P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-IV, ISSUE-IV, October-2015
E: ISSN No. 2349-9443 Asian Resonance

# An Interaction between Place of Living and Prevalence Rate of Malnutrition among Adolescents of Fatehabad, Haryana

**Nisha Rani**
Research Scholar,
Deptt. of Foods and Nutrition,
C.C.S. Haryana Agricultural University, Hisar

**Varsha Rani**
Assistant Professor,
Deptt. of Foods and Nutrition,
C.C.S. Haryana Agricultural University, Hisar

**Pinky Boora**
Professor,
Deptt. of Foods and Nutrition,
C.C.S. Haryana Agricultural University, Hisar

**Abstract**

Database on nutritional status of adolescents from different parts of the country should be developed to enable the governments and other nongovernmental agencies to formulate policies for promoting nutritional status of adolescents. The present study was carried out in *Fatehabad* district of Haryana state. Two hundred school going adolescents (13-17y) were selected for the study. Out of them 100 students were selected randomly from the rural Govt. Senior Secondary School of *Dhanger* village, *Fatehabad* and another 100 students were selected randomly from the urban Govt. Senior Secondary School of *Fatehabad* city. Under anthropometric measurements, height (cm), weight (kg), waist circumference (cm) and hip circumference (cm) were measured in duplicate while body mass index and waist to hip ratio were calculated. Z-score for height-for-age (HAZ-score) and BMI-for age (BAZ-score) were calculated using WHO Anthro Plus software (version 2014). *P* value less than 0.05 and 0.01 were considered statistically significant. Area-wise comparison of anthropometric measurements indicated that the mean values of age, weight, height, BMI, waist circumferences and hip circumferences recorded for rural adolescents were 14.83y, 42.26kg, 156.624cm, 17.58(kg/m²), 63.38cm and 82.11cm, respectively (table 4.20). The values of same parameters in urban adolescents were 15.19y, 45.98kg, 162.27cm, 17.76(kg/m²), 67.23cm and 84.19cm, respectively. Adolescents belonging to urban area had significant higher values of weight, height, waist circumferences and hip circumferences in comparison of adolescents belonging to rural area. Adolescents belonging to rural area had significantly higher prevalence of wasted (18%) than adolescents belonging to urban area (8%). However, Adolescents belonging to rural area had significantly lower prevalence of overweight (5%) and abdomen obesity (16%) than adolescents belonging to urban area (12%) and (35%) respectively.

**Keywords:** Under-Nutrition, Obesity, Adolescents, Rural, Urban.

**Introduction**

Adolescence is a period of rapid growth and maturation in human development after infancy. During adolescence, 20% of final adult height and 50% of adult weight are attained, bone mass increases of 45% and dramatic bone remodeling occur and soft tissues, organs, and even red blood cell mass increase in size (Giuseppina, 2000). The nutritional demands associated with rapid growth, cognitive development and maturation in adolescence are of great concern (Rogol *et al*., 2002; Spear, 2002). This demand doubles due to increased physical activity along with growth which make them more vulnerable to malnutrition in case of imbalanced dietary intake.

Researches done across the countries have shown that adolescents tend to have lower than desirable intakes of fruits, vegetables, dairy products, and whole grains but higher than desirable intakes of soft drinks, confectionery, and fast foods ((Neumark *et al*.,1996; Munoz *et al*., 1997; Magarey *et al*., 2001; Harnack *et al*., 2003; Yngve *et al*., 2005). Consequently, many adolescents fall short of achieving optimal nutrient intakes for good health and development. It is evident that nutrition behaviour pursue from adolescence into adulthood (Lake *et a*l., 2006).

Therefore, the adoption of healthy nutrition during adolescence has the potential to bestow significant long-term health benefits.

As a consequence the coexistence of overweight, obesity and underweight is common in developing countries and is found to be increased proportionally over time. Several studies have investigated the nutritional status of children and adolescents from different parts of India. In India alone, there are approximately 60 million children who are underweight, this prevalence is higher in rural areas compared to urban area. India has one of the highest underweight burdens in the world, even twice that of sub- Sahara region. Nutritional status assessed through body mass index revealed that 8.1per cent of adolescent girls suffered from chronic energy deficiency (CED) grade I, 6.6 per cent grade II, and 78.8 per cent grade III (Chaturvedi *et al*., 1996). Venkaiah *et al.* (2002) assessed the prevalence of stunting and underweight among rural adolescents in India. About 39 per cent of adolescents of both the sexes were stunted.

Nutritional status of adolescents can be quickly assessed by study of anthropometric measurements. Anthropometric measurements help in the monitoring changes in growth of adolescents. Anthropometric measurements of adolescents' are an important determinant of a nation's health. Measurements of height, weight, body mass index (BMI), waist circumferences and hip circumferences are the reliable means to evaluate the nutritional status and it is very much in need as large sample size can be assessed and handled easily in less time and money. Estimation of the prevalence of overweight and obesity in population are typically based on BMI. Waist circumference measurement has proved to be a useful tool for assessing risk for obesity-related diseases such as cardiovascular disease (Lemieux *et al*, 2000). Waist circumference has been shown to correlate well with intra-abdominal fat mass (Lean *et al*, 1995), which in turn has been shown to be related to an atherogenic lipoprotein profile (Han *et al*, 1995).

There is a need to develop a database on nutritional status of adolescents from different parts of the country to enable the governments and other nongovernmental agencies to formulate policies and initiate strategies for the well-being of adolescents. Therefore the present study was designed to find out the prevalence rate of wasting, stunting, overweight and obesity among the adolescents and is the prevalence rate affected from place of living.

**Materials and Methods**

**Study Area and Sample Size**

The present study was carried out in Fatehabad district of Haryana state. Government Senior Secondary School from *Dhanger* village, Fatehabad and Government Senior Secondary School from Fatehabad city was selected randomly. Two hundred school going adolescents (13-17y) were selected for the study. Out of them 100 students were selected randomly from the rural Govt. Senior Secondary School of *Dhanger* village, *Fatehabad* and another 100 students were selected randomly from the urban Govt. Senior Secondary School of *Fatehabad* city. The proportion of male and female students was assigned equal while selecting the respondents.

**Anthropometric Measurements and their Interpretation**

A pre-tested well structured questionnaire was developed to collect the data onsocio-economic status i.e. family type, family size, parent's education, parent's occupation, family income, eating habits, drinking water facilities, nutrient supplements etc. Data was collected with the help of interview schedule by paying repeated visits to the study area.

Prior to the take anthropometric measurements, all procedures were explained to the respondent. Under anthropometric measurements, height (cm), weight (kg), waist circumference (cm) and hip circumference (cm) were measured in duplicate while body mass index and waist to hip ratio were calculated.

Z-score for height-for-age (HAZ-score) and BMI-for age (BAZ-score) were calculated using the National Centre for Health Statistics (NCHS) reference data (Fryar *et al.,* 2012) and WHO Anthro Plus software (version 2014). The cut off values of Z-score for height-for-age and BMI-for age have been presented in Table 1. The associations between socio-economic status and z scores of height for age and BMI for age were also computed.

**Statistical Analysis**

Statistically data was analyzed using SPSS statistical package (version 14.0) for windows. Means of age, height, weight, BMI, waist and hip circumferences were compared area wise (rural vs. urban) using independent sample t-test. Association of area with prevalence of wasting, stunting, overweight and abdomen obesity was found using chi-square test. *P* value less than 0.05 and 0.01 were considered statistically significant. The associations between socio-economic status and z scores of height for age and BMI for age were computed using Pearson's correlations.

**Results and Discussion**

Results of socio economic status of adolescents revealed that majority of adolescent were from nuclear families, whereas 20 percent of them had joint families. Sixty three per cent of the respondents belonged to medium sized families followed by 19 and 18 per cent from large and small sized families (Table 2). In a previous study, the majority of adolescents were also from medium sized families followed by and per cent from small and large sized families (Venkaiah, 2002). Most of the respondent's fathers and mothers were illiterate followed by educated up to primary, high, middle, intermediate and graduate. Majority of respondents' fathers were engaged in labour work followed by agriculture, caste occupation, service and small scale business. Majority of respondents' mothers were housewives followed by labor, agriculture, service and caste occupation.

The average family income of 57 per cent families was in between Rs. 1,50000-3,00,000/annum while 30 per cent of families were earning less than Rs. 1,50000 per annum and 13 per cent families were earning more than 3,00,000 per annum (Table 2). The results of present study were corroborated with previous study where it was reported that 49.25 per cent of families had income between Rs. 1,50000-3,00,000/annum, 13.75 per cent families had income less than 1,50000/annum and 13 per cent families had annual income more than 3,00000/annum (Patel *et al.,* 2013). Majority of the respondents was vegetarian, 12 per cent were non-vegetarian and rest two percent were eggetarian. The results of present study corroborated with those of others investigators who also found that majority of families were vegetarians (Omidvar and Begum, 2014). Source of water in majority of the families were supply water. Forty seven percent of the respondents were consuming iron supplements which were distributed at schools, 12.5% of them were consuming calcium supplements. As a result, it may be concluded from the socio-economic profile that the level of parents' education, parents' occupation, family type and family size was more or less similar in both the rural vs. urban conditions except the agriculture as occupation in rural background where more of adolescent fathers and mothers were engaged in agriculture. The annual income, drinking water facilities were better in urban background than rural. In urban background in addition to vegetarian diets, the adolescents were having non vegetarian diets along with egg while iron supplement intake was more in adolescents of rural background.

Area wise comparison of means and standard deviation of anthropometric measurements have been provided in Table 3. Distribution of male and female adolescents was randomized. The average age of adolescents was 15 years. Area-wise comparison of anthropometric measurements indicated that the mean values of age, weight, height, BMI, waist circumferences and hip circumferences recorded for rural adolescents were 14.83y, 42.26kg, 156.624cm, 17.58(kg/m$^2$), 63.38cm and 82.11cm, respectively (table 4.20). The values of same parameters in urban adolescents were 15.19y, 45.98kg, 162.27cm, 17.76(kg/m$^2$), 67.23cm and 84.19cm, respectively. Results indicated that adolescents belonging to urban area had significant higher values of weight, height, waist circumferences and hip circumferences in comparison of adolescents belonging to rural area. The results of present investigation are in accordance with those of earlier workers (Chaturvedi *et al.,* 1996; Malhotra and Passi, 2007; Venkaiah *et al.,* 2002) who reported that adolescents were found to have lower values of height and weight when compared to NCHS reference data.

Z-scores for height-for-age revealed that rural adolescents were found to be more stunted (16%) in comparison of urban adolescents (13%). Seven percent of the adolescents were found severely stunted; out of them 5% were belonging to rural area and 2% were from urban area (chi square 4.27, $P<0.05$). The z-score for BMI-for-age revealed that 26% of the total population were wasted. Adolescents belonging to rural area had significantly higher prevalence of wasted (18%) than adolescents belonging to urban area (8%) (chi square 7.88, $P<0.01$). As a result, in rural area as compare to urban area more adolescents were facing under nutrition. The z-score for BMI-for-age further revealed that adolescents belonging to rural area had significantly lower prevalence of overweight (5%) than adolescents belonging to urban area (12%) (chi square 7.88, $P<0.01$). The abdomen obesity resulted through waist to hip ratio was also significantly lower in adolescents belonging to rural area (16%) as compare their urban counterparts (35%) (chi square 9.89, $P<0.01$). Results of present study are supported by Parimalavalli and Sangeetha (2011) who reported higher prevalence of stunted. Malhotra and Passi (2007) also reported higher prevalence of stunted, underweight and overweight than the present study.

The results presented in table 4 showed the Pearson's correlations coefficients for father occupation and family income and BMI for age were significant (r=0.54; $p<0.001$ and r=0.33; $p<0.05$). The father occupation and family income had positive association with the z score of BMI for age. The similar trend for the association of father occupation and family income was observed for z scores of height for age. The Pearson's correlations coefficients of father occupation and family income and height for age were significant (r=0.48 and r=0.41 respectively; $p<0.05$). However, the type of family and size of family had negative association with both BMI for age and height for age though the correlation coefficients were not significant. Venkaiah *et al.* (2002) assessed the association between socio-economic factors and nutritional status of adolescents. They observed that except family size all the demographic and socio-economic factors i.e. religion, caste, type of family, literacy, type of house, ownership of house and occupation were significantly ($P<0.05$) associated with the stunting of adolescents.

**Conclusions**

It may be concluded from the results of present study that adolescents (13-17 yrs.) of *Fatehabad* district were facing double burden of malnutrition as13 percent of the adolescents were wasted and 25.5 percent of them were found to be at the risk of abdomen obesity. The prevalence of wasting and stunting was significantly higher in adolescents belonging to rural area. However, the prevalence of overweight and abdomen obesity was significantly higher in adolescents belonging to urban area. The family income and father occupation was positively associated with the BMI for age and height for age whereas the type of family and size of family were negatively associated with BMI for age and height for age. The adolescents should be educated in reference to balance diet and recommended dietary guidelines, so that they may avoid nutritional complications.

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**Table-1**
**Anthropometric Indices and Cut-Off Points for Adolescents**

| Indicators | Anthropometric Variable | Cut-off-points (Z-score) |
|---|---|---|
| Tallness | Height-for-age | > +3SD |
| Normal | Height-for-age | <-1 SD to > +2SD |
| Stunting | Height-for-age | <-2SD |
| Severely stunting | Height-for-age | <-3SD |
| Overweight | BMI-for-age | > +3SD |
| Obese | BMI-for-age | > +2SD |
| Normal | BMI-for-age | <-1 SD to > +2SD |
| Wasted | BMI-for-age | <-2SD |
| Severely wasted | BMI-for-age | <-3SD |
| Normal | Waist to hip ratio (Men) | <1.00 |
| Abdomen Obesity | Waist to hip ratio (Men) | >1.00 |
| Normal | Waist to hip ratio (Women) | <0.80 |
| Abdomen Obesity | Waist to hip ratio (Women) | >0.80 |

**Table- 2**
**Socio-Economic Profile of Adolescents**

| Characteristics | Total (200) | Rural (100) | Urban (100) |
|---|---|---|---|
| **Gender** | | | |
| a) Male | 100(50) | 50 | 50 |
| b) Female | 100(50) | 50 | 50 |
| **Father Education** | | | |
| Illiterate | 81(40.5) | 39 | 42 |
| b) Primary | 37(18.5) | 18 | 19 |
| c) Matric | 71(35.5) | 38 | 33 |
| d) Intermediate | 9(4.5) | 4 | 5 |
| e) Graduate | 2(1) | 1 | 1 |
| f) Post-graduate | - | - | - |
| **Mother education** | | | |
| a) Illiterate | 116(58) | 59 | 57 |
| b) Primary | 57(28.5) | 27 | 30 |
| c) Matric | 27(13.5) | 14 | 13 |
| d) Intermediate | - | - | - |
| e) Graduate | - | - | - |
| f) Post-graduate | - | - | - |
| **Father Occupation** | | | |
| a) Labor | 131(65.5) | 60 | 71 |
| b) Caste occupation | 9(4.5) | 6 | 3 |
| c) Small scale business | 3(1.5) | - | 3 |
| d) Agriculture | 48(24) | 31 | 17 |
| e) Service | 9(4.5) | 3 | 6 |
| **Mother Occupation** | | | |
| a) Labor | 24(12) | 16 | 8 |
| b) Caste occupation | 3(1.5) | 2 | 1 |
| c) Small scale business | - | - | - |
| d) Agriculture | 20(10) | 20 | - |
| e) Service | 3(1.5) | - | 3 |
| f) Housewife | 150(75) | 62 | 88 |
| **Family Type** | | | |
| a) Joint | 40(20) | 14 | 25 |
| b) Nuclear | 160(80) | 86 | 75 |
| **Family Size** | | | |
| a) Small (≤ 4 members) | 36(18) | 13 | 23 |
| b) Medium (5-7 members) | 126(63) | 66 | 60 |
| c) Large (≥ 8 members) | 38(19) | 21 | 17 |
| **Annual Income** | | | |
| a) <1,50000 | 60(30) | 43 | 19 |
| b) 1,50000-300000 | 114(57) | 45 | 67 |
| **c)** ≥300000 | (26(13) | 12 | 14 |
| **Drinking Water Facility** | | | |
| a) Tubewell/hand pump | 17(8.5) | 17 | - |
| b) Supply water | 183(91.5) | 83 | 100 |
| **Eating Habit** | | | |
| a) Vegetarian | 172(86) | 100 | 72 |
| b) Non-vegetarian | 24(12) | - | 24 |
| c) Eggetarian | 4(2) | - | 2 |
| **Nutrient Supplements** | | | |
| a) Iron | 142(71) | 81 | 61 |
| b) Calcium | 9(4.5) | 7 | 2 |
| c) Any other | 11(5.5) | 2 | 9 |

**Values in Parentheses Indicate Percentage**

**Table 3**
**Area Wise Comparison of Anthropometric Measurements of Adolescents**

| | Total (200) | Rural (100) | Urban (100) | t-value |
|---|---|---|---|---|
| Age (years) | 15.01 ±1.28 | 14.83 ± 1.24 | 15.19 ±1.30 | 1.98* |
| Weight (kg) | 44.12 ± 8.22 | 42.26 ± 7.29 | 45.98 ± 8.71 | 3.2** |
| Height (cm) | 159.44 ± 9.28 | 156.62 ± 7.50 | 162.27 ± 10.04 | 4.5** |
| BMI | 17.67 ± 2.27 | 17.58 ± 2.30 | 17.76 ± 2.25 | 0.56NS |
| Waist circumferences (cm) | 65.31 ± 6.73 | 63.38 ± 5.12 | 67.23 ± 7.58 | 4.2** |
| Waist circumferences (cm) | 83.15 ± 6.59 | 82.11 ± 6.36 | 84.19 ± 6.69 | 2.2* |

Values are mean ±SD
**Significant at 1% level
*Significant at 5% level

**Table- 4**
**Effect of socio-Economic Status on The Z Score of BMI for Age and Height for Age**

| | BMI for age | Height for age |
|---|---|---|
| Father Education | 0.15 | 0.13 |
| Mother Education | 0.06 | 0.05 |
| Father Occupation | 0.54** | 0.48** |
| Mother Occupation | 0.07 | 0.05 |
| Family Income | 0.33* | 0.41** |
| Family Type | -0.17 | -0.16 |
| Family Size | -0.16 | 0.17 |

*Significant at 5% level
**Significant at 1% level

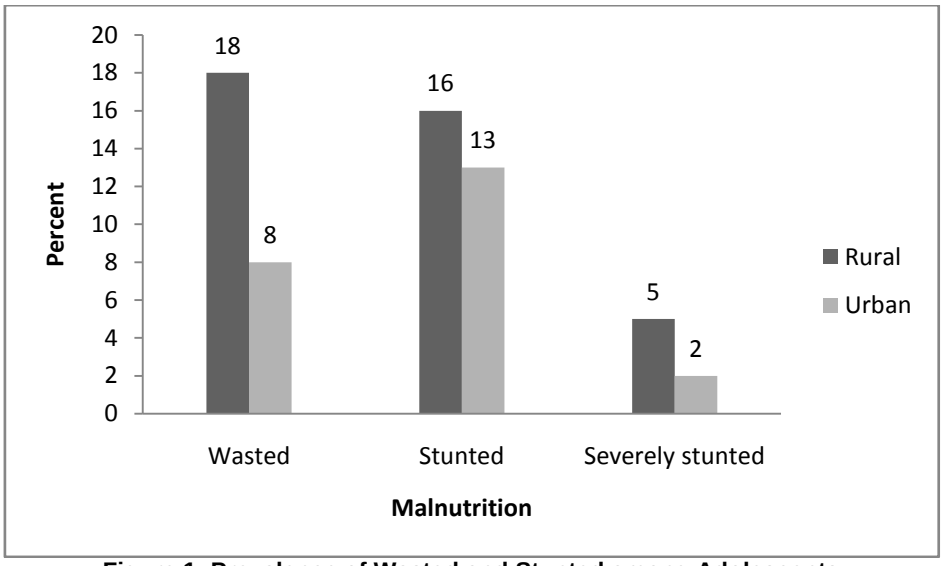


**Figure 1: Prevalence of Wasted and Stunted among Adolescents**

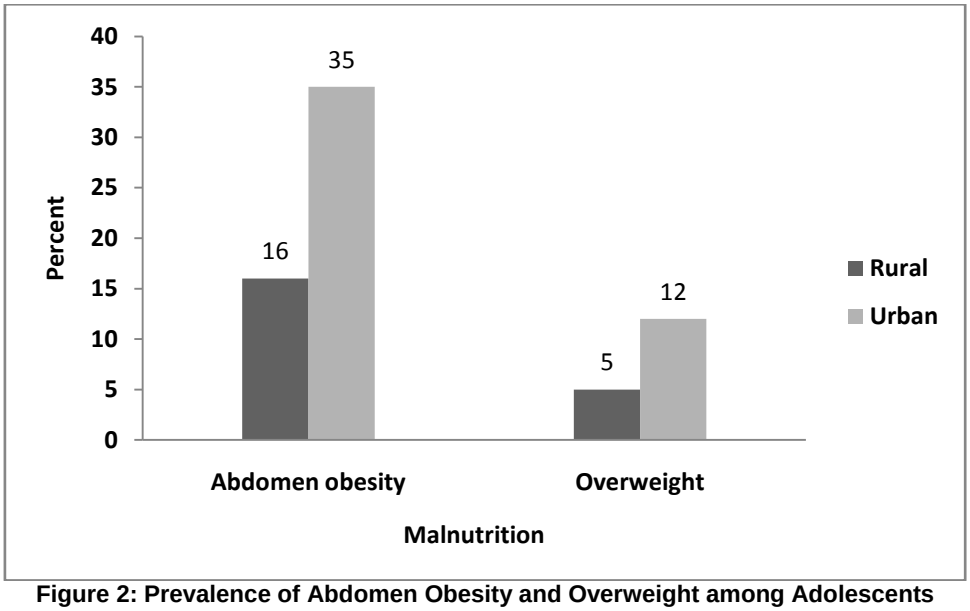


**Figure 2: Prevalence of Abdomen Obesity and Overweight among Adolescents**