

ANTHROPOMETRY AS A TOOL OF MEASUREMENT OF NUTRITIONAL STATUS OF ADOLESCENT GIRLS

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Abstract

The need for special attention for the adolescent girls is stressed as they are the power behind breaking the barriers of poverty, unemployment, illiteracy, lack of health awareness and poor nutrition that is quite prevalent in India. Under nutrition is an important determinant of health outcomes among adolescent girls. Adolescent girls have limited access to knowledge about importance of nutrition, menstruation and its hygiene in rural India, especially in government run schools and primary health centres. To address nutritional problems and malnutrition of adolescents, it is crucial to assess their current nutritional status. Hence, this research is an attempt to understand the nutritional status of 785 government school going adolescent girls in Dindigul district of Tamilnadu. Multistage sampling method has been used for collecting the data. The non-invasive method of anthropometric measurements such as height, weight, MUAC (Mid-Upper Arm Circumference) and BMI (Body Mass Index) have been used to study nutritional status of the respondents. Calculated Body Mass Index (BMI) of the respondents shows that more than two third of the female respondents were underweight and only less than one third of them were of normal range. The Mid-Upper Arm Circumference of the respondents projects that majority of them were severely underweight and stunting is highly prevalent in the respondents. In the study area, it was found that the nutritional status of adolescent girls is relatively low and can be addressed effectively through various health programmes.

Keywords: Anthropometry, physical wellbeing, adolescent girls, nutritional status, wasting and health programmes

Introduction

The word 'adolescence' has its origin from a Latin word 'adolescent' which means to 'grow' or 'grow to maturity' It is the process of development from childhood to maturity and adulthood, its period beginning with the appearance of secondary sex characteristics and terminating with the cessation of somatic growth. Kusuma, D. L. (2001)¹ in her Profile of nutrition of rural adolescent girls compiles the following: Adolescence comprises nearly half of the total growth period of human life. It has its beginning by about 10 to 12 years of age in boys and girls. The end of this stage 'adolescence' is not clearly delineated and it varies with physical, emotional, mental, social and cultural criteria that define the adult (Nelson, 1975)²; In India, National Institute of Public Cooperation and Child Development define adolescence as the period between 10 to 18 years of age (NIPCCD, 1989)³ whereas WHO (2006)⁴ defines adolescence as the period between 10 to 19 years.

Bano et al. (2016)⁵ state that adolescents make up one-fifth of the world's population, out of which 84 percent are from the developing countries. It is also reported that about 90 percent live in low and middle income countries, there by making the youth population about a third of the

country's population India has about 243 million adolescents in the age range of 10 to 19 years (MoHFW, 2016)⁶. During the adolescence stage, body's nutritional satisfaction plays a role in bringing about physical changes. Further, lifestyle and habits affect diet and food choices. Adolescents' development is associated with the 'kind of nutritious food that they consumed during childhood and adolescence' (John, 2018)⁷.

The need for special attention for the adolescent girls is stressed as they are the power behind breaking the barriers of poverty, unemployment, illiteracy, lack of health awareness and poor nutrition that is quite prevalent in India. Only recently the nutritional status of adolescent girls, the future mothers of healthy growing children are included as beneficiaries in ICDS and similar programmes. And not until very recent years, the school going adolescent girls are added to the nutrition intervention programmes. And, increased focus on addressing nutrition needs in this age group will improve health and help break the intergenerational cycle of malnutrition for a better and healthy society of the future. This special attention starts from nutrition to wellbeing in the same order. Since second world war, nutrition evaluations started and until now we have not come up with a standard measure that fits all ages, countries, races or genders.

Statement of the Problem

Adolescence is a period of transition from childhood to adulthood is crucial in the life of human beings and characterized by an exceptionally rapid rate of growth. Due to rapid growth, during this period, the dietary requirement of adolescents is higher for most nutrients than at any other period of life. First thousand days nutrition and health care approach is very important in the life of a child. The second most crucial period is one's life span is the adolescent age, where catch up possibilities are high and at the same time, lifetime impact in food and hygiene can be made possible. For females, pubertal timing is affected by childhood body mass index (BMI) and percentage of body fat. But, gender norms restrict physical fitness of girls, where strength, dominance, and competition, are considered unfeminine. Unhealthy weight loss is prioritized by adolescent girls for better body image over health (Spencer et al., 2015)⁸.

The problems faced during the adolescent period are interrelated. Major problems include health, poverty, and family-oriented problems (Bachloo, Kumar et. al., 2016)⁹. Undernutrition is the important determinant of health outcomes among adolescent girls. Adolescent girls have limited knowledge about importance of nutrition, menstruation and its hygiene. Thus an adequate nutritional knowledge is essential which helps in providing balanced nutritional diet. The nutritional support for adolescent girls helps to enhance the individual and societies wellbeing. To address nutritional problems and malnutrition of adolescents, it is crucial to assess their current nutritional status.

There are various methods and various standards practiced in different countries where the major decisive factors are time (duration) and cost effectiveness. But, the most useful non-invasive method is anthropometric measurement to assess the physiological status of body. It is also advised that to avoid misclassifying an individual's nutritional status or a population's risk, one must be cautious in interpreting adolescent anthropometric data. Ideally, more than one type of measurement or index would be used (Cashin and Oot, 2018)¹⁰. Common measurements are height, weight and mid-upper arm circumference (MUAC) for children and adolescents.

In module 3 page 77, Anthropometry: Children And Adolescents 5-19 Years by Food and Nutrition Technical Assistance (FANTA) for USAID continues, "Anthropometry, the measurement of the human body is used to determine and monitor nutritional status. Anthropometric data guide care and treatment; the design, implementation, monitoring, and evaluation of nutrition interventions; and policy design and resource allocation" (Cashin and Oot, 2018)¹¹.

Coverage Evaluation Survey (CES) 2009 was conducted in all states and union territories, which primarily focused on immunization of women and children, child nutrition, and child

morbidity. It was expected that the data would align with previous large surveys including the District Level Household Survey (DLHS3), National Family Health Survey (NFHS3), and include National Rural Health Mission programs and initiatives. But the National Family Health Survey (NFHS-4) recognizes the lack of data availability and the gaps that need to be addressed to keep up with the target of achieving the Millennium Development Goals. It has data on anthropometric measure and haemoglobin but not on body composition, physical fitness and the hidden hunger-micronutrient data of the adolescents of age 15-19, and a similar situation for below 15 age group, with a wider data gap. (NFHS-4,2016)¹².

While the majority of nutrition data come from national surveys providing the estimates at national or state level, there is paucity of data at the sub-national level. Data are also required to ensure horizontal coherence (information sharing across sectors) and vertical coherence (national to community level) among the stakeholders as well as the community members.”(WHO, 2016)¹³. This is a small attempt to understand the nutritional status of government school going adolescent girls in Dindigul district of Tamilnadu.

Methodology

The data was collected as part of Ph.D thesis by the researcher, from Government high and higher secondary school girls of 9th standard to 12th standard, aged 14 to 17. The adolescent girls pursuing their school education in government schools are taken as the population for the study. Dindigul district is divided into three revenue divisions namely Dindigul, Palani and Kodaikanal. And four educational districts namely Veda sandur, Palani, Dindigul and Batlagundu. Three revenue blocks that come under Dindigul education district namely Dindigul, Natham and Sanarpatty are chosen for the research study.

The researcher contacted government high and higher secondary girls schools of Dindigul education district for the academic year 2017-2018. Among the total 48 schools 24 schools were selected for the study. The total girl students in 24 schools were found to be 3925 in which 20% of the total students comprising of 785 students were selected for the present study. The list of students was obtained from the schools and the students are ordered in numbers and after that by using tippet method the total samples were selected for the study. As the selection of students involves different levels beginning from education district selection till the student selection, the researcher adopted Multistage Sampling Method for the present study.

Body weight was measured (to the nearest 0.1 kg) with the subject standing motionless on the weighing scale and with the weight distributed equally on each leg. Height was measured (to the nearest 0.1 cm) with the subject standing in an erect position against a vertical scale and with the head positioned so that the top of external auditory meatus was level with the inferior margin of the bony orbit. Nutritional status of the adolescents was assessed through weight for age (underweight), height for age (stunting), height for weight (wasting), BMI for age (thinning) and Mid upper arm circumference (MUAC).

For stunting and wasting, height for age and weight for height charts were used as the reference. Mid upper arm circumference (MUAC) is a useful tool for a fast assessment of the nutritional status. It is an easy and inexpensive way to detect nutritional status and is used in developing countries for rapid and extensive nutrition surveillance and screening programs of both children and adults. MUAC is the circumference of the left upper arm and is measured at the mid-point between the tips of the shoulder and elbow. The following method recommended by WHO and UNICEF is used to measure MUAC of the subjects with the assistance from social worker assistants. Bend the left arm, find and mark with a pen the olecranon process and acromion; Mark the mid-point between these two marks. With the arm hanging straight down, wrap a MUAC tape around the arm at the midpoint mark. Measure to the nearest 1 mm (0.1 cm). WHO reference chart is used as range for MUAC data.

Underweight is the indicator for which most data have been collected in the past. Evidence has shown that the mortality risk of children who are even mildly underweight is increased, and severely underweight children are at even greater risk. (WHO, 2010)¹⁴

Stunting is to measure the height for age. Children who suffer from growth retardation as a result of poor diets or recurrent infections tend to be at greater risk for illness and death. Stunting is the result of long-term nutritional deprivation and often results in delayed mental development, poor school performance and reduced intellectual capacity. This in turn affects economic productivity at national level. Women of short stature are at greater risk for obstetric complications because of a smaller pelvis. Small women are at greater risk of delivering an infant with low birth weight, contributing to the intergenerational cycle of malnutrition, as infants of low birth weight or retarded intrauterine growth tend to be smaller as adults. (WHO, 2010)¹⁵

Wasting is to measure body mass in relation to body height, and it describes current nutritional status of the subject. Wasting in children is a symptom of acute undernutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases, especially diarrhoea. Wasting in turn impairs the functioning of the immune system and can lead to increased severity and duration of and susceptibility to infectious diseases and an increased risk for death (WHO, 2010)¹⁶.

Studies have shown a positive correlation between BMI and MUAC and a few studies have shown that MUAC is a better predictor of poor nutrition.

Results and Discussion

Table 1: Physical Parameters of the adolescent girls

S.No		Frequency (N = 785)	Percentage (%)
1	Body Mass Index	Underweight	65.6
		Normal	27.5
		Pre-Obesity	6.9
2	Mid-Upper Arm Circumference (MUAC)	Severe Underweight	68.4
		Underweight	19
		Normal	12.6

The table above explains the Body Mass index of the adolescents. The Body Mass Index (BMI) is an estimate to calculate healthy weight of the individual by dividing the weight in kilograms by their height in meters squared.

With regard to Body Mass Index (BMI) of the students, it was observed that more than two third of the female students (65.6%) are underweight, while less than one third of them (27.5%) are normal and the minority (6.9%) have pre-obesity. The Mid-Upper Arm Circumference of the students projects that majority (68.4 %) of the female students are severely underweight and 19.0 % border underweight whereas it is normal only for 12.6 per cent of them. It clearly indicates that the awareness programme has to be conducted very often in the study area about the importance of having the healthy diet and consequences of underweight.

Table: 2 Distribution based on Age and Body Mass Index

S.No	Age		Body Mass Index (BMI)				
			Severe Underweight	Below Normal	Normal	Slightly Obese	Obese
1	14 years	N	75	182	30	22	9
		%	23.6%	57.2%	9.4%	6.9%	2.8%

2	15 years	N	16	59	15	8	1
		%	16.2%	59.6%	15.2%	8.1%	1.0%
3	16 years	N	60	149	23	10	5
		%	24.3%	60.3%	9.3%	4.0%	2.0%
4	17 years	N	18	78	16	7	2
		%	14.9%	64.5%	13.2%	5.8%	1.7%

The above table portrays the classification of respondents based on their age and Body Mass Index (BMI). It could be found that 57.2% of 14 years old girls are having below normal BMI, 23.6% are in severe underweight condition, 9.4% are in normal condition, 6.9% are slightly obese and 2.8% are obese. For 15 year old girls, it is 59.6% are below normal followed by 16.2% are severe underweight, 15.2% are normal, 8.1% are slightly obese and 1% are obese. It was reported that 60.3% of 16 year old girls are below normal, 24.3% are severe underweight, 9.3% are normal, 4% are slightly obese and 2% are obese. For 17 year old girls, 64.5% of them are below normal, 14.9% are severe underweight, 13.2% are normal, 5.8% are slightly obese and 1.7% are obese. Health problems among the school going girls may seriously hamper the education and intellectual growth. This can also lead to low school enrolment, early drop out, high absenteeism and poor classroom performance. The health education measures should be included through different programmes to improve nutritional status of girls students which helps to prevent severe under nutrition.

Table: 3 Distribution based on Age and Height

S.No	Age		(Height)					
			Severely under nourished	Chronically under nourished	under nourished	Normal	High normal	Tall for age
1	14 years	N	97	98	51	37	26	9
		%	30.5%	30.8%	16.0%	11.6%	8.2%	2.8%
2	15 years	N	17	9	44	17	9	3
		%	17.2%	9.1%	44.4%	17.2%	9.1%	3.0%
3	16 years	N	44	12	125	50	14	2
		%	17.8%	4.9%	50.6%	20.2%	5.7%	0.8%
4	17 years	N	28	16	50	17	5	5
		%	23.1%	13.2%	41.3%	14.0%	4.1%	4.1%

The above table portrays the classification of respondents based on their age and height of the students. The 14 year old girls with 30.8% are chronically under nourished, 30.5% are severely stunted, 16% are under nourished, 11.6% are normal, 8.2% are high normal and 2.8% are over height. It was observed that 15 year old girls of 44.4% are under nourished, 17.2% are severely stunted as well as normal, 9.1% are chronically under nourished and high normal and 3% are over height. Half of the 16 year old girls are under nourished, 20.2% are normal, 17.8% are severely stunted, 5.7% are high normal and 0.8% are over height. 17 year old girl students state that 41.3% are stunted under nourished, 23.1% are severely stunted, 14% are normal, 13.2% are chronically under nourished and 4.1% are high normal as well as over height. It indicates that frequent assessment of nutritional status of the girls students has to be assessed periodically and it can be improved by implementing the health committees in the school which monitors the nutritional status of the girls students.

Table: 4 Distribution based on Age and Weight

S.No	Age		Weight				
			Severely wasted (severely underweight)	Moderately underweight	Normal	High normal	Obese
1	14 years	N	89	197	26	3	3
		%	28.0%	61.9%	8.2%	0.9%	0.9%
2	15 years	N	16	64	12	7	0
		%	16.2%	64.6%	12.1%	7.1%	0.0%
3	16 years	N	54	158	28	6	1
		%	21.9%	64.0%	11.3%	2.4%	0.4%
4	17 years	N	25	83	10	3	0
		%	20.7%	68.6%	8.3%	2.5%	0.0%

The above table portrays the classification of respondents based on their age and weight of the adolescent girls. It was found that most of the 14 year old girls (61.9%) are moderately underweight, followed by 28% severely wasted (severely underweight), 8.2% are normal and 0.9% as high normal as well as obese. Majority 64.6% of 15 year girls reported that they are moderately underweight, 16.2% as severely wasted (severely underweight), 12.1% are normal and 7.1% are high normal. The respondents who belong to 16 years state that 64% are moderately underweight, 21.9% as severely wasted (severely underweight), 11.3% are normal, 2.4% are high normal and 0.4% are obese. It was opined by 17 year old girls that 68.6% of them are moderately underweight, 20.7% as severely wasted (severely underweight), 8.3% are normal and 2.5% are high normal. From the result it is imbibed that lack of adequate nutrition in the school going age can reduce their physical as well as mental development and condemn them to live in the margins of society. Providing protein rich foods which are locally available can improve the nutritional status of the respondents.

Table 5: Distribution of Respondents based on Height and Weight

S.No	Height		Weight				
			Severely wasted (severely underweight)	Moderately underweight	Normal	High normal	Obese
1	Severely Undernourished	N	91	89	6	0	0
		%	48.9%	47.8%	3.2%	0.0%	0.0%
2	Chronically under nourished	N	34	91	10	0	0
		%	25.2%	67.4%	7.4%	0.0%	0.0%
3	Moderately under nourished	N	45	194	22	8	1
		%	16.7%	71.9%	8.1%	3.0%	0.4%
4	Normal	N	9	84	23	4	1
		%	7.4%	69.4%	19.0%	3.3%	0.8%
5	High normal	N	3	31	12	7	1
		%	5.6%	57.4%	22.2%	13.0%	1.9%
6	Over height	N	2	13	3	0	1
		%	10.5%	68.4%	15.8%	0.0%	5.3%

The above table portrays the classification of respondents based on their height and weight. It could be observed that the 48.9% respondents who are severely short are severely underweight and 47.8% of severely short respondents are moderately underweight.

The chronically under nourished students with 67.4% are found to be in moderately underweight state and 25.2% are severely underweight. Majority 71.9% under nourished are also found to be moderately underweight and 16.7% are severely underweight. Whereas, 69.4% of the students who are having normal weight reported that are moderately underweight, followed by 19% at normal weight. More than half of the respondents 57.4% at high normal height reported are moderately underweight, 22.2% in normal weight and 13% are at high normal weight. Also, 68.4% of over height students are moderately underweight. The severe form of muscle wasting reduces the ability of the students to concentrate on their studies and affects their school education. The awareness programme on having healthy food habits has to be conducted periodically for parents and girls students which improves the nutritional status of the respondents.

Recommendations

- Health educator can be appointed in all schools to create awareness about health and hygiene and to monitor the health status of the children. All the nutrition programmes and schemes must be probed through gender lens and need to be gender sensitive
- Nutrition education have a significant effect in promoting healthy eating habits, and schools can contribute to reduce nutrition-related problems by integrating nutrition interventions into a comprehensive school health program. A curriculum that focuses on nutrition and well being can be included in the text books which create awareness about the importance of having balanced diet.
- Mass media communication are very useful for directing adolescents to access health and nutrition services in the community and to reinforce key messages that are also communicated through locally available channels.
- Community-based sensitization, especially which combines awareness-raising with networks and action through adolescent and youth centers and religious structures and groups etc., holds great potential in improving the nutritional status of school going girls

Conclusion

Girls who are taller are moderately underweight, meaning they still need more nutrition to match the height to weight. But there is no severely underweight respondent who is of normal or above height. So, to overcome stunting, nutritious food and habits are required to gain the normal weight. Most of the government high and higher secondary schools the researcher visited have the record of annual social demography and personal physical profile in the class rosters. But these are collected only for forwarding the data to the respective departments. If these data collected are processed locally at the school, and analysed how many students need special support and a rectification attempt is made at the school level by counselling the family and communicating with the local community to find immediate solutions, the result will be much quicker and better. Since school cannot take all the responsibility, local primary health centres can encourage the respondents to periodically visit them, measure the height and weight every month, monitor the growth chart on their own will give a ownership to these adolescent school going girls on their own health and wellbeing.

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