# Nutritional dynamics of adolescent girls in selected tribal regions of Telangana, India

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# Nutritional dynamics of adolescent girls in selected tribal regions of Telangana, India

Theme : Food and Nutrition Security with a Gender Lens
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**Abstract**

Malnutrition continues to be one of India's major human development challenge. Despite enormous economic progress achieved in the past two to three decades, malnutrition rates continue to be high especially among children and adolescents in both urban and rural India. The shining India is in shade on these important human development indicators. Adolescents in India and especially those residing in tribal regions are at high nutritional risk and face health issues such as anemia and chronic disorders. This paper investigates the prevalence, causes and socio-economic-cultural determinants of nutrition among 11 to 18 years old adolescent girls from three tribal districts of Adilabad, Komaram-Bheem Asifabad and Mancherial in Telangana state, India.

This paper uses baseline data collected in 2017 for a project entitled, "Nutri-Food Basket" implemented in the same locations. The analysis presented in this paper is based on data from the cross sectional survey on socio-economic, demographic, diet quality (dietary diversity), haemoglobin recordings and anthropometric indicators from 1463 adolescent girls residing in the tribal districts, out of which 695 adolescent girls belong to tribal communities. The sample of adolescent girls was selected randomly from the identified districts and a tablet based survey was used to collect the required information. Anthropometric measurements were recorded using SECA instruments and haemoglobin recordings were documented using a non-invasive device – pulse co-oxymeter. Informed consent-both verbal and written - was taken prior to the survey.

The analysis of the anthropometric data reveals that about 67 percent of adolescent girls in these districts are undernourished having a BMI of less than 18.5. The results revealed that stunting and thinness was highly prevalent among the tribal adolescent girls. The Z scores for BMI-for-age and height--for-age indicate approximately 23% of the adolescents were both stunted and thin, 36% were stunted only. Overweight or obesity is not of particular concern in these regions. The logistic regression analysis - using two different models- Stunted versus Non-Stunted (Model-1) and Underweight versus Normal BMI (Model-2) had very interesting results. The regression coefficients revealed that girls from tribal communities in early adolescent age (11-14 years) were less likely to be stunted when compared with late adolescent girls from the same communities; while they had a higher probability of being underweight compared to the late adolescent girls. Higher level of education of household head played a significant role in reduction of malnutrition, especially stunting as well as underweight of tribal adolescent girls (the coefficients were significantly negative in both the cases). Covariates such as availability of toilet to the households and education level of adolescent girls itself have a significant role in reducing malnutrition of adolescent girls in the tribal community.

**Key words:**

## 1. Introduction

Malnutrition continues to be one of India's major human development challenge. Despite enormous economic progress achieved in the past two to three decades, malnutrition among children and adolescents in both urban and rural India still claims many lives due to the immense population size, illiteracy, inadequate access to health facilities, and socioeconomic disparities in India. As a result, nutritional assessments among the adolescents play a potential role in formulating developmental strategies and programs in India.

Concept of tribe, tribal society or tribal identity requires systematic investigation as they have implications both for theory and practice including the policy-related issues. The criteria of geographical isolation, distinctive culture, primitive traits, shyness of contact with others and economic and social backwardness, are in general, considered relevant in the definition of tribes in India. Their poverty, social and economic backwardness are highly visible in the literature (Desai, 1978).India has the second largest tribal population in the world, next only to Africa. According to the 2011 census, the Scheduled Tribes comprise about 8.6 percent of India's population. Tribal population in India constitutes over 104 million according to the 2011 census. Most of the tribes are found in the North East, Southern States and Central Zone of India. In Mizoram, the tribal population constitutes 95 per cent of the total population of the state and Lakshadweep belongs to Scheduled Tribes. Despite constitutional protection, positive discrimination policies and earmarked budgets, India's 104 million tribal people remain among the poorest and most nutritionally deprived social groups (Ministry of Tribal Affairs, GOI, 2016-17).

The studies of malnutrition at national and local levels have focused predominantly on children under 5 years of age. There is little information available on adolescents, the age group with the highest growth velocity after infancy. The adolescent period is a very important phase in the life span of an individual. It is defined as the transition period from childhood to adulthood and is characterized by an exceptionally rapid growth. During this stage of the life cycle, adolescents experience rapid growth and developmental changes such as physical growth, improved gross and fine motor skills and biological maturity. Girls have additional demands of nutrients during this phase of growth due to the rapid changes in the biological functions. The nutritional status of adolescents therefore requires close monitoring because they represent the next generation of parents.

Nutritional status of the community can be easily observed through the nutritional status of adolescent girls of that community, who will be the future mother (Venkaiah 2002). In India, many adolescents are getting married before completion of their growth and maturity and this proportion is very high (23.0%) (Agrawal 1974). An adolescent girl with low height-for-age (stunted) has more chances to become a short stature woman (Khan 2005). Poor anthropometric status shows maternal complications, diminishing work capacity and high risk of mortality among adolescents and adults (Conlisk et al. 1992; Rotimi et al. 1999; Spurr et al. 1977; WHO 1995). This heightened physical growth depends upon eating behavior and socio-economic status. Several epidemiological studies have shown an association between physical developments in adolescent period with socio-economic status (Ahmed et al, 2011; Melaku et al, 2015; Kodali et al, 2016; Degarege, 2015 and Herrador, 2014). Such evidence is lacking at the moment in India. These types of evidences based on data will enable the government and nongovernmental agencies to formulate policies for the well-being of the adolescents. Similarly, there is little information available on the nutritional status of adolescents in tribal regions of India, except for few studies (Rao et al, 2006; Rao et al, 2015; Sridhar and Gauthami, 2017). This paper aims to investigate the prevalence of malnutrition among adolescent girls in the three tribal districts of Telangana and examine the socio demographic factors influencing the nutritional status of adolescent girls.

## 2. Subjects and methods

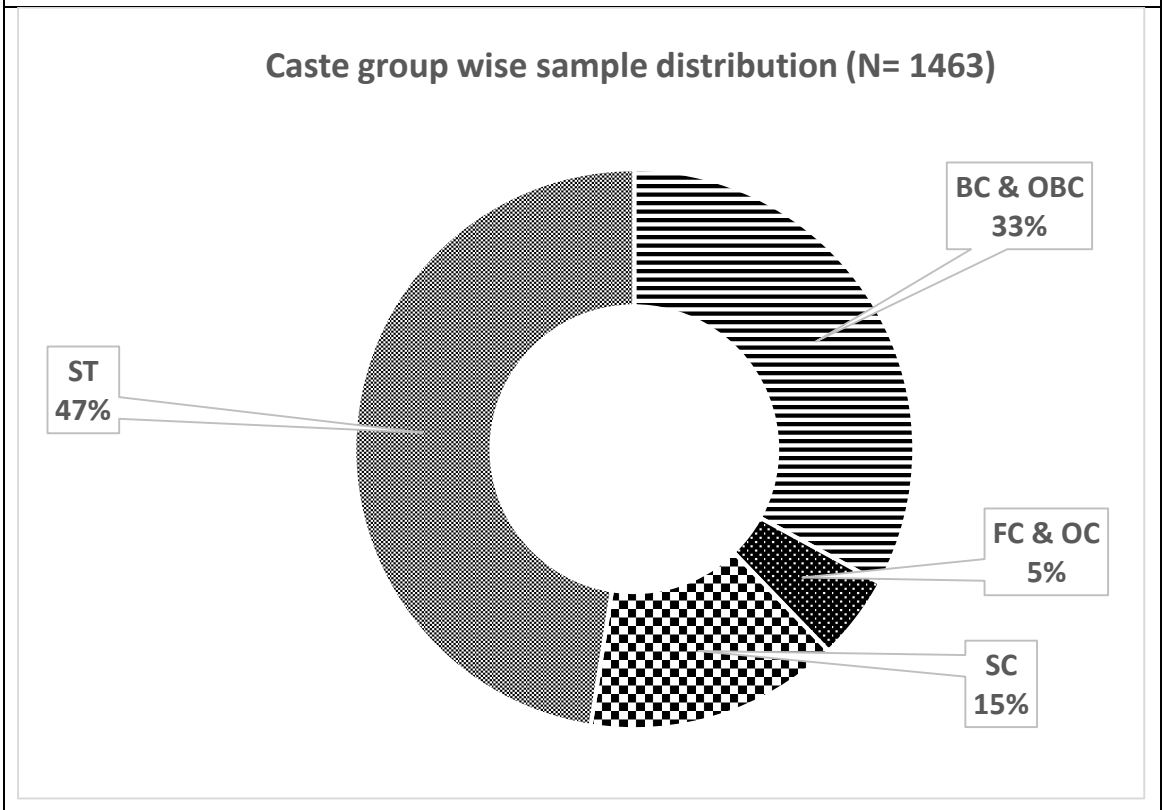
### *2.1. Study participants*

This paper uses data from a cross sectional study implemented in the three tribal districts of Telangana (Figure 1) Data was collected during May 2017 to September 2017. Similarly, among the 1463 adolescent girls, majority of them belonged to Scheduled tribe (47%) (Figure 2) followed by Backward Class (BC) and Other Backward Class (OBC) (33%), Scheduled Caste (SC) (15%) and Forward Caste and Other Caste (FC and OC) (5%). Across the selected locations, majority of the adolescent girls were from Kasipet mandal (41%) followed by Utnoor (30%) and Tiryani mandal (29%) of Komaram Bheem Asifabad, Adilabad and Mancherial (Figure 3) districts of Telangana state, India. The tribal adolescent girls included in the study were spread across 38 villages and across 171 Anganwadi Centres. The authors disqualified those participants who were residing in residential schools because they were not eligible as anthropometric measurements and dietary diversity data cannot be collected from them.

Figure 1: Location of the study areas

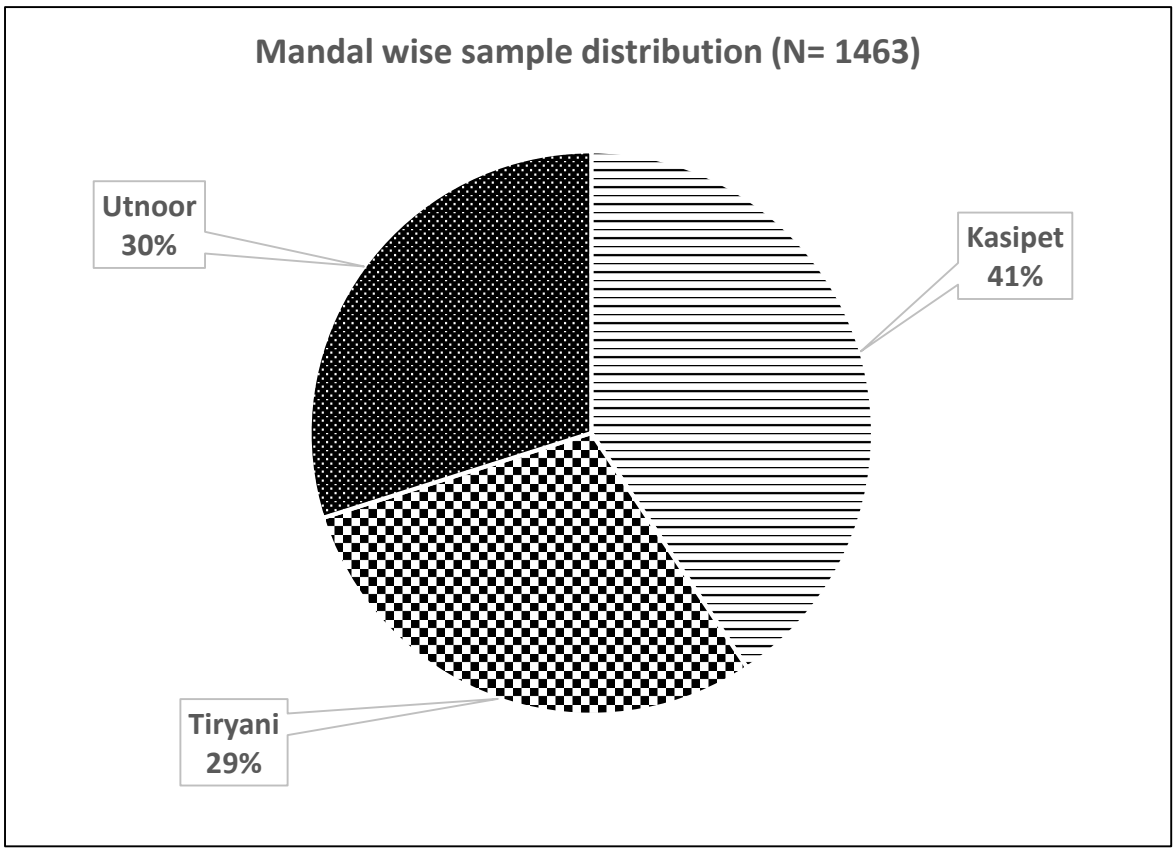

Source: Maps of India

Figure 2: Caste wise sample distribution (n=1463)




Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

Figure 3: Mandal wise sample distribution of adolescent girls




Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

**3. Data base and analytical tools:**

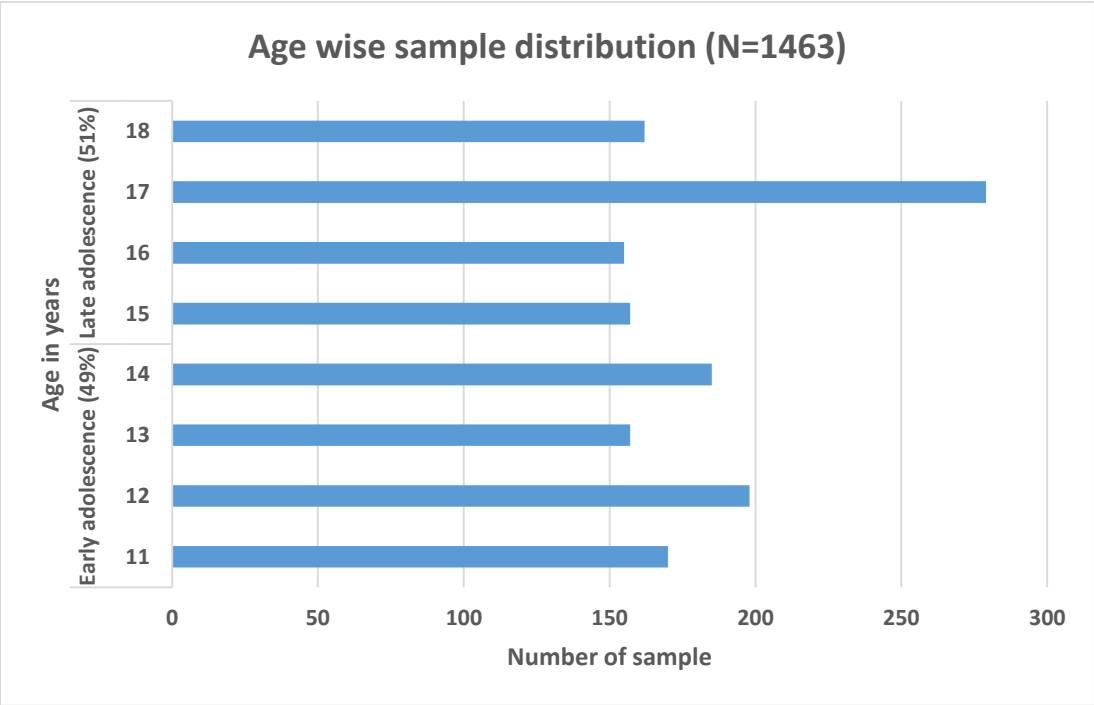
*3.1. Sample design and data collection*

A purposive sampling was adopted for selecting participants. The selected households were approached during field visits and the protocol of the study was explained verbally in the local language (Telugu, Gond). Informed consent was obtained from the parents. The sample includes around 49% of early adolescence (11-14 years) and 51% of late adolescence (15-18 years) girls (Figure 4).

Data was gathered using a 15-page household questionnaire that was developed in consultation with stakeholders both within ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) and with the representatives from Telangana Government, National Tribal Health Mission (NTHM). The approved baseline survey protocols were converted into a tablet compatible questionnaire using CS Pro software, Version 7.0.2. All the questions, instruments and informed consent were translated into local language i.e., Telugu. Drop down menus were created in English as well as local language so that response would be recorded in English only. Lenovo tablets of 7” dimensions were used for the collecting the data. Two coordinators from

ICRISAT were continuously monitoring and validating the data collected by the trained enumerators and were in the field along with the enumerators. The data is synchronized on a village basis and sent to ICRISAT HQ via internet regularly. Other staff from ICRISAT visited the data collection sites for validation, clarification of doubts and other logistical issues (ICRISAT, 2018). The details on family members, educational status, type of house, income-both farm and non-farm, cropping pattern, livestock enumeration of the household were collected using a tablet. Assessment of age is most essential for conducting growth studies. The accurate age of the participants was recorded from their birth certificate. Height and weight of the participants were measured by following standard technique and appropriate landmarks. Height was measured to the nearest of 0.1 cm using an anthropometric rod (SECA) and weight to the nearest of 0.1 kg using a portable weighing balance (SECA). From measuring the height and weight of the participants, the body mass index (BMI) was computed. WHO classification was used for the assessment of malnutrition. Stunting was defined as the height-for-age z-score less than 2 standard deviations below the median of reference population (WHO, 1983, 1995). Thinness was defined as BMI below the 5th percentile for age and overweight-obese was defined as BMI above the 85th percentile for age using the NHANES I reference population (WHO, 1983, 1995). Different anthropometric measures were described by their means and standard deviation.

Figure 4: Age-group wise sample distribution of adolescent girls




Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

*3.2. Econometrics analysis:*

Multivariate logistic regression has been used to assess the determinants of stunting and underweight of the respondent adolescent girls. Two separate models were run for two different indicators of malnutrition i.e. stunted Vs non-stunted and Underweight Vs normal BMI considered as dependent variables. While, covariates like adolescent age group, family size, age and education of head, gender of household head, per-capita monthly income, availability of toilet, and education level of adolescents was considered as explanatory variables and the models have been tested to find out the roles of these variables. Detailed description of coefficients has been provided in the subsequent section.

## 4. Results

*4.1. Socio-demographic status:*

The details of socio-demographic status of the participants are presented in Table 1. Approximately 69% of the adolescents belonged household which had both an adult male member and a female member as decision makers of the household; as type followed by male adult only (23%) and female adult only (8%). More than 88% of the adolescents belonged to the male headed households with only 12% of households being female headed households. Approximately 64% of the household heads were illiterate or just able to put in their signatures, 32% were having secondary education and above and remaining have education only upto primary level (upto class 5). The mean per capita income per month was about INR 1363 (approximately 20 USD). It was interesting to note that, for approximately 43% of the households, per capita income was less than INR 1000 (approximately 15 USD), and approximately 11% of the households had a monthly per capita income of more than INR 2000 (approximately 30 USD) per month. This indicates a variation in the socio-economic status of the households. Housing conditions were of poor standard. The mean family size of each household was 4.38 persons, and, in general, 37% of the families were large (equal or more than 5 members). About one third (67%) of the households did not have a toilet, open defecation is widespread in the area surrounding the houses or the nearby farms. Almost all the houses had no piped water supply, and families used untreated water collected from tube wells/open dug wells.

Table 1: Socio-demographic characteristics of the respondent adolescents (n=1463)

| **Particulars** | **Values** |
|---|---|
| Household Type (%) | |
| Male and female adult | 68.70 |

| | |
|---|---|
| Female adult only | 8.40 |
| Male adult only | 22.90 |
| Gender and age of Households head (%) | |
| Male headed | 88.17 |
| Female headed | 11.83 |
| *Average age of household head (years)* | *42* |
| Education of household head (%) | |
| Illiterate or just able to sign | 53.64 |
| Upto Primary level | 13.94 |
| Secondary or above | 32.42 |
| Household Income | |
| *Average monthly per-capita income (₹)* | *1363* |
| Income ≤ ₹ 1000 (% of respondent) | 46.57 |
| Income ₹ 1001-2000 (% of respondent) | 42.93 |
| Income > ₹ 2000 (% of respondent) | 10.50 |
| Family size | |
| *Average family size (No.)* | *4.38* |
| Family size ≤ 4 (% of respondent) | 62.61 |
| Family size 5-6 (% of respondent) | 30.95 |
| Family size > 6 (% of respondent) | 6.44 |
| Sanitation availability (%) | |
| Toilet (Present) | 32.91 |
| Toilet (Absent) | 67.09 |

Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

*4.2. Nutritional Status in terms of anthropometric indicators:*

The age-specific mean values of height, weight and BMI of the adolescents girls was plotted in relation to the WHO standard recommendations and are presented in Table 2. It was observed that the mean weight and height and BMI significantly ($P < .001$) increased with the advancement of age. Also it can be seen that girls in the late adolescence years had plausible better nutritional status (as the average BMI 18.54) compared to girls in the early adolescent years (average BMI 16.38). One likely explanation for this could be the benefits from the implementation of Kishori Balika yojana through which adolescent girls received additional dry take home rations.

The age specific nutritional status of the adolescents is presented in Table 3. The overall prevalence of underweight among the adolescents were 82% and 54%, respectively, when both stages of adolescence were considered together. The prevalence of overall overweight-obesity was very low (about 2%). The percentage prevalence of underweight was higher in early

adolescent girls than the late adolescents and the same possible due to socio-cultural-economic and environmental factors which influence food intake and health seeking behaviors (Kumar et al, 2004).

Table 2: Mean height, weight and BMI of adolescent girls, Utnoor, Tiryani and Kasipet mandals, Telangana.

| Indicator | Early Adolescent (11 to 14 years) | Late Adolescent (15 to 18 years) | Overall |
|---|---|---|---|
| **Height (cm)** | 142.35 (7.99) | 151.36* (4.80) | 146.99 (7.76) |
| **Weight (kg)** | 33.57 (6.58) | 42.48* (5.23) | 38.16 (7.06) |
| **BMI ($Kg/M^2$)** | 16.38 (2.27) | 18.54* (3.81) | 17.49 (2.35) |

Note: i) Values in the parenthesis represent standard deviation (SD)
ii) * indicate the values of late adolescent groups are significantly different from early adolescent group of respondent
Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

Table 3: Nutritional status of adolescent girls in terms of BMI (%), selected locations, Telangana

| BMI Status | Early Adolescent (11 to 14 years) | Late Adolescent (15 to 18 years) | Overall |
|---|---|---|---|
| **Under weight** | 81.97 | 54.32 | 67.74 |
| **Normal** | 17.46 | 42.90 | 30.55 |
| **Over weight** | 0.56 | 2.79 | 1.71 |

Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

A further analysis was undertaken by dividing adolescents into outcome categories - stunting, thinness, only thinness, only stunting and normal/stable category according to the WHO recommended BMI cutoff value for adolescents, as mentioned above. The prevalence of stunting and thinness among the two category of adolescent girls including overall situation is shown in Table 4. The results indicate that approximately 8% of the adolescents were affected by both stunting and thinness and that approximately 24% is belongs to only stunted category. The finding also revealed that the prevalence of affected by either by stunting, thinness or by both are in equal level for both early as well as late adolescent sample girls (about 45%). These findings are very much in line with the findings in the literature and corroborate with results from other studies: a. according to the WHO Report on the Nutritional Status of Adolescents, the prevalence of stunting among girls is 45%, and that among boys is 20% (WHO, 1998); b. A study of tribal and tribal region adolescents indicates that food and nutrient intakes were low compared to Recommended Dietary Allowance (RDA), as well as that of their rural counterparts. The extent of deficit was relatively more with respect to micronutrients such as iron, vitamin A, riboflavin and free folic acid (Rao et al, 2006); c. the prevalence of

undernutrition was also relatively more among tribal adolescents compared to their rural counterparts from other social groups (Rao et al, 2006); d. the higher prevalence of under nutrition among girls is another well-known and accepted fact in almost every Indian community (Medhi et al, 2007; Malhotra and Passi, 2007).

Table 4: Nutritional status in terms of Z-score of BMI-for-age and height-for-age of respondent adolescent (in percentage)

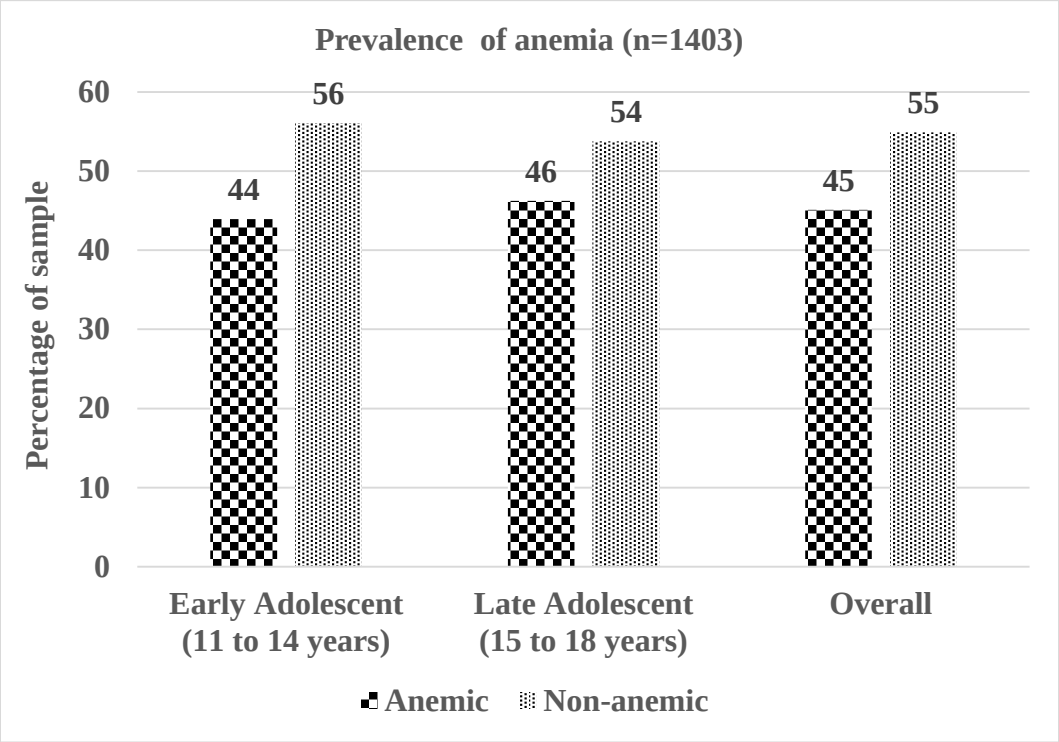
| Particulars | Early Adolescent (11 to 14 years) | Late Adolescent (15 to 18 years) | Overall |
|---|---|---|---|
| **Stunting + Thinness** | **12.25** | **4.78** | **8.41** |
| **Only Stunting** | **20.14** | **26.96** | **23.65** |
| **Only Thinness** | **12.96** | **13.81** | **13.40** |
| **Normal/stable** | **54.65** | **54.45** | **54.55** |

Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

*4.3. Prevalence of anemia in respect to Hemoglobin (Hb) Levels:*

Blood is a specialized body fluid in animals that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products such as carbon dioxide away from those same cells (Franklin Institute Inc., 2009). When the diet does not contain sufficient amounts of iron, anemia develops. It is a long run process and takes several months to show up a normal person has about 14-15g of hemoglobin. In general any person whose hemoglobin level is below 12mg / 100mL blood is considered anemic and slightly varies between different groups (like pregnant women, children etc.) people. Most of the iron in the body is located in the hemoglobin of circulating red blood cells. Whereas in many normal menstruating women, almost all of the iron is in red blood cells because of their limited iron stores (Nair, 1990). From the analysis of the collected data (figure 5), approximately 4% (60 members) of the selected sample members could not get the readings of the hemoglobin levels using the pulse co-oxy meter. Among the recorded sample, it was found that about 45 percent were hemoglobin deficient and severely affected by anemia due to low levels of hemoglobin in overall level. Also the prevalence of anemia between both early and late adolescent girls shows no significant difference in the study region.

Figure 5: Prevalence of anemia among adolescent girls in the study locations (in %)




Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

*4.4. Determinants of malnutrition – a logistic regression analysis:*

As stated in this paper and by others in the literature, malnutrition such as undernutrition is a common problem among adolescent girls especially in the tribal dominated regions. The assessment of determinants for malnutrition in the study population have been estimated using two separate models and indicated as model-1; stunted vs non-stunted (based on Z score) and model-2; underweight vs normal BMI (based on BMI score) and logistic regression model have been applied (table 5). In the model-1 the regression output indicated that higher experience and education of household head, higher income of the household, access to toilet and education of the adolescents have a significant role to reduce the stunting. Whereas in case of underweight to normal BMI (model-2) it is found that late adolescent girls were less underweight compare with that of early adolescent girls. Also adolescent girls with higher income households and higher education of household head are less likely to be under weight. Finally adolescent girls belongs to households with headed by female members also less likely to be underweight. Some earlier studies also found that significant association between undernutrition and socio-economic parameters like type of family, size of land holding and occupation of head of household was observed (Rao et al, 2006).

Table 5: Determinants of stunting and underweight of adolescent girls: a logistic regression analysis

| Variable | Model-1 (Stunted vs non-stunted) | Model-2 (Underweight Vs Normal BMI) |
|---|---|---|
| Adolescent dummy (Early adolescent=0, Late adolescent=1) | 0.034 | -1.282[S] |
| Household type (1 = Male and female adult ; 2 = Female adult only; 3=Male adult only) | 0.023 | 0.022 |
| Household size | 0.011 | 0.055 |
| Head gender dummy (Male=1, Female=0) | 0.239 | 0.390[S] |
| Age of household head (years) | -0.008 | -0.004 |
| Education of head code (Illiterate or just able to sign=1, Upto primary=2, Secondary & above=3) | -0.159[S] | -0.171[S] |
| Monthly per-capita income (in "1000/-" Rs.) | -0.089[S] | -0.061[S] |
| Toilet dummy (Available=1, Otherwise=0) | -0.319[S] | -0.117 |
| Education of adolescent code (Illiterate or just able to sign=1, Upto primary=2, Secondary & above=3) | -0.222[S] | -0.054 |
| Constant | 0.370 | 1.658 |

Note: "S" indicating the variables are statistically significant

Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

## 5. Conclusion

1. The adolescent girls lack basic awareness about food, nutrition, health and overall wellbeing.
2. Tribal populations who are socially, economically and educationally weaker, are particularly malnourished, because of their geographical isolation, uncertainty of food supply, lack of adequate healthcare facilities and existence of irrational belief systems and taboos.
3. There is a need to promote nutrition literacy and behavior change campaigns targeted for women, young children and adolescents in the rural and tribal regions. A coordinated goal oriented approach has to be adopted including stakeholders from different sectors to bring about nutrition literacy and enhance the nutritional status of women, children and the communities as a whole.
4. Adolescent girls and boys should be given special emphasis and receive targeted interventions including new knowledge.

## 6. Study Limitations

The current study has certain limitations. Different factors affecting adolescent nutritional status were studied; however, some potential confounders, such as the physical activity of the

study participants, diarrhea episode, prevalence of various parasitic infestation, and type of food consumed were not studied. Another limitation is lack of gender perspective as the study participants includes girls only. There are limitations associated with using cross-sectional data, as in every cross sectional study, conclusions related to cause and effect cannot be drawn. A longitudinal dataset would be better suited to examine the influence of socio demographic factors on nutritional status of adolescent. However, as far as we are aware, this is the only tribal based regional study to define the relationship between socio demographic factors and nutritional status of adolescent girls. This study was conducted among 11- to 18-year-old tribal adolescent girls. Additional in-depth research is recommended especially for the adolescent age group. Also finally the project collected data only from adolescent girls, hence a comparison with boys in the age group is not possible.

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