

Age-trend in thinness among birhor children and adolescents of Purulia: a primitive tribe of West Bengal, India.

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Abstract

The present cross-sectional study was undertaken among one of the smallest primitive tribes of West Bengal, the Birhors. This study is the first, to investigate thinness using body mass index (BMI) among (2-18 years) children and adolescent Birhors of Purulia, West Bengal, India. A total of 88 (51 boys and 37 girls) from two villages, Bhupatipalli and Bareriya were measured. Commonly used indicators i.e., weight (Wt), height (Ht), mid-upper arm circumferences (MUAC) and body mass index (BMI), were used to evaluate nutritional status. Significant ($p < 0.05$) sex differences in mean BMI ($t = -2.215$, $p < 0.05$) was observed in (13-18 years age-group). Significant age-group differences (ANOVA) in Wt (156.393, $p < 0.001$), Ht (171.637, $p < 0.001$), MUAC (68.684, $p < 0.001$) and BMI (28.134, $p < 0.001$) were observed. Results also reveals that prevalence of undernutrition [chronic energy deficiency (CED) grades age and sex combined] among Birhors were (75.0%). The sex-specific rates were: boys = 74.5 % and girls = 75.7 %. There was no significant sex difference in CED prevalence based on BMI ($X^2 = 1.525$, $df = 4$, $p = 0.822$). Birhor children and adolescents of Purulia, were experiencing very high (critical) nutritional condition for these age groups and the girls and youngest among them were experiencing the most critical situation with respect to their health and nutritional status.

INTRODUCTION

Children and adolescence, these two stages of life are very crucial for any individual because it is the transitional stage when one prepares for the adulthood. Adolescent phase is marked with the sudden changes in physical as well as mental growth with enhanced functional capabilities than earlier stages and tries to reach its final growth potential to adulthood. The nutritional status of children and adolescents contributes significantly to the health status of the community. Whilst India celebrates its booming economy and gross domestic product (GDP) growth, the country remains one of the most malnourished in the world today. Prevalence of malnutrition is still nearly double that reported in many countries in sub-Saharan Africa. India has the highest prevalence of underweight children under five and a new study has found the level of hunger there is "alarming" as the country ranks 67, out of 84 countries on the Global Hunger Index. The report found that in South Asia, India was among the countries with hunger levels considerably higher than their GNI [1]. India presents a typical scenario of South-Asia, fitting the adage of 'Asian Enigma' [2]; where progress in childhood malnutrition seems to have sunk into an apparent undernutrition trap, lagging far behind other Asian countries characterized by similar levels of economic development [3-6]. Birhors belongs to the 'Proto-Australoid' stock; linguistically, they originated from the 'Austro-Asiatic' group. This forest-dwelling society of over 8,000 people in 1991, who live in central and eastern India in the states of Orissa, Chhattisgarh, West Bengal, and Jharkhand with the greatest concentration in the Ranchi, Hazaribagh, and Singhbhum districts of Jharkhand. Several recent reports have indicated that the population may have dropped to 4,000 people. In West Bengal, the Birhors are very small in number comprising only about 280 people residing in 3 blocks viz., Baghmundi, Balarampur and Jhalda-I of Puruliya district of West Bengal. Most of the villages are situated either on dry and rough undulating plateau or within dense forested tracts. Anthropometric information among Birhor tribe is not available. They have exceptionally poor socioeconomic and literacy status. The lack of anthropometric data on Birhors necessitates the need

to evaluate their nutritional status. According to Calder and Jackson [2] undernutrition is one of the major causes of morbidity and mortality in the developing world. The present study is endeavored to study the nutritional status of the children and adolescent Birhor tribals of Purulia, West Bengal.

MATERIALS AND METHOD

The present study was conducted in two villages namely Bhupatipalli and Bareriya; it belongs to Baghmundi block, Purulia, West Bengal. These villages are located 22 km from Borabhum railway station, which is approximately 400 km from Kolkata, the provincial capital of West Bengal. Birhors were rehabilitated in different parts of valleys of Ajodhya hills. It is a problematic for them to collect their food as they belong to a hunting and gathering community. Deforestation has a great effect on nutritional status of Birhor community. Their traditional and primary occupation was rope making. However, this occupation has been abandoned by them due to deforestation and shifting. Since raw materials are not available, they had to change their occupation. Now they are working as daily labour although some of them are still following their traditional occupation but with a new method i.e., they now use plastic shake for rope making. As this study was aimed at children and adolescents (2-18 years of age), all available children and adolescent in the two villages were contacted, and a total of 88 (51 boys and 37 girls) individuals measured. The houses are situated in scattered manner with few (those were made by the block authority) for the betterment of the community. Ethical approval and prior permission was obtained from Vidyasagar University and local community leaders, respectively, before commencement of the study. Informed oral consent was also obtained from each participant. Information on ethnicity, age, occupation, and educational status was obtained from all subjects with the help of a questionnaire. A trained investigator (MM) performed the anthropometric measurements following the standard techniques of Lohman et al. [3]. Height, weight and MUAC were recorded to the nearest 0.1 cm, 0.5 kg and 0.1 cm, respectively.

The BMI was computed using the following standard

equation:

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

Nutritional status was evaluated following BMI cut-off points to define thinness. The age and sex specific cut off values were established based on international surveys [4, 5].

This classification categorizes the prevalence of undernutrition according to the percentage of the population with BMI under 18.5: low (5% to 9%), warning sign, monitoring required; medium (10% to 19%), poor situation; high (20% to 39%), serious situation; and very high (40% or more), critical situation WHO [6]. Student's *t*-tests were performed to test for sex differences in mean anthropometric characteristics. Differences between the proportions of boys and girls with chronic energy deficiency were analyzed by the chi-square test. One-way analyses (Scheffe's procedure) were used to test for differences in mean anthropometric characteristics between the three sex-specific age groups. All statistical analyses were performed with SPSS, version 16.0. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1 shows the age combined sex specific descriptive statistics of weight (kg), height (cm), mid-upper arm circumference (MUAC; cm) and BMI (kg/m^2) of 2 - 18 years old Birhor tribals. It is clear from this table that girls have greater mean values for all anthropometric variables than their male counterpart. However, the differences are not statistically significant.

Table 2 shows the age-trends in all the used anthropometric variables. The age grouping in this case was done on the basis of stages of life i.e., preschool, children and adolescent. It is evident from this table that there were no significant sex differences in any anthropometric variable in all mentioned three stages except for the BMI in age group 13-18 years. This table also shows that there is significant age group difference in all the variables.

Table 3 shows the prevalence of chronic energy deficiency (CED Grade I, II and III) among the adult Birhors of Purulia, age-group wise based on BMI. It is clear that grade III thinness is highest among the preschooler boys, grade II thinness is highest among the (7-12 years) boys and grade I thinness is highest among 13-18 years boys and 7-12 years girls simultaneously. The main outcome of this study is the overall prevalence of CED among both the boys and girls are very high and they are in very critical nutritional stage. There is no significant sex difference in the prevalence of CED among them.

DISCUSSION

India has a large and diverse tribal population. There are wide variations among the groups in nutritional status and access to utilization of nutrition and health services. In general, prevalence of CED among the various children and adolescent of different districts and states of West Bengal and other parts of our country is presented in **Table 4**. The overall CED was highest among the children from Hooghly, West Bengal (85.2 %) [7] followed by Purulia, West Bengal (75.0 %) (Present study); Paschim Medinipur (67.2 %) [8]; Purulia (65.3 %) [9]; Purba Medinipur (62.2 %) [10]; Dibrugarh (53.9 %) [11]; Nadia (50.7 %) [12]; Dibrugarh (50.2 %) [13]; Orissa (48.0 %) [14]; Paschim Medinipur (44.5 %) [15]; Purulia (41.3 %) [16] and children of Bankura, West Bengal have the least prevalence of CED (23.1 %) [17] among the children and adolescents of other studied

Table 1: Mean (SD) and *t*-test with significance (*p*) of anthropometric measurements among (2- 18 years) children and adolescents among Birhor tribals of Purulia.

| Variables | Sex | | | | t | p |
|-----------|----------|----------|----------|----------|--------|-------|
| | Male | | Female | | | |
| | μ | sd | μ | sd | | |
| WT | 19.5882 | 12.54620 | 20.0000 | 12.59188 | -0.152 | 0.880 |
| HT | 1.1343E2 | 28.36038 | 1.1435E2 | 28.24417 | -0.150 | 0.881 |
| MUAC | 17.5745 | 5.15767 | 17.9514 | 5.84673 | -0.320 | 0.750 |
| BMI | 13.5549 | 3.21180 | 13.8094 | 3.73354 | -0.343 | 0.733 |

Table 2: Age-trend in mean (SD), *t*-test and ANOVA (F) with significance (*p*) of anthropometric measurements (2-18 years) children and adolescent Birhor tribals of Purulia.

| Age group (Years) | Sex | Weight (kg) | Height (cm) | MUAC (cm) | BMI (kg/m^2) |
|-------------------|-----|--------------|---------------|--------------|-------------------------|
| 2 - 6 | M | 8.48 (1.89) | 86.20 (9.87) | 13.27 (2.13) | 11.55 (2.64) |
| | F | 8.08 (1.55) | 80.68 (7.81) | 13.18 (1.68) | 12.41 (1.56) |
| | t | 0.639 | 1.707 | 0.125 | -1.061 |
| 7 - 12 | M | 20.20 (7.70) | 119.27 (9.65) | 17.89 (4.08) | 13.81 (2.29) |
| | F | 19.47(6.92) | 126.47(16.10) | 17.99 (4.96) | 12.07 (3.07) |
| | t | 0.274 | -1.098 | -0.056 | 1.754 |
| 13 - 18 | M | 34.53 (8.53) | 145.72 (9.02) | 23.28 (3.02) | 16.11 (2.92) |
| | F | 38.11 (5.06) | 142.78 (4.31) | 24.78 (4.14) | 18.73 (2.58) |
| | t | -1.137 | 0.912 | -1.024 | -2.215* |
| F | | 156.393*** | 171.637*** | 68.684*** | 28.134*** |

Significance level: *** $p < 0.001$; * $p < 0.05$

Table 3: Prevalence of CED (%) based on BMI (kg/m^2) among the studied community.

| Nutritional Status | MALE (n=51) | | | FEMALE (n=37) | | |
|--------------------|-------------|-------------|--------------|---------------|-------------|-------------|
| | 2-6 (n=21) | 7-12 (n=15) | 13-18 (n=15) | 2-6 (n=13) | 7-12 (n=15) | 13-18 (n=9) |
| CED III | 71.4 | 40.0 | 33.3 | 61.5 | 60.0 | 11.1 |
| CED II | - | 13.3 | 6.7 | 7.7 | - | 11.1 |
| CED I | 14.3 | 13.3 | 26.7 | 15.4 | 26.7 | 22.2 |
| Overall CED | 85.7 | 66.7 | 66.7 | 84.6 | 86.7 | 44.4 |
| Normal | 14.3 | 13.3 | 13.3 | 15.4 | 6.7 | 44.4 |
| Overweight | - | 20.0 | 20.0 | - | 6.7 | 11.1 |

All figures presented are percentages.

Sex difference: chi-square = 1.525, df = 4, $p = 0.822$.

community using BMI.

According to National Family Health Statistics- 3 report [18], the prevalence of undernutrition in India is 33.0% among males and 28.1% among females. In urban areas, these figures were 19.8% and 17.5%, respectively. In rural areas these were 38.8% and 33.1%, respectively. However, the situation is much worse in West Bengal with corresponding prevalence of 37.7% and 31.6%, respectively. Among urban males and females they were 19.9% and 15.5%, respectively. The corresponding rural figures were 44.9% (males) and 38.0% (females). Therefore, the use of BMI and WHO (1995) BMI based cut-off points for the evaluation of CED are valid for use among tribal populations of India.

The primary importance, from the public health perspective is

Table 4: Multiple Comparisons (Scheffe's test) of three age-groups.

| Dependent Variable | (I) AGE GROUP | (J) AGE GROUP | Mean Difference (I-J) | Std. Error | Sig. |
|--------------------|---------------|---------------|-----------------------|------------|-------|
| WT | PRESCHOOL | CHILDREN | -11.5098 | 1.46368 | 0.000 |
| | | ADOLESCENT | -27.5515 | 1.55785 | 0.000 |
| HT | PRESCHOOL | CHILDREN | -16.0417 | 1.60025 | 0.000 |
| | | ADOLESCENT | -38.7755 | 3.17836 | 0.000 |
| MUAC | PRESCHOOL | CHILDREN | -60.5255 | 3.38284 | 0.000 |
| | | ADOLESCENT | -21.7500 | 3.47491 | 0.000 |
| BMI | PRESCHOOL | CHILDREN | -4.7018 | 0.85053 | 0.000 |
| | | ADOLESCENT | -10.6034 | 0.90525 | 0.000 |
| | CHILDREN | ADOLESCENT | -5.9017 | 0.92989 | 0.000 |
| | | ADOLESCENT | -1.0610 | 0.67275 | 0.294 |
| | ADOLESCENT | CHILDREN | -5.2117 | 0.71603 | 0.000 |
| | | ADOLESCENT | -4.1507 | 0.73552 | 0.000 |

* The mean difference is significant at the .05 level.

Table 5: Prevalence of CED among children: A Comparison.

| District/ State | Age-group (years) | Prevalence of CED (%) | Reference |
|----------------------------------|-------------------|-----------------------|--------------------------|
| Bankura, W.B | 6-14 | 23.1 | Bose et al., 2008 |
| Purulia, W.B | 7-18 | 41.3 | Das & Bose, 2011 |
| Paschim Medinipur & Purulia, W.B | 10-15 | 44.5 | Bose & Bisai, 2008 |
| Orissa | 1-5 | 48.0 | Mishra & Mishra, 2007 |
| Dibrugarh, Assam | 10-18 | 50.2 | Medhi et al., 2006 |
| Nadia, W.B | 3-5 | 50.7 | Biswas et al., 2009 |
| Dibrugarh, Assam | 6-14 | 53.9 | Medhi et al., 2006 |
| Purba Medinipur, W.B | 5-10 | 62.2 | Chakraborty & Bose, 2009 |
| Purulia, W.B | 2-6 | 65.3 | Das & Bose, 2009 |
| Paschim Medinipur, W.B | 2-13 | 67.2 | Bisai et al., 2010 |
| Hooghly, W.B | 2-6 | 85.2 | Mandal et al., 2009 |
| Purulia, W.B | 2-18 | 75.0 | Present study |

the need for immediate nutritional intervention programs to be implemented among Birhors of Purulia and all other tribal groups experiencing nutritional stress.

CONCLUSION

From our study it can be concluded that the nutritional status of Birhor children and adolescents was critical for all age groups; preschoolers experiencing the most critical situation than the others.

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REFERENCES

1 India has the highest prevalence of underweight kids. Updated on Tuesday, October 12, 2010, 08:55. Available from: www.zeenews.com/news661008.html. [Accessed on 01.03.2011].

2 Calder PC and Jackson AA. Undernutrition, infection and

immune function. Nutrition Research Review. 2000; 13: 3-29.

3 Lohman TG, Roche AF, Martorell R. Anthropometric Standardization Reference Manual. Illinois: Human Kinetics Books, 1988.

4 Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body mass index cut offs to define thinness in children and adolescents: international survey. Br Med Journal, 2007; 335: 194.

5 Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. Br Med Journal, 2000; 320: 1-6.

6 World Health Organization, "Physical Status: The Use and Interpretation of Anthropometry", TRS -854. Geneva, World Health Organization 1995.

7 Mandal G, Bose K, Bisai S. Thinness among rural Bengalee Children. Indian J. Ped 2009; 76 (8): 817-819.

8 Bisai S, Ghosh T, De GK, Bose K. Very high prevalence of thinness among Kora-Mudi tribal children of Paschim Medinipur district of West Bengal, India, Electronic Journal of Biological Science, 2010; 3(1): 43-49.

9 Das S and Bose K. Anthropometric characteristics and nutritional status of Bauri pre-school children of Nituria Block, Puruliya, West Bengal. Internet Journal of Biological Anthropology, 2009: Vol-3, No-2.

10 Chakraborty R, Bose K. "Very high prevalence of thinness using new international body mass index cut off points among 5-10 year old school children of Nandigram, West Bengal, India", Journal of Research in Medical Sciences, 2009; 14: 129-33.

11 Medhi GK, Barua A, Mahanta J. "Growth and Nutritional Status of School Age Children (6-14 Years) of Tea Garden Worker of Assam", J. Hum. Ecol, 2006; (19): 83-85.

12 Biswas S, Bose K, Bisai S, Chakraborty R. "Prevalence of thinness among rural Bengalee pre-school children in Chapra, Nadia district, West Bengal, India", Malay. J. Nutr, 2009; (15):155-164.

13 Medhi GK, Hazarika NC, Mahanta J, "Nutritional Status of adolescents among tea garden workers", Indian J. Pediatr, 2007; (74): 343-347.

14 Mishra B, Mishra S, "Nutritional anthropometry and preschool child feeding practice in working mothers of central Orissa". Stud. Home Comm. Sci, 2007; (1): 139-144.

15 Bose K, Bisai S. "Prevalence of undernutrition among rural adolescents of West Bengal, India", J. Trop. Pediatr, 2008; (54): 422-423.

16 Das S, Bose K. Prevalence of thinness using new international cut-off points among Santal tribal children and adolescents of Purulia District, West Bengal, India.. Sri Lanka Journal of Child Health, 2011; 40(3): 105-110.

17 Bose K, Bisai S, Mukherjee S. "Anthropometric characteristics and nutritional status of rural school children", Intern J Biol Anthropol, 2008; (2): 1.

18 National Family Health Survey (NFHS-3). Report on West Bengal by International Institute for Population Science (IIPS), India, Mumbai, IIPS, 2005-2006: Volume II.