Research Article

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A Comparative Study on Nutritional States and Anemia among Women at Reproductive Age in Pastoralist and Agro-Pastoral Setting of Ethiopian Somali Region

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Abstract

Background: In Ethiopia, anemia prevalence among women age 15-49 increased to 24% in 2016 from 17% in 2011. Where the highest burden has been observed in Somali region, 60% of the women were anemic in 2016. This study was aimed at assessing the prevalence and associated factors of anemia among women of reproductive Agein Fafan zone, Somali regional state of Ethiopia.

Methods: The community based cross sectional study using simple random sampling was conducted in Nov 2014-Jun 2015. Interview using pretested structured questionnaire as well as measurement of hemoglobin level and nutritional characteristics were used. Binary logistic regression were used to determine associated factors of anemia.

Results: Prevalence of anemia is 65.2% (95% CI: 60.35, 69.91) out of 400 participants included in the study, where 33.2%, 28.25% and 3.75% were mildly, moderately and severely anemic respectively. Pastoral community (AOR=19.03, 95% CI: 6.59, 54.95), normal body weight (AOR=0.21, 95% CI: 0.10, 0.41) and using any kind of toilet (AOR=0.39, 95% CI: 0.18, 0.82) were significantly associated with anemia status at 5% level of significance.

Conclusion: Anemia is a major public health problem in the study area. More efforts should be applied on pastoralist in order to reduce the burden of anemia.

Keywords: Anemia; Prevalence; Associated factors; Women; Pastoralist; Agro-pastoralist; Somali; Ethiopia

Introduction

Anemia is a condition characterized by a low level of hemoglobin in the blood. It is one of the most frequently observed nutritional deficiency diseases in the world today. Its adverse health consequences that affect people with varied degrees of affluence and from all age-groups, particularly women of childbearing age and children. Sub Saharan Africa is home to some of the most nutritionally insecure people in the world. Anemia remains a major public-health problem, affecting about a quarter of the world's population. In Ethiopia, even though tremendous efforts has been applied to reduce the burden of anemia, anemia prevalence among women age 15-49 increased to 24% in 2016 from 17% in 2011. Where the highest burden has been observed in Somali region, 60% of the women were anemic in 2016. Iron deficiency remains the major cause of anemia and is the most widespread single nutrient deficiency in the world. About two billion people are iron-deficient, with half of them manifesting clinical signs of anemia. It is estimated that 75% of anemia is related to iron deficiency, followed by folate and vitamin B12 deficiencies [1].

Besides, anemia can result from other nutritional and non-nutritional factors, including hemorrhage, infection, chronic disease states, or drug toxicity, certain vitamins, copper and protein. Poor infrastructure and limited resources compounded with conflict, HIV, and poor access to health service are factors that contribute to the staggering levels of under nutrition and food insecurity on the continent. Under nutrition could be due to low dietary intakes inequitable distribution of food within the household improper food storage and preparation dietary diversity, infectious diseases, and care particularly for women also contribute significantly to their poor nutritional status. It may also be affected by lifestyle (pastoralist *vs.* agro-pastoralist) of the women in the study area. That is, the pastoralism is a subsistence system for producing meat, milk, and other animal products from domestic animals such as goats, sheep, cattle and camels. Pastoralist diets generally change seasonally and inter-annually with changing climatic and socioeconomic circumstances. Agro-pastoralism is a set of practices that combine pastoral livelihoods with production of diversified crops like millet, sorghum, maize, vegetables, fruits and pulses (annual legumes). Identifying the magnitude of anemia and its determinants in high risk groups, such as women of reproductive age, would be essential for evidence based intervention modalities, particularly in developing countries, such as Ethiopia, where the social conditions pose serious challenges to women [2].

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Therefore, this study was aimed at assessing the prevalence and associated factors of anemia among women of reproductive age in pastoral and agro-pastoral communities of Fafan zone in Somali regional state of Ethiopia. This study would help us to assess the severity levels of anemia, nutritional status, dietary diversity, food security and associated factors of anemia among women of reproductive age in pastoral and agro pastoral communities.

Materials and Methods

Study setting

Fafan (Somali: Faafan) is one of the nine zones of the Somali regional state of Ethiopia. Based on the 2007 Census, the Zone has a total population of 967, 652, of whom 526,398 are men and 441,254 women. While 21.0% were urban inhabitants and 11.6% were pastoralists. Two largest ethnic groups reported in Jigjiga were the Somalis (95.6%) and Amhara (1.83%); all other ethnic groups made up 2.57%. Somali language is spoken by nearly all individuals and majority of the individuals are Muslims in the zone. There are three settlements in the zone for refugees from Somalia, with 40,060 registered individuals [3].

According to a May 24, 2004 World Bank memorandum, 7% of the inhabitants of Fafan have access to electricity, this zone has a road density of 30.5 kilometers per 1000 square kilometers, the average rural household has 1.3 hectares of land and the equivalent of 1.0 head of livestock. About twenty eight percent, 28.2% of the population is in non-farm related jobs, compared to the national average of 25% and a regional average of 28%. Twenty one percent, 21% of all eligible children are enrolled in primary school, and 9% in secondary schools. Nearly three fourth, 74% of the zone is exposed to malaria, and none to Tsetse fly. The memorandum gave this zone a drought risk rating of 386. In 2006, the Fafan zone was affected by deforestation due to charcoal production [4].

Study design and population

The community based cross sectional study was conducted in Nov 2014-Jun 2015 in Fafan zone, Somali regional state of Ethiopia. The study population was women of reproductive age living in pastoral and agro-pastoral areas of Fafan zone, Somali regional state. Women of 15-45 years of age in the study setting were included in this study. Pregnant women were not included, because pregnancy is one factor affecting hemoglobin concentration and nutritional status.

Sample size and sampling technique

A sample size of 625 was determined using single population proportion formula with prevalence of anemia among women in Somali region is 44% (based on previous study of DHS, 2011), a confidence level of 95%, margin of error 5%, 1.5 design effect and 10% non-responses. Among six woredas of Fafan zone, two woredas of pastoral and agro-pastoral were selected purposively. The kebeles and the study participants were selected randomly. Using proportional allocation 429 participants from Harshin and 147 participants from Gursumworeda were interviewed (Figure 1) [5].

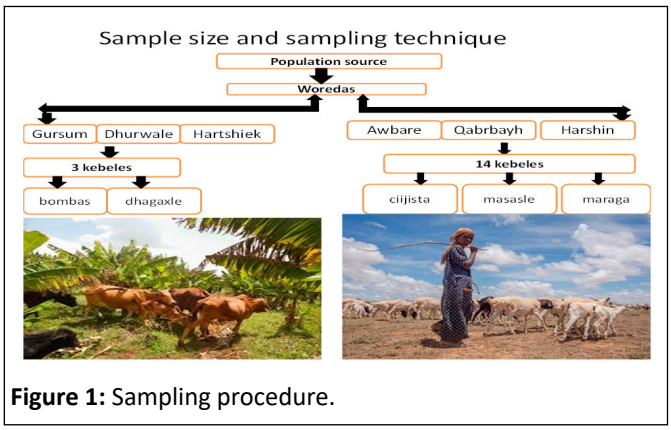

Figure 1: Sampling procedure.

Data collection and procedures

The structured interview schedule consisted of questionnaires including the socio-demographic and economic characteristics, 24 hours recall on food diversity, two weeks recall on illness, household food insecurity, hemoglobin level measurements, and other nutrition related characteristics. The pretested questionnaire prepared in English and translated to local language Somali was used. Data were collected by the researcher and trained data collectors face to face at the women's home [6].

Using guidelines for measuring household and individual dietary diversity, sixteen food groups were considered to assess dietary diversity of individuals. The 24 hour recall technique attempts to estimate food intakes of the individuals over the period of time. Additionally, data were collected using items in the Household Food Insecurity Access Scale (HFIAS) to compute four levels of food insecurity developed by a project of the United States Agency for International Development (USAID). HFIAS will provide information on food availability and consumption of the women.

Measurement and instruments

Hemoglobin and anthropometric (weight, height and mid upper arm circumference) measures were measured by trained nurses in this study. The hemoglobin level was measured using digital hemocue (201) photometer.

Hemoglobin was analyzed using finger prick by the professional nurses for determining hemoglobin status of the women. All the necessary safety measures were taken during the activity. Mid Upper Arm Circumference (MUAC) was measured to the nearest 0.1 cm using a plastic measuring tape. Measurement was taken at the mid-point of the upper arm, between the acromion process and the tip of the olecranon [7,8].

Measurements of height (cm) and weight (kg) useful to calculate body mass index, were taken twice on the same day as the interviews using weighting scale with an attached height scale model. The average of two measurements on each of weights and heights were recorded on the record sheet. The

accuracy of the weighing scale was checked daily against known weights.

The scale was placed on a flat, hard surface that allowed participants to stand securely without rocking and tipping. The participant was weighted with light clothes and without shoes by standingat the middle of the scale's platform without touching anything and with the weight equally distributed on both feet. Similarly, height of the participants were measured by standing without shoes, with heels together, arms to the sides, legs straight, shoulders relaxed and head in the Frankfort horizontal plane (looking straight ahead). Just before the measurement was taken the participants was asked to inhale deeply, hold the breath and maintain an erect posture to compress the hair [9].

Data management and statistical analysis

Data was entered into Epi-info and exported to the software Stata 14.0 for data management and further analysis. Frequencies and percentages were used to describe categorical data of women. Means, standard deviations, medians and interquartile ranges were used as appropriate in describing the continuous type variables. Binary logistic regression was used to determine associated factors of anemia. Odds ratio with its respective 95% confidence interval were used to measure strength of association after Hosmer_Lemeshow goodness of fit were checked.

Results and Discussion

Socio-demographic and housing characteristics

All participants were Muslim in religion and Somali in ethnicity. With regard to age, the median value is 23 years (IQR: 20, 25) with the majority (50.25%) residing in the age group of 20-24 years (Table 1).

Table 1: Socio-demographic and housing characteristic of study participants.

Characteristics	Frequency	Percent
Community		
Agro-pastoralists	147	36.8
Pastoralists	253	63.2
Age (in years)		
15-19	66	16.5
20-24	201	50.25
25-45	133	33.25
Educational level of women		
Uneducated	292	73
Educated	108	27
Educational level of HH head		
Uneducated	284	71
Educated	116	29
Water source		
Pipe water	108	27
Tube well/borehole	31	7.8
Dug well	259	64.8
Rain water	1	0.2
Tank truck	1	0.2

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Toilet facility type		
Open field	213	53.2
Composing latrine	101	25.2
Hanging toilet	81	20.2
Bucket toilet/pit latrines/flush toilet	5	1.2
Food security		
Secure	80	20
Insecure	320	80

Nutrition and illness related characteristics

One hundred thirty (32.5%) of the study participants had a BMI less than 18.5 kg/m^2 (chronically energy deficient); whereas only eight had a BMI greater than or equal to 25 kg/m^2 (over weight) (Table 2). With regard to history of illness in the last two weeks, there were 2.5% of the participants reported malaria, 3.5% diarrhea, 9.5% fever and 11.2% cough. Nearly half, 46.75% of the participants have only two meals per day whereas a round one fifth, 21.5% of the participants have only one meal per day. Moreover, nearly two third (66.2%) of the participants have no snacks between meals.

Table 2: Nutrition and illness related characteristics of the study participants.

Characteristics	Frequency	Percent
BMI		
Under weight	130	32.5
Normal	262	65.5
Over weight	8	2
Meals per day		
One	86	21.5
Two	187	46.75
Three	127	31.75
Have snacks between meals		
Yes	135	33.75
No	265	66.25
MUAC (cm)		
≥ 23	314	78.5
21-23	38	9.5
<21	48	12
Cough		

Yes	45	11.2
No	355	88.8
Diarrhea		
Yes	14	3.5
No	386	96.5
Fever		
Yes	38	9.5
No	362	90.5
Malaria		
Yes	10	2.5
No	390	97.5

Dietary intakes of the study participants

Out of 16 food groups, the number of food groups consumed by the study participants ranged 4 to 9 with the median of 5 (IQR: 5, 9). Besides, largest percentage observed that is around half, 54.75% consumed 5 food groups followed by nearly one fourth, 25.25% consumed nine food groups. In general, nearly three fourth of the participants consumed at most eight (half) of the total food groups [10].

Almost all of the participants consumed oil and fat (oil); cereal (sorghum, wheat, maize, teff, barley, and rice); spice, condiment and beverage (salt/iodized salt) and sweets (sugar) based foods. Majority of the study participants 91.5% consumed other vegetables (tomato, onion, garlic, potato whereas small percentage, 33.0% consumed dark green leafy vegetables based foods. Nearly equal percent, 36.0% and 36.25% of participants consumed vitamin A rich fruits and other fruits respectively. Smallest observed percentage, 28.0% was corresponding to consumption of egg. No report was obtained with regard to consumption of white roots and tuber; vitamin A rich vegetable and tubers; organ meat; flesh meat; fish and sea food; legumes, nuts and seeds; and milk and milk products (Table 3).

Table 3: Dietary diversity of foods eaten within 24 hours.

Food group	Frequency	Percent
Cereal (sorghum, wheat, maize, teff, barley, rice)		
Yes	400	100
No	0	0
Dark green leafy vegetables		
Yes	132	33
No	268	67
Other vegetables (tomato, onion, garlic, potato)		
Yes	366	91.5
No	34	8.5
Vitamin A rich fruits (mango, papaya)		
Yes	144	36

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No	256	64
Other fruits (orange, avocado, guava, banana)		
Yes	145	36.25
No	255	63.75
Eggs		
Yes	112	28
No	288	72
Oil and fat (oil)		
Yes	400	100
No	0	0
Sweets (sugar)		
Yes	399	99.75
No	1	0.25
Spice, condiment and beverage (salt/iodized salt)		
Yes	399	99.75
No	1	0.25

Prevalence of anemia

Prevalence of anemia is 65.2% (95% CI: 60.35, 69.91) where 33.2%, 28.25% and 3.75% were mildly, moderately and severely anemic respectively (Figure 2). Variation of prevalence of anemia by some characteristics was observed. Of these type of community (pastoral *vs.* agro-pastoral), educational status of the women, type of water supply source, household food insecurity, body mass index and type of toilet facility were some (Table 4).

The prevalence of anemia is very much high, 89.3% (5.9% severe, 42.7% moderate and 40.7% mild) in pastoralist community as compared to 23.8% (0.0% severe, 3.4% moderate and 20.4% mild) agro-pastoralist. Furthermore, large percent, 71.9% (4.4% severe, 31.9% moderate and 35.6% mild) of women from food insecure household were anemic relative to 38.75% (1.25% severe, 13.75% moderate and 23.75% mild) of women from food secure.

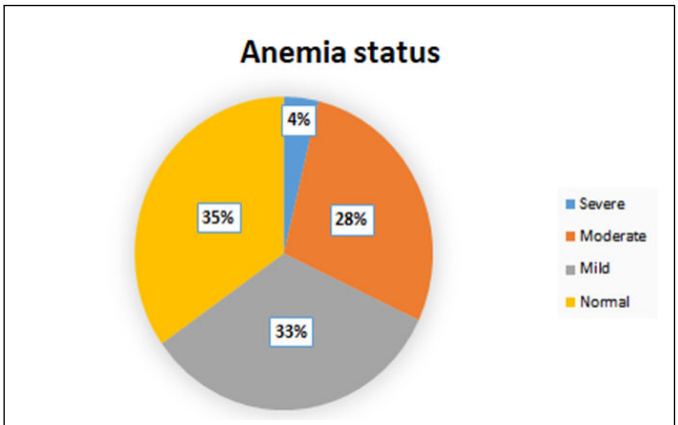

Figure 2: Prevalence of anemia.

Table 4: Prevalence of anemia by selected characteristics among women in pastoralist and agro-pastoralists.

Characteristics	Anemic (%)			Non-anemic (%)
	Severe	Moderate	Mild	
Age of women				

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15-19	3	31.8	33.3	31.8
20-24	4.5	28.4	35.3	31.8
25-45	3	26.3	30.1	40.6
Educational status of the woman				
Uneducated	4.8	35.3	36.6	23.3
Educated	0.9	9.3	24.1	65.7
Piped water supply source				
Yes	0	3.7	22.2	74.1
No[a]	5.1	37.3	37.3	20.2
Food security				
Secure	1.25	13.75	23.75	61.25
Insecure	4.4	31.9	35.6	28.1
Community				
Agro-pastoral	0	3.4	20.4	76.2
Pastoral	5.9	42.7	40.7	10.7
BMI				
Over/under weight	7.25	47.8	30.4	14.5
Normal	1.9	17.9	34.7	45.4
Open field toilet type				
Yes	5.6	40.4	41.8	12.2
No[b]	1.6	14.4	23.5	60.4
Illness[*]				
Yes	1.3	12	33.3	53.3
No	4.3	32	33.2	30.5

Note: [a]Tubewell/borehole, dug well, rain water or tank truck; [b]flush toilet, pit latrine, composing latrine, bucket toilet or hanging toilet; [*]Diarrhea, cough, fever or malaria in the last 14 days

Associated factors of anemia

All variables considered in simple binary logistic regression yielded p-values less than 0.25. As a result, all others were considered in the final model multivariable binary logistic regression. The final model is adequate fit of the data as shown in the figure below (Figure 3) as well as using Hosmer_Lemeshow goodness of fit test (P-value=0.4541). Community type, BMI and toilet type were significantly associated with anemia status at 5% level of significance from the final model variables (Figure 3).

The likelihood of being anemic for a woman from pastoral community is 19.03 (AOR=19.03, 95% CI: 6.59, 54.95) times that of agro-pastoralists (Table 5). With respect to BMI, those who are with normal body weight are 79% (AOR=0.21, 95% CI: 0.10, 0.41) times less likely as compared to those with either over weight or underweight. Besides, those using any kind of toilet including flush toilet, pit latrine, composing latrine, bucket toilet

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or hanging toilet were 61% (AOR=0.39, 95% CI: 0.18, 0.82) times less likely as compared to those using open field.

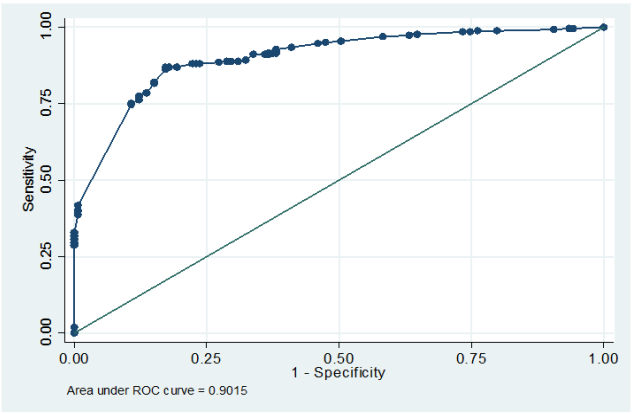

Figure 3: Model adequacy.

Table 5: Factors associated with anemia.

Variables	COR (95% CI)	AOR (95% CI)
Piped water supply source		
Yes	0.09 (0.05, 0.15)	1.50 (0.56, 3.98)
No[a]	1	1
Food security		
Secured	1	1
Unsecured	4.04 (2.42, 6.74)	1.29 (0.56, 2.94)
Education of women		
Un educated	1	1
educated	0.16 (0.10, 0.25)	0.83 (0.38, 1.83)
Community		
Agro-pastoral	1	1
Pastoral	26.78 (15.44, 46.46)	19.03 (6.59, 54.95)
BMI		
Over/under weight	1	1
Normal	0.20 (0.12, 0.34)	0.21 (0.10, 0.41)
Open field toilet type		
Yes	1	1
No[b]	0.09 (0.05, 0.15)	0.39 (0.18, 0.82)
Illness[*]		
Yes	0.38 (0.23, 0.63)	1.53 (0.74, 3.16)

No	1	1

Note: [a]Tubewell/borehole, dug well, rain water or tank truck; [b]flush toilet, pit latrine, composing latrine, bucket toilet or hanging toilet; [*]Diarrhea, cough, fever or malaria in the last 14 days

WHO considers anemia prevalence over 40% in a population to be a major public health problem, anemia prevalence between 20% and 40% is considered a medium-level public health problem, and between 5 to less than 20% is considered a mild public health problem. In this study, community type was found to be a significant determinant of anemia. Those women from pastoral community were ninety times (95% CI: 6.59, 54.95) more likely to develop anemia than whose women from agro-pastoral community [11].

According to this study, odds of developed anemia in women with normal body mass indicate was reduced by 21 percent (95% CI: 0.10, 0.41) as compare with over or under weight. A study conducted in Bangladesh found that stunted children and women with low BMI have significantly increased odds of developing anemia, as reflected by the adjusted ORs of 1.76 (95% CI: 1.10-2.83) and 1.81 (95% CI: 1.11-3.48), respectively. This result was also supported by study conducted in northern Tanzania. The finding showed, overweight (BMI of 25-<30 kg/m^2) and obesity (BMI ≥ 30 kg/m^2) were observed in 20.2%(95% CI 18.1%-22.6%) and 11.2% (95% CI 9.6-13.1) of the women, respectively.

However, a study conducted in found no association between hematological characteristics and BMI. The data showed that only 13.4% of obese women and 17.1% of the women with normal weight had IDA (odds ratio=0.75; 95% confidence interval: 0.39-1.49, P>0.05). The study also revealed, a women who didn't use open field toilet type the risk to develop anemia is reduced by 39 percent (95% CI: 0.18, 0.82). This finding was also supported by study conducted in Rwanda.

Conclusion

The result showed the risk of anemia was higher among underweight women and women living in households without toilet facilities. This may be women from households without toilet facilities may be susceptible to infection by hookworms and parasites and this may support our findings that lack of toilet facilities in household or community increases the risk of anemia. Anemia is a major public health problem in the study area. More efforts should be invested to transform pastoral to agro-pastoral in order to benefit nutritionally.

Ethical Consideration

Ethical approval was obtained from the Institutional review committee of the college of natural science, Addis Ababa University and Ministry of health at regional level. Permission to conduct the study in the villages was obtained from area chiefs and the dates for data collection were communicated to the chief before visiting the community. Oral informed consent was obtained from the participants after the purpose of the study, her right to withdraw at any time and confidentiality had been explained to her.

Funding

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Consent for Publication

Not applicable.

Availability of Data

All relevant data are within the paper.

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