

Growth and Nutritional status among adolescents of Dongria Kondh- A PVTG of Niyamgiri Hills of Odisha, India

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ABSTRACT

Poor nutritional status of individuals leads to stunting, wasting, underweight, various diseases, and poor performance in everyday life. A developing country like India is still lagging behind in achieving a healthy population. Adolescence is a very crucial phase and the growth of the reproductive stage among human being occurs during the adolescent period, this phase requires a good quality of balanced diet. So it is a matter of concern to provide better nutrition to the children to achieve the goal of a healthy nation. Here an attempt has been made to assess the nutritional status of children/ adolescents of a tribal group. Adolescent boys and girls aged 10-18 years among Dongria Kondh tribe (PVTG) of Niyamgiri hill, district Rayagada of Odisha were recruited for the present investigation. A cross-sectional study was conducted on a total of 900 respondents comprising 450 boys and 450 girls. A pre-tested interview schedule, anthropometric tools, and techniques were used for data collection. A significant difference between boys and girls has been observed in the case of age-wise means, the standard deviation of height, weight, and body mass index (BMI) of the participants. Z-score of height-for-age (HAZ), and weight-for-age (WAZ) were computed. It was found that girls were more stunted (76.7%) than boys (56.6 %). At the same time, the boys (37.8%) were more underweight (≤ -2 SD) than girls (24.9%). It was concluded that the nutritional status of the adolescents of this particularly vulnerable tribal group was quite alarming than many tribal counterparts of the country.

Key words: Stunting, Underweight, NCHS, Malnutrition, BMI, Height, Weight

INTRODUCTION

Nutrition plays a vital role in growth and development of an organism. Adolescence is a nutritionally susceptible phase when rapid physical growth demands nutrients in the body. Physical growth and maturation encompass the period of adolescence at the age of 10-19 among human beings (WHO, 1995). It is a transitional stage of physical development, the onset of Puberty occurs in this stage (Thakur and Gautam, 2017). This crucial phase is directly related to reproductive health and needs special attention towards proper management. About 80 percent of the 5 million chronically undernourished tribal children live in the Fifth Schedule area of the Indian union (UNICEF, 2021). Genetic structure, nutrition, economy, occupation, political scenario, socio-economic and geo-climatic milieu, etc. can influence stature and poverty leads to poor nutrition and ultimately results in stunting (Gautam *et al*, 2006). The indigenous tribal populations of India were mostly underweight (Adak *et al*, 2006). Traditional food practices, poor sanitation, poverty illiteracy, and poor hygienic condition have a clear effect on nutritional status of tribal (Varadarajan and Prasad, 2009).

According to India State Hunger Index (ISHI), 2008, the prevalence of calories undernourishment was 21.4% in Odisha. It is listed as one of the alarming states of the county (Menon *et al*, 2008). As per the 2011 census, Odisha has third-highest percentage of the tribal population in India. There are 62 different tribal populations and 13 PVTGs. The KBK (Koraput-Balangir-Kalahandi) district of Odisha is known as the most socio-economic backward region of the state. Rayagada comes under KBK districts and it is primarily tribal dominating where majority 88% of tribal people are residing. Out of 11 blocks of the district, the PVTGs are residing in 5 blocks. Socio-economic backwardness of this region is the root cause of poverty (<http://kbk.nic.in/koraput.htm>). And, poverty leads to scarcity of food and under-nutrition. More than 50% of women are suffering from anemia (<https://rayagada.nic.in/health/>). Growth of reproductive stage among human being occurs during the adolescent period this phase requires a good quality of balanced diet. So it is a matter of concern to provide better nutrition to the children to achieve the goal of a healthy nation.

The present study was conducted among Dongria kondh tribe Rayagada District of Odisha which falls under the 5th Scheduled area. This tribe is one of the 13 PVTGs of Odisha. They are known as forest dwellers and food gatherer. They sustain themselves from the forest resource, now they are slowly practicing horticulture and shifting cultivation. As per the 2011 census, the Dongria Kondh were enumerated a total of 9,000 individuals, inhabiting about 98 villages of three blocks viz. Bissamcuttuck, Muniguda, and Kalyansinghpur. Due to low literacy rate, topography, socio-economic backwardness, poor infrastructure, this region is most challenging in the context of administration as well as the implementation of many welfare schemes which can eradicate the different health issues and problems.

Research Objective

Here an attempt has been made to assess the growth and nutritional status of the adolescent's boys and girls of the Dongria Kondh tribe (PVTG) of Niyamgiri hill, district Rayagada of Odisha.

MATERIALS AND METHODS:

This cross sectional study was conducted among the boys and girls of age 10-18 years of age among the Dongria Kondh Tribe (PVTG) of Niyamgiri hill Rayagada district of Odisha, India. The data were collected from the villages and hamlets of Niyamgiri hill where Dongria Kondh tribes were residing which came under three blocks namely Bissamcuttuck, Muniguda, and Kalyansinghpur. Purposive sampling methods were used and data was collected from a total of 900 respondents comprising of 450 boys and 450 girls. From each age group 50 individuals were taken, in this way from 9 different age groups i.e. 10-18 years, to meet the sample size a total of 450 (50x9=450) for each sex.

Body height (cm) and weight (Kg) of the each of the participants were measured using Anthropometric tools viz. anthropometric rod and Omron bi-electric impedance. The height was measured up to the nearest millimetre, similarly the body weight was measured with an accuracy of 0.1 Kg or 100 gram. The data was collected in a pre-tested interview schedule. Marfell-Jones et al, (2012) were followed for the proper management of the Anthropometric tools.

All human subjects, procedures, material and data are contributing to this work comply with the ethical standards as per Helsinki Declaration of 1975, as revised in 2008. Prior permission were obtained from the head of the respective tribal villages, relevant local authority, and consent of participants was taken before conducting the study.

Z- Score of Height-for-age (HAZ), Weight-for age (WAZ), was calculated following Thakur and Gautam (2014) and NCHS, 2002.

$$\text{Z- Score} = \frac{\text{Measured Value} - \text{median reference value}}{\text{Standard Deviation of reference population}}$$

The analyses of data were conducted using MS-Excel and SPSS software. Descriptive statistics were used for further calculation a t-test and Chi-square test was used to establish and to verify the significant differences existed between boys and girls.

Age enumeration: The information on the correct age of children is essential for any research like the present one. If the age of children is doubtful then it will be a completely misleading. For the present study, age was estimated in the completed year of each subject through birth certificate, admission records of school (as most of the participants were enrolled in Ashram schools). For further confirmation as well as in case of doubt or absence of the record the genealogical method was also used. If the sample was 10 years and 6 months old, it refers to 10 years, at the same time, if he refers to 10 years 7 months, then the age was rounded up to 11 years.

RESULTS

Age-wise the means, standard deviations, and t-test for body weight of boys and girls are evident from table 1.

It is apparent that the girls of 10-13 years were heavier than boys; but after the age of 14 years, boys become heavier than girls. A significant difference between boys and girls has been observed for the age 10-18 years ($P < 0.05$), except for 14 years. For further elucidation line graph drawn, (fig.1)

Table 1. Means, standard deviations and t value of body weight of boys and girls

Age	Sample Size		Body weight (in Kg)				t-test
	Boys	Girls	Boys		Girls		
			Mean	SD	Mean	SD	
10	50	50	24.4	2.6	27.4	4.5	4.1*
11	50	50	26.9	3.1	28.3	5.1	1.7*
12	50	50	29.5	4.1	32.2	5.4	2.8*
13	50	50	34.9	6.3	37.6	4.6	2.4*
14	50	50	40.5	7.0	40.1	5.2	0.3
15	50	50	47.8	6.0	42.7	6.1	4.2*
16	50	50	49.0	4.9	42.6	4.6	6.7*
17	50	50	51.9	5.5	43.0	4.2	9.1*
18	50	50	54.4	6.1	45.1	4.6	8.6*

* t-value significant, , $df=98$, $P < 0.05$,

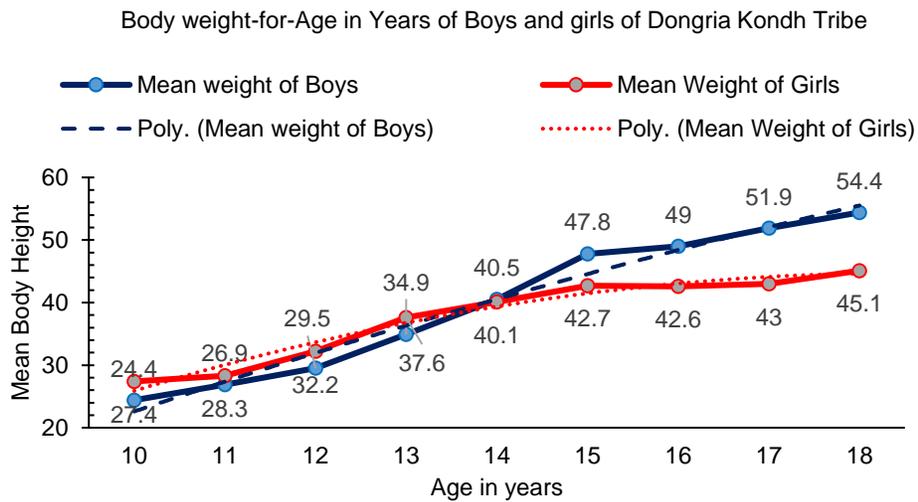


Fig. 1: Body weight-for-Age in Years of Boys and girls of Dongria Kondh Tribe

Table 2 shows the means, standard deviations, and t value of the age-wise height of the boys and girls. It is apparent that the mean body height of the boys and girls was almost similar up to age of 13 years but after the onset of the adolescent period, a variation has been seen between both sexes

where boys apparently became higher than girls. The t-test was found significant ($P < 0.05$). For further elucidation, please see fig.2.

Table 2. Means, standard deviations and t value of body height of boys and girls

Age	Sample Size		Height (in cm)				t-test
			Boys		Girls		
	Boys	Girls	Mean	SD	Mean	SD	
10	50	50	129.4	4.0	132.7	6.1	3.2*
11	50	50	135.4	5.8	132.5	6.7	2.3*
12	50	50	137.9	5.3	139.0	7.3	0.9
13	50	50	143.8	7.1	143.9	3.8	0.1
14	50	50	151.1	7.1	147.5	4.8	3.0*
15	50	50	158.3	5.6	147.0	3.6	12.0*
16	50	50	160.9	5.8	146.9	4.2	13.8*
17	50	50	162.1	7.1	146.5	4.6	13.0*
18	50	50	165.2	5.9	149.1	4.9	14.8*

*t-value significant, $df=98$, $P < 0.05$

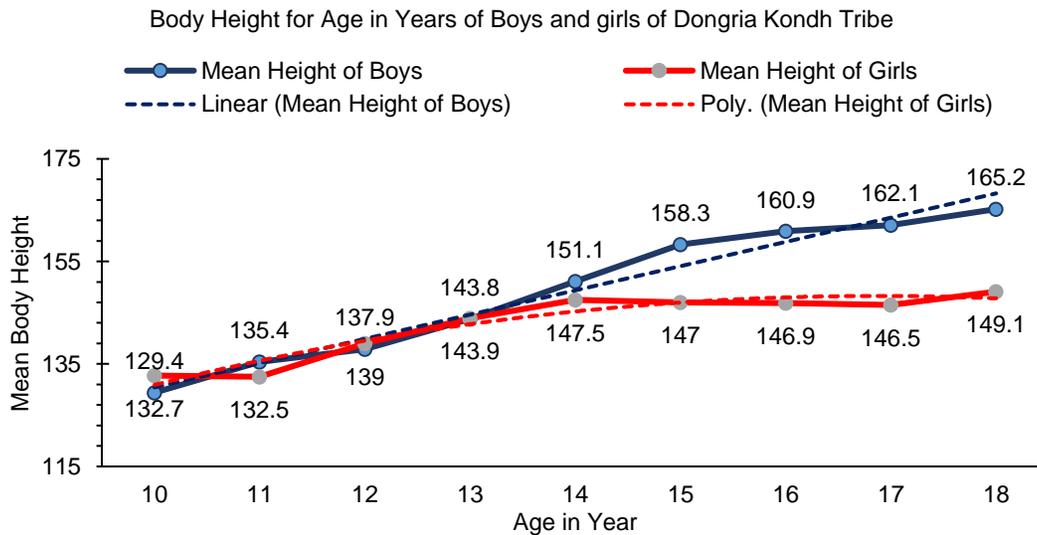


Fig. 2: Body Height for Age in Years of Boys and girls of Dongria Kondh Tribe

Table 3 shows the age-wise mean, standard deviation, and t value of BMI of participants. It is apparent that the mean BMI (Kg / m^2) of boys was lower than the girls. A significant difference has been noticed between both sexes particularly at the age of 10 years, 11 years, 12 years, and 13 years. The t-test value are 3.5, 5.5, 3.4 and 3.7 respectively (where $P < 0.05$). For further elucidation of facts, the data is plotted as a line graph (Fig. 3).

Table 3. Means, standard deviations and t value of body mass index of boys and girls

Age	Sample Size		BMI (In Kg / m ²)				t -test
	Boys	Girls	Boys		Girls		
			Mean	SD	Mean	SD	
10	50	50	14.5	1.1	15.5	1.7	3.5*
11	50	50	14.6	1.0	16.0	1.5	5.5*
12	50	50	15.4	1.6	16.5	1.6	3.4*
13	50	50	16.7	1.9	18.1	1.9	3.7*
14	50	50	17.6	1.7	18.3	1.9	1.9
15	50	50	19.0	1.8	19.7	2.3	1.7
16	50	50	18.9	1.2	19.7	1.6	2.8*
17	50	50	19.7	1.1	19.9	1.3	0.8
18	50	50	19.8	1.4	20.3	1.7	1.6

*t-value is significant, *df*=98, *P* <0.05

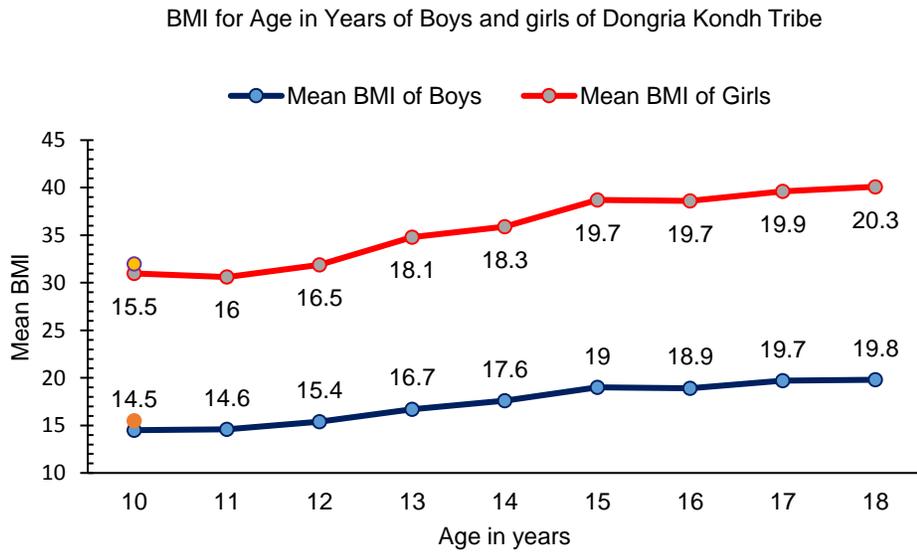


Fig. 3: BMI for Age in Years of Boys and girls of Dongria Kondh Tribe

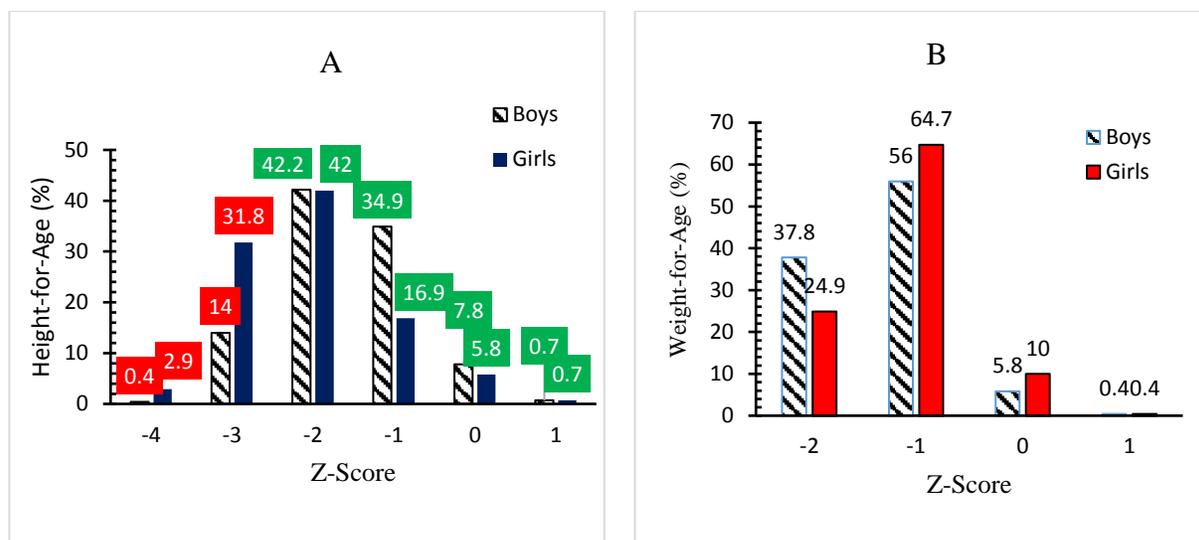


Fig. 4: Distribution of z-scores for height-for-age, and weight-for-age among boys and girls among Dongria Kondh Tribe (PVTG). A. Height-for-Age, B. weight-for-age.

Z-score of height-for-age (HAZ), and weight-for-age (WAZ) was computed by using reference population of (NCHS, 2002). On the basis of Z-score of height-for-age a total of 56.6% boys and 76.7% girls were found stunted (≤ -2 SD). Furthermore, 14.4% boys and 34.7% girls were severely stunted (≤ -3 SD) and 42.2% boys and 42% girls were moderately stunted (≤ -2 SD), and remaining 43.4% of boys and 23.3% girls were normal in height-for-age.

It is evident from weight-for-age (z-score) that 37.8% boys and 24.9% girls were underweight (≤ -2 SD) and rest 62.2% of boys and 75.1% girls were normal in weight-for-age (Table 4).

Table 4. Stunting (HAZ) Underweight (WAZ) Wasting (WHZ) among adolescent boys and girls of Dongria Kondh tribe

Category	Boys		Girls	
	N	%	N	%
Stunting (HAZ)				
Severely Stunted (≤ -3 SD)	65	14.4	156	34.7
Moderately Stunted (≤ -2 SD)	190	42.2	189	42.0
Total Stunted (≤ -2 SD)	255	56.6	345	76.7
Normal	195	43.4	105	23.3
Underweight (WAZ)				
Underweight (≤ -2 SD)	170	37.8	112	24.9
Normal Weight ($-1 \leq 1$ SD)	280	62.2	338	75.1

DISCUSSION:

A significant difference between boys and girls has been observed in the case of age-wise means, standard deviation of height, weight, and body mass index (BMI) of the participants.

The mean stature and bodyweight of the boys and girls were found almost similar for age 10-13 years; but after the onset of the adolescent period, sexual dimorphism was found in terms of anthropometric variables especially in stature and body weight. The males were taller and heavier than the females. Still, The mean BMI (Kg / m²) of boys was lower than girls.

Among the Toto tribe, it was reported that girls were taller than the boys in the age group of 12 and 14 years (P<0.05), while at the age of 17 years boys were significantly taller (P<0.05) than girls, and boys were heavier in lower age group than the girls (Sahu *et al*, 2020).

Thakur and Gautam (2015) reported that the girls were taller than boys up to 12 years of age, and after 13 years of age, boys exceeded girls and became significantly taller than girls whereas; girls were heavier than boys up to 9 years of age. Soon after reaching the age of 9 years, boys became heavier than girls. Bose *et al*. (2006) found the mean BMI among the Savar tribes of Keonjhar District of Odisha, was significantly ($t = 2.09, p < 0.05$) lower among women (18.9Kg / m²) as compared to men (19.3Kg / m²).

On the basis of the Z- Score value of the height-for-age; it was found that adolescent girls were more stunted than adolescent boys in PVTG of present study and a total of 56.6 % boys and 76.7% of girls were stunted. A similar result was reported by Medhi *et al*, (2007) who observed that the prevalence of stunting was slightly higher among girls (51.91%) than boys (47.42%). The proportion of stunting was reported higher among Mishing tribal boys (26.84%) than girls (21.31%), and the same trend was observed in underweight and thinness categories (Basu *et al*, 2014).

In the case of the z- score value of weight-for-age, a majority of the participant were normal. Where a total of 62.2% and 75.1% of boys and girls respectively were found normal body WAZ. Boys (37.8%) were higher underweight more than girls (24.9%). A similar result was found among the children of Hmars tribes of North East India, where boys was a higher prevalence of underweight as compared to girls (Maken and Varte, 2012). Bose *et al*. (2008) found that underweight was high (20.9%) among boys whereas it was medium (13.8%) in case of girls on the other hand thinness was very high (27.8%) among boys than girls (19.4%) among Bengalee Hindu children of Onda, Bankura District, India.

Fazili *et al*, (2012) studied among under 14 years school-going children of Kashmir of north India where males were found to be more underweight than females (p<0.01). The proportion of stunted children was higher among males (p<0.01). The same trend was observed for wasting also (p<0.01). For the thinness, the prevalence was higher in females in the lower age group and vice versa (p>0.05). Prashant and Shaw (2009) carried a study among adolescent girls at Panagal, a

slum of Nalgonda town, Andhra Pradesh found the prevalence of stunting, underweight, and thinness was 47%, 42.6%, and 20.6% respectively.

Joshi *et al.*, (2016) studied among Bhumija Munda tribe of Mayurbhanj district of Odisha observed a gender difference where underweight was more among boys (35%) than girls (30.43%), similarly stunting was prevalent more among boys (50%) than girls (30.43%). A total of 13.04 % of girls and 5 % of boys were found to be severely malnourished and 8.70 % of girls were found moderately undernourished in comparison to boys (10 %).

Banarjee (2001) studied an Air force center children in Pune found 31.73% of total children were underweight out of which 33.03% of boys and 30.08% were girls. Paciorek *et al.* (2013) studied 141 low-income and middle-income countries found urban children are taller and heavier than rural counterparts and the most underweight children found in countries like India, Bangladesh, Niger, and Timor-Leste. Where weight for an age lower than -1.6.

Deshmukh *et al.* (2006) studied a rural health training centre in Wardha found a total of 53.8% of adolescents were thin and 2.2% were underweight. The mean BMI was significantly higher among boys (16.88) than girls (15.54) and the prevalence of thinness was significantly higher in the early adolescent stage.

According to Chowdhury *et al.*, (2020) urbanization, causes changes affects adversely in nutritional status among Oraon tribal people who were facing both underweight and overweight. The monotonous food habits and poor absorption of nutrients of the Konda Dora tribe of Andhra Pradesh are a reason for their malnutrition (Varadarajan and Prasad, 2009).

Conclusion:

A significant difference in age-wise body height and weight among adolescent boys and girls was observed especially after 14 years. Age-wise BMI of adolescents also showed a significant difference where the girls were higher BMI than boys.

It was found that girls were more stunted (76.7%) than boys (56.6 %). At the same time the boys (37.8%) were more underweight (≤ -2 SD) than girls (24.9%). It was concluded that the nutritional status of the adolescents of this particularly vulnerable tribe group was quite higher than many tribal counterparts of the country.

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Contribution of Authors

Author RKG, designed the research and planned the execution as well as manuscript, whereas author DD executed it, data collection, analysis, and drafting of the manuscript was also done by her. Both the author approved the final manuscript. We confirm that this work is original and has not been published elsewhere, nor it is currently under consideration for publication.

Ethical Approval

The authors assert that all procedures contributing to this work comply with the ethical standards as per Helsinki Declaration of 1975, as revised in 2008. The study was approved by the Departmental research committee vide its meeting Dated 20/08/19 as well as the Board of studies of the Department of Anthropology vide its meeting dated 20/08/19

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Conflicts of Interest

There are no conflicts of interest.

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