Food & Nutrition: Current Research
FNCR, 2(1): 106-112
www.scitcentral.com

ISSN: 2638-1095

Original Research Article: Open Access

Determinants of Under Nutrition among Adolescents in Lemo District, South Ethiopia

Mengistu H Nunemo*, Bruke B Billoro and Mouaz A Yousfan

*[*1]Department of Public Health, College of Medicine and Health Sciences, Wachemo University, Hosanna, Ethiopia*

[2]Department of Pharmacy, College of Medicine and Health Sciences, Wachemo University, Hosanna, Ethiopia.

[3]Department of Clinical Pharmacy, Near East University, Northern Cyprus.

Received December 18, 2018; Accepted January 29, 2019; Published February 24, 2019

ABSTRACT

Objective: To assess determinants of under nutrition among adolescents at Lemo district, south Ethiopia

Design: Community based unmatched case-control study design was conducted. Cases comprised undernourished adolescents aged 10-19 years and controls were well-nourished adolescents.

Study setting: The study was conducted at Lemo district of Hadiya zone after eligible group identified at household from March 10 up to May 25, 2015.

Participants: One hundred eighty two (91 cases and 91 controls) study subjects were selected with probability proportional to size from six kebeles by using simple random sampling technique.

Main outcome measures: Weight was measured in kilogram using digital bath room weighing scale to nearest 0.1 kg and height was measured in centimeter using a portable measuring board to the nearest 0.1 cm, Body Mass Index<18.5 kg/m^2 cut-off point for malnutrition

Results: Age, sex and type of latrine were found to be independent predictors of adolescent under nutrition. Adolescents in age group 10-12 years were more likely to develop under nutrition as compared to adolescents in age group 13-15 years (AOR=8.7 (95% CI=2.51-30.10)), adolescents in age group 13-15 years were more likely to develop under nutrition as compared to adolescents in age group 16-19 years (AOR=7.9 (95% CI=2.67-23.82)), male adolescents were more likely to develop under nutrition as compared to female adolescents (AOR=4.3 (95% CI=1.87-10.04)), adolescents who used open field defecation were more likely to develop under nutrition as compared to adolescents who had ventilated pit latrine (AOR=8.7 (95% CI=1.27-60.03)) and adolescents who had pit latrine were more likely to develop under nutrition as compared to adolescents who had ventilated pit latrine (AOR=6.8 (95% CI=1.18, 39.94)).

Conclusion: Age, sex and type of latrine were independently associated with adolescent under nutrition. Therefore, developing and implementing health programs to tackle adolescent malnutrition should be taken into account.

Keywords: Malnutrition, Adolescent, Predictors, Lemo

INTRODUCTION

Malnutrition is the condition that results from taking an unbalanced diet in which certain nutrients are lacking, in excess, or in the wrong proportions [1].

The World Health Organization cites malnutrition as the gravest single threat to the world's public health. Improving nutrition is widely regarded as the most effective form of aid. FAO reported that there were 925 million malnourished people in the world in 2010 [2].

Malnutrition is the most serious human health and social problems that affect vast population of the world where, the effect in terms of increased mortality, morbidity, reduction in productivity and reproductive capacity is considerable particularly in the developing countries [1].

About one-quarter of the Sub-Saharan African population is unable to secure adequate food to meet their nutritional requirements. The large and increasing incidence of

Corresponding author: Mengistu H Nunemo, Department of Public Health, College of Medicine and Health Sciences, Wachemo University, Hosanna, Ethiopia, Tel: 251 9 16357401; E-mail: mengistuhandiso@yahoo.com; menhand2011@gmail.com

Citation: Nunemo MH, Billoro BB & Yousfan MA. (2019) Determinants of Under Nutrition among Adolescents in Lemo District, South Ethiopia. Food Nutr Current Res, 2(1): 106-112.

malnutrition in Sub-Saharan Africa impedes the social and economic progress of the continent. In Ethiopia there is a high level of chronic food insecurity and vulnerability to acute food insecurity, due to drought, environmental degradation, as well as poor access to and availability of food. Between 2004 and 2006, 44% of the people in the country were estimated to be undernourished [3].

World Health Organization, in 1986 defines adolescent as person age 10 to 19 years old. Adolescents are the future generation of any country and their nutritional needs are critical for the wellbeing of society. Growth during adolescence is faster than at any other time in an individual's life except the first year. 20% of adult height, 50% of adult weight and 50% of adult skeletal mass is attained during adolescence; as a result, nutritional requirements peak in adolescence [4].

Good nutrition during adolescence is critical to cover the deficits suffered during childhood and should include nutrients required to meet the demands of physical and cognitive growth and development. Adolescent represent around 20% of the global world's population and around 84% of them are found in developing countries [1].

Adolescents from developing countries are more vulnerable to nutritional deficiencies due to early childhood nutritional problems, which include underweight, stunting and low dietary intakes. In developing countries where a large segment of the population is involved in low income jobs with large family sizes can't afford to buy good quality food and their diets are mostly restricted to cereals and legumes [5].

Adolescent in Ethiopia accounted for 25.2% of the total population according to Demographic and Health Survey, 2005 [6].

Adolescents haven't received much attention with respect to their nutritional needs and wellbeing so there is limited information on the determinants of adolescent under nutrition and the precise mechanisms by which it is linked to other health and social outcomes [7].

The Federal Government of Ethiopia has been working to reduce under nutrition significantly through public education and providing nutritional supplements and financial support to vulnerable families. However, the risk factors of under nutrition are diverse and could potentially change in space and time. Thus, there is a need to determine the current nutritional status to review the pitfalls and design effective intervention strategies.

To the best of my knowledge, there was no study done on nutritional status of adolescent in the area. Therefore, this study was carried out to assess determinants of under nutrition among adolescents and to fill information gaps and recommend possible intervention in Lemo district, South Ethiopia.

METHODS AND MATERIALS

Design

Community based unmatched case-control study design was conducted in Lemo district, Hadiya zone, South Ethiopia from March 10 to May 25, 2015. Cases comprised undernourished adolescents aged 10-19 years and controls were well-nourished adolescents. Sample size was determined using statistical formula for two population proportions. Assumption was based on considering sex (OR=2.5), boys had greater chance to be underweight as compared to girls, prevalence of under nutrition among controls was 58.3% with 95% CI and 80% power and case to control ratio 1:1 [8,9].

The study subjects were selected with probability proportional to size from six kebeles From 2 urban kebeles, 77 households were included and from 4 rural kebeles, 105 households were included in the study using simple random sampling technique data until sample size was fulfilled. If there were more than one eligible adolescent in household, one adolescent was selected using lottery method. Finally 182 sample sizes were enrolled.

Data collection was conducted using a structured questionnaire developed in English and addressed all important variables and translated in to local language which is Hadiysa. Six data collectors and two supervisors who were recruited based on previous data collection and work experience. In each kebele one data collector was assigned. Data collectors were trained for two days on purpose, scope of the study, and overall procedure of data collection instrument and supervision.

The information was obtained both from parents and study subjects. Weight was measured in kilogram using a portable bath room digital weighing scale with the adolescents in light clothing and without shoes to nearest 0.1 kg. Weighing scale was recalibrated before taking the weight of each study subject. The height was measured in centimeter using portable measuring board standardized by WHO and used by CSA and EHNRI at national level in standing position without shoes to nearest 0.1 cm.

Supervision was conducted by supervisors and principal investigator during data collection and data was edited each day and feedback was given for data collectors.

Pre-test was done in 18 subjects in other district with similar socio-demographic background and consistency was ensured and appropriate modifications was made after discussing with supervisors and data collectors such as skipping patterns and some other corrections two days before starting the actual data collection process.

STATISTICAL ANALYSIS

Data were entered into a computer, edited, cleaned and analysis was done using Statistical Package for the Social

Sciences (SPSS) version 20 for analysis. Both bivariate and multivariate analyses were done by using binary logistic regression. Variables those having association in binary logistic regression was checked by multivariate logistic regression to identify confounders. A bivariate analysis was carried out to see the association between dependent and independent variables. All variables with p value<0.5 were taken to multivariable model to control all possible confounders odds ratio along with 95% confidence level which was estimated to identify predictors under nutrition among adolescent using multivariable logistic regression analysis. Level of statistical significance was declared at p value<0.05. Finally, the results were presented by text and tables.

RESULTS

A total of 182 adolescents (91 cases and 91 controls) aged 10-19 years were participated in the study. It was found that 50 (86.2%) of cases and 8 (13.8%) of controls were between age group 10-12 years. Adolescents in age group 10-12 years were more likely to develop under nutrition as compared to adolescents in age group 13-15 years (COR=5.4; 95% CI: 2.15, 13.49) and adolescents in age group 13-15 years were more likely to develop under nutrition as compared to adolescents in age group 16-19 years (COR=5.6; 95% CI: 2.46, 12.73) **(Table 1)**.

Table 1. Socio-demographic related factors with adolescent under nutrition at Lemo District, South Ethiopia, March 10 to May 25, 2015.

Variables	Category	Under nutrition		COR
		Cases (N=91)	Controls (N=91)	
Age in years	10-12 years	50	8	5.4 (CI=2.15-13.49)*
	13-15 years	29	25	5.6 (2.46-12.73)*
	16-19 years	12	58	1.00
Sex	Male	47	27	2.5 (1.38-4.66)*
	Female	44	64	1.00
Birth order	First birth	43	27	2.0 (1.09-3.83)*
	2-6	42	54	1.00
	7+	6	10	0.8 (0.25-2.29)
Birth interval	First birth	21	34	0.7 (0.37-1.57)
	<24 months	17	5	3.8 (1.22-12.35)*
	24-47 months	32	28	1.3 (0.60-2.83)
	48+ months	21	24	1.00
Adolescent education	No education	3	5	2.6 (0.48-14.01)
	Primary	69	35	8.5 (3.21-22.68)*
	Junior	13	25	2.3 (0.74-6.85
	Senior	6	26	1.00
Current mothers age	25-29	13	4	4.7 (1.39-15.4)*
	30-34	17	17	1.4 (0.64-3.23)
	35-39	29	24	1.7 (0.86-3.51)
	≥ 40	32	46	1.00

** Variables which shown significant association during the Bivariate analysis at P<0.05*

Male adolescents were more likely to develop under nutrition as compared to female adolescents (COR=2.5; 95% CI: 1.38-4.66). Adolescents with first birth order were more likely to develop under nutrition as compared to adolescents with 2-6 birth order (COR=2.0; 95% CI: 1.09, 3.83). Adolescents with less than 24 months birth interval were more likely to develop under nutrition as compared to adolescents with 48+ months birth interval (COR=3.8; 95% CI: 1.22, 12.35) **(Table 1)**.

Majority 69 (66.3%) of cases and 35 (33.7%) of controls were educated to level of primary. Adolescents educated to level of primary were more likely to develop under nutrition as compared to adolescents educated to level of senior secondary/tertiary (COR=8.5; 95% CI: 3.21, 22.68).

Adolescents whose mothers age group 25-29 years were more likely to develop under nutrition compared to adolescents whose mothers age greater than or equal to forty years (COR=4.7; 95% CI: 1.39, 15.4) **(Table 1)**.

13 (41.9%) of cases and 18 (58.1%) of controls had history of addictive substance used. 48 (59.3%) of cases and 33 (40.7%) of controls were practicing regular physical exercise. Adolescents who practiced physical exercise were more likely to develop under nutrition as compared to adolescent who did not practice physical exercise (COR=1.9; 95% CI: 1.08, 3.55). Adolescents who practiced physical exercise twice a week were more likely to develop under nutrition as compared to adolescents who did not practicing physical exercise (COR=2.6; 95% CI: 1.24, 5.45). History of substance use and illness were not significantly associated with adolescent under nutrition **(Table 2)**.

Table 2. Health related factors with adolescent under nutrition at Lemo District, South Ethiopia, March 10 to May 25, 2015.

Variables	Category	Under nutrition		COR (95% CI)
		Cases (N=91)	Controls (N=91)	
History of substance use	Yes	13 (41.9)	18 (58.1)	0.67 (0.31-1.47)
	No	78 (51.7)	73 (48.3)	1.00
Khat	Yes	1 (25.0)	3 (75.0)	0.3 (0.01-3.61)
	No	90 (50.6)	88 (49.4)	1.00
Alcohol	Yes	12 (44.4)	15 (55.6)	0.7 (0.31-1.88)
	No	79 (51.0)	76 (49.0)	1.00
Regular physical exercise	Yes	48 (59.3)	33 (40.7)	1.9 (1.08-3.55)*
	No	43 (42.6)	58 (57.4)	1.00
Frequency of exercise	Daily	6 (66.7)	3 (33.3)	2.7 (0.63-11.39)
	Once a week	13 (46.4)	15 (53.6)	1.2 (0.56-2.71)
	Twice a week	29 (59.3)	15 (40.7)	2.6 (1.24, 5.45)*
	No exercise	43 (42.6)	58 (57.4)	1.00
History of illness	Yes	26 (46.4)	30 (53.6)	0.8 (0.43-1.52)
	No	65 (51.6)	61 (48.4)	1.00
Frequency of illness	<3 times	13 (39.4)	20 (60.6)	1.00
	≥ 3 times	13 (56.5)	10 (43.5)	1.6 (0.78-3.64)

** Variables which shown significant association during the Bivariate analysis at P<0.05*

Adolescents who used open field defecation were more likely to develop under nutrition as compared to adolescents who had ventilated pit latrine (COR=4.6; 95% CI: 1.22, 17.68). Adolescents who had pit latrine were more likely to develop under nutrition compared to adolescents who had ventilated pit latrine (COR=7.3; 95% CI: 2.03-26.93) **(Table 3)**.

Table 3. Bivariate analysis of environment related factors with adolescent under nutrition at Lemo District, South Ethiopia, March 10 to May 25, 2015.

Variables	Category	Under nutrition		COR (95% CI)
		Cases (N=91)%	Controls (N=91)%	
Availability of latrine	Yes	56	61	1.00
	No	35	30	1.3 (0.69-2.33)
Type of latrine	Open field	27	31	4.6 (1.22-17.68)*
	Pit toilet	61	44	7.3 (2.03-26.93)*
	Ventilated pit latrine	3	16	1.00
Waste disposal	Open field	50	42	2.5 (1.22-5.21)*
	Communal container	32	15	3.5 (1.47-8.48) *
	Private container	9	34	1.00

** Variables which shown significant association during the bivariate analysis at P<0.05*

Adolescents who used open field waste disposal were more likely to develop under nutrition as compared to adolescents who had private waste disposal container (COR=2.5; 95% CI: 1.22, 5.21). Adolescents who used communal waste disposal container were more likely to develop under nutrition as compared to adolescents who had private waste disposal container (COR=3.5; 95% CI: 1.47, 8.48). Only source drinking water was not significantly associated with adolescent under nutrition **(Table 3)**.

The final model was constructed using backward binary logistic regression method. All variables which had shown statistically significant association during chi-square analysis such as age, sex, birth order, birth interval, educational status of study subjects, practicing regular physical exercise, frequency of physical exercise, current mother's age, mothers educational status, ethnicity, type of latrine and availability of waste disposal container were included. However, on multivariate backward binary logistic regression analysis, out of these twelve independent variables only age, sex and type of latrine were found to be independent predictors for the occurrence of adolescent under nutrition.

Adolescents in age group 10-12 years were more likely to develop under nutrition as compared to adolescents in age group 13-15 years (AOR=8.7; 95% CI: 2.51, 30.10), adolescents in age group 13-15 years were more likely to develop under nutrition as compared to adolescents in age group 16-19 years (AOR=7.9; 95% CI: 2.67, 23.82) **(Table 4)**.

Table 4. Independent predictors of under nutrition among adolescent at Lemo district, South Ethiopia, March 10 to May 25, 2015.

Variables	Category	Under nutrition		COR (95% CI)	AOR (95% CI)
		Cases (N=91)	Controls (N=91		
Age	10-12	50	8	5.4 (2.15-13.49)*	8.7 (2.51-30.10)*
	13-15	29	2	5.6 (2.46-12.73)*	7.9 (2.67-23.82)*
	16-19	12	58	1.00	1.00*
Sex	Male	47	27	2.5 (1.38-4.66)*	4.3 (1.87-10.04)*
	Female	44	64	1.00	1.00
Type of latrine	Open field	27	31	4.6 (1.22-17.68)*	8.7 (1.27-60.03)*
	Pit latrine	61	44	7.3 (2.03-26.93)*	6.8 (1.18-39.94)*
	Ventilated pit latrine	3	16	1.00	1.00

** Variables which had significant association during the multivariate analysis at P<0.05*

Male adolescents were more likely to develop under nutrition as compared to female adolescents (AOR=4.3; 95% CI: 1.87, 10.04) **(Table 4)**.

Adolescents who used open field defecation were more likely to develop under nutrition as compared to adolescents who had ventilated pit latrine (AOR=8.7; 95% CI: 1.27, 60.03). Adolescents who had pit latrine were more likely to develop under nutrition compared to adolescents who had ventilated pit latrine (AOR=6.8; 95% CI: 1.18, 39.94) **(Table 4)**.

DISCUSSION

This study investigated determinants of under nutrition among adolescents in Lemo district.

Recently many unindustrialized countries have entered a nutrition transition in which rapid changes in food availability and physical activity patterns have led to an upward shift in BMI [10]. This changeover has also been observed in countries in Latin America, Asia and Africa. Ethiopia is undertaking many changes, including demographic, life style and food habits, and socio-economic changes.

Despite lack of historical data, the nutrition transition in Ethiopia has been explained by changes in lifestyle borrowed from Western countries of diets high in refined carbohydrates, saturated fats and sugars [11]. Recently, Ethiopia has seen an upsurge in the food availability and little is known on whether it benefitted all sections of the society to improve the nutritional level.

Adolescence is an important stage of growth and development that requires increased nutrition. But it has often failed to get increased attention as observed in childhood with regards to health related uses and interpretation of anthropometry.

In this study, many variables (age, being male, birth order, birth interval, adolescent education, current mother age, regular physical exercise, frequency of exercise, type of latrine and waste disposal) were significantly associated with under nutrition in bivariate logistics association, but later

most of the variables lost their significance in multivariate logistics analysis.

Factors such as age, sex and type of latrine were significantly associated with an increased risk of under nutrition.

Under nutrition was common in adolescent who were 10 to 12 years old and 13-15 years old. This is in agreement with the studies in different African countries, including Ethiopia [12-18]. Feeding practices, care and exposure to infection, which primarily determine the nutritional status of adolescent, vary with age [19,20]. Children of age 10 to 15 years are more active and lose more amount of energy. Excess energy loss, together with lack of nutritious food, could make them undernourished. Indeed, it was the underweight adolescent (compared to those that were overweight) who demonstrated a high level of physical activity [21]. This may have important public health implications to countries like Ethiopia which require a strategy to keep the energy balance.

The risk of under nutrition was high among males than females. Male adolescents were 4.3 times higher at risk of developing under nutrition compared to female adolescents. This was in line with Turkey, Ramallah, Nigeria, Tanzanian and South Africa study that documented significantly more boys underweight than girls [7,8,22-24]. This can be explained as male did more physical exercise than females and hence can demand more energy replacement. Also biological factors, inequalities in resource allocation within households and socio-cultural norms prevailing in the community could be responsible for the variation in the risk of under nutrition between males and females.

Adolescents who used open filed defecation were 8.7 times higher at risk of developing under nutrition compared to respondents who used ventilated pit latrine. Also adolescents who used pit latrine were 6.8 times higher at risk of developing under nutrition compared to adolescents who used ventilated pit latrine. This finding is consistent with reports from a study conducted on nutritional status of rural adolescent girls in Tigray in 2009 that showed lack of latrine the predictors of malnutrition [9].

Adolescents with less than 24 months birth interval were 3.8 times more likely to develop under nutrition compared to adolescents with 48+ month's birth interval. This can be attributed to inadequate child spacing and early starting of weaning diet which can lead to childhood infection that can affect growth and development in adolescence.

Substance use and illness were not significantly associated with adolescent malnutrition. This study was similar with a survey conducted in India in 2009 which showed addiction was not significantly associated with nutritional status of study subjects at the time of survey and also illness or frequency of illness was found not significantly associated with malnutrition [25,26].

When we look at predictors of adolescent under nutrition age group 10-12 years were 8.7 times higher at risk of developing under nutrition compared to age group 13-15 years and age group 13-15 years were 7.9 times higher at risk of developing under nutrition compared to age group 16-19 years. This finding is consistent with reports from a study conducted on nutritional status of rural adolescent girls in Tigray in 2009 that showed age the predictors of malnutrition [9].

CONCLUSION

It was found that adolescents in age group of 10-15 years old, being male, open field defecation and pit latrine was found to be independent predictors for the occurrence of adolescent under nutrition in study area.

The results of this study give a clue on the factors contributing to malnutrition and provide a base line data for other investigators and policy makers. Addressing the nutritional needs of adolescents could be an important step towards breaking the vicious cycle of intergenerational malnutrition. Special attention should be sought to early and middle adolescents and male sex in particular in nutrition. Prevention of communicable diseases through improving environmental hygiene and sanitation especially increasing latrine coverage.

Therefore, developing and implementing health programs to tackle malnutrition among adolescents should take into account such differences that are consequence of socio-demographic, health and environment related factors.

ACKNOWLEDGEMENT

We would like to thank the Wachemo University and South Ethiopia People Development Agency (SEPDA) for its material support and providing us all the necessary facilities needed during the study period. We also acknowledge Hadiya zone health department, Lemo District health department, study participants and data Collectors for their valuable contribution in the realization of this study.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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