

VERY HIGH PREVALENCE OF THINNESS AMONG THE KORA-MUDI PRESCHOOL CHILDREN OF PURULIA DISTRICT, WEST BENGAL, INDIA

Kailash Chandra, Shiule Gope, Latu Lal Mahata, Sadaruddin Biswas*, Samiran Bisai

Department of Anthropology & Tribal Studies, Sidho-Kanho-Birsha University, Purulia 723104, West Bengal, India

*Corresponding Author: sadaruddin-biswas@skbu.ac.in

Short running title: Thinness among Koro-Mudi Preschool children

ABSTRACT

Background: Undernutrition in the form of thinness seems to be a major public health problem among preschool children in developing countries including India. It leads to morbidity and mortality among infants and under five children. There is a scarcity of information on prevalence of thinness among preschool children, particularly among tribal population of rural West Bengal. **Objectives:** To assess the prevalence of thinness among the Kora-Mudi preschool children by internationally accepted cut-offs as described by Cole et al. (2007). **Methodology:** This cross-sectional study was undertaken at Para Block of Purulia district during January – March, 2021. A total of 221 (boys=109, girls=112) subjects were measured and included in the present analysis. Thinness was assessed by Cole et al. 2007 cut-off values. **Results:** There were significant age variations in all anthropometric characteristics. Results of one-way ANOVA showed that weight, height and BMI increased significantly with advancement of age in both sexes. Overall, prevalence of thinness Kora-Mudi preschool children was 71.95%. The prevalence of thinness was higher among the boys (77.06 %) than the girls (66.96 %). Moreover, the study found a significant age variation in the prevalence of thinness among boys ($\chi^2 = 22.86$, $df = 9$; $p < 0.01$). **Conclusion:** Results of the present study revealed that there was a severe undernutrition stress in the form of thinness among the studied preschool children. There is much scope for improvement. Thus, present findings will be helpful for the policymaker to formulate effective nutritional intervention programme(s) for prevention of thinness among the Kora-Mudi tribal preschool children in this area.

Key words: India; Kora-Mudi; Thinness; BMI; Preschool children

INTRODUCTION

Undernutrition during childhood is a major health problem in the developing countries (Giri et al., 2017) and it leads to morbidity and mortality in infants and under five children (Khanra et al., 2019). During childhood, malnutrition can also affect the child growth pattern (Giri et al., 2017). In human life, childhood is an important stage and it is directly associated with growth and development (Khanra et al., 2019). Children are affected in various kinds of malnutrition due to lack of nutrients, poor quality diet etc. Poor nutrition increase the risk of illness and it is directly or indirectly related to child mortality (WHO, 2009). The majority of deaths of children occur during preschool age due to undernutrition (Pelletier DL, 1994). More than half of the children during preschool age period in India are moderately or severely undernourished.

Anthropometry is an inexpensive and easy to perform method to assess nutritional status of any population. Generally, undernutrition among the children was assessed by different measurements, which are stunting (low height for age), underweight (low weight for age), wasting (low weight for height), thinness (low BMI for age) and leanness (low skinfold for age) (WHO, 1995 & WHO, 2006). BMI is well established and widely used methods to determine nutritional status (WHO, 1995). For the range of 2-18 years undernutrition has been termed as underweight or thinness, defined as low BMI (weight in kilogram divided by height in meter squared) for age and it has been graded as III (severe thinness), II (moderate thinness) and I (mild thinness) (Cole et al., 2007).

India has 8.6% tribal population and they are considered to be more underprivileged than non-tribal population (Bisai and Bose, 2009). Various studies have showed that the degree of undernutrition is higher among the underprivileged communities (Bisai et al, 2008; 2009; 2010). Kora-Mudi is the fifth largest tribal community in West Bengal. According to Census (2011) the total population of Kora-Mudi is constitutes 3% of tribal population of West Bengal and most of Kora-Mudi tribes are found in western part of West Bengal which includes Purulia, Bankura, Birbhum, Paschim Mednipur and Hoogly districts. Information about anthropometric characteristics and nutritional status on Kora-Mudi children of Purulia district is extremely scanty. Only few published literature have been found. Keeping this in mind, the present study was conducted with an aim to assess the prevalence of malnutrition in terms of thinness among the Kora-Mudi preschool children of Purulia district of West Bengal, India.

METHODOLOGY

Study Area: This cross-sectional study was undertaken at Para block of Purulia district of West Bengal, India during January – March, 2021. This study area is situated at 350 km away from Kolkata, the provincial capital of West Bengal.

Sample Size: A total of 221 children (109 boys and 112 girls) aged 2-5 years were measured. The minimum estimated sample size was calculated based on single proportional formula (Cochran 1963) with 95% confidence interval, 7% margin of error and 50.7% prevalence of thinness (Biswas et al 2009). Age of the children were ascertained from the Anganwadi register, immunization card and also subsequently confirmed by the parents of the children. For analysis age was grouped into twelve months intervals. Formal ethical approval was obtained from Sidho-Kanho-Birsha University and local authorities prior to the commencement of the study.

Anthropometric measurement: Height and weight measurements were taken on each subject following the standard techniques (Lohman et al., 1988). The BMI was calculated through internationally accepted standard equation as weight in kg divided by square of height in meter. Nutritional status of each subject was evaluated using the age-sex specific cut-off values (Table 1) of BMI as developed by Cole et al., (2007). Low BMI for age was defined as thinness as corresponding adults BMI values of below 16.0kg/m², 17.0kg/m² and 18.5kg/m², which is graded as III (severe thinness), II (moderate thinness) and I (mild thinness), respectively (Cole et al., 2007).

Statistical analysis: Student's t-test was used to test the significance of differences in means between the sexes at each age group. One-way ANOVA was done to test the significance of differences in means for each sex and also the sex-combined mean values across the age groups. Chi-square test was done to see the significance age variation of thinness. All statistical was set at p< 0.05.

Table 1. Age and sex specific international cut-off values of BMI (kg/m²)

<i>THINNESS</i>						
<i>Age(Years)</i>	<i>Boys</i>			<i>Girls</i>		
	<i>Grade III</i>	<i>Grade II</i>	<i>Grade I</i>	<i>Grade III</i>	<i>Grade II</i>	<i>Grade I</i>
2.0	13.37	14.12	15.14	13.24	13.90	14.83
3.0	13.09	13.79	14.74	12.98	13.60	14.47
4.0	12.86	13.52	14.43	12.73	13.34	14.19
5.0	12.66	13.31	14.21	12.50	13.04	13.94

Source: Cole et al. (2007).

RESULTS

Anthropometric characteristics

Anthropometric characteristics of the studied children are presented in table 2. There were significant age variations observed in all anthropometric characteristics. Results of one-way ANOVA showed that maximum age variations were observed in mean height ($F=89.51$, $p<0.001$) and weight ($F=54.67$, $p<0.001$) among the girls. Whereas minimum age variations in mean BMI were observed among the boys ($F=9.52$, $p<0.001$). The age combined mean height for boys and girls were $92.71 (\pm 8.88)$ cm and $90.96 (\pm 9.62)$ cm, respectively. There was a significant increase in mean height with advancement of age (boys: $F=71.78$, $p<0.001$; girls: $F=89.51$, $p<0.001$). The age combined mean weight for boys and girls were $11.91 (\pm 1.95)$ kg and $11.58 (\pm 2.13)$ kg, respectively. Mean weight also increased significantly with advancement of age (boys: $F=33.18$, $p<0.001$; girls: $F=54.67$, $p<0.001$). The age combined mean BMI (kg/m^2) was $13.88 (\pm 1.46)$ and $13.98 (\pm 1.48)$ for boys and girls, respectively. Mean BMI (kg/m^2) decreased with the age among boys and up to 2-4 years age among girls, except at the age of 5 years (Mean BMI= 13.61 , ± 1.30).

Nutritional status

Prevalence thinness among the studied subjects is depicted in table 3. There was a significant age variation in thinness status among boys ($\chi^2 = 22.86$, $df = 9$; $p<0.01$). Overall, prevalence of thinness Kora-Mudi preschool children was 71.95%. Prevalence of thinness for boys and girls are presented in figure 1 and 2. The study found the prevalence of thinness was higher among the boys (77.06 %) than the girls (66.96 %) counterpart. The highest rates of thinness were found in the age of 5 years for boys (92.86 %) and in the age of 4 years among girls (79.31 %). Grade I thinness were highest at the age of 5 years among boys (53.57 %) and at the age of 4 years among the girls (41.38 %). Grade II and Grade III thinness were highest among the boys compared to girls at the age of 4 years. Grade III thinness were highest among the girls at the age of 2 and 5 years as compared to their counterpart.

Table 2. Anthropometric characteristics of the Kora-Mudi Preschool children

Anthropometric variables	Boys				Girls			t value
	Age(Yrs.)	n	Mean	SD	n	Mean	SD	
Height (cm)								
	2	20	80.64	4.38	31	80.79	6.22	-0.09
	3	31	89.45	5.72	27	88.22	4.26	0.92
	4	30	95.89	4.57	29	95.15	4.46	0.63
	5	28	101.54	5.61	25	101.67	4.75	-0.09
	Age combined	109	92.71	8.88	112	90.96	9.26	1.43
	F-value		71.78***			89.51***		
Weight (kg)								
	2	20	9.86	1.07	31	9.51	1.22	1.10
	3	31	11.15	1.30	27	11.04	1.18	0.33
	4	30	12.42	1.43	29	12.16	1.50	-0.68
	5	28	13.69	1.71	25	14.06	1.54	-0.81
	Age combined	109	11.91	1.95	112	11.58	2.13	1.22
	F-value		33.18***			54.67***		
BMI (kg/m²)								
	2	20	15.18	1.35	31	14.60	1.55	1.36
	3	31	13.97	1.65	27	14.22	1.60	-0.59
	4	30	13.48	0.96	29	13.41	1.15	0.25
	5	28	13.27	1.18	25	13.61	1.30	-0.90
	Age combined	109	13.88	1.46	112	13.98	1.48	-0.58
	F-value		9.52***			4.39**		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3. Prevalence of thinness among Kora-Mudi Preschool children.

Age (yrs)	Boys					Girls				
	Thinness (%)				Overall	Thinness (%)				Overall
	Normal (%)	CED Grade I	CED Grade II	CED Grade III		Normal (%)	CED Grade I	CED Grade II	CED Grade III	
2	55.00	25.00	15.00	5.00	45.00	38.71	29.03	6.45	25.81	61.29
3	22.58	25.81	25.81	25.81	77.42	37.04	33.33	7.41	22.22	62.96
4	16.67	26.67	26.67	30.00	83.33	20.69	41.38	17.24	20.69	79.31
5	7.14	53.57	25.00	14.29	92.86	36.00	28.00	12.00	24.00	64.00
Total	22.94	33.03	23.85	20.18	77.06	33.04	33.04	10.71	23.21	66.96
$\chi^2 = 22.86, df = 9; p < 0.01$					$\chi^2 = 4.97, df = 9; p = 0.84 (ns)$					

Figure 1: Prevalence of thinness (%) among boys.

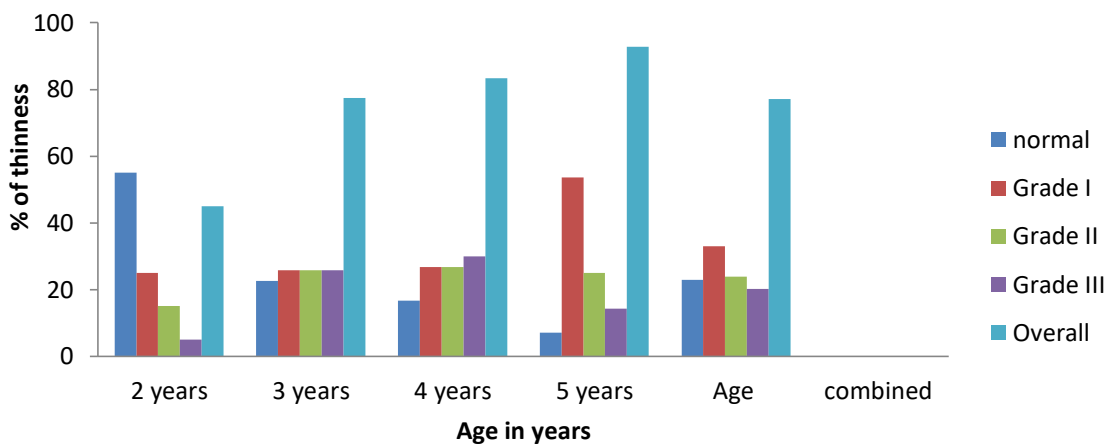
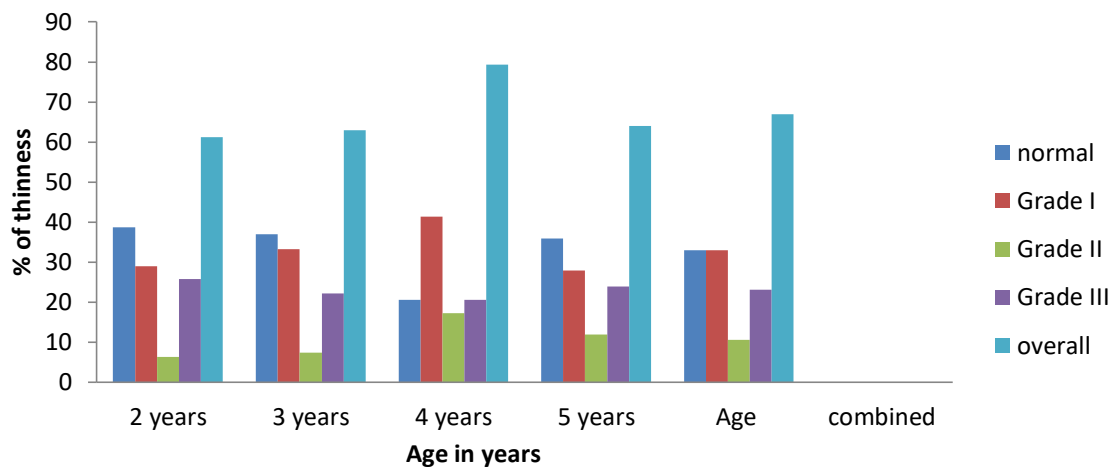


Figure 2: Prevalance of thinness (%) among girls.



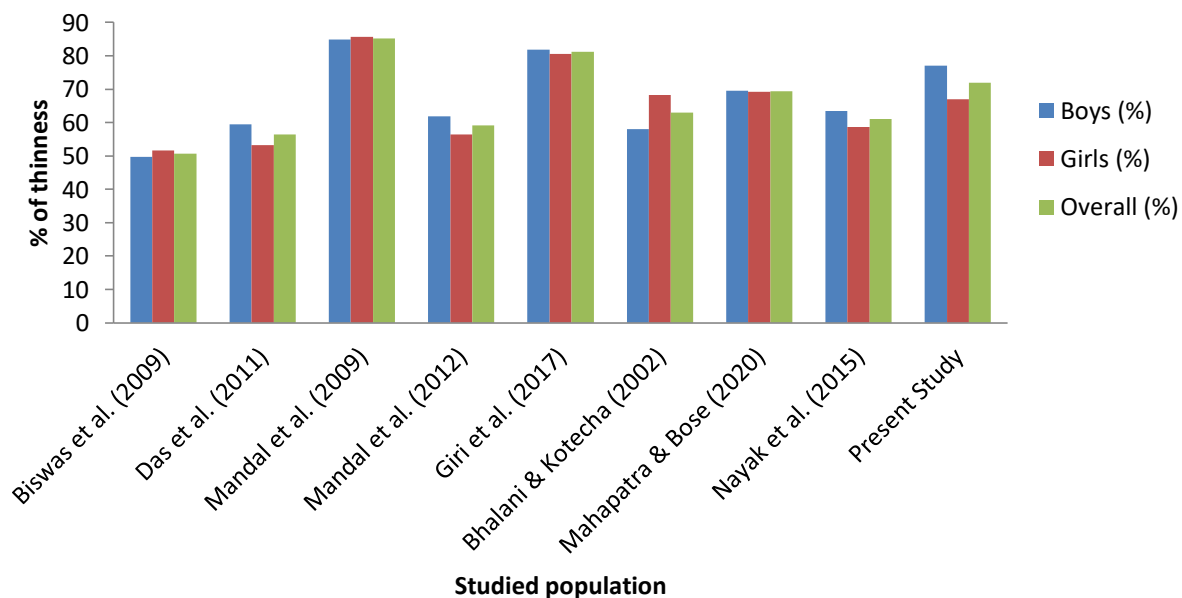
DISCUSSION

One of the most miserable global public health problem is undernutrition among the preschool children and it was also established that developing countries is very much suffering in this pathetic scenario (Pelletier 1994). Undernutrition leads the mortality rate among the children (Giri et al., 2017). According the various studies conducted in worldwide have been showed that environment and dietary pattern has a great influence on growth pattern among the children either developed or developing country (Biswas et al., 2009). According to Cole et al. based on international cut-off point for BMI, our study showed that the prevalence of thinness among the Kora-Mudi preschool children of Purulia district was 71.95% which was lower than ICDS children (85.20%) of Bali-Gram Panchayat, Hooghly, Arambag, West Bengal, India (Mandal et al., 2009) and ICDS children (81.25%) of Sagar Block, South 24 Parganas, West Bengal, India, respectively. Besides this prevalence of thinness of our study was much higher than ICDS children of Chapra, Nadia (50.70%) (Biswas et al., 2009), Santal children from Purulia (56.40%) (Das et al., 2011), ICDS children of Patashpur, East Medinipur (59.10%) (Mandal et al., 2012), Tribal preschool children of Jhargram & Paschim Medinipur (69.40%) (Mahapatra and Bose, 2020) of West Bengal, India; Preschool children of Belgaum, Karnataka (61.00%) (Nayak et al., 2015) and ICDS children of Vadodara, Gujrat, India, (63.00%) (Bhalani and Kotecha, 2002). The comparisons of thinness among preschool children in various parts of India are presented in Table 4 and Figure 3. An earlier study reported, the prevalence of thinness of 67.2% among Kora-Mudi children aged 2-13 of Paschim Medinipur West Bengal. In the above facts and figures, the result of the present study clearly indicated that the preschool children of India was suffering from very high rate of thinness, indicating critical nutritional stress.

Table 4. Overall comparison of the prevalence (%) of thinness among pre-school children.

Studied population	Prevalence of Thinness			Studied By
	Boys	Girls	Overall	
	(%)	(%)	(%)	
ICDS children of Chapra, Nadia, West Bengal, India.	49.68	51.57	50.70	Biswas et al. (2009)
Santal children from Purulia, West Bengal, India	59.50	53.30	56.40	Das et al. (2011)
ICDS children of Bali-Gram Panchayat, Hooghly, Arambag, West Bengal, India.	84.80	85.60	85.20	Mandal et al. (2009)
ICDS children of Patashpur, East Medinipur, West Bengal, India.	61.80	56.50	59.10	Mandal et al. (2012)
ICDS children of Sagar Block, South 24 Parganas, West Bengal, India.	81.90	80.61	81.25	Giri et al. (2017)
ICDS children of Vadodara, Gujrat, India.	58.00	68.20	63.00	Bhalani & Kotecha (2002)
Tribal preschool children, Jhargram & Paschim Medinipur	69.50	69.20	69.40	Mahapatra & Bose (2020)
Preschool children of Belgaum, Karnataka	63.40	58.60	61.00	Nayak et al. (2015)
Kora-Mudi children from Para block, Purulia, West Bengal, India	77.06	66.96	71.95	Present Study

Figure 3: comparison of the prevalence (%) of thinness.



CONCLUSION

The prevalence of thinness among preschool children of India was very high as indicated by almost all studies. Despite of low sample size, we can conclude that the Kora-Mudi preschool of Purulia district of West Bengal, India, was found to be under serious nutritional stress in term of thinness. The result of the study can be used for comparison with other studies in various regional, national and international studies. The findings might be useful to policymaker for effective formulation of intervention programme(s) to improve health and nutritional status of preschool children of tribal population of India.

ACKNOWLEDGEMENT

The authors would like thanks to the parents of the subject and all the concerned Anganwadi staff and authority including administrative authorities for their help and cooperation during the study period. We were also thanks full to the children who participated in the study. Special thanks are due to the ICDS authority of Para Block, Purulia district of West Bengal, India.

COMPETING INTEREST

The authors declared that they have no conflict of interest with respect to the research and publication of this article.

REFERENCES

- Bhalani KD & Kotecha PV (2002) Nutritional status and Gender difference in the children of less than 5 years of age attending ICDS Anganwadis in Vadodra city. *Indian J Community Med*, 27 (3), 124-129.
- Bisai S & Bose K (2009). Undernutrition in the Kora Mudi tribal population, West Bengal, India: a comparison of body mass index and mid-upper-arm circumference. *Food Nutr Bull*, 30, 63-67.
- Bisai S, Bose K & Ghosh A (2008). Nutritional status of Lodha children in a village of Paschim Medinipur district, West Bengal. *Indian J Public Health*, 52, 203-206.
- Bisai S, Bose K & Dikshit S (2009). Undernutrition among slum children aged 3-6 years in Midnapore town, India. *Internet J Biol Anthropol*, 2 (2).
- Bisai S, Ghosh T, De GK, Bose K (2010). Very high prevalence of thinness among Kora- Mudi tribal children of Paschim Medinipur District of West Bengal, India. *eJournal Biol Sci*, 3(1): 43-49.
- Biswas S, Bose K, Bisai S & Chakraborty R (2009). Prevalence of thinness among rural Bengalee pre-school children in Chapra, Nadia District, West Bengal, India. *Malays J Nutr*, 15 (2), 155-164.
- Cochran WC. *Sampling techniques*. New York: Wiley, 1963.

- Cole TJ, Flegal KM, Nicholls D & Jackson AA (2007). Body mass index cut offs to define thinness in children and adolescents: International survey. *BMJ*, 335: 194. Doi: 10.1136/bmj.39238.399444.55
- Das S & Bose K (2011). Prevalence of thinness among santal preschool children using new body mass index cut-off points. *Journal of Anthropology*, 2011, 602782. doi: 10.1155/2011/602782
- Giri SP, Biswas S & Bose K (2017). Prevalence of undernutrition among Bangladeshi preschool children of Sundarban, South 24 Parganas, West Bengal, India. *Human Biology Review*, 6 (4), 284-300.
- Giri SP, Biswas S & Bose K (2017). Very high prevalence of thinness among rural Bengalee preschool children of integrated child development service (ICDS) scheme of Sagar Island, South 24 Parganas, West Bengal, India. *Anthropol Open J*, 2 (2), 54-60. doi: 10.17140/ANTPOJ-2-114
- Giri SP, Biswas S & Bose K (2019). Assessment of Nutritional status using Mid-Upper Arm Circumference among Bengalee preschool children of Sagar Island, South 24 Parganas, West Bengal, India. *J Life Science*, 11 (1-2), 1-6.
- Lohman TG, Roche AF & Martorell R (1988). *Anthropometric Standardization Reference Manual*. Human Kinetics Books, Chicago.
- Mahapatra B & Bose K (2020). Prevalence of Thinness among tribal preschool children of West Bengal: An assessment measured by BMI cut off points. *Antrocom J. of Anthropology*, 16 (2), 213-222.
- Mandal GC, Acharya A & Bose K (2012). Prevalence of thinness among rural preschool children of East Midnapur, West Bengal, India. *Asian Journal of Biological and Life Sciences*, 1 (3), 181-185.
- Mandal GC, Bose K & Bisai S (2009). Thinness among the rural children of Bengal. *Indian J Pediatr*, 76 (8), 817-819. doi: 10.1007/s12098-009-0178-y
- Nayak RK, Walvekar PR & Mallapur MD. Thinness among preschool children residing in rural area: A cross-sectional study. *Journal of the Scientific Society*, 42 (2), 78-81 DOI: 10.4103/0974-5009.157034
- Pelletier DL (1994). The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future research. *J Nutr*, 124: 2047-2081S.
- World Health Organisation (1995). Report of the WHO expert committee: Physical Status. The use and interpretation of Anthropometry. Technical Report Service No 854. Geneva: WHO.
- World Health Organisation (2006). Child Growth Standards. Length/Height for Age, Weight for Age, Weight for Length, Weight for Height and Body Mass Index for Age. Methods and Development. Geneva: WHO.
- World Health Organisation (2009). *Infant and Young child feeding*, Model Chapter for textbooks for medical students and allied health professional. Geneva: WHO.