



**Original Work**

**Nutritional Status in Rural Adolescent Girls Residing at Hills of Garhwal in India (2009)**

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**ABSTRACT:** Nutritional inadequacy leads to health problems, especially during the period of increased demand. Adolescents are a potential group in view of rapid growth and maturation which demands extra nutrients. With the multitude of social customs and beliefs cited against adolescents especially adolescent girls it is no wonder that they form the vulnerable group of under nutrition. With poor socio economic status, hostile living conditions and food influenced by vagaries of nature, adolescents living at hills form the distinct group to be studied. This cross-sectional prevalence study included 45 adolescent girls of age group 12-19 years residing in hills of Garhwal. The outcome measures for nutritional status were stunting, thinness and proportion of underweight/under nutrition. In this study 34.61% of adolescents' girls were found to be stunted. The stunting was more (33.33%) in 16 to 19 years of age group. The overall prevalence of thinness was 43.47%. However percentage of thinness was higher (56.25%) in the lower age group (12-15 years). Under nutrition was prevalent in similar proportions in both the age groups with > 50% of the rural adolescent girls having less than 3<sup>rd</sup> percentile of weight for age by NCHS standards. The prevalence of stunting, thinness and underweight was high among adolescent girls living at high altitudes. In this regard special attention should be paid to the girls of hills and specific strategies should be formulated for meeting their nutritional demands.

**KEY WORDS:** *Stunting; Thinness; Body Mass Index; Under-nutrition; Adolescent girls*

**INTRODUCTION**

Nutrition is a major component of human health and is a determinant of the quality of life, as inadequacy of it leads to health hazards and even mortality especially during the period of increased demand. Adolescence (10-19 years) – a period of transition between childhood and adulthood is a potential group in view of rapid growth and maturation which demands extra nutrients and energy rich food<sup>1</sup>. Inadequate diet and unfavourable environmental condition in developing nations like

India may adversely affect the growth and nutrition of adolescents. Although adolescence is a period of life free from both childhood diseases and ravages of aging the mortality rate among them are high (6.7%)<sup>2</sup>.

The state of rural adolescent girls in India is quite dismal. Despite the increased nutritional requirements during adolescence, their average nutrient intake is much below the recommended allowances. It has been estimated that 35% of rural girls, at 17 years of age, are underweight (<38 kg) and 23% are lesser than critical height (<145 cm) which is recognized as an obstetric risk factor<sup>3</sup>. It may be associated with many concurrent and future adverse health outcomes including poor reproductive outcome in girls perpetuating the vicious cycle of malnutrition<sup>4,5</sup>.

Socio-cultural factors, peer influences, craze for trendy foods; mood; body image; and extreme

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changes in the lifestyle, and food habits of adolescents in recent past have affected both their nutrient intake and needs<sup>6</sup>. Moreover intra household gender discrimination in food allocation with preference to sons, and the girls to receive less and/ or inferior quality of food have compounded the under nutrition in the girls to a larger extent<sup>7</sup>. Wide disparity with respect to socio economic status, living condition and diet between different sections of population, growth performance of the rural adolescents (16.06 BMI for age) are lower than the affluent adolescent girls (18.53 BMI for age)<sup>8</sup>.

Adolescents constitute ~23% of the population of the newly formed state of Uttarakhand. The state of adolescents in the state is sketchy. With 34% of the female literacy of 10<sup>th</sup> and above, one third of the females (15-49 years) are undernourished<sup>9</sup>. In this hilly region females are chiefly involved in household as well as other work. Moreover people of hills reside in unique physical, socio-economic and cultural environment. In view of their habitat and different food habits and availability of quality food, they form the distinct group to be studied and compared to general population. Also their food is influenced by vagaries of nature, with large seasonal variation on which their agriculture depends.

Growth during adolescence is faster than at any other time in an individual's life except the first year. Increasing nutritional intake during adolescence gives us another opportunity to cover the deficits suffered during early life<sup>10</sup>, provide adequate stores of energy for illnesses and pregnancy<sup>11,12</sup> and provide opportunity to implement activities to prevent adult onset of nutrition-related diseases. Their current nutritional status decides the well being of the present as well as the future generation.

Therefore an attempt has been made to assess the nutritional status of adolescent girls residing at 6000-7000 feet in Garhwal region of Uttarakhand using WHO recommended anthropomorphic indicators.

## METHODOLOGY

This cross-sectional study was done on rural adolescent girls who had come for a Life-Skill training workshop at Rural Development Institute of the Himalayan institute of Medical sciences, Dehradun, Uttarakhand. The study was carried out in May-June 2009.

A total of 45 adolescent girls have participated in the study with the age ranging from 12 to 19 years from the rural area of Garhwal region residing at average height of 6000-7000 feet. Written consent from the guardians of the volunteers was obtained. The primary tools in this study were predesigned and pretested during examination schedules for

recording of family as well as individual information. The nutritional status of the subjects was assessed by anthropometry and dietary intake. Anthropometric measurements included height, weight, using which indices, viz., body mass index (BMI) was computed.

Each study subject was subjected to weight & height measurement<sup>13</sup> following standard techniques. Height (to the nearest 0.1 cm) and weight (to the nearest 0.5 kg) were measured using wall mounted scale and the Krups weighing machine respectively. Body Mass Index (BMI) was subsequently computed by dividing the weight in kilograms by the square of height in metres (kg/m<sup>2</sup>). Their anthropometric parameters (weight & height) at different age points were compared with the corresponding reference value. All the data was collected by the same observer and repeated measurements were undertaken to remove intra observer variability.

## Objective parameters

The anthropometric nutritional status was assessed by 'BMI for age', weight for age and 'height for age' as per National Centre for Health Statistics (NCHS)/WHO standards<sup>14</sup>. Height for age below 3<sup>rd</sup> percentile of National Center for Health Statistics (NHCS)/WHO reference values were classified as stunting. Thinness and overweight were evaluated using WHO recommended age specific cut off points of BMI based on National health and Nutrition examination survey (NHANES) reference data. BMI for age below 5<sup>th</sup> percentile of NHANES reference value was classified as thinness<sup>4</sup>. Relevance of weight for age parameter was examined against available reference values viz. 50<sup>th</sup> percentile of CDC 2000 with the Weight for age <3<sup>rd</sup> percentile considered as under nutrition.

## Statistical analysis

The major objectives of the study were to record anthropometric data and calculate BMI of adolescents and to compare these values with NCHS standards; and to study the correlates of nutritional status with weight, age, height, and BMI. The data were analyzed using Statistical Package (SPSS, version 10.v). Anthropometric data collected was stratified by age and subjected to analysis by the standard percentile charts for the parameters. The data was subjected to tools like mean, standard deviation, to obtain the result. The results cannot be generalized as the sample is small and not representative of the state. Opportunity of conducting this study has been taken to analyse basic nutritional indicators which can provide some direction for large scale epidemiological study.

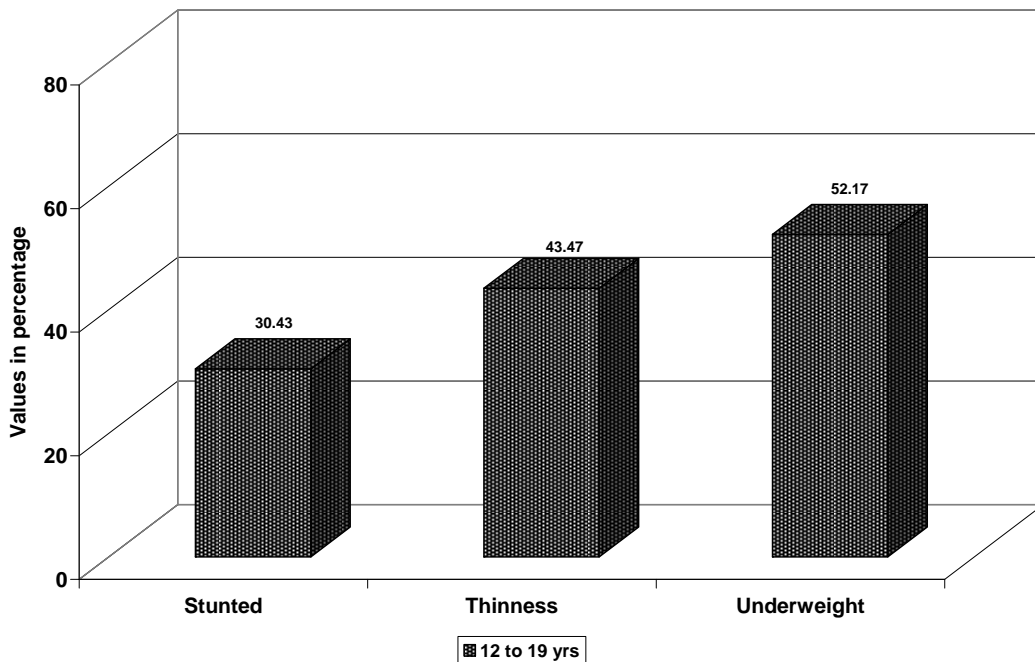
**RESULTS**

A total of 45 healthy adolescent girls of 12 to 19 years age group participated in the study. The mean age of adolescent girls was 16.17 years. All the subjects are showing the chronic energy deficiency with BMI <18.5kg/m<sup>2</sup> (Table 1).

**Table 1: Demographic data of adolescent girls residing at high altitudes**

N= 45	Mean ± SD
Age (years)	16.17 ± 2.03
Height (cm)	151.33 ± 6.45
Weight (Kg)	39.63 ± 6.25
BMI (Kg/m <sup>2</sup> )	17.24 ± 1.91

Over all 43.47% of the adolescents girls were thin with BMI for age <5<sup>th</sup> percentile by NCHS /WHO standards (Figure 1). Although the Mean BMI was higher in late adolescent (17.87±1.74) than the early adolescents; on comparing the BMI for age the prevalence of thinness was higher (56%) in lower adolescence (12-15 years) as compared to the higher age group adolescents. (Table 2) Three different criteria are used to assess the nutritional status of adolescents. They are BMI for age, Height for age and weight for age. When weight for age was used, under weight (< 3<sup>rd</sup> percentile of NCHS) observed was found to be equally prevalent in both the age groups (50%) suggesting a similar degree of under nutrition in them (Figure 2). 30.43% of the adolescent girls of Garhwal were found to be stunted as per the Height for age (<5<sup>th</sup> percentile by NCHS/ WHO) with maximum stunting (33.3%) seen in the late adolescent girls (Table 2).



**Figure 1: Bar Diagram showing Anthropomorphic indicators of Nutritional status of adolescent girls 12 to 19 years (n=45)**

**Table 1: Prevalence of Stunting, Thinness and Underweight among Adolescent girls residing at high altitudes**

Age (years)	Stunting (Height for age)		Thinness (BMI for age)		Underweight (Weight for age)	
	Mean ±SD	<3 <sup>rd</sup> percentile NCHS/WHO 1983	Mean ±SD	<5 <sup>th</sup> percentile NCHS/WHO 1983	Mean ±SD	<3 <sup>rd</sup> percentile NCHS/WHO 1983
12-15 (n=16)	148.25± 4.5	4 (25%)	16.25±1.8	9 (56.25%)	35.75± 4	8 (50%)
16-19 (n=29)	152.92± 6.8	10 (33.3%)	17.87±1.74	11 (36.66%)	41.7±6.2	14 (50%)

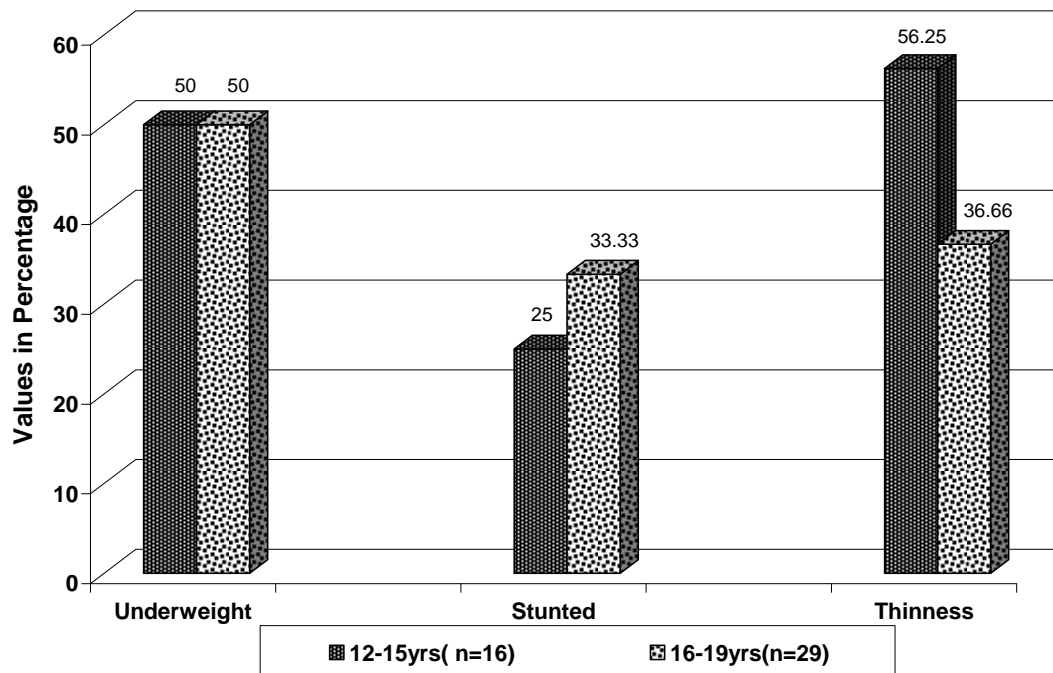


Figure 2: Age-wise distribution of Stunting, Thinness and Underweight among Adolescent girls

## DISCUSSION

The study highlights the extent of stunting and thinness among rural adolescent girls of Garhwal region living at height of 6000-7000 feet. Nutritional status was evaluated using anthropometric indicators recommended by the WHO expert committee. In the present study, 43.47% of the adolescent girls were thin (BMI for Age <5<sup>th</sup> percentile by NCHS standards). The prevalence of thinness found in the present study is close to the national average of 47%<sup>15</sup>. Studies from various regions of India have reported a variable percentage of thinness among adolescent girls which vary from 16.7% in urban to 62.7% in rural and tribal areas<sup>5</sup>. A higher percentage of thinness was reported by several of the studies from southern states and Rajasthan (93.5%)<sup>6,16</sup>. Choudhary et al have reported 68.52% of adolescents having a BMI less than 18.5 kg/square meter in rural area of Varanasi<sup>17</sup>. Deshmukh et al reported an overall prevalence of 53% of thinness among adolescents with maximum contribution from the girls<sup>18</sup>. Studies overseas in developing country like Bangladesh have also reported higher rate of prevalence (67%) of thinness among girls in the south east region<sup>19</sup>. Anand et al however reported lower percentage (30.1%) of thinness in north Indian rural school going girls near Delhi<sup>1</sup>. Our findings of higher percentage of thinness in early adolescents (56.25%) as compared to 36.3% in late adolescents (15 -19 years), was similar to that reported by Haboubi and Rizwana on adolescents of Indian origin in UAE<sup>20</sup>.

Shahabuddin et al also reported that as age increased, thinness decreased in Bangladeshi girls<sup>19</sup>. National Nutrition Monitoring Bureau<sup>6</sup> also reported that under-nutrition decreased from 78% in 10-13 years to 66% in 14-17 years. This could be because of the early growth spurt seen in the girls with sudden increase in height in early age group. One of the major reasons for thinness may be poor nutritional intake of adolescent girls and the increased physical activity due to hostile environment. Higher percentage of thinness may prove an obstacle in achieving RCH (Reproductive and Child Health) program targets, like reduction in proportion of low birth-weight babies and in improving reproductive outcomes.

The report on regional WHO consultation on nutritional status of adolescent girls reported 45% prevalence of stunting among girls<sup>21</sup>. In the present study, the stunting was present in 30.43% of adolescents which was much less than the National average of 45.5% as per the NHFS 3 survey. Venkaiah et al reported stunting of 39% among rural adolescents in India from National Nutrition Monitoring Board data<sup>22</sup>. A higher prevalence rate of 38.5% was reported by Anand et al in their study on adolescents of north India<sup>1</sup>. Shahabuddin et al also reported stunting to be as high as 48% in Bangladesh adolescent girls<sup>19</sup>. Fluctuations of percentage of stunting across age group could be due to relative smaller sample size. The prevalence of stunting and thinning among adolescent girls of Garhwal are less than most of the studies conducted in region of northern India<sup>23,24</sup>. Stunting indicates long term cumulative inadequacy of nutrition and

suggests nutritional deprivation in early childhood<sup>4</sup>. Under nutrition seems to affect equally all the age group of the adolescents in the present study. The weights of 50% of the girls were less than 3<sup>rd</sup> percentile for the age and had mild to moderate degree of malnutrition. This may suggest a similar degree of dietary intake with increased physical activity could have resulted in poor nutritional status of adolescent girls.

Our results suggest that beside inadequate nutrition intake, increased physical activity because of difficult terrain has been a major contributory factor for poor nutritional status of study participants.

## CONCLUSION

Study has indicated high level of under nutrition amongst adolescent girls indicating need for further analytical socio-epidemiological study to delineate the causes for the same and development of appropriate strategies for combating such a high grade of under nutrition.

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