Prevalence of Malnutrition in Adolescent Girls: A Cross-Sectional Study in the Tribal Regions of Telangana

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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 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 malnutrition among 11 to 18 years old adolescent tribal girls from the districts of Adilabad, Komaram-Bheem Asifabad and Mancherial in Telangana state.

The cross sectional survey collected data in the year 2017 on socio-economic, demographic, diet and anthropometric indicators from 695 tribal adolescent girls out of 2542 tribal households. The analysis of the anthropometric data reveals that about 67 percent of adolescent girls 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. Overweight or obesity is not of particular concern in the studied tribal adolescent girls. These adolescents also lack basic awareness about food, nutrition, health and overall wellbeing. The paper ultimately determines the need for a concerted combination of policies and programs specifically aimed at adolescents in the tribal regions addressing poverty, education, nutrition literacy, empowerment to challenge the existing cultural norms related to food consumption and access to diverse diets both in terms of quantity and quality.

Key words: Adolescence, tribal, malnutrition, socio-demographic factors, logistic regression

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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.
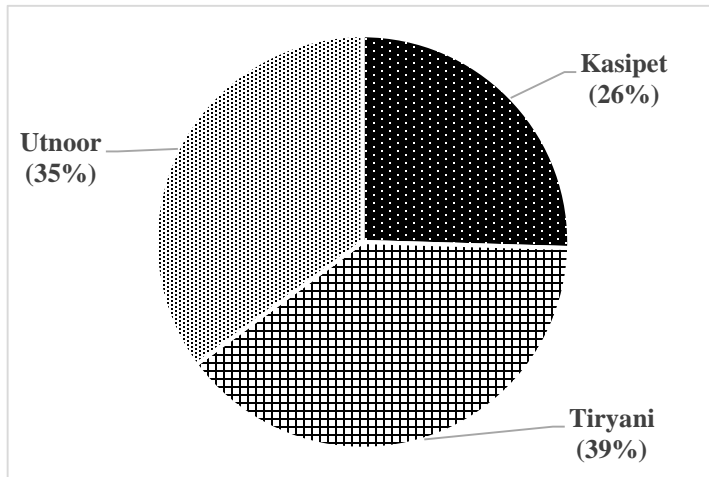
Nutritional status of the community can be easily observed through the nutritional status of adolescent girls of that community, who will be the future mother (Venkaiah 2002). In India, many adolescents are getting married before completion of their growth and maturity and this proportion is very high (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 etal, 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.

Subjects and methods

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. The dominance of Gond tribes is observed across the erstwhile Adilabad district (Figure 2a). Similarly, among the 2542 households surveyed, majority of them belonged to Gond tribe (55%) (Figure 2b) followed by Sugali/Lambada (14%), Naikpod (13%), Kolam (10%) and other tribes (8%). Out of 2542 tribal households, 693 households were with at least one adolescent girl. In total, a sample of 695 tribal adolescent girls was selected for the present study. Across the selected locations, majority of the adolescent girls were from Tiryani mandal (39%) followed by Utnoor (35%) and Kasipet mandal (26%) of Komaram Bheem Asifabad, Adilabad and Mancherial (Figure 3) districts of Telangana state, India.

Figure 1: Location of the study areas

Source: Maps of India

Figure 2a: Sub-caste wise composition of tribals in Adilabad district	Figure 2b: Sub-caste wise distribution of tribal households (n=2542)
Source: Census of India, 2011	Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

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.

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Figure 3: Mandal wise sample distribution of tribal adolescent girls (n=695)

Sample design

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 48% of early adolescence (11-14 years) and 52% of late adolescence (15-18years) tribal girls (Figure 4).

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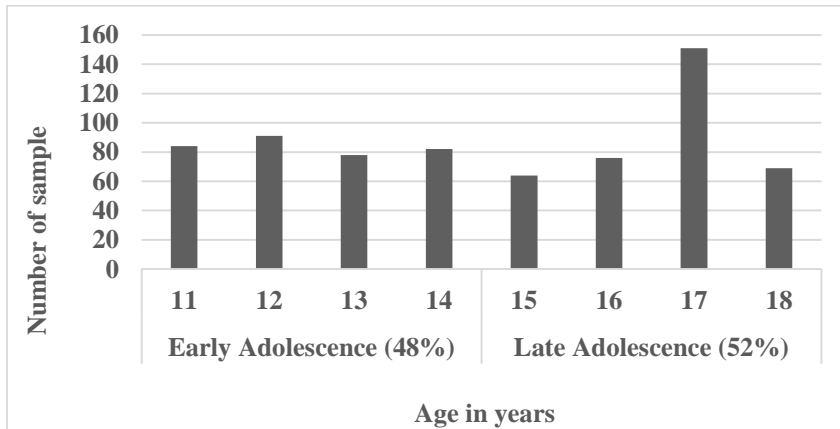
Data collection

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.

Econometrics analysis:

Multivariate logistic regression have been used to assess the determinants of stunting and underweight of the respondent tribal 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 have been provided in the subsequent section.

Results

The details of socio-demographic status of the participants are presented in Table 1. Approximately 65% 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 (25%) and female adult only (10%). More than 86% of the adolescents belonged to the male headed households with only 14% of households being female headed households.

Table 1: Socio-demographic characteristics of the respondent adolescents (n=695)

Particulars	Values
Household Type (%)	
Male and female adult	65.47
Female adult only	9.93
Male adult only	24.60
Gender of Households head (%)	
Male headed	86.47
Female headed	13.53
Average age of household head (years)	*43.00*
Education of household head (%)	
Illiterate or just able to sign	62.30
Upto Primary level	13.53
Secondary or above	24.17
Household Income	
Average monthly per-capita income (₹)	*1338*
Income ≤ ₹ 1000 (% of respondent)	53.38
Income ₹ 1001-2000 (% of respondent)	35.83
Income > ₹ 2000 (% of respondent)	10.79
Family size	
Average family size (No.)	*4.68*
Family size ≤ 4 (% of respondent)	50.50
Family size 5-6 (% of respondent)	38.56
Family size > 6 (% of respondent)	10.94
Sanitation availability (%)	
Toilet (Present)	18.85
Toilet (Absent)	81.15

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

Approximately 62% of the household heads were illiterate or just able to put in their signatures, 24% were having secondary education and above. The mean per capita income per month was about INR 1338 (approximately 20 USD). It was interesting to note that, for approximately 53% 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 4.68 persons, and, in general, 50% of the families were large (more than 5 members).

Almost all the houses had no piped water supply, and families used untreated water collected from tube wells/open dug wells. A large proportion of the houses (81%) did not have a toilet, open defecation is widespread in the area surrounding the houses or the nearby farms.

The age-specific mean values of height, weight and BMI of the adolescents was plotted in relation to the WHO standard recommendations and are presented in Table 2. It was observed that the mean weight and height significantly (P < .001) increased with the advancement of age. The mean BMI also significantly (P < .001) increased for both early and late adolescent girls. As can be seen from table 2, girls in the late adolescence years had normal BMI (greater than 18.5) compared to girls in the early adolescent years. One plausible 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 are presented in Table 3. The overall prevalence of underweight among the adolescents were 84% and 52%, respectively, when both stages of adolescence were considered together. The prevalence of overall overweight-obesity was very low (1%). The percentage prevalence of underweight was higher in early adolescent girls than the late adolescents. Socio-cultural-economic and environmental factors 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 (put the years)	Late Adolescent (put the years)	Overall
Height (cm)	141.89 (8.96)	150.45* (5.80)	146.32 (8.62)
Weight (kg)	33.05 (7.42)	42.10* (7.11)	37.74 (8.55)
BMI (Kg/M2)	16.22 (2.43)	18.54* (2.72)	17.42 (2.83)

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	Late Adolescent	Overall
Under weight	84.48	52.22	67.77
Normal	15.52	45.83	31.22
Over weight	0.00	1.94	1.01

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 among the three nutritional groups is shown in Table 4. The results indicate that approximately 23% of the adolescents were in the stunting and thinness category and that approximately 36% in the stunted category. 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 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	Late Adolescent	Overall
Stunting + Thinness	25.97	20.28	23.02
Only Stunting	28.06	44.17	36.40
Only Thinness	11.34	10.28	10.79
Normal BMI	34.63	25.28	29.78

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

Determinants of malnutrition – a statistical 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 community. In the present study the determinants of malnutrition have been measured using two different models- Stunted versus Non-Stunted (Model-1) and Underweight versus Normal BMI (Model-2) using logistic regression technique (Table-5). The regression coefficients revealed that early adolescent girls were less likely to be stunted when compared with late adolescent girls; early adolescent tribal girls had a higher probability of being underweight. 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 (because 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 to tackle the problem of stunting of adolescent girls in the tribal community. 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 tribal 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)	0.517[s]	-1.560[s]
Household size	0.008	0.065
Head gender dummy (Male=1, Female=0)	0.207	0.177
Age of household head (years)	-0.015	-0.008
Education of head code (Illiterate or just able to sign=1, Upto primary=2, Secondary & above=3)	-0.246[s]	-0.238[s]
Monthly per-capita income (in "1000/-" Rs.)	0.028	-0.072
Toilet dummy (Available=1, Otherwise=0)	-0.373[s]	-0.129
Education of adolescent code (Illiterate or just able to sign=1, Upto primary=2, Secondary & above=3)	-0.229[s]	-0.068
Constant	1.614[s]	2.269[s]

Note: "s" indicating the variables are statistically significant
Source: Baseline survey, Nutri-food Basket project, ICRISAT, 2017

Conclusion

Tribal populations are particularly malnourished, especially under nutrition is more prevalent because of their geographical isolation, uncertainty of food supply, lack of adequate healthcare facilities and existence of irrational belief systems and taboos. The present study confirmed the same that socially, economically and educationally weaker sections of this tribal region were more likely to be undernourished. In addition to the existing universal education program, 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. Adolescent girls and boys should be given special emphasis and received targeted interventions including new knowledge. The results of the present study will be useful for policy makers and programmers to formulate various developmental and health care programs as well as evolve comprehensive programmes for the overall development of tribal population with special focus on adolescents.

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.

References

Agarwal, K. N., Tripathi, A. M., Sen, S., & Katiyar, G. P. (1974). Physical growth at adolescence. Indian pediatrics, 12(2), 93-97.

Ahmed, E., Mofida, Y., Elkhalifa, H., & Elnasik, H. (2011). Nutritional status of the children under age of five in a desertified area of Sudan; alrawakeeb valley, Khartoum, Sudan. International Journal of Current Research, 2, 103-108.

Babu Kodali, P., Kopparty, S., Vallabhuni, R., & Kalapala, G. R. (2016). Mid-day Meal Programme and Adolescent Undernutrition-an Epidemiological Study in Hyderabad, India. Journal of Pharmacy Practice and Community Medicine, 2(1).

Conlisk, E. A., Haas, J. D., Martinez, E. J., Flores, R., Rivera, J. D., & Martorell, R. (1992). Predicting body composition from anthropometry and bioimpedance in marginally undernourished adolescents and young adults. The American journal of clinical nutrition, 55(6), 1051-1060.

Degarege, D., Degarege, A., & Animut, A. (2015). Undernutrition and associated risk factors among school age children in Addis Ababa, Ethiopia. BMC Public health, 15(1), 375.

Desai, I. P. (1978). Tribal Problem in India: A Perspective. Surat: Centre for Social Studies, Mimeo.

Herrador, Z., Sordo, L., Gadisa, E., Moreno, J., Nieto, J., Benito, A., & Custodio, E. (2014). Cross-sectional study of malnutrition and associated factors among school aged children in rural and urban settings of Fogera and Libo Kemkem districts, Ethiopia. PLoS One, 9(9), e105880.

ICRISAT. (2018). Improving dietary diversity through introduction of Nutri-Food Basket in tribal households of Adilabad, Mancherial, Komaram Bheem-Asifabad Districts of Telangana - Transitioning tribal households from nutrient deficient diets to diverse nutritional foods. Baseline Report, Nutri-Food Basket Study in Adilabad, Telangana

Khan, M. R., & Ahmed, F. (2005). Physical status, nutrient intake and dietary pattern of adolescent female factory workers in urban Bangladesh. Asia Pacific journal of clinical nutrition, 14(1), 19.

Kumar, V., Basu, D., & Reddy, B. M. (2004). Genetic heterogeneity in northeastern India: reflection of tribe–caste continuum in the genetic structure. American Journal of Human Biology, 16(3), 334-345.

Malhotra, A., & Passi, S. J. (2007). Diet quality and nutritional status of rural adolescent girl beneficiaries of ICDS in north India. Asia Pacific Journal of Clinical Nutrition, 16(S1), 8-16.

Medhi, G. K., Hazarika, N. C., & Mahanta, J. (2007). Nutritional status of adolescents among tea garden workers. The Indian Journal of Pediatrics, 74(4), 343-347.

Melaku, Y. A., Zello, G. A., Gill, T. K., Adams, R. J., & Shi, Z. (2015). Prevalence and factors associated with stunting and thinness among adolescent students in Northern Ethiopia: a comparison to World Health Organization standards. Archives of Public Health, 73(1), 44.

Ministry of Tribal Affairs.2017. Annual Report, 2016-17. https://tribal.nic.in/writereaddata/AnnualReport/AnnualReport2016-17.pdf Jan 31, 2017.

Rao, K. M., Balakrishna, N., Laxmaiah, A., Venkaiah, K., & Brahmam, G. N. V. (2006). Diet and nutritional status of adolescent tribal population in nine states of India. Asia Pacific journal of clinical nutrition, 15(1), 64.

Rao, K. M., Kumar, R. H., Krishna, K. S., Bhaskar, V., & Laxmaiah, A. (2015). Diet & nutrition profile of Chenchu population-a vulnerable tribe in Telangana & Andhra Pradesh, India. The Indian journal of medical research, 141(5), 688.

Rotimi, C., Okosun, I., Johnson, L., Owoaje, E., Lawoyin, T., Asuzu, M., & Cooper, R. (1999). The distribution and mortality impact of chronic energy deficiency among adult Nigerian men and women. European journal of clinical nutrition, 53(9), 734.

Spurr, G. B., Maksud, M. G., & Barac-Nieto, M. (1977). Energy expenditure, productivity, and physical work capacity of sugarcane loaders. The American journal of clinical nutrition, 30(10), 1740-1746.

Sridhar, D., & Gauthami, N. (2017). Menstrual health status and cultural practices of tribal adolescent girls. International Journal of Community Medicine And Public Health, 4(11), 4120-4124.

Venkaiah, K., Damayanti, K., Nayak, M. U., & Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. European journal of clinical nutrition, 56(11), 1119.

WHO Expert Committee on Physical Status. Physical status: the use and interpretation of anthropometry, report of a WHO expert committee. Geneva: World Health Organization; 1995 WHO Technical Report Series, No. 85

WHO. Measuring change in nutritional status. Geneva: World Health Organization; 1983.

World Health Organization. (2010). Nutrition Landscape Information System (NLIS) country profile indicators: interpretation guide.