



NUTRITIONAL STATUS, DIETARY DIVERSITY AND THEIR ASSOCIATION AMONG ADOLESCENT GIRLS IN TEA GARDEN COMMUNITIES OF DIBRUGARH AND TINSUKIA DISTRICTS, ASSAM

Dr. Surabi Dutta¹, Dr. Ankita Kotoky², Reshmin Ara Begum³

¹Associate Professor, Department of Economics, Women's college Tinsukia, Assam.

²Guest faculty, Department of Economics, Birangana Sati Sadhani Rajyik Viswavidyalaya, Golaghat Assam

³Research Scholar, Department of Economics, Dibrugarh University, Dibrugarh, Assam

Article DOI: <https://doi.org/10.36713/epra31298>

DOI No: 10.36713/epra31298

ABSTRACT

Adolescent health is a crucial factor responsible for overall development of an economy and a nation as a whole. The study is set in the context of studying the health status of adolescent girls belonging to age group 10-19 covering both early and late adolescence. The core objective of the study was to know the nutritional status, household dietary diversity score (HDDS) and association between HDDS and nutritional status of adolescent girls in Tea Garden areas of Dibrugarh and Tinsukia district. Using purposive sampling Tea gardens of Dibrugarh and Tinsukia districts were selected. A field survey using a well-prepared questionnaire was conducted. A sample of four-fifty (450) was finally collected. The nutritional status of the Adolescent girls was calculated using anthropometric measure Body Mass Index for height and weight. A chi square for significant association was used to test for significant association between BMI and HDDS. The results of the study show that despite having households access to food majority of the school going adolescent girls was found to be underweight with BMI less than the normal range. The mean value of the Household Dietary Diversity score (HDDS) in the present study was 5.35 indicating inadequate dietary diversity. The chi-square findings indicate that no significant relationship between BMI and HDDS. The findings of the study can provide meaningful insights to policy makers and researchers for future research and initiatives relating to health and nutrition of adolescent girls and also as a whole.

KEYWORDS: Nutrition, Health, Adolescents, BMI, food.

INTRODUCTION

A healthy mind and body are said to be a prerequisite for development of a nation. A nation without a healthy population may not be capable enough to attain overall growth and development. Nutrition, well being and development can be said to be closely linked with each other. An individual through out his life process passes through various phases of physical development. It is therefore necessary to have an idea of the nutritional status of people. Adolescent period is said to be a crucial stage of development where an individual undergoes physical, emotional and mental development.

Adolescent period is divided into two stages namely early (10-14 years) and late adolescents (14-19 years). Nutritional status is a measure to know the nutritional health of individuals. The core objective of the study is to measure the nutritional status of adolescent's girls in the tea garden areas of Dibrugarh and Tinsukia district of Upper Assam. The main basis for selecting the districts is because of the concentration of maximum number of tea gardens in both the districts. The tea gardens in Assam are said to suffer from nutritional disorders according to report published by Indian Council of Medical Research (ICMR). Therefore, to have an idea of the nutritional status of adolescent's girls in tea gardens of Dibrugarh and Tinsukia the study was initiated. Apart from knowing the nutritional status the study also attempted to know the Household Dietary Diversity Score (HDDS) and to know if

there is any significant association between nutritional status measured by Body Mass Index (BMI) and Household Dietary Diversity Score (HDDS)

Methodology of the study

The study is basically based on primary sources of data. The data was collected using a well-structured interview schedule from four hundred fifty (450) adolescent girls. The study also opted for some secondary sources of data like government reports, published books and so on.

BMI of Adolescent Girls

The nutritional transition that is occurring in developing country context is resulting in the double burden of nutrition i.e. overweight on one side and underweight on the other. To break this chain proper assessment of nutritional status is the solution. For measuring nutritional status of individuals and population as whole anthropometric measures are widely used. Different anthropometric measures have different degrees of usefulness for measuring nutritional status. Anthropometric measures alone or a combination of different anthropometric measures are used together to measure nutritional status according to literature. For our study we have used Body mass Index commonly BMI as a measure for assessing the nutritional status of adolescent girls. BMI is a reliable and authentic source of knowing the nutritional status of individuals. It is obtained by



dividing an individual's weight in Kilograms by the square of the individual's height in meters.

Height

WHO, 1983 suggests height as important indicator for measuring growth in children. Height is a summation of four parts namely legs, pelvis, skull and spine. For measuring nutritional anthropometry total height is needed. Height was measure with the help of an anthropometric rod.

Weight

Body weight is also a measure of nutritional status. Body volume and body mass of an individual can be known by body weight. Lower body weight and over body weight are indicators of undernutrition and malnutrition. Malnutrition is best indicated by weight deficiency (Jelliffe, 1996).

BMI calculation and formula

The formula for calculating BMI is given as

$$\text{BMI} = \text{Weight (kg)} / \text{Height(m}^2\text{)}$$

Using the above formula the BMI for height and weight of individuals can be easily calculated. BMI scores obtained after calculation can be used to identify whether a person is overweight, underweight or normal. The BMI scores mentioned below can be used as a benchmark to know the nutritional status of individuals.

Table 1: BMI Scores

BMI	Status
Less than 18.5	Underweight
18.5 to 24.5	Normal
24.5 to 29.5	Overweight
29.5 to 34.5	Obese

Source: World Health Organization (WHO) recommendations.

The present using the standard methodology calculated the height weight BMI for adolescent girls in the study area. The BMI of the Adolescent girls in the study area are shown in the table below.

Table 2: BMI of Adolescent girls

BMI	Frequency	Percentage
Underweight	285	63.3
Normal	161	35.9
Overweight	4	0.9

Source: Author's calculation.

Table 2 shows the BMI of the Adolescent girls in Dibrugarh and Tinsukia district. The table shows that the majority of the surveyed adolescent girls were underweight. The underweight BMI status was the lion's share. Very few among the surveyed girls were found to be overweight. Out of the total surveyed respondents, about 161 (35.9) adolescents had normal BMI. The poor nutritional status can be associated with many factors where distance, education, awareness among families and parents of having good and balanced diet may affect the nutritional status. Moreover, tea gardens are located far from the main area which can lead to negligence. The frequency of underweight compared to normal was more.

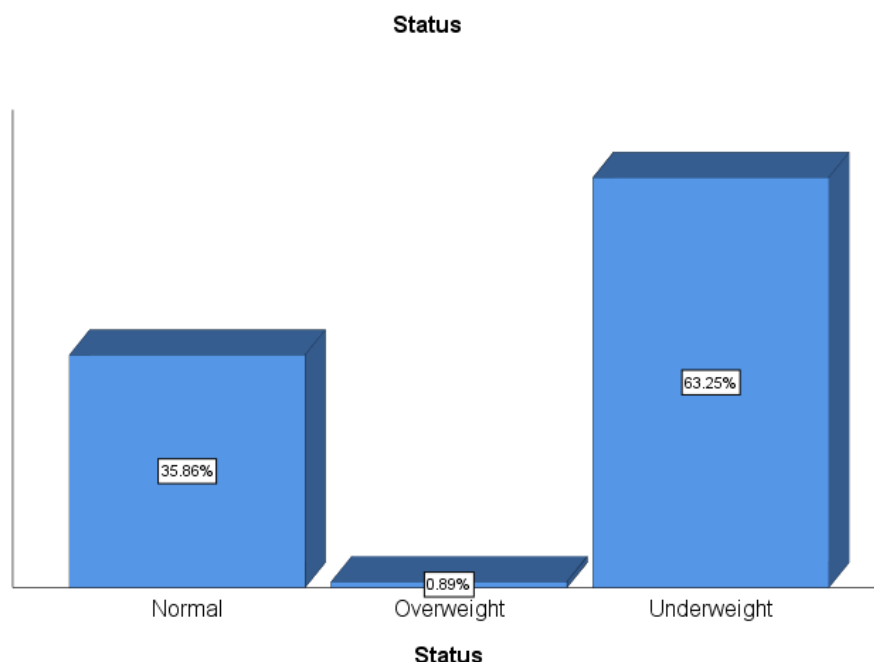


Figure 1: BMI status of Adolescent girls

Figure 1 represents the nutritional status of adolescent girls in tea gardens of Dibrugarh and Tinsukia. The figure clearly depicts the major share of underweight about 63.25 percent.

An attempt was also made to separately calculate the BMI of adolescent girls in both the districts.



Table 3: BMI for adolescents in Tinsukia.

BMI	Frequency	Percentage
Underweight	126	56.8
Normal	93	41.9
Overweight	3	1.4

Source: Author's calculation

Table 4: BMI for adolescents in Dibrugarh

BMI	Frequency	Percentage
Underweight	158	69.3
Normal	68	29.8
Overweight	2	0.9

Source: Author's calculation

The number of underweight adolescent girls in tea gardens is more in Dibrugarh as compared to Tinsukia when calculated separately.

Dietary Diversity

Dietary Diversity is an indicator which shows household's access to food and nutrients. According to FAO, 2011 Dietary Diversity is a qualitative indicator representing food consumption and households (HH's) food accessibility and also is a representation of nutrient adequacy in individual's diet. Dietary Diversity (DD) can also be defined as the number of different food groups consumed by an individual over a particular reference period (FAO and FHI 360, 2016). Dietary

assessment can be helpful to ensure whether food consumption is balanced enough in terms of both quantity and quality for overall growth and development.

DDS is a quantitative measure of dietary variety. DDS is a score that is assigned to a household or individual in relation to access to particular food. In simple ways, it is a measure of household food security. DDS involves collecting data relating to food intake of individuals through structured schedules. The information gathered through schedules is then analysed to obtain DDS.

A diet is said to be balanced if it is a whole of all necessary vitamins, minerals, carbohydrates and fats. (Drewnowski et al., 2019) defined healthy eating as nutrient-dense food across and within all food groups: nuts, vegetables, fruits, protein, fats and oil. The present study uses food items divided systematically into twelve (12) food groups to measure the Household Dietary Diversity Score (HDDS). Food groups are categorised into twelve (12) according to suggestions by WHO and FHI, 360. HDDS is measured by the number of food items consumed by a family within a particular time period.

Dietary Diversity was assessed by taking 24 hours recall. The twelve food groups are cereals, white roots and tubers, vegetables, fruits, fish, meat, legumes nuts and seeds, milk and milk products, oils and fat, sweets and spices respectively. For the present study some translation for particular foods were done for convenience and comfort.

Table 5: Twelve food groups of measurement of HDDS.

Questi on No.	Food Group	Examples	Yes=1 No=0
1.	CEREALS	Rice,roti,bread, noodles, sira, komolchawol,dalia,muri,pithaguri,handahguri,pasta,oats,suji	
2.	WHITE ROOTS AND TUBERS	Potato, yam (kath aloo), sweet potato (meetha aloo or rong a aloo), Taro root(kosu), or other food made from roots.	
3.	DARK GREEN LEAFY VEGETABLES	Paleng,lai,moricha,khutura,jilmil,dhekia, methixaak,maatikanduri,dhania, mosndori,narasingha,kosu xaak, kol mou or any other DGLVs.	
	OTHER VEGETABLES	phulkobi,oolkobi,beet,koldil,kaskol,posola,kothal,potol,bhol,jikaa,dhunduli,to roi,jatilao,komora,kerela,bhatkerela,kunduli,bhendi,tiyoh,mula,bilahee,kon bilahee,bengena,bhekuri,omita,sojina,outenga,thechera,betgaj,bahgaj,kathphula ,capsicum.	
4.	VITAMIN A RICH FRUITS	Aam, omitta,amora,ahom bogori,siral,kothal,tormuj and 100% fruit juice	
	OTHER FRUITS	Apple,kol,amllokhi,bel,bogi jamu,bogori,bokul,gool nemu,jolphai,kola jamuk,kordoi,leetku,noga tenga,nora bogori,nini,robab tenga,sokola tenga,xilikha,mati kathal,khejur	
5.	ORGAN MEATS	Liver,kidney,heart or any other organ meat.	
	FLESH MEATS	Beef,pork,goat,chicken,duck,pigeon or any other meat.	
6.	EGGS	Chicken,duck pigeon or any other egg.	
7.	FISH	Fresh or dried fish.	
8.	LEGUMES, NUTS AND SEEDS	Mosur mah,motor mah,dhoa mogu,mati mah,mogu mah,rohar dail,butmah,chana dal,motormah dail.rajma,lubia,fesh bean,dangbodi,lesera mah,urohi,badam(groundnut or peanut), soyabean,Almond(kath badam), kaju(cashew), pistachio,Akhroot(walnut), til(sesame), rongalau gooti,peanut buter or any other food made from legumes,nuts and seeds.	
9.	MILK AND MILK PRODUCTS	Milk,cheese,Curd(doi), Custard,paneer,kheer, ice cream (dairy basedor other milk products.	



10.	OILS AND FATS	Butter, ghee, mustard oil, coconut oil, badam tel(groundnut oil), olive oil, til tel (sesame oil), Soyabean oil, sunflower oil or any other oil, fats and butter added to food or used for cooking.	
11.	SWEETS	Sugar,honey,gur(molasses or jaggary), sweet biscuits or cookies,cakes,chocolates,jam, pastries,sweetened fruit juice and sugary drinks.	
12.	SPICES, CONDIMENTS, BEVERAGS	Adaa,nohoru,piyanj,jeera,kaal jeera, jaluk,jolokia,halodhi,dhoniya,dalseni,elasi,long, methiguti,boga xoriyoh,sofguti,tezput,fish powder,fish sauce,soya sauce,tomato ketchup,musterd seeds ketchup,Tea,coffee,bear,wine,rice bear (haj),aapong	
17.	Did you eat anything (meal or snack) outside the home yesterday?		

Source: Author's compilation following literature.

Table 5 shows the list of food items categorised in to twelve groups to calculate the Dietary Diversity Score for household. The above table for HDDS was prepared following proper guidelines from FAO. (FAO, 2013). HDDS was calculated by summing all the food groups consumed by the household within the last 24 hours (Smith et.al., 1987). The HDDS was calculated for 446 households where the 450 adolescent girls belonged to 446 households with four households contributing two eligible adolescent participants each. One consideration of the HDDS is that includes food consumed by any member in the household within 24 hours and exclude foods consumed and purchased outside home within the period. If any member consumes any food within the group a score of 1 is assigned and for not having 0 was assigned. Using this procedure a score which ranges from a minimum of 1 to a maximum of 12 is calculated. The score

range is 1-12 for HDDS. The 24 hours recall was used as a reference period as recommendations of FAO. The reference of 24 hours is suitable as it is less troublesome for individuals to recall and also the most commonly used (FAO,2013).

Household Dietary Diversity Score (HDDS)

To have an idea of household's access to food a Dietary Diversity Score (DDS) using a 24-hour recall method was collected. Among the various methods the DDS initiated by FANTA project for its superiority over calorie intake. DDS can be calculated at Household level, individual level and also specific to women. The present study adopted the Household Dietary Diversity Score 24-hour recall procedure. The HDDS was assessed and the results are presented below.

Table 6: Mean DDS of the households

HDDS	No. of Households	Minimum	Maximum	Mean	Standard deviation
	446	4	6	5.35	0.495

Source: Author's calculation.

Table 6 shows that the minimum value for the Household Dietary Diversity Score of households is 4 and the maximum value is 6. As per criteria, inclusion of more than seven food groups indicates adequate dietary diversity and inclusion of less than seven food groups indicate inadequate dietary diversity. The mean value for HDDS in the present study is 5.35 which highlights the fact that on an average the households of the adolescent's in tea gardens of Dibrugarh and Tinsukia consume

less than seven food groups out of 12 food groups in the last 24 hours which shows the inadequate dietary diversity. The inadequate dietary diversity may be due to the living conditions, illiteracy and hence lack of sufficient knowledge of maintaining healthy food habits, poverty and lower purchasing power, geographical proximity being far from mainland areas. This finding is consistent with similar studies on dietary assessment Surbhi et.al., 2021.

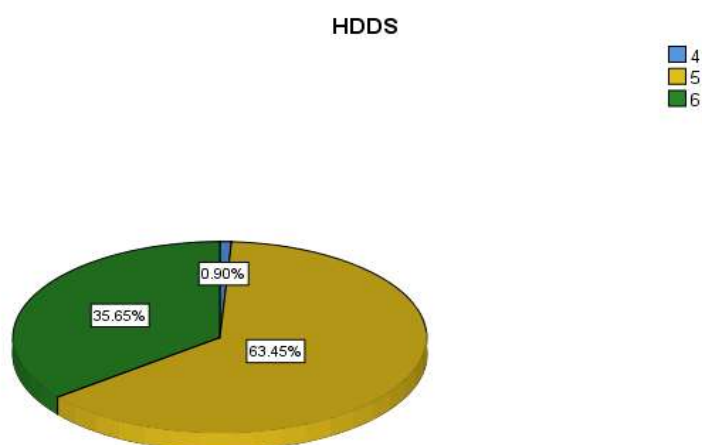


Figure 2: Percent distribution of the HDDS of the households.



Table 7: HDDS Scores of Households

	Frequency	Percentage
4 (low dietary diversity)	4	0.9
5 (medium dietary diversity)	283	63.5
6 (high dietary diversity)	159	35.7

Source: Author's calculation.

Table 7 shows the Household Dietary Diversity score of the households. The source for classification of dietary diversity was made according to (Khumalo et.al., 2019). The table shows that the dietary diversity of the adolescent's household was not satisfactory. About 283(63.5) percent households belong to the medium diversity level while only 159 (35.7) percent of the households belong to high dietary diversity. In the study, 4(0.9) percent of the households also belong to the low dietary diversity level.

Overall, the findings indicate that dietary diversity among the surveyed households was limited. The mean score of 5.35 suggests that households consumed, on average, food from approximately five to six of the twelve food groups during

the preceding 24 hours. Limited dietary diversity may be influenced by household income, food prices, purchasing power, food availability, seasonal variations, nutritional knowledge and geographical access to markets.

Chi-square association between Household Dietary Diversity Score (HDDS) and Body Mass Index (BMI) of adolescent's girls.

An attempt was made to determine whether household dietary diversity was significantly associated with the BMI-based nutritional status of adolescent girls. Pearson's chi-square test was used for this purpose.

Table 8: Pearson Chi-Square Test for Association between HDDS and BMI

Value	d.f	Asymp.Sig.(2 tailed)	
Pearson Chi-square	4	5.525	0.486
No. of valid cases	450		

Source: Author's calculation.

Table 8 shows the chi-square test results for association between Household Dietary Diversity Score and Body mass index. The table clearly paves us a way for rejecting the alternative hypothesis claiming significant association between household diversity and body mass index. There is no significant association between Household dietary diversity and body mass index in the study area and the null hypothesis is accepted.

Discussion

The findings of the study reveal a considerable burden of undernutrition among adolescent girls living in tea garden communities of Dibrugarh and Tinsukia. Nearly two-thirds of the surveyed girls were classified as underweight and the prevalence was particularly high in Dibrugarh.

The study also found limited household dietary diversity. Most households consumed food from five or six food groups during the 24-hour reference period, with a mean HDDS of 5.35. Although household dietary diversity alone cannot explain individual nutritional status, limited access to diverse foods may contribute to inadequate nutrient intake when combined with other socioeconomic and dietary factors.

The absence of a statistically significant association between HDDS and BMI suggests that adolescent nutritional status is influenced by factors beyond household dietary diversity alone. Individual dietary intake, meal frequency, infections, physical activity, socioeconomic status, maternal education, access to healthcare and other household and environmental factors may also play important roles.

Policy Implications and Conclusion

The findings have important implications for nutrition and public health interventions in tea - garden communities. Policies and programmes should focus on:

- improving access to affordable and diverse foods
- strengthening nutrition education among adolescents and their families
- promoting consumption of locally available nutrient-rich foods
- strengthening school-based nutrition and health programmes
- ensuring regular screening of adolescent girls for undernutrition and anemia
- improving access to primary healthcare and nutrition counselling in tea garden areas; and
- strengthening food-security interventions for economically vulnerable households.

A coordinated approach involving schools, health workers, tea garden management, community organizations and government agencies could contribute to improving the nutritional well-being of adolescent girls.

Acknowledgement: This work is a part of Minor Research Project(MRP) from Indian Council of Social Science Research (ICSSR), New Delhi. The authors would like to acknowledge ICSSR (New Delhi) for the support and funding in this academic endeavor.

REFERENCES

1. World Health Organization. Recognizing adolescents. Available from: <https://apps.who.int/adolescent/second-decade/section2/page1/recognizing-adolescence.html>.
2. UNICEF. Progress for children: a report card on adolescents. Socio-demographic profile of adolescents: UNICEF; 2012. _
3. Sunitha, S., & Gururaj, G. (2014). Health behaviours & problems among young people in India: Cause for concern & call for action. *Indian journal of medical research*, 140(2), 185-208.



4. International Institute for Population Sciences (IIPS) and ICF. 2021. National Family Health Survey (NFHS-5), 2019-21.
5. Wassie, M. M., Gete, A. A., Yesuf, M. E., Alene, G. D., Belay, A., & Moges, T. (2015). Predictors of nutritional status of Ethiopian adolescent girls: a community based cross sectional study. *BMC nutrition*, 1(1), 20 <https://doi.org/10.1186/s40795-015-0015-9>.
6. Singh, J. K., Acharya, D., Rani, D., Gautam, S., Thapa Bajgain, K., Bajgain, B. B., ... & Lee, K. (2021). Underweight and associated factors among teenage adolescent girls in resource-poor settings: A cross-sectional study. *Risk Management and Healthcare Policy*, 9-19.
7. Goyal, P. A., & Talwar, I. (2024). Nutritional status and anemia among Scheduled Caste adolescent girls of district Yamunanagar, Haryana, India. *Journal of Social Behavior and Community Health*, 8(2), 1394-1406.