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Original Paper

Prevalence of Chronic Energy Deficiency and Associated Factors among Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badwacho District, Hadiya Zone, Southern Ethiopia

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Abstract

Background: *Non-pregnant and non-lactating women are the most vulnerable and neglected segments in most society. However, the non-pregnant and non-lactating women are the best window of opportunity to implement strategies, to correct maternal and child death and improve good pregnancy outcomes especially in Ethiopia. The aim of this study was to assess the prevalence of chronic energy deficiency and associated factors among rural women (18-49 ages) in Mirab-Badwacho district, Hadiya zone, Southern Ethiopia.*

Methods: *A community based cross sectional study was employed. Multi-stage sampling technique was used to select 634 study participants. Data were collected by structured questionnaire by trained data collectors. Descriptive statistics was done and the association between the dependent and independent variables was measured using OR at 95% confidence interval.*

Results: *The overall prevalence of chronic energy deficiency among non-lactating and non-pregnant women was 35.2% (95% CI: 31.5%, 38.9%). Age of the respondents (AOR=1.91, 95% CI: 1.06, 3.46), family size (AOR= 1.61, 95% CI: 1.14, 2.27), meal frequency per day in the past 24 hours (AOR=3.18, 95% CI: 1.26, 8.05), drinking treated water (AOR=1.82, 95% CI: 1.11, 3.08), and past history of illness (AOR=1.60, 95% CI: 1.13, 2.26) were statistical significantly associated with women's chronic*

energy deficiency.

***Conclusion**: Chronic energy deficiency was found to be high in the study area. Therefore, sustained health and nutrition education should be recommended to the communities on health care practices, proper water treatments, feeding practices and dietary diversifications in order to improve health and nutrition outcomes of non-pregnant and non-lactating women.*

Keywords

Chronic, Energy, Deficiency, Non-pregnant, Non-lactating

1. Introduction

Many reports indicate that maternal malnutrition is high in the world. Especially in the developing countries, maternal malnutrition is the most serious and devastating condition, which may affects nearly 870 million people (Verbeek, 2013; Dewan, 2008).

Recent evidence from developing countries indicates that malnourished women with a body mass index (BMI) below 18.5 show a progressive increase chronic energy deficiency(CED) as well as increase mortality rates (Wu, Ho, Nah, & Chau, 2014). Ethiopia is one of the first ranked by chronic energy deficiency from east and southern Africa countries (Elmadfa & Meyer, 2010).

Similarly, many studies have indicated that malnourished mothers are more vulnerable to diseases, encounter more miscarriages and give birth to chronic energy deficient mother especially whose survival is also at risk for rural women (Coutts, 2014).

Inadequate intake causes nutritional problems; which mainly causes of morbidity and mortality (Mittal, 2013). The major problems are protein-energy malnutrition and micronutrient deficiencies. Almost all they were hungry people, 852 million, live in developing countries (Tinker, Finn, & Epp, 2000), representing 15% of the population of developing counties (Keding, Msuya, Maass, & Krawinkel, 2013). In Bangladesh, over 34.0% of the age group (18-49) groups, which are suffering in chronic energy deficiency, are rural women (Sarrafzadegan et al., 2013; Kamal & Islam, 2010).

The number of hungry people grew in Africa over the period, from 175 to 239 million, with nearly 20 million added in the last few years. From 22 countries in sub-Saharan Africa; nearly one in four are hungry (Sikkink, 1986; Tatem et al., 2013), over 30% of all women were found to suffer from chronic energy deficiency (Tenmann, 2013).

Ethiopia is the second most populous country in sub-Saharan Africa with a population of over 92.8 million people and out of which 44.8 million are females (Haileslassie, Mulugeta, & Girma, 2013). It is a country over 84% of the population resides in a rural area. Maternal chronic energy deficiency in Ethiopia was found to be 30.5%, 26.9% and 27% in 2007, 2009 and 2011 respectively (Setegn, Gerbaba, & Belachew, 2011; Hogan, Berhanu, & Hailemariam, 1999).

Chronic energy deficiency is a common problem affecting virtually all women especially those who live in the rural area of developing countries. In Ethiopia, many studies were conducted to identify the extent and consequence of under nutrition among different age groups. However, nutritional status of

non-pregnant and non-lactating women, were not well addresses.

2. Materials and Methods

2.1 Study Design and Setting

A community based cross-sectional study was used to assess the prevalence of chronic energy deficiency among rural women (18-49 ages) in Mirab-Badwacho district from April to May, 2019. Mirab-Badwacho district is one of the 10 districts in the Hadiya zone, Southern Ethiopia with the total population 101, 603. Out of 98,668 (48,354 males and 50,314 females) live in rural areas and 47% were females in child bearing age group and 20,016 were non-pregnant women. The economic livelihood of the people in the district was based on livestock (14.6%), crop production (77.4%), trade (6.7%) and other activities (1.25%).

2.2 Source and Study Population

The source population for the study was women of the age group (18-49 years) who were live the Mirab-Badewacho district. The study population was sampled from the source population who were non-pregnant and non-lactating women. However, those who were mentally and physically incapable were excluded from the study.

2.3 Sample Size Determination and Sampling Procedure

The sample size was calculated by a single population proportion formula using Epi-Info version 3.5.3 statistical software by considering proportion of maternal thinness 27% from national prevalence of Ethiopia(17), 5% marginal error, 95% confidence interval, 5% non-response rate and design effect 2, which yields the total sample size was 636.

To select required number of sample from source of population, a multistage sampling technique was used. Five kebeles were selected randomly from the 20 rural kebele of Mirab-Badwacho district. The number of households to be included in each kebeles was determined in proportion with the total number of households found in each kebeles. Finally, a systematic random sampling method was employed to select the households. Whenever more than one eligible respondent (non-pregnant and non-lactating women who were residing in the randomly selected kebeles) was found in the same selected household, only one respondent was selected using the lottery method. When in case no eligible candidate was identified in a selected household or the selected household was closed even after three visits, the interviewer went to the next household in the clockwise direction until an eligible participant was obtained.

2.4 Data Collection Procedures and Quality Control

Data were collected using structured and pre-tested questionnaires adapted from EDHS and FAO. It was prepared in English and translated to Hadiyisa and back to English by different language experts in order to keep consistency with the original meaning of the questionnaires. Measurement of height (length) was measured in a standing position in centimeters to the nearest of 1cm and weight was measured to the nearest 0.1 kg by using meter and digital bath balances respectively and calibrate the

instrument correctly by using well-known weighted material. Finally, the data collection techniques were conducted by interview.

Two days training were given to all data collectors and supervisors to have common understanding on data collection process. During the training the trainers were demonstrated how to take anthropometric measurements and the trainee were re-demonstrated it in front of the trainers. The supervisors were overseeing the data collectors on daily basis for completeness and consistence of the filled questionnaires and the errors were returned to the interviewers for correcting.

2.5 Data Processing and Analysis

The data was thoroughly cleaned and carefully entered in to computer by using EPI Info version 3.5.3 and the statistical analysis was done using SPSS version 20. Body mass index (BMI) was computed using weight divided by the height squares (Kg/m^2). Different frequency tables and descriptive measures were used to describe the study variables. Multivariable logistic regression analysis was used to see significant association between dependent and independent variables. Finally, adjusted odds ratios with their 95% confidence intervals and explanatory variables with p-value of 0.05 were considered to have significant association with the outcome variable.

Wealth index analysis: Wealth index was constructed using principal components analysis to determine the weights for the index based on information collected about several household durable assets and facilities. This index was divided into three categories (tertiles), and each household was assigned to one of these categories of household wealth index (poor, middle and high).

2.6 Ethical Consideration

Ethical clearance was obtained from ethical review board of the Wachemo University. Formal letter of cooperation was written to Mirab-Badwacho district and local authorities and concerned government bodies.

Informed consent was obtained from each study participants before interview the questionnaires and takes the anthropometric measurements. Participation was voluntary based and participants can withdraw from the study at any stage/time without explanation and penalty or loss of benefit. Confidentiality was kept.

3. Results

3.1 Socio-demographic Characteristics of Respondents

A total of 634 non-pregnant and non-lactating rural women were participated in the study with response rate of 99.7%.

The mean age of the respondents was 34.3 (SD $\pm$ 6.9) years. Majority of the respondents were Protestant (76.7%) followed Catholic, Orthodox and Only Jesus (11.5%), (9.9%), (1.9%) respectively. Most of the respondents were Hadiya (75.3%) followed Kembata (15.7%) by Ethnicity. The mean family size of the respondents was five (SD $\pm$ 2).

Concerning the occupational status, (64.5%) of women were housewives, (8.5%) were students, (7.4%)

were farmers, 16%) were merchants and (3.6%) were daily labors. Regarding educational status, (57.1%) of women was no education. Household wealth index of the respondents, (34.0%) was low index (Table 1).

Table 1. Socio-demographic Characteristics of Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badewacho District, 2019

Socio-demographic variable	Frequency	Percent
Age of woman		
18-25	38	6.0
26-35	325	51.1
36-49	273	42.9
Marital status		
Married	397	62.4
Divorced	42	6.6
Widowed	113	17.8
Single	53	8.3
Separated	31	4.9
Ethnicity		
Hadiya	479	75.3
Kembata	100	15.7
Wolayita	48	7.5
Amhara	9	1.5
Educational status		
No education	363	57.1
Primary	235	36.9
Secondary	28	4.4
Collage and above	10	1.6
Family size		
2-4 persons	264	41.5
≥5 persons	372	58.5
Household wealth index		
Low	216	34.0
Middle	198	31.1
High	222	34.9

3.2 Maternal Characteristics Related to Nutritional Status

Three hundred forty-one (53.6%) had three up to six pregnancies and majority (91.7%) of the respondents had greater than 24 months since the birth of last child. Two hundred thirty-three (36.6%)

of the respondents had history of illness in the past one month. Three hundred thirty six (52.8%) of the respondents had get less than three meal per day in the last 24 hours (Table 2).

Table 2. Maternal Health and Feeding Practices of Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badewacho District, 2019

Maternal Characteristics	Frequency	Percent
Number gravidity		
≤ 2 pregnancies	203	31.9
3-6 pregnancies	341	53.6
≥ 7 pregnancies	92	14.5
Number of children born		
≤ 2	240	37.7
3-6	324	50.9
≥ 7	72	11.4
Last child age		
≤ 24 months	53	8.3
> 24 months	583	91.7
Women dietary diversity		
Inadequate	375	59.0
Adequate	261	41.0
Frequency of meals/day eaten in past 24 hrs		
< 3 meals	336	52.8
3 meals	254	39.9
4 meals	25	3.9
> 4 meals	21	3.4
History of maternal illness		
Yes	233	36.6
No	403	63.4
Stay of illness		
Less than a weeks	67	28.8
1-2 weeks	91	39.0
3-4 weeks	54	23.2
> 4 weeks	21	9.0

3.3 Nutritional Status of the Respondents

Five hundred seventy (89.6%) of respondents were above 145 cm height and sixty-six (10.4%) of them were below or equal to 145 cm height. Four hundred thirty-six (68.6%) of the respondents weight were greater than 45 kg and two hundred twenty-four (35.2%) of the respondents were thin. The mean body

mass index of the respondents was 20.0 (SD ± 3.0) and four hundred twelve (64.8%) of respondents had body mass index greater or equal to 18.5 kg per square meters (Table 3).

Table 3. Anthropometric Status of Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badwacho District, 2019

Anthropometric variable	Frequency	Percent
Maternal height		
≤ 145 cm	66	10.4
> 145 cm	570	89.6
Maternal weight		
≤ 45 kg	200	31.4
>45 kg	436	68.6
Maternal BMI		
< 18.5 kg/m^2	224	35.2
≥ 18.5 kg/m^2	412	64.8
BMI(Mean/SD)	20.0 (± 3.0)	

3.4 Environmental Characteristics of the Participants

More than half of the respondents (67.1%) had reported home gardening available in their home. Five hundred fifty-five (87.3%) of the respondents reported that they had home latrine and the rest had no have latrine. Four hundred forty one (69.4%) of the respondents were using public tap water for drinking whereas one hundred eighty-two (28.6%) of them were using a spring water sources (Table 4).

Table 4. Environmental Characteristics of Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badwacho District, 2019

Environmental variable	Frequency	Percent
Availability of home gardening		
Yes	427	67.1
No	209	32.9
Availability of home latrine		
Yes	555	87.3
No	81	12.7
Source of drinking water		
Public tape	441	69.4
Spring	182	28.6
Surface water	13	2.0

3.5 Factors Associated with Chronic Energy Deficiency

The covariates, age of the respondent, family size, wealth index of the household, history of illness, source of drinking water, drinking treated water, hand washing and meal frequency per day in the past 24 hours were significantly associated with chronic energy deficiency in bivariate analysis. Multivariable analysis of logistic regression was performed to examine the net effect of each independent variable in the model on chronic energy deficiency in women, while controlling for the other independent variables. Multivariable analysis was revealed that age of the women, family size, meal frequency per day in the past 24 hours and drinking treated water were significantly associated with chronic energy deficiency.

Women age between 18-25 years were two times more likely to be chronic energy deficient as compared to women in age group 36-49 years (AOR=1.91, 95% CI: 1.06, 3.46). Women who had greater than or equal to five family size were two times more likely to be chronic energy deficient as compared to those who had 2-4 family size in the household (AOR=1.61, 95% CI: 1.14, 2.27). Women having three times per day meal frequency were three times more likely to be chronic energy deficient as compared to women having four and more times per day in the past 24 hours (AOR=3.18, 95% CI: 1.26, 8.05). Women who did drink untreated water were two times more likely to be chronic energy deficient as compared to women who did drink treated water (AOR=1.84, 95% CI: 1.11, 3.13). Presence of past history of illness were two times more likely to be chronic energy deficient than those who had not (AOR=1.60, 95% CI: 1.13, 2.26) (Table 5).

Table 5. Factors Associated with Chronic Energy Deficiency among Non-pregnant and Non-lactating Rural Women (18-49 Ages) in Mirab-Badewacho District, 2019

	Chronic energy deficiency			
Characteristics	Yes	No	Crude OR (95% CI)	Adjust OR (95% CI)
Age group (18-49)				
18-25	20	18	1.75(0.99, 3.08)	1.91(1.06, 3.46)*
26-35	98	227	1.23(0.87, 1.74)	1.35(0.93, 1.91)
36-49	106	167	1.00	1.00
Family size				
2-4 persons	107	157	1.00	1.00
≥ 5 persons	117	255	1. 48(1.07, 2.06)	1. 61(1.14, 2.27)***
Wealth index				
Low	87	129	1.53(1.01, 2.26)	
Middle	69	129	1.26(0.85, 1.88)	
High	68	154	1.00	
Meal frequency per day				

< 3 meals	133	203	1.68(0.69, 4.06)	1.91(0.77, 4.77)
3 meals	71	183	2.84(1.15,6.97)	3.18(1.26, 8.05)**
4 meals	9	16	1.96(0.60, 6.38)	2.38(0.70, 8.02)
> 4 meals	11	10	1.00	1.00
Dietary diversity				
Inadequate	144	231	0.71(0.51, 0.99)	
Adequate	80	181	1.00	
History illness				
Yes	98	135	1.59(1.14, 2.23)	1.60(1.13,2.26)***
No	126	277	1.00	
Source of drinking water				
Public tape	142 (32.2)	299	1.00	
Spring	75 (41.2)	7	1.66(0.54, 5.15)	
Surface water	7 (53.8)	6	2.45(1.03, 7.44)	
Drinking treated water				
Yes	33	39	1.00	1.00
No	191	373	1.65(1.00, 2.71)	1.82(1.11, 3.08)*
Hand washing after latrine				
Yes	105	159	1.00	
No	119	253	1.40(1.01, 1.95)	

Note. ******* P-value is significant at < 0.05*** ******** P-value is significant at < 0.01***

********* P-value is significant at < 0.001*** *Backward LR methods was used*

4. Discussion

This study revealed that the prevalence of chronic energy deficiency (BMI less than 18.5 kg/m^2) in the study population was 35.2% (95% CI: 31.5%, 38.9%). This finding was higher than the previous study conducted in Bangladesh (28.5%) (Kamal & Islam, 2010), Bashahpur, India (25%) (Mittal, 2013), Philippines (10%) (Goyena, Valdeabella-Maniego, & Guirindola, 2017). The discrepancy in the prevalence of chronic energy deficiency among different countries might be due to the difference in sociocultural and economic characteristics, diet diversity, and year of the study. This high prevalence might be due to differences of study period (March to April) and this study was conducted in rural women. They are vulnerable for chronic energy deficiency as compared to urban women. Seasonal variation from March to April most of the population were exposed food scarcity and nutritional deficit in our study setting. Based on the recent DHSs conducted between 2003 and 2016, when compared to the prevalence of undernutrition in other sub-Saharan African countries (i.e. Ethiopia (30%), Kenya (12%), Malawi (9%), Mozambique (9%), Rwanda (8%), Uganda (12%) and Zambia (10%), Sanderson & Auricht, 2012). The difference might be due to countries' DHS reports which used to include

participants from both the rural and urban. Moreover, these finding was also higher than national prevalence of Ethiopia (27%) (Ethiopia Central Statistical Agency, International, 2012). This difference might be due to national figure /EDHS 2016 reports which used to include participants from both the rural and urban as well as the data for national prevalence were collected from different regional state that compromise the prevalence of NPLP at national level as compared to a single study area. Nevertheless, this study finding was lower than the study done in Tigray, Ethiopia (47.9%) (Abraham, Miruts, & Shumye, 2015). This might be due to the regional variation of undernutrition. Tigray region is mountainous and thus makes farming difficult, which puts women in Tigray at a higher risk of malnutrition than in other regions in Ethiopia.

In our study, women age between18-25 years were more likely to be chronic energy deficient than the age group 36-49 years women. This result was similar with the study done in Ghana (Nyangasa, 2011) and Philippines (Goyena, Valdeabella-Maniego, & Guirindola, 2017). This might be due to high energy demand for fast growth, physical activities and mostly workloads higher in the younger women than the older once that cause CED among age group 18-25 years old.

In this study, women had having greater than or equal to five family sizes were more likely to be chronic energy deficient than women had having less than five family sizes. Large family size may need more food preparation and engaging different activities to overcome family food shortage. This might increase the energy consumption of the body, and in the meantime, they would get tired, but still they would have the responsibility to prepare food for the rest of the family members afterwards which might affected their nutritional status.

In our study, women having three times per day meal frequency were more likely to be chronic energy deficient as compared to women having four and more times per day in the past 24 hours. This finding was inconsistent with study done in Tigray, Ethiopia (Abraham, Miruts, & Shumye, 2015) and Arsi zone, Ethiopia (Tafa & Haidar, 2014). This inadequate meal frequency per day might be happen due to the shortage of food accessiblity,lack of proper food diversification, handling system and the facts of lack meeting body nutrient requirments.

In our study,women who had history of illness were more likely to be chronic energy deficient than women had no have a history of illness. This finding was similar with the study conducted in India (Wu, Ho, Nah, & Chau, 2014). This might be due to the fact that, illness cause appetite loss,decrease weight,loss nutrients and electrolytes level and inapproprate nutrient intake during illness period which results chronic energy deficiency. In adition that, our study area is malaria hot spot area in the region, so due peroidic attach with malaria disease might cause maternal chronic energy deficiency.

In our study, women who did drink untreated water were more likely to be chronic energy deficient compare women who did drink treated water. This finding was similar with the study done in Northern Nigeria about the importants of water to reducing a broad range of infections and improving nutritional status of women (Akchurin & Lee, 2013). In addition, this was due to the fact that treating water reduces the exposure of water born diseases and occurrences of diarrheal diseases.

5. Conclusion

The finding revealed that the prevalence of chronic energy deficiency was found to be high in the study area according to the WHO cut of values for public health significances. Age of mother, family size, and history of illness, meal frequency per day in the past 24 hour and drinking treated water were significantly associated with non-pregnant and non-lactating maternal chronic energy deficiency. Therefore, sustained health and nutrition education should be recommended to the communities on health care practices, proper water treatments, feeding practices, dietary diversifications and family planning in order to improve health and nutrition outcomes of non-pregnant and non-lactating women.

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Data availability: All relevant data are within the manuscript and its supporting information files.

Abbreviations

BMI: Body Mass Index; CED: Chronic Energy Deficiency; DHS: Demographic and Health Survey; EDHS: Ethiopia Demographic and Health Survey; FAO: Food and Agricultural Organization; NPNL: Non-Pregnant and Non-Lactating: SD; Standard Deviation.

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