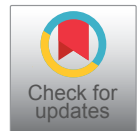# Household Food Insecurity and Nutritional Status of Under-Five Children and Women of Reproductive Age from Pond Fish Farming Households in Sidama Zone, Southern Ethiopia: Community Based Cross-Sectional Study

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Abstract

Food insecurity is defined as situation that exists when all people, at all times, have no physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Fish farming plays an important role in food security and nutrition by providing food and income. The aim of this study was to assess household food insecurity status and nutritional status of under-five children and women of reproductive age from pond fish farming households in Sidama Zone, Southern Ethiopia. The entire under five children (n = 39) and reproductive age women's (n = 56) and households (n = 81) who produce fish using pond within the targeted; Woreda's of Sidama zone were purposively selected based on the availability of pond fish. The data of household food insecurity status, anthropometric measurements, focus group discussion and key informant interviews were conducted. Epi info version 7 was used for data entry. SPSS version 20 was used for data analysis. Food insecurity experience scale was used to describe the household's food insecurity status. Anthropometric indices HAZ, WAZ and WHZ were calculated by using WHO Anthro 2007. The main findings of the discussion summarized manually by narrating techniques. The finding shows that more than half of (64%) the study households were from food secured. Regarding the nutritional status (17.9%), (12.8%) and (5.2%) children were stunted, wasted and underweight respectively and 98.2% and 1.8% of reproductive age women BMI were within the normal range (BMI 18.5 - 24.9 kg/m²) and below the normal range (<18.5 kg/m²) respectively. Pond Fish farming has a contribution to household food security, Child and woman nutritional status through generating additional income which increases their purchasing power for other food groups and direct consumption of fish from their own pond.

Keywords

Nutritional status, Pond fish farming, Food Insecurity

Introduction

The production of fish and fisheries worldwide is approximately 154 million tons per year, and its consumption is 18.5 kg per year [1]. Annual fish production in Ethiopia has ranged between 13 and 29 MT (million tons) per year over the last decade. The country in the lower end of fish consumers among the African countries (where the average is 9.4 kg). According to FAO estimates, fish consumption in Ethiopia for the year 2009 was estimated at 0.2 kg. Food insecurity (is) a "situation that exists when all people, at all times, have no physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life [2,3]. According to latest FAO estimates, in 2017, close to 10% of the world population »was exposed to severe food insecurity. Food insecurity is a critical challenge in Ethiopia, which is Africa's second populous country after Nigeria [4]. Under nutrition still persists in

the vast majority of the world's poorest countries, affecting in particular women and children, Ethiopia ranked first in having the highest number of people in state of undernourishment which is 32.1 million people in 2014 [5]. Fish plays an important role for food security and nutrition by providing food and income [6]. Aquaculture interventions can contribute to improving nutritional status of households [7].

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The effect can be direct, through within-household consumption and dietary improvement, but also indirect, through sale of fish produce and purchase of other food items (often at lower unit value than the sold fish) [8]. In Southern Ethiopia, since 2003 E.C. farmers had constructed ponds and started fishing production in their own farms. Right now more than 200 farmers in the Sidama zone of southern Ethiopia were producing fish using constructed ponds on their farms. This was increasing the availability and consumption of the fish by the households. The justification of assessing the household food insecurity and nutritional status of under-five children and women of reproductive age in a pond fish farming household were important for further action to increase the fish production, consumption and to decrease household food insecurity, to improve nutritional status of child and women in pond fish farming household. However, in Sidama Zone less justification was collected about pond fish farming activities decrease the household food insecurity, to improve nutritional status of child and women in pond fish farming household.

Materials and Methods

Description of the study area

This study was conducted at two selected woreda's of Sidama Zone Southern Ethiopia. The study woreda's were based on the availability of pond fish farming practices. These woreda's were Dara and Wensho from Sidama Zone.

Dara is one of the woredas of the Sidama Zone. Dara was bordered on the South by the Gedio Zone and on either side of it of the Oromia Region, on the Northwest by Chuko Town, on the North by Aleta Wendo Town, and on the northeast by Hula Town. Dara include Kebado and Teferi Kela Towns. Based on the 2007 Census conducted by the (CSA, 2007), the woreda has a total population of 155,265 of whom 76,475 are men and 78,790 are women; 10,660 or 6.87% of its population are urban dwellers.

In this woreda, currently there are 13 kebeles with more than 51 Pond fish farming and among these 38 of them started fish production. These kebeles are: Alemkoricha, Teramaj, Gelewacho, Satangala, Badessa, Orate, Shilcho, Shoicho, Setamo, Buna Tewaba, Loya, *Kumato and Safa.* Wensho is one of the woredas of the Sidama Zone located in the Great Rift Valley; Wensho was bordered on the Southwest by Aleta Wendo Town, on the West by Dale woreda, on the North by Shebedino woreda, on the Northeast by Gorche woreda, and on the Southeast by Bursa woreda. Wensho was separated from Dale woreda. Based on the 2007 Census conducted by the CSA, this woreda has a total population of 89,662 of whom 45,562 are men and 44,100 are women; 2,039 or 2.27% of its population are urban dwellers. In this woreda, currently there are five kebeles with more than 30 pond fish farming HHs and among these 15 of them started fish production. These kebeles are: Hunkute, Fero, Bokaso, Alekena and Kinante.

Instruments

Semi-structured questionnaires were designed about household food insecurity status, nutritional status of under five children and reproductive age women's. Fish consumption frequency was measured using a two-point category scale and coded in descending order as follows: (1) More than once a year, (2) once a year irrespective of WHO. The result was categorized into two patterns of fish consumption: Fish Eaters (the respondents that consumed fish at once or more than once servings per a year) and Non-Fish Eaters (the respondents that not consumed fish) this was also irrespective of WHO.

In addition to the quantitative data collection focused group discussion and key informant interviews were used to gather the community fish consumption practices, barriers and facilitator's of fish consumption and overall information about fish in the study area respectively. Anthropometric assessments, height and weight were used to assess the nutritional status of under five children and reproductive age women's. Weight was measured using an electronic scale (Seca 770) with worn a light cloth of known weight during the measurement. The instrument was checked and adjusted to zero for each measurement. Sliding board to the nearest 0.1cm gradation was used in measuring recumbent length for less than 2-years-old and height boards (Shorr measuring board) without shoes to the nearest 0.1 cm gradation was used in measuring standing height for greater than 2-years-old.

Quantitative data collection

In this study, data were obtained by face-to-face interviews for gathering socio-demographic characteristics, household food insecurity information's by data collectors with the supervision of the supervisors and anthropometric measurements done by the researchers with supervisors. So as to avoid observer variation using calibrated equipment and standardized techniques.

Qualitative data collection

A focused group discussion (with men and women who had pond fish) with 8 minimum and 12 maximum participants with 2 group from fish farming and key informant interviews (agricultural workers**)** were done by the researchers with supervisors who were native speakers of the local language (Sidamigna) and Amharic.

Data management and analysis

The data was fed to Epi info version 7 computer software programs to make them ready for analysis by SPSS version 20 computer software program. House hold food insecurity experience scale was used to describe the household's food insecurity status. A total of 53 women of reproductive age were interviewed for the barriers and opportunities of fish consumption.

The focus group discussions were first transcribed in Sidamigna and Amharic by the two supervisors who can speak the local language and Amharic and translated into English by the principal investigator. The transcription and the notes taken during the discussions were used to identify main concepts. The main findings of the discussion, which was different from the survey results, were selected and summarized manually by narrating techniques. Anthropometric indices HAZ, WAZ,

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WHZ were calculated by using the WHO 2006 multi center growth reference data using the computer program WHO Anthro 2007. Being stunted, underweight, and wasted were defined by Z-scores for HAZ, WAZ, and WHZ less than -2 standard deviations below median values was used to calculate the nutritional status of under five children and BMI was used to calculate the nutritional status of reproductive age women's. To gather the community's belief and fish consumption practices, fish consumption barriers and facilitators and benefits of fish farming with men and women who had pond fish farming.

Ethical considerations

Approval of the research was given by Hawassa University Institutional Review. The nature of the study was fully explained to the participants to obtain their oral consent. Data obtained from each study participant was kept confidential. No discrimination was made if the participant wanted to withdraw from participating in the research.

Results

Socio-demographic characteristics of the HHs

Nearly all (98.8%) of the head of the households were men (father) and 91.4% of the age of both (men and women) head were between 28 and 50 years old. The majority (64.2%) of the household have 4-5 family size. Main occupations (93.8%) of the head of households were farmer. All (100%) of the head of households were married. More than three fourth (88%) of the head of households were protestant. The majority (91.4%) of the head of households were from the Sidama ethnic group. More than half (64.2%) of the educational status of the head of the households were primary schools and (2.5%) were illiterate (Table 1).

Table 1: Socio-demographic characteristics of the HHs in the study area 2019.

Variables		Frequency	Percent
Age	28-50 yrs	74	91.4
	> 50 yrs	7	8.6
	Total	81	100.0
Family Size	1-3	13	16.0
	4-5	52	64.2
	6-7	16	19.8
	Total	81	100.0
Occupational Status	Farmer	76	93.8
	GO/NGO	3	3.7
	Merchant	2	2.5
	Total	81	100.0
Head of the household	Mother	1	1.2
	Father	80	98.8
	Total	81	100.0
Religion	Orthodox	8	9.9
	Muslim	1	1.2
	Catholic	1	1.2
	Protestant	71	87.7
	Total	81	100.0
Ethnicity	Sidama	74	91.4
	Oromo	4	4.9
	Others (Wolayita, Amhara...)	3	3.7
	Total	81	100.0
Educational status	Not educated	2	2.5
	Primary school	52	64.2
	Secondary school	17	21.0
	Certificate (training)	1	1.2
	Diploma/Degree	9	11.1
	Total	81	100.0

Categorical data are presented as a proportion (frequency and percent).

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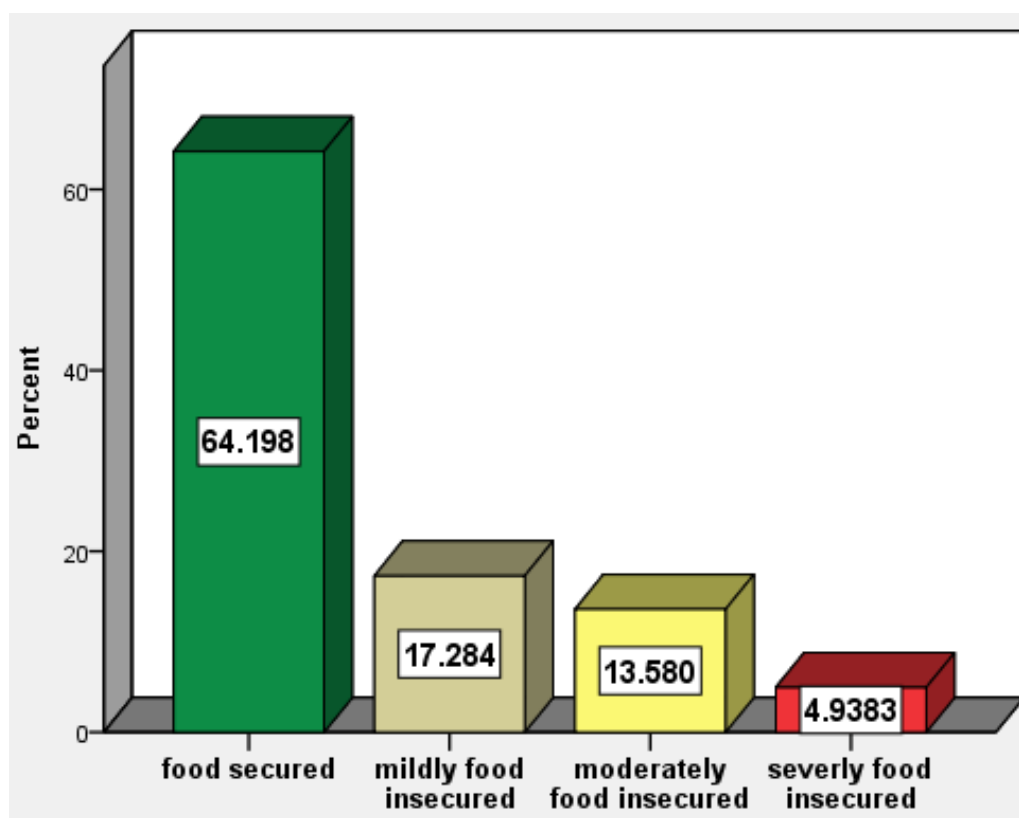
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Figure 1: Food security status of the household in the study area 2019.

Table 2: Women's perception on pond fish farming to HHS food security 2019.

Variables		Frequency	Percent
Women's perception	Agreed	75	92.6
	Strongly agreed	1	1.2
	Disagreed	5	6.2
	Total	81	100.0

Household food insecurity status in the study Area

The finding shows that, more than half (64.2%) of the study households were food secured and the rest 35.8% were food insecured. From the food insecured households, 17.3%, 13.6% and 4.9% were mildly, moderately and severely food insecure respectively based on Food Insecurity Experience Scale (FIES) (Figure 1).

Women's perception on pond fish farming to HHFS

Almost (92.6%) of woman's perception were agreed on the contribution of pond fish farming to household food security (Table 2).

Barriers and facilitators to fish consumption among reproductive age women's

Fish consumption among reproductive age women's, various factors make it "very difficult" to consume fish once and more than once per a year were, "Fish Availability, Self Efficacy (not good at determining the quality of fish) and Fish eating habits" as vocalized by reproductive age women's (Table 3).

Nutritional status of under five children

Anthropometric measurement of children, the Mean ± SD of W/H, H/A and W/A were 1.2 ± 0.4, 1.1 ± 0.3, and 1.1 ± 0.2 respectively. Regarding their nutritional status, 17.9% severely stunted, 41% were normal (Z-score -1 SD to +1 SD) and 41.1% were over-nourished for their/H/A. 12.8% were wasted and 87.2% were normal (Z-score -1 SD to +1 SD) for their W/H. Similarly, 5.2% were underweight and 94.8% were normal (Z-score -1 SD to +1 SD) for their W/A (Table 4).

Nutritional status of reproductive age women's in the study area

Anthropometric measurements of reproductive age women's, 55.6% of their weight were between 55.1-60 kg. Whereas 69.9% of their height were between 145-160 cm. Regarding their nutritional status, 98.2% and 1.8% of reproductive

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age women's BMI were within the normal BMI range (BMI 18.5 - 24.9 kg/m²) and below the normal BMI (<18.5 kg/m²) respectively (Table 5).

Focused group discussion and key informant interview results

They told the following benefits for the household. Since they started pond fish farming, they harvest fish one to two times a year. By selling fish, they generate additional income and by using the water from the ponds they started to grow different vegetables. These increased purchasing of other food groups and growing different vegetables helps the households for consumption of different food groups besides

Table 3: Barriers and facilitators to fish consumption among WRA in the study area (n = 53).

Variables		Frequency	Percent
Fish availability	YES	31	58.5
	NO	22	41.5
	Total	53	100.0
Price perception	YES	21	39.6
	NO	32	60.4
	Total	53	100.0
Self efficacy (not good at determining the quality of fish)	YES	29	54.7
	NO	24	45.3
	Total	53	100.0
Convenience perception	YES	25	47.2
	NO	28	52.8
	Total	53	100.0
Fish eating habits	YES	41	77.4
	NO	12	22.6
	Total	53	100.0
Health beliefs	YES	25	47.2
	NO	28	52.8
	Total	53	100.0
Sensory perception	YES	16	30.2
	NO	37	69.8
	Total	53	100.0

Categorical data are presented as a proportion (frequency and percent).

direct fish consumption which indirectly contributes to improve household food security and nutritional status.

Discussion

The aim of this study was to assess the household food insecurity status and child and women nutritional status in Sidama Zone, Southern, Ethiopia. The finding shows that more than half (64.2%) of the study households were food secured and the rest (35.8%) were food insecured. From the food insecured households, (17.3%), (13.6%) and (4.9%) were mildly, moderately and severely food insecure respectively. This finding is supported by study done in western Kenya which state, most household heads reported that fish farming used as a way of producing high quality food, either for their families or for the market, and as a way of earning extra income, these enabled many fish farmers to reduce the number of months in which they faced serious food shortages [8] and study also done in Nigeria, fish contributes significantly to urban food security by increasing purchasing power at individual or household level., it was gathered that the main reason for most of the farmers' involvement in raising fish is to ensure food security at household level [9]. Similarly, study done in Cambodia Small-scale pond fish farming holds considerable potential to improve nutrition, enhance household food security and supplement household incomes through the sale of fish [10]. Almost (92.6%) of woman's perception were agreed

Table 5: Anthropometric measurement and nutritional status of WRA in the study area 2019.

Variables		Frequency	Percent
Weight	45 – 50 kg	11	19.6
	50.1 – 55 kg	9	16.1
	55.1 – 60 kg	30	53.6
	>60 kg	6	10.7
	Total	56	100.0
Height	145 – 160 cm	39	69.6
	161 – 175 cm	17	30.4
	Total	56	100.0
BMI	<18.5 kg/m²	1	1.8
	18.5-25 kg/m²	55	98.2
	Total	56	100.0

Categorical data are presented as proportion (frequency and percent).

Table 4: Nutritional status of under five children in the study area 2019.

Variables	Z-Score									
	< -3 SD		< -2 SD		-1 SD to +1 SD		>+1 SD		> +2	
	N	%	N	%	N	%	N	%	N	%
L/ht-for-age	2	5.1	5	12.8	16	41	12	30.8	4	10.3
Wt-for-L/ht	2	5.1	3	7.7	34	87.2				
Weight-for-age	1	2.6	1	2.6	37	94.8				

Categorical data are presented as a proportion (z-score and percent).

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on the contribution of pond fish farming to household food securit While conducting the surveys on barrier and facilitator to fish consumption, the most common factors were Fish Availability, Self Efficacy (not good at determining the quality of fish) and Fish eating habits as vocalized by WRA.

The result of current finding revealed that, the anthropometric measurement of children, the mean ± SD of H/A, W/H and W/A were 1.2 ± 0.4 SD, 1.1 ± 0.3 SD, and 1.1 ± 0.2 SD respectively. Anthropometric measurement of children, the Mean ± SD of W/H, H/A and W/A were 1.2 ± 0.4, 1.1 ± 0.3, and 1.1 ± 0.2 respectively. Regarding their nutritional status, 17.9% stunted, 41% were normal (Z-score -1 SD to +1 SD) and 41.1% were over-nourished for their L/Ht/Age. 12.8% were wasted and 87.2% were normal (Z-score -1 SD to +1 SD) for their W/H. Similarly, 5.2% were underweight and 94.8% were normal (Z-score -1 SD to +1 SD) for their W/A Similarly, the study done in Salima, Malawi supported that the nutritional status of under- five children in the fishing community had no case of severe malnutrition and 10% of the children had moderate malnutrition whilst 90% of the children had a normal nutrition status [11].

Anthropometric measurement of reproductive age women's, the minimum and maximum of weight, height, and BMI of women's were 46 kg and 64 kg, 154 cm and 164 cm and 18.20 kg/m^2 and 24.4 kg/m^2 respectively. Regarding their nutritional status, 98.2% and 1.8% of reproductive age women's BMI were within the normal BMI range (BMI 18.5 - 24.9 kg/m^2) and below the normal BMI (<18.5 kg/m^2) respectively. The present finding is supported by the study done in Zambia, More than half of the mothers (59.4%, n = 423) were within the normal BMI range (BMI 18.5-25 kg/m^2) [12].

Conclusion

The finding shows that, while household pond fish as a subsistence product have a direct contribution to household food security, child and women nutritional outcome, the generation of incomes derived from fish selling have more an indirect contribution to household food security, child and women nutritional outcome. With regards to barriers and facilitators for fish consumption among womens of reproductive age (WRA), the current finding clearly revealed that, Fish availability, Self- efficacy (not good at determining the quality of fish) and Fish eating habits were common barriers and facilitators from womens of reproductive age (WRA) and events like, fasting, inputs access and knowledge were common barriers and facilitators from focused group discussion (FGD) in the study area.

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Author's Contributions

Yohannes Kifle is principal investigator, designed the study, took part in the data collection process, entered and analysed and wrote the first draft of this manuscript. Alemneh Kabeta & Derese Tamiru oversaw the whole data collection processes, entered and analysed data and wrote the manuscript. Three of the authors read and approved the final manuscript.

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Computing Interests

All authors declare that they have no competing interests.

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