

Nutritional Status of Adolescent School Girls in a Rural Area in Sri Lanka; Anthropometric Assessment

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Citation: Adikari AMNT and Weerathunga SC. 2015. Nutritional Status of Adolescent School Girls in a Rural Area in Sri Lanka; Anthropometric Assessment. Human Biology Review, 4 (2), 175-185.

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ABSTRACT

Adolescence is the transition period between childhood and adulthood in where rapid physical, mental, emotional and social development takes place. Adolescence females are at greatest risk for nutrient deficiency and it badly affects to their education and physical development. Nutritional status of female adolescents is important not only for their growth and development, but also for future pregnancies. The objective of this study was assessing the nutritional status of adolescent school girls in a rural area, located in North Western Province in Sri Lanka by using anthropometric measurements. A total number of 110 adolescent school girls, age range of 13 to 15 years, studied schools in Pannala sub-zonal education division were randomly selected after briefly explained the purpose of the study and getting a written consent from their parents. Anthropometric measurements were measured. Epi info version 3.4 was used to generate Z scores and percentiles for weight for age, height for age and Body Mass Index (BMI) for age. According to WHO cut off subjects were categorized in to underweight, stunting, overweight and obese. In the study sample 20.7%, 19.8% 19.1%, 9.1%, 0.9% and 52.7% were underweight, stunting, wasting, overweight, obese and normal nutritional status, respectively. Since 46 % of the studied subjects were under-nutritional status appropriate intervention should be directed towards adolescent school girls to improve their nutritional status and education for healthy diets.

Key words: Adolescence, Nutrient deficiency, Stunting, Wasting, Underweight

INTRODUCTION:

Background: Adolescent is the transitional stage from childhood to adulthood and comprises person aged 10-19 years. This stage of life dominated by physiological process leading to puberty which accompanied by rapid growth and maturation. With the puberty, both girls and boys go through a growth spurt that last for approximately 2 – 3 years. Due to that, stage of

adolescent considered as unique and intervention point of life cycle (Adolescent Nutrition, 2005). Adolescent can be the second opportunity to catch up growth if environmental conditions, especially nutrient intake are favorable (Marcell et al., 2007). Adolescent period growth is faster than at any other time in life except the first year and adolescent gain up 50% weight of their adult weight, more than 20% of their adult height and 50% of their skeletal mass. Peak height velocities achieved during the growth spurt are 9 and 10.5cm / year for girls and boys, respectively. In both sex weight gain is proportionally greater than height gain. In boys, height and weight gain occur together, but girls weight gain is lags behind the height gain by 3 -6 months (Brasel, 1982). Twenty one percent of Sri Lankan population consists of adolescents aged between 10-19. Among them prevalence of underweight, stunting, and overweight were 47.2%, 28.5%, and 2.2%, respectively (Jayatissa and Ranbanda, 2006). A study in Southern Province of Sri Lanka mentioned that the prevalence of wasting among adolescent (age 11-16) boys and girls were 14.9% and 21.3% respectively and 21.1% girls were stunted (Hettiarachchi et al., 2006) Further, they found that underweight and overweight prevalence of girls was 37.7% and 1.9% respectively.

Situation of adolescent girls is indispensable as she is the foundation stone of the family. After the onset of puberty nutritional needs of male and female are deviated. In adolescent girls psychological and emotional problems are considerably magnitude and they need exert significant influence on their nutritional statuses. Particularly adolescent girls are vulnerable to malnutrition than boys (Neumark and Hannan, 2000). If these nutritional problems among adolescents are not adequately addressed, they will have major implications on women in child bearing age contributing the high percentage of low birth weight. Cordeiro in 2006, emphasized the importance of assessing nutritional status of adolescents, mentioning adolescent malnutrition in developing countries is at long last should receive the attention it deserves (Corderio et al., 2006). Typically adolescents have been considered a low risk group for poor health, and often receive few health care resources and scant attention. However, this approach ignores the fact that many health problems later in life can be improved or avoided by adopting healthy, life-style habits in adolescence (WHO, 2005). Research done by Mulugeta *et al*, in 2009, mentioned that information regarding the nutritional status of adolescents from the developing world is lacking (Mulugeta et al., 2009). Part of the reason for the lack of information has been the difficulty of interpreting anthropometric data in these age groups. Yet adolescents remain a largely neglected, difficult-to- measure, and hard-to-reach population, in which the needs of adolescent girls in particular are often ignored (Shahid et al., 2009).

Different methods are available to assess the nutritional status of the population such as anthropometric, biochemical, clinical and dietary assessment methods. Anthropometry is the one of the tools by which the overall nutritional status is the better accessed. In the assessment of the nutritional status of individuals and community anthropometric measurements play an important role (Raja and Kaushik, 2008). Purpose of using the anthropometric assessment is, it is the single most inexpensive, non invasive and universally applicable method of assessing body composition, size and proportion (Onis and Habicht, 1997). However, in Sri Lanka few studies have been carried out to assess the nutritional status of school adolescent girls by using anthropometric measurements.

Objective:

The present study was an attempt towards this direction, to assess the nutritional status of Sri-Lankan adolescent school girls in a rural area, located in North Western Province in Sri Lanka by using anthropometric measurements.

METHODOLOGY:

This study was conducted as a cross sectional study and randomly selected five schools in Pannala sub zonal educational division in the North Western Province in Sri Lanka. Out of 54 schools in the Pannala sub zonal educational division, only 16 schools comprised classes from grade 9 to 13 and among those 16 schools five schools were randomly selected.

Adolescent school girls aged 13 – 15 who were willing to participate the study were recruited after briefly explained the purpose of the study and getting a written consent from their parents. Subjects were given the information sheet and consent form. A pre-tested self administered questionnaire was used to collect the information on socio demographic characteristics, family income of the subjects, their dietary habits, nutrition knowledge and health information.

Height and weight were measured using standardized techniques (WHO, 1995). Weight was measured using electronic digital scale (Seca 835, USA) to nearest 100 g (0.1Kg) while the subjects were wearing light clothes and without shoes. Prior to each weighing, the scale was adjusted to zero reading to enhance validity. Each participant was weighed twice to improve the accuracy and reliability of measurement; the mean value was recorded.

Height was measured using stadiometer (Seca corporation, Germany) to the nearest 0.1cm. Subjects were asked to stand straight and look straight ahead.

The nutritional index of adolescents was computed using Z scores for weight for age and height for age. Further, percentiles for Body Mass Index ($BMI=Kg/m^2$) for age also used.

The following definitions were used to compute the nutritional indices of study participants: BMI for age value less than 5th percentile as underweight, BMI for age-value greater than or equal to 5th percentile but less than 85th percentile as normal weight, BMI for age-value greater than or equal to 85th percentile but less than 95th percentile as overweight, and BMI for age-value greater than or equal to 95th percentile as obese.

Table: Recommended cut off values of reference data for adolescents

Indicators	Anthropometric variable	Cut-off values
Stunting (low height for age)	Height for age	<3rd percentile
Thinness (low BMI for age)	BMI for age	<5th percentile
At risk for overweight	BMI for age	>85 th percentile, but <95 th percentile
Obese	BMI for age	≥95th percentile

(WHO,1995)

Nutritional status of the study sample was assessed by Epi-info version 3.4 (CDC, USA), and generated Z scores of weight for age and height for age and percentile value for weight for height. Statistical analysis was done by using Minitab 14.

RESULTS:

A total of 110 adolescent girls from schools at Pannala sub zonal educational division were enrolled for this cross sectional study. Table 1 shows the socio-demographic characteristics of the sample.

Mean age of the study sample was 14.68 (± 0.6) years and approximately 25% of the subjects were born as low birth weight babies. The percentage of **attaining puberty**, the condition of being or the period of becoming first capable of reproducing sexually marked by maturing of the genital organs, development of secondary sex characteristics by the first occurrence of menstruation in the female, of the study sample was 96%. Among them 34% and 43% were attained puberty at 12 and 13 years, respectively. Nearly 50% of the families spend > 5000 rupees per month for their food. Forty percent of the sample skipped any of the three meals and 63% of them skipped breakfast. Most of them (30.9%) preferred to have tempered food items whereas 18.8% of subjects preferred to have sweet. Majority (79.1%) of the subjects

did not consume nutrition supplements, while only few of them (21.8%) consumed supplements.

Table 1: Socio-demographic and general characteristics of the study sample

General characteristics	Number of subjects	Percentage (%)
Ethnicity		
Sinhalese	110	100
Religion		
Buddhist	108	98.2
Christians	02	1.8
Age (years)		
13	24	21.8
14	65	59.1
15	21	19.1
Birth weight		
Low birth weight (<2.5 kg)	27	24.5
Normal weight (≥2.5kg)	83	74.5
Pubertal characteristics		
Attained menarche	106	96.4
Not attained	4	3.6
Age of *attaining puberty (years)		
10	1	0.9
11	12	11.3
12	36	33.96
13	43	40.1
14	12	11.3
15	2	1.9
Monthly income of family (LKR)		
< 10000	46	42
10001-20000	40	36
≥20001	24	22
Monthly expenditure for food (LKR)		
<3000	28	25
3001-5000	37	34
≥5001	45	41
Meal skipping		
Yes	41	37.3
No	69	62.7
Type of meal skipping		
Breakfast	27	62.8
Lunch	9	20.9
Dinner	7	16.3
Type of food preference		
Deep fried	16	14.5
Tempered	34	30.9
Starchy	15	13.6
Sweet	20	18.2
Oily	21	19.1
Other	4	3.6
Supplement intake		
Yes	24	21.8
No	87	79.1
Commonly consumed food supplements		
Calcium	2	8.3
Vitamin	16	66.7
Mineral	2	8.3
Iron	2	8.1
Folic acid	1	4.1

Anthropometric characteristics of the sample showed that the mean weight of the sample was 43.46 (± 8.32) kg while mean height was 151.37(± 10.36) cm. The mean BMI of the subjects was 18.69 (± 3.20) kgm^{-2} . There were no any significant difference of height, weight and BMI with respective to age categories.

The nutritional index of the study participants are shown in table 2.

Table 2: Mean of Weight for age (WAZ) and mean Height for age (HAZ) of the sample

Age (Years)	Mean Weight for age* Z- score (SD)	Mean Height for age** Z-score (SD)
13	-0.83(1.21)	-1.20(0.84)
14	-1.17(1.08)	-1.28(0.763)
15	-1.33(1.34)	-1.54(0.70)
P Value	0.271*	0.45**

According WHO cut off, between +2Z scores and -2Z scores values indicates normal healthy nutritional status, while less -2Z scores indicates under-nutritional status. According to that, the all age categories mean weight for age Z scores and mean height for age Z scores values were within normal nutritional statuses and there were no significant difference between age categories.

BMI for age percentile between 5th and 85th percentile indicates normal nutritional status while less than 5th percentile indicates under nutritional statuses, over the 85th percentiles represents over-nutrition condition. With respect to the results of this study mean BMI for age percentiles for 13, 14 and 15 of three age categories were 40.28(22.02), 33.21(18.05) and 35.17(20.70) respectively and they were lag behind normal level. There was no significant difference between age groups and the mean values of BMI for age percentiles.

Table 3: Distribution of the sample according to their nutritional status and age

Nutritional status	Age in years		
	13	14	15
Underweight	20.8%	18.6%	28.2%
Stunting	20.8%	21.5%	23.1%
Wasting	16.6%	18.4%	19.0%
Overweight	12.5%	7.7%	14.2%
Normal	50.0%	64.6%	57.1%

According to the table 3, age specific underweight, wasting, stunting percentage was greater than the overweight percentage. Adolescent girls in the age groups 13, 14, 15 had 50%, 64.6% and 57.1% normal nutritional status respectively.

Table 4 shows the distribution of studied adolescent school girls according to their nutritional status and Birth weight.

Table 4: Distribution of the sample according to their nutritional status and birth weight

Anthropometric Indices	Birth weight in Kg		*p value
	<2.5 Kg (n=26)	> 2.5 Kg (n= 84)	
Weight for age			
Under weight	4 (15%)	12 (14%)	0.096
Not under weight	22 (85%)	72 (86%)	
Height for age			
Stunted	7 (27%)	15 (18%)	0.014
Not stunted	19 (73%)	69 (82%)	
BMI for age			
Wasted	7 (27%)	12 (14%)	0.082
Overweight	1 (3.8%)	10 (12%)	
Normal	18 (69%)	62 (74%)	

*Person correlation p value

The results revealed that there was a significant correlation ($p= 0.014$) between low birth weight (birth weight <2.5 Kg) and the stunting condition.

DISCUSSION:

The study was a cross sectional study to assess the nutritional statuses of adolescent school girls aged between 13 – 15 years old, in Pannala Sub Zonal Educational division by means of anthropometric measurements. All subjects were Sinhalese and all most all of them were Buddhists (98.2%). More than half of the study group (59.1%) was in the age group of 14 years. The prevalence of low birth weight of the sample was 24.5% and this value is comparatively higher than the national prevalence of low birth weight, 17.7% (Ministry of Healthcare and Nutrition, 2007). This could be due to improper food intake pattern of pregnant mothers, adolescent pregnancies, lack of care and support during pregnancy and lack or improper intake of food. The results of this study also indicated that 38% of the study adolescent school girls were skipping meals.

As adolescent is one of the important stages in life cycle achievement of proper nutrition during this time period is indispensable (Agroha et al., 2009). In this stage growth is faster than at any other time in life except the first year. Due to this dramatic growth rate, unable to use weight, height or BMI directly for expressed their nutritional statuses. To avoid that error,

specifically weight for age, height for age, BMI for age Z scores and percentiles were used to assess the nutritional statuses in this age category.

According to the results of this study mean height, weight, and BMI and age were 43.5 Kg, 151.4 cm, 18.7 Kgm⁻² and 14.5 years, respectively. According to the WHO cut off, with respect to the specific age levels, above values were lag behind in the normal stage. According to the p values, it suggested that there were no any significant difference in the respective anthropometric measurements among the difference age categories. Mean weight for age Z scores, mean height for age Z scores and mean BMI for age percentiles in all three age categories were in the normal nutritional states category with references to the WHO cut off values. Also respective p values suggested that no any significant differences in the mean values of anthropometric indices in the all age categories.

Stunting reflects low height for age, it indicates long term cumulative effects of under nutrition and infections since birth, and even before birth, an indicator of past nutrition. Underweight defines low weight for age and is an indicator of either current or past nutrition. Wasting reflects low weight for height and is an indicator of current nutritional status (Kamal and Hum, 2005). Some studies found that adolescent were affected from all types of nutritional problems, stunting, wasting and under nutrition (Hettiarachchi et al., 2006; Bidhan, 2009; Gopalan, 1989).

Results gained from this study shown that overall prevalence of underweight, stunted wasted, overweight and obese condition among school girls in a study area located in Pannala, North Western Province in Sri Lanka were 20.7 %, 19.8 % 19.1 %, 10% and 0.97% respectively. And more than half of the study subjects were in normal nutritional states. The national study on adolescent nutrition done by Jayathissa and Ranbanda in 2006, found that overall prevalence of underweight, stunted and overweight were 47.2%, 28.5% and 2.2%, respectively. When comparing the result of this study with the national survey results, prevalence of under nutritional statuses were not greater than the national values except over-nutrition. Another study done by Hettiarachi *et al* in 2006, Southern province shown that stunted, thinness, wasted and overweight prevalence of female school children age 11- 16 were 21.1%, 37.7%, 26.4% and 1.9%, respectively.

In this study several factors were considered to have an influence on the nutritional statuses. In order to identify influencing factors, logistic regression was applied. Birth weight can be the risk factor of the future undernourished condition because reduced fetal growth is strongly associated with a number of chronic conditions later in life (Akher et al., 1998). As low birth weight is intra uterine growth retardation, reduced fetal growth can affect the nutritional status in future. The study by Qadir and Bhutta in 2009 also found that low birth weight infants who survive, have greatly restricted chances of fully reaching their growth potential (Qadir and Bhutta, 2009).

Besides low birth weight one of the major factors determining nutritional statuses of an individual is socio- economical statuses (Seema et al., 2009; Elizabeth, 2003). Socio Economical status can be evaluated by using the per capita income level. The subjects who had monthly income less than Rs 3000 considered as the ones below the poverty line having low socio economical states. According to the Seema *et al.*, 2009, mentioned that income level effect for the nutritional states. According this study, found that there was significant relationship between nutritional statuses and the income level.

CONCLUSION:

The overall percentage of underweight, stunting, wasting, overweight, obese and normal nutritional status of the studied sample were 20.7%, 19.8%, 19.1%, 9.1%, 0.9% and 52.7% respectively. The percentage of under nutritional status were greater than percentages of the over nutritional statuses. Hence, special attention should be directed towards the importance of having proper nutritional status of adolescents through schools.

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