

Assessment of undernutrition by mid-upper arm circumference among Pre-school children of Arambag, Hooghly District, West Bengal, India: An observational study.

G Mandal, K Bose

Citation

G Mandal, K Bose. *Assessment of undernutrition by mid-upper arm circumference among Pre-school children of Arambag, Hooghly District, West Bengal, India: An observational study.*. The Internet Journal of Pediatrics and Neonatology. 2008 Volume 11 Number 1.

Abstract

A cross sectional observational study of 894 children (441 boys and 453 girls) was undertaken at 20 Integrated Child Development Services (ICDS) Scheme Centres to determine their nutritional status using mid-upper arm circumference (MUAC) in Bali Gram Panchayet, Arambag, Hooghly District of West Bengal, India. The study area consists of remote villages located approximately 100 km from Kolkata, the provincial capital of West Bengal. Information on age and ethnicity (all were of Bengalee Hindu ethnicity) of the children were collected from their parents following face to face interview and verified from official records. The measurement (in centimeters) was taken by the first author (GCM) following the standard technique. Nutritional status was determined following the World Health Organization age and sex-specific cut-off points. Results revealed that mean MUAC among boys was higher than girls at all ages except 5 years. Significant sex differences were observed at ages 3 ($p < 0.005$) and 4 ($p < 0.05$) years. The age-combined rates of overall (moderate + severe) undernutrition were similar in both sexes (boys = 66.2%; girls = 62.9%). This result implied that both the sexes were experiencing similar nutritional stress. The age-combined rates of moderate (boys = 57.4%; girls = 51.7%) and severe (boys = 8.8%; girls = 11.2%) undernutrition were also similar in both sexes. In general, there was an increasing trend in the rates of overall undernutrition from 3 to 5 years in both sexes. years affected by severe and moderate acute malnutrition were 44.85%, 18.07% and 2.29% respectively. In conclusion, our study clearly indicated that the nutritional status of these pre-school children was serious with very high rates of undernutrition in both sexes. Thus, it seems that there is scope for much improvement in the form of enhanced supplementary nutrition than what is currently being offered by the ICDS scheme in Arambag, Hooghly District of West Bengal. Therefore, it is imperative that the ICDS authorities urgently consider the enhancement of the supplementary nutrition being currently given to them.

Funding: Gopal Chandra Mandal received financial assistance in the form of a Minor Research Project from the University Grants Commission, Government of India.

INTRODUCTION

India is a developing country. Since attaining independence in 1947, one of the greatest problems for India has been undernutrition among children. The country is still being confronted with this problem. As in other developing nations, malnourishment is a burden on a considerable proportion of population, the most vulnerable being the youngest of the country (1).

Undernutrition in childhood was and is one of the reasons behind the high child mortality rates observed in developing

countries. It is highly detrimental for the future of those children who survive (2). Chronic under-nutrition in childhood is linked to slower cognitive development and serious health impairments later in life that reduce the quality of life of individuals (3). Nutritional status is an important index of this quality (4). Improved child health and survival are considered universal humanitarian goals. In this respect, understanding the nutritional status of children has far reaching implications for the better development of future generations (5).

Child growth is universally used to assess adequate nutrition, health and development of individual children, and to estimate overall nutritional status and health of populations. Compared to other health assessment tools, measuring child

growth is a relatively inexpensive, easy to perform and non-invasive process (6, 7, 8). During preschool age period, children have special nutritional needs because of their extensive growth and development (6, 7, 9). Undernutrition among pre-school children is an important public health problem in rural India (10, 11, 12, 13, 14) including West Bengal (15). However, there exists scanty information of the prevalence of undernutrition among preschool children in India (9, 16) and West Bengal (15, 17). Anthropometric examination is an almost mandatory tool in any research on health and nutritional condition in childhood and the study of nutritional status is of great importance for the understanding of the social well being in a population (18, 19).

The mid-upper arm circumference (MUAC) is an important measurement which is often used for the assessment among pre-school children. In community based studies, MUAC appears to be a superior predictor of childhood based anthropometric indicators

(6). MUAC is a relatively simple index, but with a fixed cutoff, it ignores age-related changes. Compared with weight-for-height, MUAC has a sensitivity of 24.6% and a specificity of 94.8% (20) appears to be a better predictor of childhood mortality than is weight-for-height (21). Currently available evidences indicate that MUAC is the best

(i.e. in terms of age independence, precision, accuracy, sensitivity and specificity) case – detection method for severe malnutrition and that it is also simple, cheap and acceptable (22). Consistently high case of fatality rates in hospitalized Kenyan children of all ages between 12 – 59 months with low MUAC values, (≤ 11.5 cm.) was reported ; this result

(23) suggests that unadjusted (i.e. by age) MUAC may be useful in clinical settings. Velzeboer and others (24), reported in a comparison of W/H and MUAC in Guatemala, that, younger children tended to become upset and agitated during both height and weight measurements and that no such behavior was observed during the measurement of MUAC. He also opined that, this measurement can be taken by minimally trained health workers.

Keeping these in mind, the aim of the present study was to evaluate the nutritional status of rural Bengalee preschool children from Arambag, Hooghly District, West Bengal, India, using the World Health Organization (6) age and sex-specific MUAC cut-off points.

MATERIALS AND METHODS

This cross sectional observational study was undertaken during the period from November 2005 to December 2006 at 20 ICDS centers in Bali Gram Panchayet, Arambag, Hooghly District of West Bengal, India. The study area consists of remote villages located approximately 100 km from Kolkata, the capital of West Bengal. All children (aged 2-5 years old) living in these areas are enrolled at these centers and all children are given a daily food supplementation, in the form of porridge, consisting of approximately 60 grams of rice and 20 grams of lentils per day. They are also fed an egg per week.

Formal ethical approval was obtained from Vidyasagar University and ICDS authorities before initiation of the study. All children enrolled at these centers were eligible for the study. A total of 894 children (boys = 441; girls = 453) aged 2-5 years were included in the present study. Information on age and ethnicity (all were of Bengalee Hindu ethnicity) of the children were collected from their parents following face to face interview and verified from official records. The measurement (in centimeters) was taken by the first author (GCM) following Lohman et al.(25).

Nutritional status of the children was evaluated using the following scheme:

Moderate undernutrition: $< - 2$ sd

Severe undernutrition : $< - 3$ sd

Where sd refers to the age and sex-specific WHO standard deviations of MUAC.

The $- 2$ sd and $- 3$ sd of age and sex-specific cut-off points are given in Table 1.

Table 1: The WHO (1995) recommended cut-off points for MUAC (cm) by age and sex.

Figure 1

Age in years	Boys		Girls	
	- 2 SD	- 3 SD	-2 SD	- 3 SD
2	13.6	12.2	13.4	12.0
3	13.8	12.4	13.6	12.2
4	14.1	12.6	13.9	12.4
5	14.2	12.6	14.1	12.5

The distribution of MUAC was not significantly skewed thus not necessitating their normalization. Sex differences in mean MUAC were determined using t-test. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

The sex differences in mean MUAC by age are presented in Table 2. Results revealed that mean MUAC among boys was higher than girls at all ages except 5 years. Significant sex differences were observed at ages 3 ($p < 0.005$) and 4 ($p < 0.05$) years. Significant sexual dimorphism in mean MUAC at ages 3 and 4 years could be a result of differential rate of fat deposition at this site between the sexes. No such significant sexual dimorphism was observed at ages 2 and 5. Sexual dimorphism in adiposity deposition and distribution has been well documented by earlier studies worldwide (5,6, 25) in different populations.

Table 2: Sex differences in mean MUAC by age.

Figure 2

Age in years	Boys	Girls
2	13.0 (1.0)	12.8 (0.9)
3**	13.6 (0.7)	13.4 (0.8)
4*	13.8 (0.8)	13.6 (0.8)
5	13.9 (0.8)	14.0 (0.8)

Standard deviations are given within the parentheses.

* $p < 0.05$; ** $p < 0.005$

The prevalence of under-nutrition among the pre-school

children is presented in

Table 3. The age-combined rates of overall (moderate + severe) undernutrition were similar in both sexes (boys = 66.2%; girls = 62.9%). This result implied that both the sexes were experiencing similar nutritional stress.

Table : 3. Assessment of nutritional status of the studied pre-school children.

Figure 3

Age (years)	Boys			Girls		
	UNDERNUTRITION			UNDERNUTRITION		
	Moderate	Severe	Overall	Moderate	Severe	Overall
2	52 (57.1)	17 (18.7)	69 (75.2)	45 (48.9)	27 (29.3)	72 (78.2)
3	59 (47.2)	6 (4.8)	65 (52.0)	56 (52.8)	8 (7.5)	64 (60.4)
4	59 (53.6)	11 (10.0)	70 (63.6)	65 (49.6)	8 (6.1)	73 (55.7)
5	83 (72.2)	5 (4.3)	88 (76.5)	68 (54.8)	8 (6.4)	76 (61.3)
Total	253(57.4)	39(8.8)	292 (66.2)	234 (51.7)	51(11.2)	285 (62.9)

Percentages are given within the parentheses.

The age-combined rates of moderate (boys = 57.4%; girls = 51.7%) and severe (boys = 8.8%; girls = 11.2%) undernutrition were also similar in both sexes. In general, there was an increasing trend in the rates of overall undernutrition from 3 to 5 years in both sexes. Prevalence of undernutrition of the present study clearly show higher rates than the pre-school children of Jaffna, Sri Lanka in post-Exodus period (26). That study revealed that the percentages of the preschool children within the age groups 1-2, 3-4 and 5-6 years affected by severe and moderate acute malnutrition were 44.85%, 18.07% and 2.29%, respectively. Whereas, in an earlier study (27) it was found that the prevalence of acute malnutrition in Jaffna district, Sri Lanka in 1993 (prior to exodus in 1995) was 18.5%. Considering the Indian context (Table – 4), the prevalence of undernutrition among the preschool children of the present study was higher than those reported among preschool children from Punjab(28) and Kolkata (1). The rates were 38.5% and 28.6%, respectively. The rate of undernutrition among the preschoolchildren from Central Orissa (by using MUAC) was comparatively higher at 58.0% (29).

Table : 4 Comparison of the overall prevalence (%) of undernutrition among the preschool children based on MUAC.

Figure 4

Studied children	Prevalence (%)	References
Punjabi children	38.52%	Kaur et al., 2005
Central Orissa	58.0%	Mishra and Mishra, 2007
N.R.S. Medical college, Kolkata	28.6%	Chatterjee and Saha, 2008
ICDS children from Bali-Gram panchayet	64.5%	Present study

Our study clearly indicated that the nutritional status of these pre-school children was serious with very high rates of undernutrition in both sexes. However, it must be mentioned here that one of the limitations of this study was the lack of information on detailed dietary history of the subjects. Due to this lack of information it is not possible to draw any conclusion regarding the quantity and quality of food given to the subjects at their homes. Nevertheless, our results clearly indicated that there existed distinct nutritional deprivation among the subjects regardless of the food supplementation being administered by ICDS.

Considering the rates of stunting, underweight and wasting among the same population, very high prevalence of undernutrition was also noticed (30). Thus, it seems that there is scope for much improvement in the form of enhanced supplementary nutrition than what is currently being offered by the ICDS scheme in Arambag, Hooghly District of West Bengal. Therefore, it is imperative that the ICDS authorities urgently consider the enhancement of the supplementary nutrition being currently given to them.

ACKNOWLEDGEMENTS

All subjects who participated in the study are gratefully acknowledged. Special thanks are due to the ICDS authorities of these centers.

References

- Chatterjee, and Saha S, (2008), A study on knowledge and practice of mothers regarding infant feeding and nutritional status of under-five children attending immunization clinic of a medical college. *Internet J Nutrition and Wellness*, vol 5, no. 1.
- Pelletier DL.(1994) The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future research. *J Nutr* 1994;124:2047-812.
- Scrimshaw(1996), *Nutrition and Health from Womb to Tomb*, Nutrition Today, 31.
- Sachdev HPS (1995), *Assessing child mal-nutrition :*

some basic issues. *Bulletin of the Nutrition Foundation of India*.

- World Health Organization (1986), Use and interpretation of anthropometric indications of nutritional status. *Bull. WHO.* 64 : 921-941.
- World Health Organization (1995), *Physical Status: the Use and Interpretation of Anthropometry: Technical Report Series no. 854*. Geneva: World Health Organization.
- Lee RD, Nieman DC (2003), *Nutritional Assessment*. New York: McGraw Hill.
- Blossner M, De Onis M, Uauy R (2006), Estimating stunting from underweight survey data. In: Bose K ed. *Culture, Nutrition, Health and Disease. J Hum Ecol (Sspecial Issue no. 14)*. Chapter 20. Delhi : Kamal Raj Enterprise.
- Bishnoi P, Sehgal K, Kwatra A (2004), Anthropometric measurements of preschool children as effected by socioeconomic factors. *Asia Pac J Clin Nutr* 13 (Suppl.): S132
- Yadav RJ, Singh P (1999), Nutritional status and dietary intake in tribal children of Bihar. *Indian Pediatr* 36: 37-42
- Mahapatra A, Geddam JJ, Marai N, Murmu B, Mallick G, Bulliyya G, Acharya AS, Satyanarayana K (2000) Nutritional status of preschool children in the drought affected Kalahandi district of Orissa. *Indian J Med Res* 111: 90-94
- Rajaram S, Sunil TS, Zottarelli LK (2003), Analysis of childhood malnutrition in Kerala and Goa. *J Biosoc Sci* 35: 335-351
- Ray SK (2005) Action for tackling malnutrition: growth monitoring or surveillance. *Indian J Pub Health* 49: 214-217
- Dolla CK, Meshram P, Srivastava P, Karforma C, Das S, Uike M (2005) Nutritional status of Kodaku pre-school children in central India. *J Hum Eco* 17: 229-231
- Mustaphi P, Dobe M (2005), Positive deviance – the West Bengal experience: *Indian J Pub Health* 49: 207-213.
- Kumari S, (2005) Nutritional status of scheduled caste pre-school children. *Indian J Pub Health* 49: 258-259
- Bose K, Biswas S, Bisai S, Ganguli S, Khatun A , Mukhopadhyay A , Bhadra M (2007), Stunting, underweight and wasting among Integrated Child Development Services (ICDS) scheme children aged 3-5 years of Chapra, Nadia District, West Bengal, India. *Matern Child Nutr* 3:216-221
- Martin-Prevel Y, Delpeuch F, Trassac P, Massamba JP, Adoua-Oyila G, Couderet K and TrecheS. (2000), Determination in the nutritional status of young children and their mothers in Brazzaville, Congo, following the 1994 devaluation of the CFA franc. *Bull WHO* 78 : 108-118.
- Marins VMR, and Almeida RMVR. (2002), Under-nutrition prevalence and social determinants in children aged 0-59 months. *Niterol, Brazil. Ann. Hum.Biol.* 29 : 609-618.
- Bobby J, Rebello A, Kullu P, Raj VD. Prevalence of malnutrition in rural Karnataka, South India: a comparison of anthropometric indicators. *J Health Popul Nutr* 2002;20:239-44.
- Briend A, Zimicki S. Validation of arm circumference as an indicator of risk of death in one to four years old children. *Nutr Res* 1986;6:249-61.
- Maytt M, Khara T and Collins S (2006), A review of methods to detect cases of severely malnourished children in the community for their admission into community – best therapeutic care programs. *Food and Nutrition Bulletin*, Vol.27, NO.3 (supplement), S7-S23, The United Nations University.
- Barkley J, Newton C, Maitland K. (2005), Severe malnutrition assessment in children in rural Kenya, *JAMA*,

294: 2577.

24. Velzrboer MI, Selwyn BJ, Sargent F, Pottitt E, Delgado H (1983) , The use of arm circumference in simplified screening for acute malnutrition by minimally trained health workers. *J Trop Pediatr* ; 29 : 159-166.

25. Lohman, T.G., A.F. Roche, and R. Martorell. *Anthropometric Standardization*

Reference Manual. Chicago: Human Kinetics Books, 1988.

26. Elankumaran,C (2003), Malnutrition in Preschool children of Jaffana society – A Post-Exodus statistical perspective. Paper presented in 9th International conference on Srilankan studies, University of Ruhuna, Srilanka, 28-30 November, 2003.

27. Sivrajan N (1998), War and healyh in Jaffna. Sectional Chairman's address (Medical sciences) . Proceedings of Jaffna Science Association,

University of Jaffna, Srilanka, pp 1995: 85 (5): 622-624.

28. Kaur G, Sing Kang H, Singal P and Sing SP. (2005). Nutritional status :

Anthropometric perspective of preschool children. *Anthropologist*. 7(2) : 99-103.

29. Mishra B and Mishra S. (2007). Nutritional anthropometry and preschool child feeding practices in working mothers of central Orissa. *Stud. Home. Comm. Sci.*, 1 (2) : 139-144.

30. Mandal GC, Bose K, Bisai S and Ganguly S (2008), Undernutrition among Integrated Child Development Services (ICDS) Scheme Children aged 2-6 years of Arambag, Hooghly District, West Bengal, India : A serious health problem. *Italian J Pub Health year-6*,vol. 5,no. 1, 28-33.

Author Information

Gopal Chandra Mandal

Department of Anthropology, Bangabasi College, Kolkata, India

Kaushik Bose

Department of Anthropology, Vidyasagar University, Midnapore, India