that maternal and child under nutrition accounts for 11% of total global disability-adjusted life years (DALY; a measure of overall disease burden, expressed as the numbers of years lost due to ill-health, disability or early death), with dire consequences for development. People who are food and nutrition insecure largely reside in Asia and Sub-Saharan Africa and for many; fish represents a rich source of protein, micronutrients and essential fatty acids. The contribution of fish to household food and nutrition security depends upon availability,

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access and cultural and personal preferences. Access is largely determined by location, seasonality and price but at the individual level it also depends upon a person's physiological and health status and how fish is prepared, cooked and shared among household members. Without action, the situation can only worsen. By 2050, it is anticipated that the global population will rise to 9 billion. Satisfying the food and nutrition needs of the growing population, let alone its demands, is likely to require a profound change in what and how much is eaten, and where and how food is produced. Failure to do so could profoundly affect the biosphere in ways that further erode the life-support system through biodiversity loss, changes in ecosystem services supply and exacerbated global warming [4].

In almost every country of the world, malnutrition is a serious public health burden incurring high economic costs. Thus, reducing malnutrition can have significant contribution in reducing poverty and achieving better health [5]. In Ethiopia, maternal under nutrition is still a national problem which directly affected health of mothers and their children.

Encouragingly, in Ethiopia, prevalence of malnutrition has been decreasing over the last two decades. Focusing on food security and scaling up nutrition like micronutrient supplementation and fortification programs have made tremendous contribution to reducing under nutrition [6]. Fishery sector has the potential to improve food and nutrition security. Hence, it is very important to understand its contribution and the existing situations. Fisheries can contribute in direct and/or indirect ways. Directly through consumption of´ fish and indirectly through increased purchasing power from the sale of fish (*i.e*. increased access). Fisheries also contribute to household food availability especially in dry season or when other foods are not available. Additionally, fishery could indirectly help the individuals or households involved to earn more money to cover their financial needs including health and nutrition [7,8].

In Ethiopia, fish supply comes from the major lakes and rivers. Several national reports indicated that fish production of the major lakes is declining at an alarming rate. Despite the countries huge aquaculture potential, the contribution of aquaculture towards food security is not well documented. Hence, more studies are needed in relation to fish production, consumption of fish and its overall contribution to livelihood and nutritional status of households. .. Per capita consumption of fish is very low in Ethiopia. There is steady growth in demand reflecting population increase, rising incomes and a shift in preferences. The main areas of fish consumption are mainly towns and close to the main production areas of major lakes including.

Additionally the existing literature relates contribution of fishery to merely consumption and does not address other food and nutrition security indicators. Therefore, the current study is aimed at to produce evidences whether fish production do really contribute to consumption of fish, dietary diversity and nutritional status of reproductive age women which will in turn helps for further action to increase the production and consumption in the study area.

2. Materials and Methods

2.1. Study Area and Population

The Survey was conducted in four Kebeles found in two Sub City (Tolo, Fincho) from Tula Sub city and (Hayik Dar and Tilte) from Tabor Sub City are selected around Hawassa town in Southern Ethiopia. Households engaged in fishing as a livelihood activity were approached in the study area. In Hawassa, there was a legal fish production union which has about 570 active members. Sample size (i.e. a total of 804 reproductive age women) was determined using double population proportion formula. A total of 401 reproductive age women from households with at least one member of the fishing union and 403 from the households with members of the union were included in the study.

2.2. Data Collection Tool

Questionnaires contained socio demographic, economic and fish consumption characteristics were prepared in English and were translated into local language. Minimum Dietary Diversity of Women (MDD-W) was determined and women who consumed at least 5 of the 10 possible food groups over a 24-hour recall period classified as having minimally adequate diet diversity [9]. Household food security was assessed using Food Insecurity Experience Scale (FIES) [10]. Anthropometries were measured by using, height and weight scales to report nutritional status of the women. Fish consumption frequency was measured using a five-point category scale and coded in descending order as follows: (1) more than once a week, (2) once a week, (3) more than once a month (two or three times), (4) once a month, and (5) more than once a year [11]. Lastly it was categorized as regular (>2 times a week) and rare (<2 times a week).

2.3. Data Analysis

Data were entered to SPSS version 22 packages; the data were checked and preliminary analysis was carried out. Confounding variables were controlled by using multivariate analysis. Means, standard deviations for the continuous data and frequency distributions for nominal variables, were determined. Continuous variables were checked for normality using the Kolmogorov-Smirnov test and histogram. Chi-square test was used to compare outcome variables (fish consumption, household food security and nutritional status) of women in both households.

2.4. Ethical Consideration

The whole project plan including study design, objectives, and the research protocols were submitted to Hawassa University's Institutional Review Board and approved

(Approval letter with unique reference number Ref No: IRB/182/10 dated May 18, 2018). In addition, the nature of the study was explained to the participants before obtaining their verbal consent. Confidentiality of the data obtained from participants is strictly secured and maintained. And finally, consent was read to all participants and they were asked to sign to confirm their permission to participant in the study.

3. Results

3.1. Socio-demographic and Economic Characteristics

A total of 804 reproductive age women with a response rate of 96.9% were participated in the current study. More than half (55.5%) of study participants were in between 15-25 years of age. Majorities (60.6%) of the study participants were belonging to Protestant religion. At the time of the survey, nearly three fourth of the reproductive age women were married 586 (73%). More than half, 461 (57.3%) respondents' households earn more than 1000 Ethiopian Birr (about 35USD) monthly income. From the total, 708 (88.1%) respondents' households were male headed (Table 2).

Among socio-economic variables, chi square test reveals that mean age of the child, maternal educational status and wealth index showed statistically significant difference between the two groups being compared (P<0.05) (Table 1).

3.2. Fish Consumption of Reproductive Age Women

Overall, the majority 793 (98.6%) of the respondents reported that they ever used fish for household consumption. Half, 402 (50.0%) of respondents reported that the source of fish was directly from fishery from Lake Hawassa. Whereas, the others access from fish market and fish venders in Hawassa town. In relation to Fish consumption frequency, was 266 (66.3%) and 93 (23.0%) of respondents reported that they eat twice or more than per week from fishing households and none fish producing households; respectively. Majorities of the respondents mentioned Nile Tilapia '(Koroso in local name)' as the most common fish type they consumed (Table 2).

Table 1. Socio-demographic characteristics of reproductive age women of the selected fishing and non-fishing households, Hawassa Ethiopia, 2018 (n=804)

Variables		Respondents' household						
		Fishing		Non-fishing		Total		
		No. (%)		No. (%)		No. (%)		*p*-value
Age	15-25	234	(58.3)	212	(52.6)	446	(55.5)	0.140
	26-35	116	(28.9)	122	(30.2)	238	(29.6)	
	36-49	51	(12.7)	69	(17.1)	120	(14.9)	
Marital status	Single	98	(23.4)	115	(28.5)	213	(26.5)	0.370
	Married	301	(75.0)	285	(70.7)	586	(72.9)	
	Divorced/Widowed	2	(0.49)	3	(0.74)	5	(.6)	
Occupation	Housewife	21	(5.23)	104	(25.8)	125	(15.5)	0.000*
	Petty-trade/farmer/	380	(94.7)	299	(74.1)	679	(84.5)	
Religion	Orthodox	117	(29.1)	124	(30.7)	246	(30.6)	0.429
	Protestant	254	(63.3)	238	(59.0)	487	(60.6)	
	Muslim	6	(1.49)	6	(1.48)	13	(1.6)	
	Others	24	(5.98)	35	(8.68)	58	(7.2)	
Educational status	Illiterate	64	(15.9)	72	(17.8)	136	(16.9)	0.000*
	Under High school	126	(31.4)	50	(12.4)	176	(21.9)	
	High school & above	211	(52.6)	281	(69.7)	492	(61.2)	
Monthly income	<500	11	(2.74)	23	(5.70)	34	(4.2)	0.000*
	500-1000	69	(17.2)	240	(59.5)	309	(38.4)	
	>1000	321	(80.0)	140	(34.7)	461	(57.3)	
Family size	≤ 5	230	(49.8)	232	(57.5)	462	(57.5)	0.952
	> 5	171	(50.0)	171	(42.4)	342	(42.5)	
Head of the household	Father	349	(84.0)	359	(89.0)	708	(88.1)	0.370
	Mother (yourself)	52	(21.9)	44	(10.9)	96	(11.9)	
Wealth status	Poor	13	(3.24)	35	(8.68)	48	(6.0)	0.000*
	Middle	66	(16.4)	228	(56.7)	294	(36.6)	
	Rich	322	(80.2)	140	(34.7)	462	(57.5)	

**- Significant at p-value=0.05*

Table 2. Fish consumption of reproductive age women in fishing and non-fishing households Hawassa, Ethiopia, 2018 (n=804)

Variable		Type of household						
		Fishing		Non-fishing		Total		
		No. (%)		No. (%)		No. (%)		*p*-value
Frequency of fish consumption	< 2x/ week	135	(33.6)	299	(74.1)	434	(54.0)	<0.001*
	≥2x/ week	266	(66.3)	93	(23.0)	359	(44.7)	
	Non-fish eater	0	(.0)	11	(2.72)	11	(2.72)	
Estimated amount of fish consumed	<250 g	95	(23.6)	255	(62.2)	350	(43.9)	<0.001*
	250 to 500 g	306	(76.3)	137	(33.9)	443	(55.1)	
Know about fish species	No	60	(14.9)	174	(43.1)	234	(29.1)	
	Yes	341	(85.03)	229	(56.8)	570	(70.9)	
Fish species usually consumed	Nile Tilapia	250	(62.3)	124	(30.7)	374	(65.6)	<0.001*
	African catfish	44	(10.9)	74	(18.3)	118	(20.7)	
Consume fish	Rare	135	(33.6)	310	(76.9)			<0.001*
	Regular	266	(66.3)	93	(23.0)			
Occasion fish is consumed	Fasting	242	(60.3)	91	(22.5)	333	(41.4)	
	High production	154	(38.4)	308	(76.4)	462	(57.5)	<0.001*
	Other	5	(1.24)	4	(0.99)	9	(1.1)	
Reason for not consume fish	Fasting	28	(6.98)	69	(17.1)	97	(12.1)	
	Low Production	42	(10.4)	0	(.0)	42	(5.2)	<0.001*
	When expensive	331	(82.5)	334	(82.8)	665	(82.7)	
Believed fishery contributes to fish consumption	No	78	(19.4)	144	(35.7)	222	(27.6)	<0.0001*
	Yes	323	(80.5)	259	(64.2)	582	(72.8)	
Preferred cooked type of fish food for consumption	Roasted	253	(63.0)	258	(64.0)	511	(63.6)	0.003*
	Fish Soup	134	(33.4)	145	(35.7)	279	(34.6)	
Common method fish preparation	Raw	4	(0.99)	0	(.0)	4	(0.99)	

Table 3. Comparison of fishing livelihood among reproductive age women in fishing and non-fishing households around Lake Hawassa Ethiopia, 2018 (n=804)

		Type of HH				
		Fishing (n=401)		Non-fishing (n=403)		
		No. (%)		No. (%)		X^2 & p-value
Nutritional status	Underweight	40	(54.1)	34	(45.9)	X^2=0.571
	Normal weight	291	(49.5)	297	(50.5)	*p*=0.752
	Overweight	70	(49.3)	72	(50.7)	
Dietary diversity of women	< 5 inadequate	215	(45.7)	255	(54.3)	X^2=7.723
	≥ 5 adequate	186	(55.7)	148	(44.3)	
Household food security	Moderate/Severe hunger	157	(39.2)	244	(60.8)	X^2=36.799
	Little or no hunger	244	(60.5)	159	(39.5)	*p*=0.000*

*- *Significant at p-value=0.05, p= P-value*

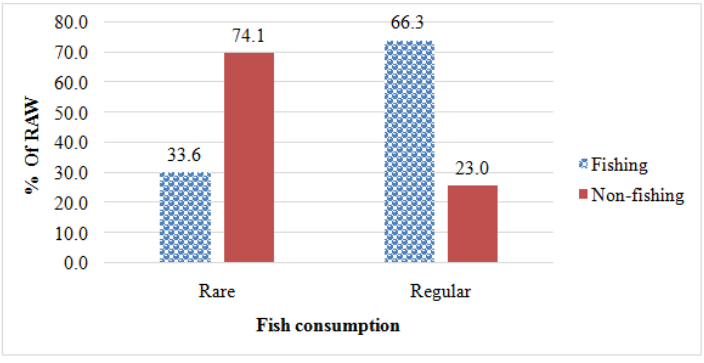

Figure 1. Fish consumption among reproductive age women (RAW) in fishing and non-fishing households around Lake Hawassa, Ethiopia, 2018 (n=804)

As figure 1 illustrates, women consume fish either regularly or very rarely. Larger proportion of respondents (66.3%) from households participating in fishing do consume on regular basis where as from none fishing households, fewer proportions (23%) do consume the fish regularly (Figure 1).

3.3. Minimum Dietary Diversity and Nutritional Status

The overall mean (±SD) minimum dietary diversity of the respondents from fishing households was 5 (±2.536) and from non fishing households was 4 (±2.582) at the time of survey; and the difference between these groups was statistically significant ($p<0.05$). There was no statistically significant difference in nutritional status categories of reproductive age women in the study area (Pearson Chi square (x2) = 0.571, p=0.752). However, significant difference was noted between the groups in terms of household food insecurity experiences.

3.4. Key Informant Interview Results

In addition to quantitative survey, in-depth key informant interview-KII was conducted to have insight about the existing opportunities and challenges to maximize the contribution of fishery for food and nutrition security. Regional, Zonal, Hawassa city administration and other stakeholder's were contacted for the key interview. Following is brief summary of the KII.

Existing Opportunities and challenges to maximize fisheries for food and nutrition contribution in the study areas

The key informants agreed that fishing activities were very essential for the community's food and nutrition security through increasing the income from fish marketing and better food from consumption of fish. They also pointed out that the study area and the region at large has a great potential for fishery. However, maximal benefit from it is not well exploited.

For instance, a senior Animal and Fisheries resources Officer at Sidama Region Agriculture Bureau stated that ''…currently our region has the potential to produce fish and rich in different water bodies. Some of them are Lake Hawassa, Lake Abaya, Lake Chamo, and Omo Rivers which are the major sources for fish production. However, even though the region has these water bodies for fish production, the sector has lots of home work to do. Technology inputs and awareness to maximize fishery benefits for the household food and nutrition security are the most important. Additionally, we feel that still there are gaps in proper management and the sustainability of the fish production. The situation of fishing from Lake Hawassa is top agenda for Sidama Region…. ".

Another key informant from Sidama Region Agriculture Bureau Nutrition expert also added that fish is an excellent source of protein and essential fatty acid and so increasing fish productivity could help in reducing poverty and prevention of food and nutrition problems. Even though fish plays an important role there are many constraints on the production, consumption and related activities…'' The expert mentioned some of the factors in the study areas. ''… Low production and seasonal variation, unbalanced demand and supply, lack of storage and proper management of the fish product, poor community awareness on fish consumption, expensive fishing materials, lack of technology, high prices of fish, limited market centers are the major factors that affect fish consumption of the community. Since the sector plays an important role for food and nutrition security, diet diversity, job opportunity and income generation, every sector and stakeholders are expected to support fishing related ongoing initiatives of the local government''.

According to the Hawassa City Administration Agriculture Bureau Fish Resources Officer, ''…. The community around the lake obtains fresh fish from Lake Hawassa. Access to fresh fish for the population was possible. However, the access is usually constrained by high price of fish and seasonal scarcity of fish specifically during the wet season…''. The officer added that there are some of the activities done by the City Administration Agriculture Bureau Fish sector. These includes providing continues training (3-4 times per a year) for the members of fisheries unions. Through communication with different nongovernmental organizations and stakeholders we are providing skill and technical supports.

4. Discussions

The aim of this study was to determine and compare fish consumption, dietary diversity and nutritional status of reproductive age women from fishing and non-fishing households Hawassa, Southern Ethiopia. The study result reveals that fish was consumed by 266 (66.3%) of reproductive age women from fishing households while it is only 93 (23.0%) from non fishing households. This indicates that individuals or households who participate in fishing consume more fish than those who does not.

This result is consistent with the study conducted on analyzing links between fishing livelihoods and food security around Lake Victoria which showed that fishing households ate more fish and had higher food security than non-fishing households around Lake Victoria, Kenya [12] and another study Around Lake Victoria, suggested fishing households have higher mean incomes [13]. Similarly, a study done in Malawi showed frequency of fresh fish and dried fish consumption is higher in households with fish ponds [14]. Another study done by Stepan [15] in Nepal also found significantly greater percentage of reproductive age women from fish producing households consumed more fish than those who are not fish producers.

The current study, again reveals the overall mean (±SD) minimum dietary diversity of the respondents from fishing households was 5 (±2.536) while it is 4 (±2.582) in non fishing households. Significant difference ($p<0.05$) was

noted between the two groups. Hence this shows fishing activities might contributed to the dietary diversity of individuals and households level. Other studies confirmed that producing fish and participating in fishing activities could increase dietary diversity of women. A study by Kawarazuka and her colleagues [14] reported that fish can be sold for cash to purchase sufficient staple foods, and can also be used for consumption or purchase of non-staple foods which directly improve dietary intake beyond energy intake. In addition, a study done in Kenya [15] documented that overall diet diversity increased for all farmers who started and dependent on fishing.

In the current study, it is indicated that there was no difference in nutritional status categories of reproductive age women in the study area (Pearson Chi square (x^2) = 0.571, p=0.752). Similarly, to our knowledge different literatures related with fishery and aquaculture activities didn't document significant impacts of fish consumption on long term nutritional status indicators in Ethiopia. Another study that was done to identify association of household pond fish production with dietary diversity and nutritional status in the southern Ethiopia also reported that there was no statistically significant association between fish intake and nutritional status indicators [17]. The current study is also supported by the study done in Malawi and Nepal [15,18]. The reason for no association as stated by other studies is that since nutritional status is affected by any factors, it is difficult to see significant nutritional outcomes focusing on fishery and aquaculture alone without addressing other factors which determine nutritional status [14].

5. Conclusions

In general fishery activities in the study area have significantly contributed to fish consumption and dietary diversity among the reproductive age women. However, there is more work to be done in the area for maximal food and nutrition security outcome from the fishing sector. As it is depicted from the key informant interviews, the issues which need further attention are related with the sustainability of fishing due to over exploitations and improper managements. The key informants also agreed that demand and supply side, lack of storage technologies, high prices of fish, limited market centres, and seasonal scarcity of fish specifically during the wet season are the major factors that affect fish consumption of the community including women. Thus, we recommend more research and interventions to promote proper fishing management, better fishing technologies and awareness creation education for local population about benefits of fish consumption especially among those who are not engaged in fishing activity.

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