NUTRITIONAL STATUS OF SECONDARY HIGH SCHOOL ADOLESCENT GIRLS AGES 14-19 YEARS, MANATUTUO DISTRICT, TIMOR-LESTE

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ABSTRACT: The objective of the study was to determine the host, agent, and environment factors associate with nutritional status of adolescent girls aged 14-19 years old in three secondary high schools of Manatuto district, Timor-Leste. This research was a cross-sectional study with simple random sampling was used for 244 participants, with purposive selected at two sub-district on February 2013. Data collection was done by self-administrated questionnaire. Anthropometric measurement was used for the calculation of BMI, and height for age (stunting). Data analyzed using SPSS version 17.0 and food consumption using nutrisurvey window program. The results revealed that 50.8% of adolescent girls in Manatuto district had BMI with the normal healthy weight range (18.6-25 kg/m^2). Of 49.2% had low BMIs score ≤18.5 kg/m^2. Majority 75.4% had height comparing into age a normal (-2Zscore-+2Zscore), 24.6% stunting (≤ -2Z score). Nearly half of respondents (43.3%) had low knowledge level. Only 39.3% had low energy consumption, 31.2% had moderate consumption, 24.2% of them had deficit and only 5.3% good consumption, 95.9% had calorie intake <2200 kcal per person per day and 61.8% had daily protein intake of less than 50 gram/day. This study examined statistically significant (p-value <0.05) association between, nutrition knowledge, energy consumption, mother level of education with nutritional of BMI. Also found the association between fish consumption and nutritional status of height for age statistically significant (p -value <0.05). The recommendation for further study is that create more nutrition promotion materials and provide advice to families and adolescents about the importance of eating a balanced diet to meet the nutrient requirements of early adolescents, middle adolescent and late adolescent with more consumption of animal sources and a variety of cereals, vegetable, legumes, and fruit. Consider the introduction of multi-micronutrient supplementation specific on iron folic acid to meet the nutrition requirements in reduction anemia deficiency. Policy implication of national nutrition strategy and reproductive health strategy, more in action plan to address the adolescent issues in particular of adolescent girls to be included as a target group in all maternal and child health program in across sectors.

Keywords: Nutritional status, Body Mass Index, Nutrition knowledge energy, Consumption, Adolescent girls, Timor-Leste

INTRODUCTION

There are approximately 1.2 billion adolescents in world and make up roughly 20% of the total world population [1] and their numbers are increasing. Four out of five of adolescents live in developing countries and because they often grow up in deprived situations where resources are limited they will enter to be undernourished, making them more vulnerable to disease and early death [2]. In developed countries and in situations where poverty and deprivation are not an issues overweight and obesity are more common issues in adolescents also making them vulnerable to diseases and early death in life [3]. Poor nutritional status in situation before birth, generally continues to adolescence and adult life and can span generations. Chronically malnourished girls are more like to deliver low birth

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weight babies, and nutritional challenges will continue throughout the life cycle, particularly for women [3]. Good nutritional status is a precondition for healthy and active lives and has direct implications on growth and intellectual ability, which ultimately impacts positively on the socio-economic development of the individual, their community and their country [4]. Nutrition throughout the lifecycle from conception until adulthood impacts on human growth and development, and builds the foundation of good health now and into the next generation [2]. Nutritional deficiencies have far reaching consequences, especially in adolescent girls [5]. If their nutritional needs are not met, they are likely to give birth to undernourished children, thus repeating the intergenerational cycle of under nutrition in future generations [6-8]. If not broken the vicious cycle of under nutrition will result in more and more severe consequences including protein energy malnutrition (PEM), iodine deficiency disorder (IDD), iron deficiency anemia (IDA), vitamin A deficiency (VAD), folate and calcium deficiency [9]. In adolescence these deficiencies can result in delayed growth spurt, stunted height, retarded intellectual development, goiter, increased risk of infection, blindness and anemia [9]. Timor–Leste is presently one of the countries in the Asia-Pacific region and in the world with alarming nutrition indicators. Utilizing data from the Timor-Leste Demography Health Surveys (TL-DHS) in 2003 and 2009-2010, trend analysis indicates that under nutrient rates have not decreased during the last eight years and the prevalence of the stunting, wasting, and underweight have all been on the rise [10].

The basic causes of under nutrition in Timor-Leste are complex and include among other things, the political economic, socio-cultural perspectives, institutional arrangements and limited human resource capacity to address under nutrition [10]. In addition poverty, inadequate and inappropriate nutrition knowledge and skills, unemployment, inadequate distribution and utilization of services and other resources, high food prices especially for imported food commodities all contributed to the burden of under nutrition in woman, new-borns, infants and young children and adolescents in Timor-Leste a significant determinant of health is women's education [10].

On average in Timor-Leste 7 percent of women aged between 15 and 19 are pregnant with their first child while this is the highest in Manatuto district at 9 percent [10]. This figure when compared to countries in South Asia is quite low where about 34.2 percent women are married by the age of 18 years old, general maternal mortality are 42 percent in across all of age 15-49, but 20 percent in age 15-19 years old [10]. The adolescent girls are the future mother of the nation. Well-nourished educated girls will grow into woman facing fewer risks during pregnancy and childbearing. The objective of this study was to determine the nutritional status of adolescent girls, determine the knowledge about nutrition of adolescent girls and determine the host factor, agent factors, and environment factor associated with nutritional status of adolescent girls.

MATERIAL AND METHOD

This is a cross-sectional study with simple random sampling. Two hundred forty four participants (calculated using the Taro Yamane for appropriate sample size), adolescent girls aged between 14 and 19 years old, were selected from the three secondary high schools of Manatuto district, Timor-Leste which were purposive selected in two sub-districts in urban and rural, in the urban area was selected one private school called secondary high school of Santo Antonio, and with random sampling selected 81 students girls from grade I to grade III with each grade 27 students. Next one government school (secondary high school of Kay-rala) with random sample 82 students girls, from grade I to grade III with each grade 27 students and then sub-district laclubar was selected in which one private school (secondary high school of Dom Basilio) with random sampling selected 81 students girls from grade I 27 students girls, grade II, 30 students and grade III 24 students girls. The data was collected in February, 2013.

The inclusion criteria are female 14 - 19 years old, willing to participate in study and exclusion criteria those who are not present at the time of data collection. The study was approved by Ethical Committee of Timor-Leste.

The data was collected by self-administration with structure questionnaire. It was divided into 6 parts: socio economic status (family income, education, occupation, and number of family member), knowledge about nutrition, diseases status, food consumption, eating habit and anthropometric measurement (weight and height) of nutrition status. The food consumption was recalled by self-report, and analyzed using nutrisurvey for windows-program. The result of individual consumed converted into categories as follow: >100% of RDA a good consumption, 80-89 % of RDA a less energy consumption, 70-79 % moderate, and < 70% deficit. The anthropometric nutritional status was assessed by BMI and height

Table 1 Host factor characteristic (N=244)

Items	Frequency	Percent
Age (years)		
14-15	21	8.6
16-17	123	50.4
18-19	100	41.0
Classes		
Grade I	81	33.0
Grade II	85	35.0
Grade III	78	32.0
Birth order		
First child	105	43.0
Second child	89	36.5
Third child	32	13.1
Fourth child	18	7.4
Living with		
Others	104	42.6
Parents	140	57.4
Diseases		
None diseases	125	51.2
Have diseases	119	48.8
Nutrition knowledge of 18 items		
Low knowledge (≤10 scores)	106	43.4
Moderate knowledge (11-12 scores)	79	32.4
Good knowledge (>12 scores)	59	24.2
Min=5		
Max= 17		
Mean ±SD = 11.0 ±2.2		

for age. The knowledge questions by reliability pretest done among the 30 students girls that give the Kuder-Richardson (KR-20), score obtained for knowledge level was 0.78. Informed and written consent form obtained from respondent and parents.

STATISTICAL ANALYSIS

The data were analyzed using the statistical package for social sciences (SPSS version17.0). Frequency, mean, standard deviations, maximum, minimum was collected for the descriptive statistics. Categorical data (Host, Agent, environment factors and nutritional status) were analyzed by chi-square test. Statistical significance was set as $p<0.05$.

RESULTS

General characteristic (host factors)

There were 244 participants who participated in this study, all were female students aged 14-19 years old. Majority of respondents in were 16-17 years old (50.4%) and followed by participants 18-19 years old (41.0%). Only 8.6% were 14-15 years old. The mean age was 17 years and SD was 1.17. Among respondent (35%) in class grade II, 33% in grade I and 32% in grade III. Nearly half of the total respondent birth order was found in first child (43.0%) the second child 36.5%, the third 13.0% and only 7.4% in fourth children. Majority of the total respondent (57.4%) living with their parent, 42.6% living with others their aunt, uncle, grandparent, and non-relatives. The majority of respondents (51.2%) no diseases, only 48.8% have some diseases, and found 23% of them with oral health, and 12.3% with diarrhea. Nearly half of the respondents (48.4%) have moderate knowledge level, 43.4% have middle knowledge and only 24.2% of them have good knowledge (Table 1).

Agent factors characteristic

On assessing of RDA it was found nearly half of the respondents (39.3%) have less consumption, 31.1% had moderate consumptions, 24.1% of them had deficit and only 5.3% of respondents had good consumptions. All most (59.9%) of respondents had low calories intake <2200 Kcal per person per day and all most (61.8%) of respondent had low protein gram intake less than 50 gram based on protein gram requirements for aged 13-19 years old (per person per day). Majority of respondent reported (84.4%) no eating liver during a week, 43.9-63.1% eating red meat, fish, egg and chicken 1-2 times per week. About 49.1-54.9% respondents reported eating spinach, cassava leaf, pumpkin leaf,

Table 2 Agent factor characteristic (N=244)

Items	Frequency	Percent
Total energy consumption (RDA		
Good consumption (>100%)	13	5.3
Moderate consumption (80-99%)	76	31.2
Less consumption (70-79%)	96	39.3
Deficit <70%)	59	24.2
Mean ±SD= 77.25 ± 12.71		
Min=48		
Max=117		
Calorie intake		
< 2,200 Kcal	234	95.9
2,200-2,350 Kcal	4	1.6
>2,350 Kcal	6	2.6
Mean ±SD=1726 ±274.6		
Min=1060		
Max= 2580		
Protein intake		
<50 gram	151	61.8
50-75 gram	37	15.2
>75 gram	56	23.0
Mean ±SD= 47.34 ±13.712		
Min=18		
Max=87		

Table 3 Environment factors characteristic (N=224)

Item	Frequency	Percent
Parents income per month		
Low income (<$200.00)	29	11.9
Middle income($200-500.00)	27	11.1
High income (>$500.00)	2	0.8
Don't know	186	76.2
Mother education		
Non education	78	31.9
Elementary school	32	32.0
Primary school	594	24.2
Secondary high school	73	30.0
Diploma/bachelor degree	2	0.8
Father occupation		
Public servant	51	20.9
Private employed	29	11.9
Farm livestock	149	61.1
Others	15	6.1
Number of family members		
Small family (<6 persons)	49	20.1
Middle family (6-10 persons)	121	49.6
Large family (>10) persons	74	30.0
Living area		
Urban area	163	66.8
Rural area	81	33.3

mustard, white pumpkin and potato leaf 1-2 times per week. Majority 48.8-64.8% respondents reported eating mango, tomato, pineapple, guava, papaya and avocado 1-2 times per week. Majority 57.8% of respondents reported eating red bean 1-2 times per week, 11.9% eating red bean 3-5 times per week and only 9.0% eating 6-7 times per week. Haft of respondents 59.0% reported eating rice 5-6 times per week, 53.3% respondents eating corn, 61.3% of them eating Cassava 1-2 per week. Of 49.6-57.8% respondents reported eating taro, sweet potato, potato and noodle 1-2 times. Nearly haft of respondents 31.1-49.5% reported drinking milk with coffee, coffee, soft drink, tea and milk 1-2

Table 4 Nutritional status

Item	N=244	Percent
BMI		
Thin (BMI≤18.5 kg/m^2)	120	49.2
Normal (BMI 18.6-25 kg/m^2)	124	50.8
Mean ±SD =19.02 ±1.5		
Min = 16.4 Max = 25.1		
Height for Age		
Short (≤-2Z score)	60	24.6
Normal (-2Zscore-+2Zscore)	184	75.4
Height (cm)		
Mean ±SD = 153 ±5.7		
Min = 135 Max = 179		
Weight (kg)		
Mean ±SD = 44.5 ±5.6		
Min = 30.0 Max = 60.0		

Table 5 Association between host, agent, environment factors and nutritional status

Item	BMI ≤18.5 n (%)	BMI>18.5 n (%)	Total	x^2	*p-value*
Knowledge and nutritional status					
Low (≤10) scores	60 (56.6)	46 (43.4)	106 (100.0)		
Moderate (11-12) cores	41 (51.9)	38 (48.1)	79 (100.0)	7.328	*0.026
Good (>12) scores)	19 (32.2)	40 (67.8)	59 (100.0)		
Total	120 (49.2)	124 (50.8)	244 (100.0)		
Energy consumption (RDA) and nutritional status					
Adequate consumption	33 (37.9)	54 (62.1)	87 (100.0)		
Less consumption	87 (55.4)	70 (44.6)	157 (100.0)	6.846	*0.009
Total	120 (49.2)	124 (50.8)	244 (100.0)		
Mother education and nutritional status					
No education	37(47.4)	41 (52.6)	78 (100.0)		
Low education	53(59.6)	36 (40.4)	89 (100.0)	7.142	*0.028
High education	30(39.0)	47 (61.0)	77 (100.0)		
Total	120 (49.2)	124 (50.8)	244 (100.0)		

times per week (Table 2).

Environment factors characteristic

The majority of respondent (76.2%) did not know their parents monthly income, 11.9% of them parents have low income, 11,1% of them parents have middle income and only 0.81% of them parents have high income. Respondents father occupation, 61.1% as a farm livestock, 20.9%, of their fathers' public servants, 11.9% private employed and 6.1% other including retired. For respondents mothers, 31.9% no education, 29.9% have secondary high school, 24.1% have primary school, 13.1% have elementary school, and only 0.8% have diploma or bachelor degree. Nearly half of respondents family members 6-10 peoples (49.6%) as medium family, more than 10 peoples (30.3%) as big family and less than 6 peoples (20.1%) as small family, 66.8% living in urban area, minority of them (33.2%) living in rural area. Majority of respondent family have more than sixty percent of moderate affordable of fish/ meat, and milk (6.2%) and (64.8%) more than twenty percent have high affordable of fish/meat and milk and only seven to eight percent have poor affordable of fish/meat and milk. compared into oil majority (62.3%) of their family in high affordable of oil and 37.7% moderately affordable of oil (Table 3).

Nutritional status

The majority (50.8%) of participants revealed that having BMI scores between 18.6-25 kg. and indicating a healthy body weight, 49.2% having BMI scores ≤ 18.5 kg/m^2 indicating thinness or underweight. The mean height of the study group was 153 cm. SD±5.7, the minimum height was 135 cm and the maximum height was 179 cm. The mean weight of the study group was 44.5 kg ±SD 5.6. The minimum weight was 30 kg., the maximum weight was 69 kg. The average BMI of the study group was 19.0 ±SD1.5 with minimum of BMI 19.0 and maximum 25.1 kg/m^2. Almost 75.4% of study participants' had a height for age classified as normal (-2Zscore-+2Zscore), 24.6%

of study participants were classified as stunted (≤ -2HAZ score) in Table 4.

Association between host, agent, environment factors and nutritional status

Host factor; The relationship between nutrition knowledge and nutritional status of BMI was found statistically significant (*p-value* = 0.026). The respondents who had low nutrition knowledge level also had low BMI (Table 5).

Agent factor; The results indicated to have association between energy consumption and nutrition status of BMI, statistically a highly significant (*p-value* = 0.009) low energy consumption and low BMI (Table 5).

Environment Factors; The study results showed that therewas significant association between mothers level education and nutritional status BMI, statistically significant (*p-value*= 0.028). Mother's educations have an effect on the nutritional status of the children low education mother with low BMI (Table 5).

The variables of age, living with, and birth order, family size, diseases, parents income, parents occupation and living area, family afford food founded a no association with nutrition status.

DISCUSSION

Adolescents (aged 14 to 19 years) have specific health and development needs, and many face challenges that hinder their well being. Adolescence is a phase of rapid growth and development during which physical, sexual and emotional changes occur [11]. The result showed at this age (14-16 years) a child will be in the middle of the adolescent growth spurt, it's a period where the women usually have significant physical grow than pubescent development so it is likely that nutrient needs are harder to meet during this period of adolescents. World Health Organization (WHO) to improve the nutritional status, implementing this will decrease the poorly nourished adolescent mothers, who are more likely to give birth to low birth-weight babies, perpetuating a cycle of health problems which pass from one generation to the next. Knowledge of nutrition can affect food choices. Knowledge was measured to ascertain respondent understanding of some of the basic principles of nutrition. Inadequate nutrition knowledge, lack of understanding about good eating habits, and lack of understanding of the nutritional contribution of various types of food can result in under nutrition and the resulting effects on learning ability and capacity. Various studies have shown the correlation of body image and knowledge of balance nutrition toward the nutritional status of students at Jayapura in 2012. A significant association variables of knowledge of balance nutrition with nutritional status according to BMI indicated p= 0.005 [11]. The 24 hour and recall and food frequency data also indicated that the girls from poorer families add less well than girls from wealthier families, they were also less likely to consume meats and dairy products such as milk. In study examining the socio-demographic factors associated with body mass index of female adolescent students aged 14-18 years in Semnan City, Iran, the authors found that there was no association between parents' job and BMI status of the students [10]. Majority of study participants 65.6% came from a large-family size of 5-10 persons and the mean ± SD family size was 5.1 ± 1.2 persons. Similar to this study no association was found between family size and BMI status (p>0.05) [12].

Education is one of the important factors as it also determines the level of knowledge and awareness. Education level and the status of the mother is one of the most important factors contributing to the health and well-being of children. Education of the mother can determine the level of knowledge and awareness of good nutrition as well as impact on the nutritional outcomes for herself and her family. Our finding shows that all most (39.3%) of adolescent of their daily requirement of energy in between 70-79% as less consumption with calorie consumption (<2,200 kcal, and less than 50 gram protein requirement per person per day) it reflected from less of calories, protein and other micronutrient requirements and the eating habits of various type of food that majority in an balance eating, likely more in carbohydrate of time consumption 1-7 day per week.

A cut point of 18.5 is used to defined thinness than or acute under nutrition. This indicated that it is a serious public health problem. According to WHO, a prevalence of more than 20% of women with BMI less than 18.5 indicates a serious public health problems, 27% of women were found to be malnourished with BMI < 18.5 indicated that malnutrition among women is a serious public consent in Timor – Leste. Women in aged 15-19 are more likely to be thin or undernourished than women in other age cohorts (33%). Women are more likely to have a BMI less than 18.5 in rural areas (28%) than in urban areas (24%). The nutrition status is an issues that going already in childhood period most likely to chronic status [10]. The 2010 TLDHS showed consistently that a child who was underweight, stunted or wasted was more

likely to come from a low income family, living in a rural area and from a family where the mother's education is poor [10].

LIMITATIONS

The study represents only one district of Timor-Leste, therefore the results cannot be generalized for all adolescent girls in Timor-Leste. The dietary data and environmental and socio-demographic data were collected by participants self-report therefore subject to reporting bias. Some respondents could not accurately estimate family income, not report disease status. In future studies, diseases status could be validated against clinical health records or clinical examinations could also be used. Twenty four hour recall method of dietary assessment has known limitations, in this study time limitations did not allow repeated 24 hour recalls to take place and was based on one day of the week. Timor also experiences a" hungry season" where, particularly in rural areas, food is in short supply, future studies should endeavour to collect diet intake data across a range of seasons. In this study the method was supported by conducting a food frequency questionnaire which is also open to reporting bias.

RECOMMENDATIONS

The nutritional health of adolescent girls is important and this information should be provided to the girls and their families in school and through the health community in community program. In the home parents and the adolescent girls themselves should give priority to ensuring that girls receive the correct quantity and quality of food, in particular more animal food sources, a variety of vegetable and fruits.

Nutrition education should be provided at schools through nutrition training packages a standardised curriculum.

This should be supported by canteens and vendors who sell appropriate healthy food choices. For all teachers it is important to place more attention on nutrition theory and practices when teaching and advocate for nutrition within the curriculum. The country school feeding program should a ensure that a balanced diet is provided including a range local food products in the correct quality and quantity to meet the needs of adolescent girls

For the community health centre and health staff provides advice for family and adolescents about the important of eating a balanced diet to meet the nutrient requirements of adolescent with more consumption of animal sources and a variety of cereals, vegetable, legumes, fruit**.** Support this by developing Timor-Leste specific food base guidelines for adolescents and information education and communication material to promote basic nutrition

Recommendation at policy and program level; The inclusion of adolescent girls as a priority group in relevant nutrition and food security policies and strategies. Support and encourage multi-sectors approach to improving the health of adolescent girls e.g. involve the Ministry of Education in nutrition programming and as an access point for programs that target adolescent girls. Ensure that policies such as the national nutrition strategy, the reproductive health strategy focus, the national education policy and related action plans address the adolescent health and nutrition issues. Consider the introduction of multi-micronutrient supplementation specific on iron folic acid in pilot are of research base on national nutrition plan with develop a simple guideline.

CONCLUSION

This study found that within a cohort of adolescent girls ages 15 -19 years attending 3 secondary schools in Manatutu district in Timor-Leste, the girls who were found to be underweight (BMI<18.5) were more likely to have poor knowledge of nutrition and come from a family where the level of education of the mother was low. In addition those who were found to be stunted (<2HAZ) were more likely to consume small amounts of fish and meat food sources per week. Although these associations were found, more research is required to ascertain the extent to which underlying factors in Timor Leste affect the nutritional status of adolescent girls in Timor-Leste and to determine approaches to addressing these. The results of this study would indicate that improving nutrition education in schools and improving access to education for women in Timor should be a priority.

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