Nutritional Status of Adolescent Girls Living in Southwest of Ethiopia

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Abstract

Malnutrition in adolescent is a major public health problem in the world, especially in developing countries, which is responsible for bone mass disability and affects their ability to learn and work at maximum productivity. A cross sectional study design was employed from April to May, 2014 to assess nutritional status of adolescent girls and determinant factors at Ingibi High School which is found in Bedelle town, Illubabor Zone, Oromia Regional State of Ethiopia. A systematic random sampling technique was used to select study subject. Pretested and structured questionnaires were used to collect the data. Anthropometric measurements were used to measure mid upper arm circumference, weight and height of the study participants. A total of 211 adolescent girls were enrolled in the present study. The prevalence of underweight was 28% by having body mass index less than $18.5 kg/m^2$ and 5.2% were at risk of developing obesity by having body mass index $>=25 kg/m^2$. According to their mid upper arm circumference, 21.3% were moderately acute malnourished. The nutritional status of adolescent girls were significantly associated with place of residence (P=0.035), usual diet skipped (P=0.000), frequency of meal per day (P=0.000), history of diarrheal disease in the last two weeks (P=0.000) and family size (P=0.000). In this study, undernutrition was the major problem among adolescent girls in study area. Thus, nutrition education and interventions should be done by considering the potential associated risk factors.

Keywords: Nutritional Status, Adolescent Girls, Body Mass Index, Bedelle, Ethiopia

Introduction

Between 11-19 years of age young people undergo rapid changes in body structure and physiologic, psychological and social functioning. Hormones set with these development agenda together with social structure designed to foster the transition from childhood to adulthood. Adolescent passes through three distinct periods: early (11-13), middle (14-16), and late (17-19) years. Each marked by characteristics set of biologic, psychological and social issues (1).

Adolescence is an intense anabolic period which requires all nutrients increases. During adolescence, 20% of final adult height and 50% of adult weight are attained, bone mass increases of 45% dramatic bone remodeling occur and soft tissue, organs and even red blood cell mass increase in size. This situation is further complicated when adolescents are often exposed to infection and parasite that can compromise nutritional status (2).

The period is also the second most critical period of physical growth in the life cycle after the first year. Twenty percent of adult height and 50 % of adult skeletal volume is maintained at this age. During this stage the bone mineral content increased at a rate of 8.5% per year (3). Current nutritional status of adolescents will decide the well-being of the present as well as the future generations.

Adolescent has typically being considered as low risk of poor health and often receive few health care source and scant attention. However, this approach ignores the fact that many health problems later in life can be improved by adapting health life style habit in adolescents (4). Nutritional difficulties have consequences specially, on adolescent girls. If the nutritional need was not meet, they are likely to givebirth undernourished children, thus transmitting undernourished to future generation. One way to break integration cycle of malnutrition is to improve adolescent girls prior to conception; the vicious cycle of malnutrition, if not broken will go on resulting in more and more severe consequences (4). Studies had showing childhood under nutrition, continues to persist throughout adolescence but little attention has been given to under nutrition of adolescents perhaps for the belief that adolescents are a low-risk group.

There is little information about the nutritional status of adolescents in Ethiopian despite of above facts. Thus, adolescent nutrition is suffering from lack of data; low policymaker interest in the nutritional problems of adolescents; little program experience; and the shortage of resources-contribute to a critical lost opportunity to strengthen the health, development, and economic progress of nations. Thus, this study aimed to determine

nutritional status of adolescent girls and determinant factors in Ingibi High School, Bedelle Town, Ilubabor Zone, Oromia Region, Ethiopia.

Methods and Materials

Study area, subjects and sample recruitment

A school based cross sectional study was conducted from April to May 2014 in Bedelle Ingibi High school which is found in Bedelle town. The town is found at 492km southwest of Addis Ababa. The town located at longitude of 8*270'N, 36*210'E and Latitude of 8*450'N 36*350'E and an elevation between 2012-2162m above sea level. The climate of the town is 'Woynadega' with an average daily temperature of 20^0C (15-25^0) and the mean annual rain fall of 1500mm. It has a total area of 40 hectares and two Kebeles (smallest administrative) with average total population of 32,148. From these, males are 15,753 and females are 16,395. The School has a total of 1213 students (589 male and 624 females) (21).

Eligibility criteria were selected adolescents who have permanent residence in the study area having apparently healthy adolescent girls from 10-19 years old. An exclusion criterion was an adolescent girl with evidence of physical impairment (such as physical defects or a grossly deformed), mental impairment and edematous conditions.

Sample size determination

The sample size was determined using the formula of sample size determination for single population proportion ($n = \frac{(Z\,1-\alpha/2)2\,P\,(1-P)}{d2}$). By the following assumptions: The level of confidence (α) is taken to be 95% ($Z_{1-\alpha/2}$=1.96); and the margin of error (d) is taken to be 5% [0.05]. The proportion (p) of adolescents' girls of who were underweight was 27%, according to the study conducted in Tigray (5). The calculated sample size was 217 female adolescents (required sample size).

Sampling techniques

Structured questionnaires were used to collect the required data from two high schools that are found in Bedelle town and the school was selected by randomly. The sample size is 217 from 624 enrolled female students of Bedelle Ingibi High School. The total number of female students was identified through reviewing records in director office. The female students to be included in the study were determined by systematic random sampling method. Then, every 3rd female students were included in an interview until required sample size was obtained.

Data collection methods

A structured interviewer administered questionnaire was used to collect data related to the objectives of the study. The questionnaire covered a range of topics including socio-economic and demographic factors such as place of residence, grade level, religion, monthly income of household, family size, marital status, sex and age were collected through face-to-face interview. In this study also included other variables such as dietary habit, source of information about nutrition, source of water and history of diarrheal disease.

Anthropometric measurements were used to measure mid upper arm circumference (MUAC), weight and height of respondents. The weight was measured using portable standing scale. It has ability to measure weight from 0 to 150 Kg. The weight was recorded to the nearest 0.1 kg. It was calibrated against known weight regularly. During the procedure the subjects have worn light clothes and bare foot. Height in cm was marked on a wall with a help of a measuring tape. All girls was measured against the wall without foot wear and with heels together and their heads positioned and eyes looking straight ahead (frankfert plane) so that the line of vision was perpendicular to the body and wood scale was brought down to the top most point on the head. The height was recorded to the nearest 0.1cm. The same measurer was employed for a given anthropometric measurement to avoid variability. MUAC was measured by marking midway between acromion (shoulder) and the olecranon (elbow) on the vertical axis of the upper arm with the arm bent at right angle and between the lateral and medial surface of the arm. The measurement of MUAC is normal: if > 18cm for 10-14 years, and >21cm for >= 15 years; moderate malnutrition if 16-18cm for 10-14 years, 18-21cm for >= 15 years; severe malnutrition if < 16cm for 10-14 years and < 18cm for >=15 years (6). Body mass index (BMI) was calculated by dividing weight (in kg) for height (in m^2). It is underweight if <18.5, normal if 18.5-24.9, overweight if 25-29 and obese if >=30 kg/m^2 (6).

Data management and analysis

The data were checked for completeness, coded and entered in to a computer and then edited, cleaned, processed and analyzed using SPSS for windows version 20.0. Descriptive statistics (frequencies, proportions and tables) were used. P-value < 0.05 was considered to be statistically significant. To evaluate the association between nutrition status and predictor variables by using interactive chi square (x^2).

Ethical consideration

Before data collection, the study was reviewed and approved by the Institutional Review Board (IRB) of Wollega University. Informed consent were then handed over and explained to participants. Parents who signed consent, their children participated in the study and the confidentiality of results was observed.

Results

From the total of 217 adolescent girls who were selected for the study, 211 were enrolled in the study yielding the response rate of 97.2%. Majority of them; 117 (55.5%) were in aged between 14-16 years and 94 (44.5%) were in aged between 17-19 years. About 206 (97.6%) of them were single and only 5 (2.37%) have married. The dominant religion of the respondents were Christian orthodox which accounting 88 (41.7%), followed by Protestant 70 (33.2%), and Muslim 53 (25.1%) (Table1).

Table 1. Socio Demographic Characteristics of respondents in Bedelle Ingibi high school from April to May, 2014 (n=211).

Variables	Frequency	Percent
Age in years		
14-16	117	55.5 %
17-19	94	94.0%
Marital Status		
Single	206	97.7%
Married	5	2.37%
Grade		
Nine	122	57.8%
Ten	89	42.2%
Address		
Urban	167	79.1%
Rural	44	20.9%
Total	**211**	**100%**

Hundred forty eight (31.2%) of the respondents got the information from the school and fifty (17.3%) from television (Table 2).

Table 2. Sources of information among respondents who have information about nutrition Bedelle Ingibi high school from April to May, 2014 (n=211).

Source of information	Number	Percent
School	148	31.2%
Television	82	17.3 %
Radio	50	10.5 %
Parents	70	14.8 %
Text book	61	12.9 %
Health professional	63	13.3 %
Total	**474***	**100 %**

* Since more than one response is possible, the column total exceeds the sample size.

About three fourth of the respondents, 200 (74.4%) reported that their staple food were prepared from grains like teff and only 3 (1.10%) from sorghum. Hundred forty four (68.3%) ate three times per day and only two (0.90%) ate five or more times per day. Only forty three (20.4%) of respondents experienced diarrheal disease in the last two weeks and all of the respondents have started menstruation (Table 3).

Table 3. Dietary habit among respondents in Bedelle Ingibi high School from April to May, 2014 (n=211).

Staple Foods/type of grains	Number	Percent
Wheat	32	11.9%
Teff	200	74.4%
Maize	24	8.90%
Barely	10	3.70%
Sorghum	3	1.10%
Total	**269***	**100%**
Frequency of meal per day		
2 times	29	13.7%
3 times	144	68.3%
4 times	36	17.0%
>=5 times	2	1.00%
Total	**211**	**100%**

 * Since more than one response is possible, the column total exceeds the sample size.

Nutritional status of adolescents

One hundred eighty six (88.2%) of the respondents had height greater than 150cm and only twenty five (11.8%) were between 100-150cm. Hundred ninety eight (93.8%) of the respondents had a weight of greater than 40 kg and only 13 (6.2%) had weight between 20-40kg (Table 4).

The prevalence of underweight among adolescent girls was 59 (28%) by having BMI less than 18.5kg/m^2. Hundred forty one (66.8%) had normal body mass index and only eleven (5.2%) were at risk of developing obesity by having BMI >=25 kg/m^2.

According to their mid upper arm circumference (MUAC) only one (0.47%) was severe acute malnourished by having MUAC less than 18cm. Forty five (21.32%) were moderate acute malnourished (MUAC between 18-21cm) and hundred sixty five (78.2%) were normal (MUAC greater than 21 cm) (Table 4).

Table 4. Anthropometric measurements among respondents in Bedelle Ingibi high School from April to May, 2014(n=211).

Character	Number	Per cent (%)
Height (cm)		
100-150	25	11.8
>150	186	88.2
Weight (kg)		
20-40	13	6.20
>40	198	93.8
Nutritional status by BMI (kg/m^2)		
Underweight (<18.5)	59	28.0
Healthy weight (18.5-24.9)	141	66.8
Overweight (>=25)	11	5.2
Nutritional status by MUAC (cm)		
<18	1	0.47
18-21	45	21.3
>21	165	78.2
Total	**211**	**100**

Associated risk factors

The nutritional status of adolescent girls had no statistically significant with age (*P=0.368*), marital status (P=0.15), source of water (*P= 0.496*) and family income (*P=0.988*). There was statistically significant difference between the nutritional status (malnutrition) of adolescent girls and place of residence (*P=0.035*), usual diet skipped (*P=0.000*), frequency of meal per day (*P=0.000*), history of diarrheal disease in the last two weeks (*P=0.000*) and family size (*P=0.000*) (**Table 5**).

Table 5: Association between some variables and nutritional status (malnutrition) among respondents in Bedelle Ingibi high School from April to May, 2014 (n=211).

Variables	Nutritional Status by BMI in kg/ m^2			X^2	Df	P-value
	Underweight BMI<18.5	Normal BMI18.5-24.9	Overweight BMI>=25			
Age in years						
14-16	37	75	5	1.99	2	0.368
17-19	22	66	6			
Marital Status						
Single	59	137	10	3.71	2	0.150
Married	0	4	1			
Grade						
Nine	34	81	7	0.16	2	0.922
Ten	25	60	4			
Family size						
1-3	6	14	4	34.0	6	0.000
4-6	30	104	0			
7-9	20	22	6			
10-12	3	1	1			
Residence						
Urban	41	115	11	6.28	2	0.035
Rural	18	26	0			
Source of water						
Pipe water	52	136	10	3.38	4	0.496
Spring	5	4	1			
River water	2	1	0			
Family monthly income (ETB)						
<500	6	15	1	3.74	12	0.988
500-1000	21	49	4			
1001-1500	10	23	1			
1501-2000	9	21	2			
2001-2500	6	15	2			
2501-3000	3	9	0			
>3000	4	9	1			
Number of meals per day						
Two times	24	5	0	56.1	6	0.000
Three	28	112	4			
Four	7	23	6			
Five or more	0	1	1			
Diarrhea in last two weeks						
Yes	30	8	5	56.8	2	0.000
No	29	133	6			
Usual diet Skipped						
Yes	40	52	7	17.3	2	0.000
No	19	89	4			

Discussion

Adolescence, a period of transition between childhood and adulthood, occupies a crucial position in the life ofhuman beings. This period is characterized by an exceptionally rapid rate of growth. The peak rates of growthare exceeded only during the fetal life and early infancy (7). The poor nutritional status of adolescents, especially girls has important implications in terms of physical work capacity, adverse reproductive outcomes, pregnancy outcomes, and birth weight (8). Adolescents (aged 10 to 19 years) have specific health and development needs, and many face challenges that hinder their well being (9). These problems are prevailing in developing countries like Ethiopia. The findings of this study were important to determine the nutritional status of adolescent girls and associated factors among Bedelle Ingibi High School girls, South Western Ethiopia.

The overall prevalence of underweight of this study was found to be 28.0% which indicated that malnutrition was a major problem in the adolescent girls. It was consistent with the study done in rural community of Tigray which reported the prevalence of underweight was 26.5 % (5). It is also consistent with study done in Sudanese public school girls and Jimma that showed the prevalence of underweight were 25.0% (10) and 27.1% (11), respectively. But, it disagrees with the study done in India, Bangladesh, and Nepal in which prevalence of under nutrition is 53.0%, 50.0%, and 36.6%, respectively (12). It also disagrees with the previous study conducted in Saud Arabia and Addis Ababa, Ethiopia which reported that the prevalence of underweight as 11.0% (13) and 13.4% (14), respectively. This difference might be due to the difference in socio demographic, economic characteristics and study areas.

The current study showed that the prevalence of overweight is 5.21% which is comparable with study in Addis Ababa in which prevalence of overweight was range between 4.3% for government to 12.7% for private school students (14). But, it contradict with study done in Sudanese (Khartoum) private school girls, Bangladesh, and Saud Arabia in which prevalence of overweight were 23.0% (10), 0.30% (7) and 28.0% (13), respectively. This might be due to the economic difference between Ethiopia and those countries.

In this study, the nutrition status of adolescent girls was significantly associated with place of residence ($P=0.035$), where rural resident had high proportion underweight (Body Mass Index <18.5) than other. This is similar with reported elsewhere (16-19). This observed because of high level of poor nutritional status among adolescent girls were gender discrimination; poverty; lack of education; inappropriate feeding practices, superstitious beliefs, food taboos that prevented consumption of certain foods; and faulty interfamilial distribution of food in most rural part of a country.

Family size also influences nutritional status of adolescent girls. Present study showed that, when increase in family size, decrease in nutritional status in adolescent girls. This is similar with the report of study conducted Khagrachhari district in Chittagong hill tracts, Bangladesh (20). This could observed by the effect of diet skipped ($P=0.000$) and frequency of meal per day ($P=0.000$) which significantly associated in present study with nutrition status.

The presence of diarrheal disease in the last two weeks ($P=0.000$) was significantly contributed malnutrition. This is attributed to the effect of disease on malnutrition and has been reported by other studies (20).

Conclusion
In the present study, undernutrition was a major problem among adolescent girls in study area. There was statistically significant difference between the risk factors of nutritional status of adolescents and their BMI. Thus, the programs to support adequate nutrition for adolescents could provide an opportunity for healthy transition from childhood to adulthood and could be an important step towards breaking the vicious cycle of intergenerational malnutrition. Moreover, the focus should be given to Adolescent nutrition and interventions by considering the potential associated risk factors.

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Author Contributions
Tsedeke Wolde, Dagnie Mekonnin, Fedasa Abu, Firew Yitayin, Fufa Dufer and Wakjira Amanu were designed the study, participated in data collection and data analysis. Tsedeke Wolde, Tadesse Birhanu and Eyasu Ejeta were participated in data analysis, write up and drafted the manuscript. All authors read, critically revised and approved the final manuscript.

Conflict of Interest
The authors declare no conflict of interest.

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