World Scientific Research
Vol. 5, No. 1, 13-23, 2018
ISSN(E) 2411-6661/ ISSN(P) 2518-0177
DOI: 10.20448/journal.510.2018.51.13.23

Chronic Energy Deficiency and Associated Factors among Lactating Mothers (15-49 years old) in Offa *Woreda,* Wolayita Zone*, SNNPRs, Ethiopia*

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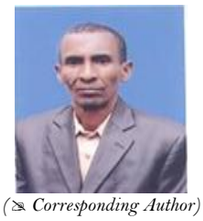
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Abstract

The lactating mothers in developing countries like Ethiopia are the first targeted and nutritionally vulnerable groups to under nutrition due to different socio demographic factors which influence the health and well being of mothers and children. During lactation periods, mothers need more nutritious food than the rests of the household members. The aim of this study was to determine the nutritional status, associated factors and dietary diversity of lactating mothers 15-49 years old in Offa woreda. A cross-sectional community based study was carried out to determine the Chronic Energy deficiency of lactating mothers in the studied woreda. The lactating mothers were randomly selected from four rural and two urban kebeles. A total of 422 households were visited and the required data were collected as scheduled in all selected kebeles. The prevalence of under nutrition among the lactating mothers in the studied area was determined using BMI by Anthropometric measurements and the blood sample test for hemoglobin (Hb) concentration was done using Haemocue methods. The collected data were analyzed using Stata version 14.2 software. Among the participated lactating mothers the values 15.8%, 74.2%, 8.3% and 1.7% were obtained for under weight, normal, over weight and obese in their BMI (kg/m2), respectively. The studied participants of 15.8% were in chronic energy deficiency according to WHO guidelines. The lactating mothers' percentage value 36.4%, 59.3%, 4.3% were in age group of 15-24, 25-34 and 35-49 years, respectively. The blood test showed that among the lactating mothers 11.4% were found anemic which had got hemoglobin level less than normal level (12g/dl). The daily dietary diversity intake per day of lactating mothers was classified as high (>5 DDS) 1.2%, medium (4-5 DDS) 50.7% and low (<3 DDS) 47.4% among the nine food groups recommended for women dietary diversity score (WDDS). The independent variables: education, family size, marital status and occupation were significantly associated with nutritional status of the lactating mothers at P<0.05. In conclusion the majority of the lactating women in the study area had normal BMI. The researchers would like to recommend that the government and development agencies should focus on the risk factors identified, to ensure better health and nutrition for lactating mothers in this *woreda.*

Keywords: Nutritional status, Lactating mothers, Dietary diversity, Offa *Woreda*, BMI.

Citation | Berhanu Wodajo Julla; Abebe Haile; Girma Ayana; Solomon Eshetu; Desalegn Kuche; Tsehai Asefa (2018). Chronic Energy Deficiency and Associated Factors among Lactating Mothers (15-49 years old) in Offa Woreda, Wolayita Zone, SNNPRs, Ethiopia. World Scientific Research, 5(1): 13-23.
History:
Received: 6 November 2017
Revised: 18 December 2017
Accepted: 28 December 2017
Published: 10 January 2018

Publisher: Asian Online Journal Publishing Group

Contribution/Acknowledgement: First of all I would like to thank the Almighty God who is always beside me during my happiness and trouble time. I am very thankful to Addis Ababa University in equipping me with Research back ground and other necessary logistic and finance support to fulfill the Research objective. Let also my sincere gratitude goes to Dr. Abebe Haile, who advised me well while this thesis was prepared from beginning to end. I am very thankful to the Center for Food Security Studies for good administration service offered for any raised issues. I had a great support and encouragements from all families while I was learning and conducting this Research I would like to say may God bless them. The Regional Health, Wolayita Zone Health and Offa Woreda Health Offices were very co-operative in giving supportive letter to the respective offices. Lastly, I am greatly, indebted to the lactating mothers in Offa Woreda, Wolayita zone, SNNPRs, for their full willingness in responding the questionnaires as expected. Lastly, the appreciation I have for Ethiopian Public Health Institute is very great. In general, without the support of EPHI, I can say that this Research would not have been completed.
Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no conflict of interests.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study was reported; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.
Ethical: This study follows all ethical practices during writing.

Contents

1. Introduction

Low dietary diversity and its consequence of under nutrition is a problem of millions of people in the developing world. Low dietary diversity at individual, household and community levels, or a combination of these, may contribute to poor nutrition and health status. In particular, under nutrition among women is likely to have a major impact on their own health and their children. Maternal under nutrition, including chronic energy and micronutrient deficiencies, account for 11% of the global burden of disease [1]. So many studies had been conducted on maternal nutritional problems in various countries and the outcome showed that maternal under nutrition ranges from 10-19% in most developing countries. This is usually a result of inadequate dietary intake, occupation, family size, education, food insecurity at household level and other social factors. Maternal and child in low and middle income countries encompasses both under and over nutrition [2]. Lactation places high demands on maternal stores of energy and protein than in any other stage of a woman's reproductive life. To support lactation and maintain maternal reserves, most mothers in developing countries will need to eat about 500 additional kilocalories or an increase of 20 to 25 percent over the usual daily intake.

About 35% Ethiopian population is chronically undernourished [3]. Twenty seven percent were women aged 15-49 who had BMI < 18.5 kg/m² which remained relatively constant since 2005 as it was reported by CSA [4]. EDHS 2011 report showed that the period 2000-2005 in which significant improvement showed in reduction of under nutrition in Ethiopia, however, it remained constant after the periods of 2005. In year 2000 survey, age marital status, religion, occupation, wealth index were found to significantly affect women's nutritional status. Whereas, in 2005 religion of residence was no longer factor influencing women's under nutrition by EDHS (Ethiopia Demographic and Health Survey) [5]. In EDHS (Ethiopia Demographic and Health Survey) [6] report, socio-demographic characteristics, maternal health care and other household family issues were indicated. At national level, 97%, 56.5% of urban and rural respectively used to get drinking water from improved source. With regarding to education, 47.86%, 35%, 11.6%, 5.6% had no education, primary, secondary and above, respectively. The maternal health care was assessed as 63% and 27% urban and rural, respectively had antenatal care (ANC) ≥4 times from skilled provider. The ANC coverage in SNNPR was 69.3% and postnatal care (PNC) within 48 hours check up was 16.9%. The prevalence of anemia in this region was 22.6% [6].

The study conducted in Nekemte referral Hospital showed, among the participants 20% of lactating mothers had BMI less than 18.5kg/m² [7]. The similar, study conducted in west Showa, Ambo district on household food insecurity and factors associated with under nutrition among lactating mothers in rural Ambo result showed that 21.5% were nutritionally under weight or their BMI less than 18.5kg/m² [8]. Proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and a well being of all living things WFP [9]. According to EHNRI (Ethiopian Health and Nutrition Institute) [10] nutrition baseline survey reports among non-pregnant women, women with no education were more likely to be underweight (31%) where educated (17%). The survey of EDHS (Ethiopia Demographic and Health Survey) [6] result showed that the percentages of educated women at different education levels were, women not educated (47.8%), primary (35.0%), secondary (11.6%) and more than secondary (5.6%).

Age of lactating mother, place of residence, employment and marital status were found to be significantly associated with nutritional status of women. The prevalence of under-nourished women was also higher among older women [11]. Moreover, women in rural areas were twice more likely to be under-nourished than those in urban areas. According to WHO [12] report, low body mass index (<18 kg/m²) or short stature height (<145 cm) are common in women in low-income countries, with the highest rate in southern and south-eastern Asia, followed by sub-Saharan Africa, with "critical" rates (> 40%) in Eritrea and Bangladesh, and a "serious" (20 to 39%) prevalence in Cambodia, Chad, Ethiopia, Indian, Madagascar, Mali, Nepal and Yemen; most other countries have a prevalence chronic energy deficiency between 10 to 19%. More than 10% of women are shorter than 145cm in Bangladesh, India, Nepal and in Latin America and Caribbean countries. An estimated 663 million people worldwide do not have access to an improved drinking-water source [12]. About 2.4 billion people or one third of the world's population, lack access to an improved sanitation facility and 13% practice open defecation. Among the world's regions, sub-Saharan Africa and South Asia continue to have the lowest sanitation coverage [12]. As the study from SriLanka showed the availability of adequate sanitation facilities, such as safe drinking water and unshared sanitary toilet facilities were important determinants of women nutritional status [12]. In rural areas of Burkina Faso the BMI was significantly associated with the hygienic level of the household and the care for women [13]. Unlike household access to drinking-water and sanitation, no global mechanism exists to monitor hand washing practices in homes and communities.

According to EDHS (Ethiopia Demographic and Health Survey) [6] report, a large proportion of maternal and neonatal occur during the first 48 hours after delivery. Thus, prompt postnatal care (PNC) for both the mother and the child is important to treat any complications arising from the delivery, as well as to provide the mother with important information on how to care for herself and her child. Safe motherhood programs recommended that all women receive a check of their health within 2 days after delivery. Dietary diversity represents the number of different foods or food groups consumed over a reference period-usually 24-hour recall which is designed to capture the micronutrient adequacy of food groups consumed by the individual [14, 15]. Cross sectional Research exploring the wealth and under nourishment among two impoverished nations, Burkina Faso and Cong Democratic Republic had been conducted to evaluate the under nourished level between the rich and poor of women in two nations. The reported results showed that 19.4% and 18.4% the poor against 7.2% and 9.7% rich

women in Burkina Faso and Democratic Republic Congo made assessments, respectively. Besides to this older women were more prevalence of under nourish than younger. According the Burkina Faso and Congo research undernourished women was common among the poor and with no formal education [7]. The problem of most developing countries in the world was not identifying the impotence of micro nutrient intake and dietary diversity. According to Food and Agriculture Organization [16] report, more than 2 billion people were in micro nutrient deficiency which is referred to as 'hidden hunger."

An estimated 663 million people worldwide do not have access to an improved drinking-water source [12] and an estimated 1.9 billion people rely on drinking-water that is fecal contaminated [17]. Improved water sources that are not operated or maintained properly may deliver water that is microbiologically contaminated that of open defecation. Among the world's regions, sub-Saharan Africa and South Asia continue to have the lowest sanitation coverage [12].

Under nourishment is a worldwide problem of lactating women living in developing countries. Lactating women in south East Asia, sub- Saharan and Africa are highly vulnerable to chronic energy deficiency. As a result of this, the lactating women are exposed to some non- infectious disease caused by the low deficiencies of dietary diversity food. The Research conducted in Pakistan and Nepal showed, 15.1 and 27% of lactating mothers were in chronic energy deficiency respectively [18].

Evidence from urban slums of North-east district of Delhi, India (2011) showed that the among 160 lactating mothers, after deliverance of three months, 16% of respondents had a BMI of less than 18.5 kg/m^2 [19]. However, the study conducted in Alemtidad area around Khartoum was the inverse result obtained in other parts of developing countries in which no underweight was observed. According to the result, the problem of lactating mothers in Alemtidad was the problem of overweight and obesity. Among the participants only 35.6% had normal BMI and the rest were observed as overweight and obese. The Global economic crisis, commodity price hikes and climate change have worsened the position of the poorest and most vulnerable people. Thus the crisis compromising the diet and health up to 80% of population [20]. According to this statement the future generation's nutritional status, especially the developing countries is in threatening condition. In Ethiopia, one of every four or 26% women of reproductive age were undernourished that is twice the sub-Saharan average of 13.3% [21]. Comparing the nutritional status of Ethiopian women, with that of women in 29 other sub-Saharan African countries, based on the DHS conducted between 1998 and 2008, the prevalence of under nutrition in Ethiopia is higher when compared with other developing countries. Ethiopia has decreased from 75% to 35% over two decades, even though, these positive advances shown in Ethiopia, one in three people live below the poverty line [22, 23].

The food insecurity which contributes to under nutrition of lactating mothers was studied to identify the contribution of food insecurity to under nutrition both on mothers and children. According to the research output women from food insecure households had a lower energy intake than those from food secure households [24]. Food insecurity has a wide range of negative health impacts beyond under nutrition. In Southern Nations, Nationalities and Peoples' Region (SNNPR) so many lactating mothers were suffering from food insecurity. According to Almaz [25] 67.8% total households of Wolayita zone were under food insecure. Moreover, there was a knowledge gap in utilizing necessary health care as studied around Gonder 'Zuria' and due to this knowledge limit only 66.83% had utilized ANC service [26].

Offa is one of the densely populated *woreda* in Wolayita zone and supposed with low dietary diversity intake by lactating mothers. The nutritional status, dietary diversity and the associated factors for chronic energy deficiency were assessed in detail both in selected rural and urban kebeles. There was a gap of information about the prevalence of under nutrition in study area (Offa *woreda)* and due to this, the high percentage prevalence under nutrition was considered for this *woreda to identify* the chronic energy deficiency of lactating mothers of 15-49 years in the study *woreda.*

Thus, the objective of this Research is to determine the nutritional status, dietary diversity and associated factors among the lactating mothers in Offa *woreda*, Wolayita Zone, SNNPR, Ethiopia having infant/child less than 24 months and breast feeding.

2. Methods and Materials

2.1. Description of Study Area and Duration

This study was conducted from March 8 to April 13, 2017 in six kebeles, Offa *woreda.* The selected study area was one of the wolayita zone woreda, SNNPR and the research was conducted to estimate the nutritional status of lactating mothers 15-49 years. Gesuba is the capital town of Offa *woreda* which is 29 km from Wolayita Sodo and 414 Km from Addis Ababa capital city of Ethiopia. The *woreda* is bounded with Kindo Koysha woreda in the north, Gamo Gofa Zone in the south, Humbo and Sodo Zuriya in the East and Kindo Didaye Woreda in the west. Based on National Census the projected total population of the *woreda* in 2009 E.C was 132,054, out of which, 65,765 and 66,291 were male and female, respectively. There are 21 rural and 2 urban kebeles in the *woreda.* The total area of the *woreda* is 38,557 hectare. The cultivated proportional land according to the *woreda* agriculture Office information was 22,912 hectare or (59.4%). According to CSA [4] the *woreda* is situated at 6°37'07.63"N--6°50'07.10"N, latitude and Longitude: 37°24'18.06"E-37°89'13.27"E and altitude: ranges 1200 -2800 meter above sea level. Geo-ecology of Offa woreda: Kola, Weynadega and Dega (22, 62 and 16%) respectively The *woreda's* annual average rainfall, 800-1400 mm and annual average temperature, 14 °C-34 °C (Offa woreda Agriculture Office).

2.2. Major Crops and Animals

The major crops in Offa woreda are: maize, teff, sorghum, wheat, barley, bean, pea, peanuts and chickpea. Different roots and tuber crops like enset, sweet potato, cassava, taro, and white yam were commonly cultivated. There are also fruits and vegetables; mainly mango, banana, avocado, papaya, sugar cane, tomato, onion, cabbage and green paper are common. The animals reared in the study *woreda* are: Cattle, sheep, goat, chicken donkey, Horse (rarely).

2.3. Map of the Study Area

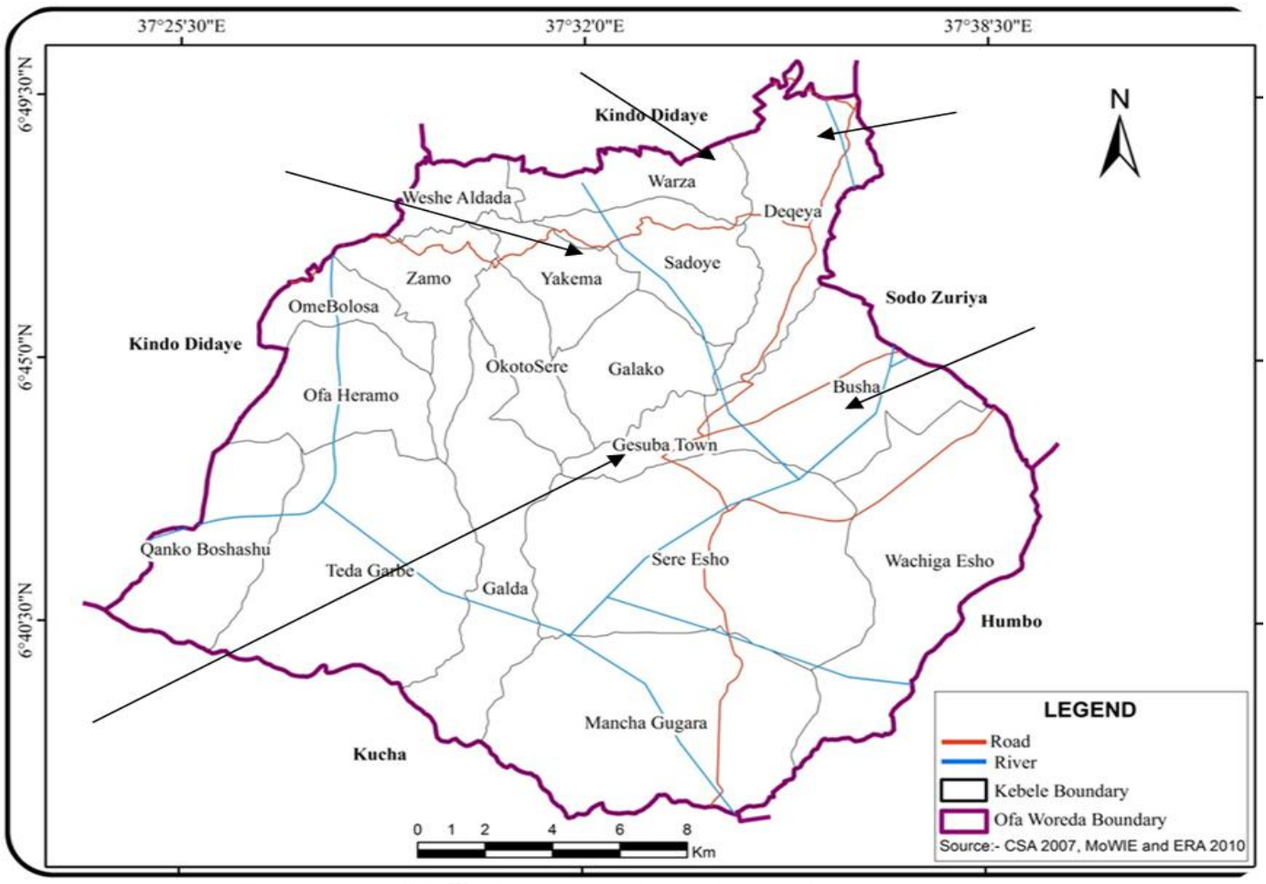


Figure-1. Map of Offa *Woreda* arrows are indicating the selected sampling kebeles
Source: CSA [21], MoWIE and RRA 2010.

2.4. Food Groups for Women Dietary Diversity Score (WDDS)

The food grouping was adopted from FAO nutritional and consumer protection division [27].

Table-1. Aggregated food groups for WDDS

Food group for WDDS	Food type
1,2	Starchy staples (roots and tuber, vitamin A rich vegetables and tubers)
4	Dark green leafy vegetables
3,6 red palm oil if applicable	Other vitamin A rich fruits and vegetable
5,7	Other fruits and vegetables
8	Organ meat
9,11	Meat and fish
10	Eggs
12	Legumes, and seeds
13	Milk and milk products

Source: FANTA 2009, *Developing and Validating Simple Indicators of Dietary diversity*

2.5. Description on the Food Group

The leafy vegetable food is a combination of vitamin A rich vegetables and tubers, dark green leafy vegetables and other vegetables. The fruit group is a combination of vitamin A rich fruits and other vegetables. The meat group is a combination of organ and flesh meat giving sampling codes.

2.6. Study Design

A community based cross sectional study design was employed to estimate nutritional status and associated factors of lactating mothers in the study area.

2.7. Source Population

Lactating mothers between 15 – 49 years of old having children less than 24 months found in study *woreda.*

2.7.1. Study Population

All lactating mothers aged between 15 – 49 years and having children less than 24 months and breast feeding during sample collection time in the studied selected six kebeles of Offa woreda.

2.8. Inclusion and Exclusion Criteria

2.8.1. Inclusion Criteria

Lactating mothers who were breast feeding child of less than 24 months during data collection and resident of the kebeles

2.8.2. Exclusion Criteria

Lactating mothers who were critically sick or unable to stand.

2.9. Sample Size Determination and Sampling Techniques

2.9.1. Sample Size Determination

To determine the minimum sample size required for prevalence studies single population proportion formula was used:

$$N = \frac{Z^2_{\alpha/2} p(1-P)}{d^2}$$

Where,
N = Sample size
$Z_{\alpha/2}$ = Standard normal variable corresponding to the 95% confidence level = 1.96
P = Prevalence of under nutrition among lactating mothers, 50% estimated
d = Margin error (precision) = 0.05, NRR = Non response rate (%) = 10%
The total samples size estimated was 422 (four rural and two urban kebeles)

2.9.1. Sample Selection Methods

To determine the total required amounts of samples, four rural and two urban kebeles were selected for sampling. The 4 selected rural kebeles were called Busha, Adaye Dakaya, Yakima, and Waraza. While urban Gesuba 01 and 02 Kebeles were considered without randomization due to limited number of population when compared with the rural kebles'. The total sample size divided equally to the studied kebeles (Figure 1).

2.10. Training and Sampling Procedure

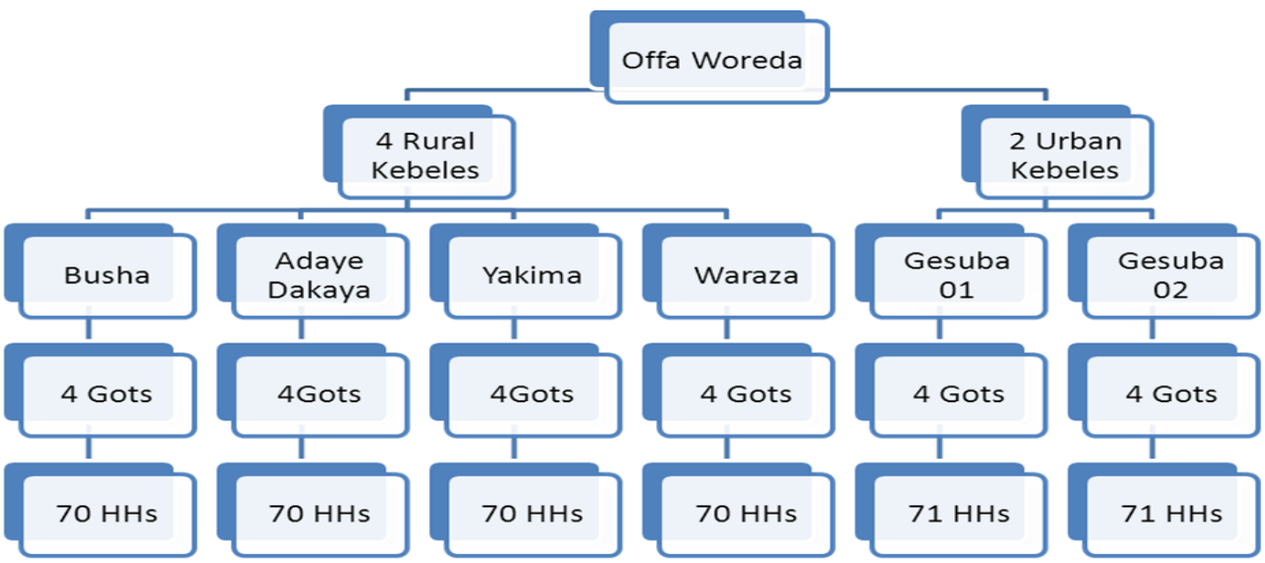
2.10.1. Training

Necessary training was given for data collectors on the topics of household approaching methods and data collection techniques. Up on completion of the trainings, pilot field test was conducted in nearby rural areas of studied kebeles. The purpose of pilot testing is to evaluate how the trainers understood and implement in the field what they were trained on. After pilot test evaluation was made to take corrective action on the error committed during house to house visiting.

2.11. Sampling Procedure

Before entering to the sample collection sites, permission from all hierarchy of the administration levels was obtained. After the permission processes completed, randomization was done to select the study kebeles. After the study kebeles were selected again four 'got' from each kebeles were selected in a similar way of randomization method. After the 'gots' were identified, requisition was forwarded to Kebele office to get language translator from Amharic to 'walitigna'. Then, home to home visiting started and the consent form read and translated to local language.

After the targeting groups understood about the objective of the study and decided to participate in the research study, randomization and listing household from selected four 'gots' was started. For each household unique code number was marked on the outer upper parts of the door, which indicates the presence or absence of lactating mother in the coded household. From each randomly selected 'gots'18 lactating mothers were required; when the availability of lactating mothers in the 'got' exceeds the required level, again randomization method employed. The marked label on each for eligible household was: LW/01, LW/02… and for non eligible, LW/X. Before sampling and interviewing the targeted groups started, first, self introduction to the household was the primary job of the enumerators and coordinator.



Total HHs (rural kebeles = 70x4 = 280 & urban kebeles = 71x2 = 142) = 280+142 = 422

Figure-2. Schematic sampling procedure in study area of Offa *Woreda, 2017.*
Source: Sampling procedure designed by the Author

In each 'got', there was no shortage of lactating mothers and averages of 32 were found and after completing listing, re-randomization was used to work on 18 mothers in each 'got'. Whenever the respondents were not found at home at household visiting time, appointment was taken to re-visit, three times appointment was possible and if not succeeded within the three times appointment, replacement from adjacent got was taken in the same randomization method.

2.12. Screening for Anemia

The consent agreement was made between the participants and the data collectors, Blood sample was collected using HaemoCue method according to the guide line manual. The HaemoCue was turned on until 'ready' shown on the screen. Blood sample was drawn from the participants finger after cleaning with alcohol and the finger was held firmly and pricked with disposable lancet. Gentle pressure was applied to extrude a large drop of blood. The finger was wiped off the drop with a dry, lint-free wipe. Wipe away additional one or two large drops, alternately applying and releasing pressure on the finger as needed. The micro cuvette is applied to a drop of blood from the same finger pricked. Blood is drawn into the cuvette by capillary action. Held the cuvette in place until the entire teardrop-shaped cavity is filled with blood. After wiping off any excess blood from the sides of the cuvette, placed in the cuvette holder and inserts it into the HemoCue. Read the hemoglobin [Hb] concentration and record the hemoglobin concentration to one decimal point.

2.13. Anthropometric Measurements

Anthropometric measurements were taken using electronics scale balance and height board was used. All data collection was electronically recorded while surveyed in to SUMSUNG Tablet S2 for saving sample entering time.

2.14. Procedure

Weights of the lactating mothers was measured to the nearest 0.1 kg using calibrated portable electronic digital scale with dual display (Seca 874U, Germany) and height was measured to the nearest 0.1 cm using a portable height-measuring board with a sliding head bar following standard WHO guide line. During height measurements, the eligible lactating mothers were told to remove any hair covering and stand straight on the marked space of the height board. In the same manner, before taking weight measurements, the balance scale was calibrated to normal standard and after all calibration was completed, the respondent advised kindly to remove extra cloths worn and only use light cloths. Lastly, the weight measurement was taken with bare foot. All measurements were done in duplicate to maintain accuracy and whenever the duplicate units divert significantly from each other taking third measurement was compulsory. All data were recorded electronically and for each eligible household GPS was taken to track the exact location of household in case if the needed to be repeated.

2.15. Study Variables

2.15.1. Dependent Variable: Maternal Under Nutrition

2.16. Independent Variables:

2.16.1. Socio-Demographic Factors

Maternal age, religion, ethnicity, marital status, maternal occupation, maternal educational status, residence and family size and safety, WDDS

2.17. Maternal Health Care

Place of delivery, parity, Illness over two weeks prior to the study, anemia, number of Antenatal care (ANC) and Postnatal care (PNC) visit and Water, Sanitation and Hygiene

2.18. Feeding Practice

The majority of the respondents used to eat with regardless of cultural norms or other habits any available food at Households. Only very few in number used to eat selectively taking in to consideration the culture norms and habits they learned from their parents.

2.18.1. Data Quality Control

The questionnaire was written in English first and translated into the local languages (Amharic). In order to know the age of the child's age, birth certificate obtained from health institute was asked to display on the interview day. In absence of birth certificate some known events, like, holidays, seasons etc, and used to be asked. The sampling tools were pre-tested prior to the data collection training for its accuracy and not encountering problems in the field.

2.19. Data Processing and Analysis

2.19.1. Data Processing

The collected were analyzed using Stata version 14.2 software in two steps. First, descriptive statistics was used to examine the frequency and distribution of lactating mothers' socio demographic. Secondly, chi square test was applied for association and risk factors for under nutrition of lactating mothers in the study area with the significance value of $p<0.05$.

2.19.1. Ethical Consideration

The ethical approval was obtained from EPHI ethical review committee. The ethical clearance was submitted to the SNNPR, health office and following the zone, *woreda* and kebeles health offices/centers had received the ethical clearance copies. The lactating mothers were informed about the data collection and its contribution for their future nutritional benefits for the *woreda* and the country as a whole. The verbal consent was obtained from each participant it was assured that the information obtained from them was maintained confidential.

3. Results and Discussion

3.1. Results

3.1.1. Socio-Demographic Status of the Lactating Mothers

In this study, a total of 422 lactating mothers aged 15-49 years were participated making a response rate of ≥ 99%. The majority of the participants (59.3%) were in age group of 25-34 and the participants mean age was 25.39% years. With regarding to ethnicity 99.53% were wolayita ethnic group. Among the participants, (87.7%) were protestant. The majority, 415 (98.1%) of lactating mothers were married. Almost half of the mothers, 217 (51.3%)) were housewives': concerning educational status of the participants, 207 (48.9%) was grade one to eight. The percentage of lactating mothers participants were, 111(26.34%), 239 (56.24%) and 7 (1.65) have 1-3, 4-6 and ≥ 7 family size, respectively.

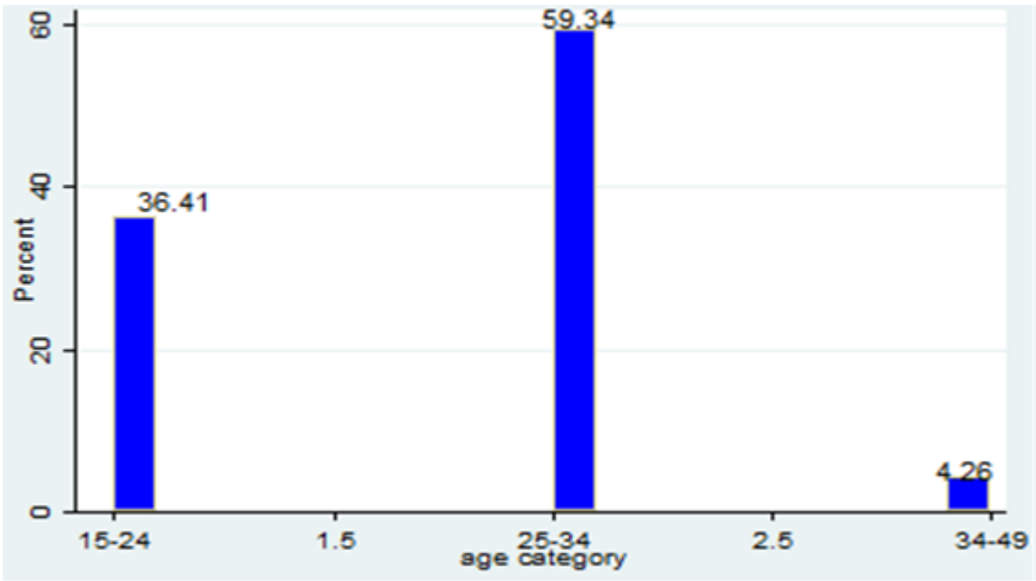


Figure-3. Age category of lactating women in Offa *woreda, 2017*
Source: Age category from study area *//Offa woreda,2017/*

3.2. Water, Sanitation and Hygiene (WASH)

Among the lactating mothers, contamination free drinking water and availability of toilet are among the maternal health care services. Accordingly, 90.05% of lactating women obtained drinking water from pipe line service and the coverage of toilet was 82.23%, with many defects of facility services.

3.3. Body Mass Indexes of Lactating Mothers

Among the lactating mothers participants, 15.84 %(< 18.5kg/m²), 74.23 %(18.5-24.9kg/m²), 8.27(25-29.9m²) and were 1.64(≥30kg/m²) in their BMI had chronic energy deficiency, normal, over weight and obese respectively as shown in (Figure 5).

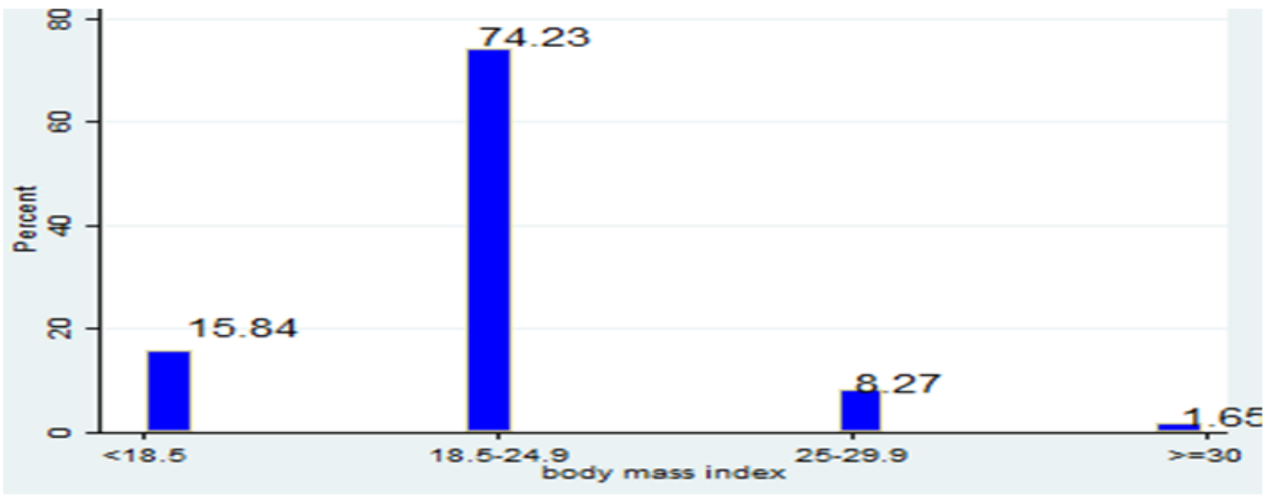


Figure-5. BMI of lactating mothers in the Offa *woreda, 2017*
Source: From study area of lactating mothers

3.4. Dietary Diversity of Lactating Mothers (WDDS)

The recall period of 24 hours was chosen by FAO as it is less subject to recall error, less cumbersome for the respondent and also conforms to the recall time period used in many dietary diversity studies [28]. The analysis of dietary diversity data based on a 24-hour recall period is easier than with longer recall periods. The study conducted in the study area was based on the above guidelines the daily dietary diversity intake per day of lactating mothers was classified as high (>5) 1.2%, medium (4-5) 50.7% and low (<3) 47.4% among the nine food groups recommended for WDDS.

Table-2. Effect of different risk factors on underweight status of lactating mothers in Offa *Woreda* , 2017.

Variables	No. observed	Frequency	Percent	Chi²	P-value
Marital status					
Married	415	62	14.93	19.8820	0.001
Others	8	5	62		
Age					
15-24	154	26	16.88	0.2273	0.893
25-34	251	38	15.13		
35-49	18	3	16.66		
Religion					
Orthodox	47	7	14.89	2.1553	0.541
Protestant	371	59	15.90		
Others	4	1	25		
Educational status					
Illiterate	107	16	14.95	1.3278	0.857
1 – 8th	211	36	17.06		
9-12th	66	11	16.66		
Collage	38	4	10.52		
Family size					
1-3	111	20	18.01	0.6692	0.716
4-6	239	37	15.48		
>7	73	10	13.69		
Occupation					
Farmer	75	10	13.33	6.9564	0.044
Student	10	4	40.0		
Merchant	81	11	13.58		
Government	25	3	12		
House wife	217	38	17.51		
Others	14	1	7.14		
Total					

Source: from study area/ *woreda* , 2017

Table-3. Factors contributing to under nutrition in Offa *woreda*, 2017

Factor	OR	Z	p-value		95%CI
ANC Service					
≥4	1.27	0.98	0.326	0.7878	2.0478
<4	0.889	-0.54	0.588	0.5806	1.3608
Family size	1.11	0.067	0.084	0.9860	1.2493
Education					
Able to read and write	0.168	0.17	0.869	-1.8279	2.1651
1-8th	0.013	0.05	0.957	-0.4557	0 .4817
9-12th grade	0.862	2.65	0.008	0.2246	1.4993

Source: Data analyzed from study area/Offa woreeda/

Table-4. Effect of various risk factors on nutritional diversity of lactating mothers in the Offa *woreda*, 2017

	Coef.	Std. Err.	Z	P>|z|		95% CI
No ANC	-0.031	0 .0853	-0.36	0.717	-0.1981	0.1364
Intercept	0.2333	0.3285	0.71	0.478	-0.4106	0.8772
Education	0.2374	0.0812	2.93	0.003	0.0784	0.3965
Intercept	-0.6067	0.2487	-2.44	0.015	-1.0940	-0.1193
No formal edu.	1.0186	0.17	0.869	-1.83	-1.8279	2.1651
1-8th Grade	0.0130	0.2391	0.05	0.957	-0.4557	0.4817
9-12th Grade	0.8618	0.3253	2.65	0.008	0.2242	1.4994
Collage level	1.0665	0.4069	2.62	0.009	0.2899	1.8641
Intercept	- 0.1686	0.1940	-0.87	0.385	-0.5489	0.2117
No formal edu.	1.0186	0.170	0.869	-1.83	-1.8279	2.1651
Occupation						
Farmer	-0.8804	1.2465	-0.71	0.480	-3.3235	1.5628
Merchant	-0.4418	1.2453	-0.35	0.723	-2.8826	1.9989
Gov. Employee	0.6931	1.3229	0.52	0.600	-1.8996	3.2859

Source: Data analyzed from study area/Offa *woreda/*

Table-5. Dietary diversity level of lactating mother in the Offa *woreda*, 2017

Status	Daily intake	Freq.	Percent
High	(>5)	7	1.66
Medium	(4—5)	214	50.83
Low	(<3)	200	47.51
		421	100

Source: Data analyzed from study area/Offa *woreda/*

Table-6. Dietary diversity status of the Offa w*oreda, 2017*

Diversity	Mean	Std. dev.	Min.	Max.
Food made from grain	0.9574	0.2023	0	1
White root and tube	0.7156	0.4564	0	1
Pulse	0.4550	0.4986	0	1
Nuts and seeds	0.0261	0.1595	0	1
Milk and milk product	0.1754	0.3807	0	1
Organ meat	0.0024	0.0487	0	1
Meat and poultry	0.0166	0.1279	0	1
1	0	0	0	0
Egg	0.0047	0.0688	0	1
Dark green leafy	0.3649	0.4820	0	1
Vit. A rich vegetable, root and tuber	0.0308	0.1730	0	1
Other vegetables	0.7488	0.4342	0	1
Average weight in (Kg)	52.2580	8.9427	34.6	108.2
Average height (cm)	157.2863	6.1155	138.1	179.2

Source: Data analyzed from study area/Offa *woreda/*

3.5. Maternal Health Care

Among the lactating mothers, (79.86%) of them ANC service ≥4 times, (78.44%) Iron tablet, (23.78%) vitamin A obtained during the last birth of pregnancy and (52.61%) have given birth at health institute during their last child. The blood hemoglobin test in the study *woreda* shows 11.37% among the participants were the hemoglobin level in the blood was ≤12g/dl (Table 7).

Table-7. The effect of anemia on dietary diversity of lactating mother in Offa woreda, 2017

Anemia status nutritional diversity	Anemic	Normal	Total
DDS ≥4	26(11.98%)	196(88.02%)	217
DDS <4	22(10.78%)	182(89.22%)	204

Source: Lactating Mothers from Offa *woreda,* 2017

Hemoglobin < 12g/dl is anemic and ≥ 12g/dl normal (WHO guide line).

The minimum and maximum recorded values of hemoglobin were 9.3 and 17.2 g/dl, respectively. The recorded mean value was 13.56±1.35 g/dl. The effect of being normal or anemic had no significant ($p>0.05$) effects on dietary diversity intake of lactating mothers. The minimal amount of animal source foods intake in their daily meal could likely be the reason why it was not observed as significant effect.

4. Discussion

The study conducted on the particular community members of lactating women in SNNPR, Wolayita zone Offa *Woreda* in the selected six kebeles showed that among the participants, 15.84% with 95% CI (12.52, 19.72) were < 18.5 kg/m² in their BMI. This result is comparable with chronic energy deficient of lactating women in Pakistan 15.1% [18]. The nutritional status of the study area was much less than the national level (27%) as reported by Food and Agriculture Organization [3]. The chronic energy deficiency status identified in the study area (Offa *woreda)* was much difference from chronic energy deficiency in Babile woreda 41.7% and 54.4% during post and pre-harvesting, respectively [29]. The chronic energy deficiency in other parts of the developing countries showed, in Bangladaesh (30%) UNICEF/ Hossain, et al. [30] and Vietnam (28.3%) [31]. The study conducted at Ambo district of lactating mothers was 21.5% [29] which was higher than the result obtained in this study.

When the blood hemoglobin in the study woreda was checked out, the prevalence of anemia in the study *woreda* was 11.4%. This indicates that among the participants 11.4% had <12g/dl hemoglobin in their blood. No severe case of anemia was observed for lactating mothers in the studied area (Table 7).

In EDHS 2016 report, the prevalence of anemia in all regions and community members was assessed, from the report. The studied area observation was somehow compared with the anemia prevalence of Addis Ababa (15.9%) and Amhara (16.3%) mothers by EDHS 2016.however the national prevalence of anemia was 16.4% and 24.4% urban and rural, respectively as it was reported by EDHS (Ethiopia Demographic and Health Survey) [6].

According to Kennedy and Nantel [14] project survey, nine types of dietary diversity of food groups were recommended for reproductive age women; out of the nine, at least four types of Dietary foods are needed in their daily meal at minimum level. The daily, dietary intake of lactating mothers in the studied *woreda* was classified in to high level (>5), medium or optimum (4-5) and minimum (<3) per day in their daily meal. The result obtained in the study *area* was, (>5) 1.2%, medium or optimum) (4-5) 50.7% and low (<3) 47.4%). From the result, the minimum and medium are comparable; almost half of the lactating mothers used to get minimum level of dietary food in their daily meal. The two major staple foods in the study *woreda* were food made up of grains (95.7%) and wheat and root crops (71.7%). However, the rests of dietary diversity were much below recommended level for lactating mothers.

Contamination free and treated water is one of the health factors for all human beings. In the study *woreda,* only 52.2% of the participants were getting drinking water from the pipeline around their residences which are slightly less than the reported percentage value of the EDHS (Ethiopia Demographic and Health Survey) [6] 56.6% at rural level. However, with respect to hygienic condition, only 18.7% had a habit of washing their hands before taking food. Among the lactating mothers only 15.2% had knowledge about the cause of disease like diarrhea. Most of the lactating mothers (80.2%) were not counseled on nutritional food when they are visited for other health care services and only 19.8% were counseled on nutritional issues. Thus shows the knowledge level of nutritional food was very limited.

The socio-demographic of the lactating mothers in the studied *woreda* showed that percentage of the participants 56.5 and 26.2 households had 4-6 and 1-3 family size, respectively. The education status of the participants was also identified and the interview made with them 25.4% of the participants, had no formal education which had less than the reported value (47.8 %) [6]. The minimum obtained participants percentage education level were high school and above. Among the participants 98.8 were married. 59.3% were in the age group of 25-34 and 51.4% were housewife. The number of children in each study participants was identified and among the participants 68.9 and 37.8% had 1-3 and 4-6 children, respectively. With regarding to the ethnicity 99.9% were walayita; the majority or 415 (98.1%) lactating mothers were married. With regarding to maternal health care, 35.9% participants had obtained ANC service three times followed by 29.4% who got four times. The rest (34.7%) of the participants were less when compared with the two service periods.

The risk factors for chronic energy deficiency in this study were marital status and education level with ($p < 0.05$). While the rest were not risk factors for chronic energy deficiency (Table 1).

In this studied area, age category, religion, Dietary Diversity and health care services like ANC, didn't have significant effects on the nutritional status of the lactating mothers. This was similar to the study conducted at Ambo, rural areas dietary diversity had no significant ($p > 0.05$) effects on BMI of lactating mothers [32]. In this studied *woreda*, the non-educated mothers were more likely to be malnourished than those High school and college levels as indicated in (Table 2)

5. Conclusion

The results obtained from this study showed that chronic energy deficiency status of the lactating women in the study *woreda* was much lower than the chronic energy deficiency reported at national and regional levels. The daily dietary diversity intake of low and medium level were comparable, indicating insufficient level for lactating mothers to maintain themselves health and the child breast feeding from this portion. The percentages of lactating mothers who have reached high school and above level were very low; thus education had significant risk factors on chronic energy deficiency of lactating mothers. In order to improve the knowledge level of lactating mothers, continuous education is required. Besides, the dietary diversity of lactating mothers should be improved by adopting multi cropping system in the studied Offa *woreda*.

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