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

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**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 tented 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 *UNDERNUTRITION* | | | Girls *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% | Chaterjee 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.

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