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Undernutrition among Integrated Child Development Services (ICDS) Scheme Children aged 2-6 years of Arambag, Hooghly District, West Bengal, India: A serious public health problem

Gopal Chandra Mandal[1,2], Kaushik Bose[2], Samiran Bisai[2], Sanjib Ganguli[2]

[1]Department of Anthropology, Bangabasi College, Kolkata, India, [2]Department of Anthropology, Vidyasagar University, Midnapore, India

Correspondence to: Kaushik Bose, Department of Anthropology, Vidyasagar University, Midnapore – 721 102, West Bengal, India. E-mail: banda@vsnl.net

Abstract

Background: Childhood undernutrition is a major public health problem in developing countries. In view of this, the objective of the present study was to evaluate the rates of stunting, underweight and wasting among 2-6 year old rural children of Bengalee ethnicity.

Methods: In this study, 20 Integrated Child Development Services (ICDS) Centres of Bali gram panchayet, Arambag, Hooghly District, West Bengal, India, were selected. A total of 1012 (boys = 498; girls = 514) 2-6 year old children were studied. Height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) < -2 z-scores were used to evaluate stunting, underweight and wasting, respectively, following the National Center for Health Statistics (NCHS) Guidelines. Classification of severity of malnutrition was done based on the World Health Organization recommendations.

Results: Boys were significantly heavier than girls at ages 2-4 years; they were significantly taller at ages 2 and 4. Significant age differences existed in mean height and weight in both sexes. Mean HAZ, WAZ and WHZ were less than those of NCHS for both sexes at all ages. The overall (age and sex combined) rates of stunting, underweight and wasting were 26.6 %, 63.3 % and 50.0 %, respectively. The prevalence of stunting (boys = 24.9 %; girls = 28.2 %), and underweight (b = 62.2 %; g = 64.4 %) was higher among girls whereas that of wasting was higher among boys (b = 52.4 %; g = 47.4 %). Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was medium (20 – 29 %), whereas those of underweight (≥ 30 %) and wasting (≥ 15 %) were very high, in both sexes.

Conclusions: The nutritional status of the subjects was unsatisfactory indicating a major public health problem. There is scope for much improvement in the form of enhanced supplementary nutrition.

Key words: India, bengalee, children, stunting, underweight, wasting

Introduction

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 [1 - 3]. During preschool age period, children have special nutritional needs because of their extensive growth and development [1, 2, 4]. The legacy of malnutrition, especially among preschool children is a major public health problem and a huge obstacle to overall national development [4]. Undernutrition among pre-school children is an important public health problem in rural India [5-12] including West Bengal [13]. However, there exists scanty information of the prevalence of undernutrition among preschool children in India [4, 14, 15] and West Bengal [13, 16, 17].

Three most commonly used internationally recommended indicators are child stunting (low height-for-age), underweight (low weight-for-age) and wasting (low weight-for-height) [1, 2]. While stunting reflects a failure to reach linear growth potential due to sub optimal health and/or nutritional conditions, underweight reveals low body mass relative to chronological age, which is influenced by both, a child's height and weight. Stunting is an indicator of chronic undernutrition, the result of prolonged food deprivation and/or

disease or illness. Underweight thus cannot distinguish between a child that is small in weight relative to his/her height and a child that is low in height relative to his/her age, but who may be normal in weight-for-height. On the other hand wasting is an indicator of acute undernutrition, the result of more recent food deprivation or illness [1].

The Integrated Child Development Services (ICDS) scheme of Government of India is the largest national program for the promotion of mother and child health and their development in the world [18]. The beneficiaries include preschool children, pregnant and lactating mothers, and other women in the age group 15 to 44 years [18].The package of services provided by the ICDS scheme includes supplementary nutrition, immunization, health check-up, referral services, nutrition and health education, and pre-school education [18]. The scheme services are rendered essentially through the "Anganwadi" worker at a village center called "Anganwadi". There is therefore an urgent need to evaluate the nutritional status of children at ICDS centers to determine whether they have low rates of stunting, underweight and wasting. Low rates of stunting, underweight and wasting would imply that the supplementary nutrition being administered to the children is effective in reducing the rates of undernutrition. However, very few investigations have done this [13, 17, 19].

In view of this, the present investigation was undertaken to determine age and sex variations in height and weight as well as to evaluate the levels of stunting, underweight and wasting among 2-6 year old ICDS children of Bengalee ethnicity from Arambag, Hooghly District, West Bengal, India.

Methods

Background

In the field of public health, anthropometric indicators have been widely used in population-based studies directed to nutritional evaluation. Even though they are proxy indicators, that is, they represent indirect measures of undernutrition that do not take into account nutrient intake or biochemical examination, their wide use is justified due to the ease of the method and its high sensitivity to nutritional alterations in a population [20]. Cohort studies, ideal for nutritional conditioning monitoring, suffer, in developing countries, from the logistic difficulties usually associated with population studies of large magnitude. In such cases, cross-sectional studies can provide relevant elements for understanding the connection between health status and physical conditions of life. These studies have the advantage of relatively low costs, and they can also provide fundamental information for the implementation of health surveillance systems and the definition of long-term health intervention strategies [21, 22, 23].

Study area and subjects

The present study was undertaken during the period November 2005 to December 2006 at 20 ICDS centers in Bali gram panchayet, Arambag, Hooghly District of West Bengal. The study area consists of remote villages located approximately 100 km from Kolkata, the provincial capital of West Bengal. All children (aged 2-6 years old) living in these areas are enrolled at these centers. At these centres, all children are given a daily food supplementation, in the form of porridge, consisting of approximately 60 grams of rice and 25 grams of lentils. They are also fed an egg per week.

Formal ethical approval was obtained from Vidyasagar University and ICDS authorities prior to the commencement of the study. All children enrolled at these centres were eligible for the study. The participation rate was over 90%. Absenteeism and illness were the main reasons for non-participation. A total of 1012 children (boys = 498; girls = 514) aged 2-6 years were measured. Age and ethnicity of the subjects were verified from official records.

Anthropometric measurements and evaluation of nutritional status

Height and weight measurements were taken on each subject by the first author (GM) following the standard techniques [24]. Technical errors of measurements (TEM) were found to be within reference values [25] and thus not incorporated in statistical analyses.

Three commonly used undernutrition indicators, i.e., stunting, underweight and wasting were used to evaluate the nutritional status of the subjects. Internationally accepted the National Centre for Health Statistics (NCHS) (26, 27) age and sex specific – 2 z-scores were followed to define stunting, underweight and wasting. Z-scores were calculated following the standard formula:

$$\text{Z-score} = \frac{\text{X} - \text{Median of NCHS}}{\text{Standard deviation of NCHS}}$$

Where X is an individual value.
Three Z-scores were calculated

HAZ = Height-for-age Z-score
WAZ = Weight-for-age Z-score
WHZ = Weight-for height Z-score

The following scheme was utilized to define undernutrition:

Stunting : HAZ < - 2
Underweight : WAZ < - 2
Wasting : WHZ < - 2

The WHO [1] classification (Table 1) was followed for assessing severity of malnutrition by percentage prevalence ranges of these three indicators among children.

was observed at ages 2-4 years. Significant sex differences also existed in mean height at ages 2 and 4 years. For both weight as well as height, there existed significant increasing age trends in both sexes.

Table 4 presents the mean z-scores for height-for-age, weight-for-age and weight-for height. . Results revealed that the mean HAZ, WAZ and WHZ were less than (negative value) those of NCHS for both sexes at all ages. These values ranged from –0.6 (HAZ for boys aged 2 years) to –2.5 (WAZ for boys aged 5 and 6 years).

The frequencies of stunting, underweight and

Table 1. World Health Organization classification of public health problem of undernutrition among children.

	Low (%)	Medium (%)	High (%)	Very High (%)
Stunting	< 20	20 – 29	30 – 39	≥ 40
Underweight	< 10	10 –19	20 – 29	≥ 30
Wasting	< 5	5 – 9	10 – 14	≥ 15

Statistical Analyses

The distributions of height and weight were not significantly skewed therefore not necessitating their normalization. Between sexes differences in means of height and weight were tested by students t-test (equal variances assumed). Oneway ANOVA (Scheffe's Procedure) analyses were undertaken to test for age differences in mean height and weight in each sex.

Results

Table 2 presents the distribution of the study subjects. The means and standard deviations of height and weight by age and sex are presented in Table 3. Significant sex difference in mean weight

wasting are presented in Table 5. The overall (age and sex combined) rates of stunting, underweight and wasting were 26.6 %, 63.3 % and 50.0 %, respectively. The rates of stunting and underweight were higher among girls (stunting = 28.2 %; underweight = 64.4 %) compared with boys (stunting = 24.9 %; underweight = 62.2 %). On the other hand, boys had higher prevalence of wasting (boys = 52.4 %; girls = 47.4 %). Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was medium (20 – 29), whereas those of underweight (≥ 30 %) and wasting (≥ 15 %) were very high, in both sexes.

Table 2. Distribution of study subject by age and sex.

Age (year)	Boys	Girls	Total
2	91	92	183
3	125	106	231
4	110	131	241
5	115	124	239
3	57	61	118
Total	**498**	**514**	**1012**

Table 3. Mean and standard deviation of weight and height by age and sex.

Age (year)	Weight (kg) Mean (sd) Boys	Mean (sd) Girls	t	Height (cm) Mean (sd) Boys	Mean (sd) Girls	t
2	9.8 (1.6)	9.2 (1.4)	2.483*	83.7 (5.0)	81.6 (6.7)	2.429*
3	11.3 (1.7)	10.7 (1.5)	2.913**	90.9 (6.3)	90.6 (5.5)	0.489
4	12.8 (1.5)	12.0 (1.4)	4.063***	98.8 (5.1)	96.7 (4.8)	3.216**
5	13.4 (1.6)	13.3 (1.6)	0.358	103.1 (5.3)	102.8 (4.3)	0.566
6	14.8 (1.8)	14.8 (1.6)	0.023	107.9 (4.9)	107.9 (5.5)	0.035
	F= 112.63* **	**F= 178.40*** **		**F= 266.11*** **	**F= 321.06*** **	

* p < 0.05, ** p < 0.01, *** p < 0.001.

Table 4. Mean HAZ, WAZ, WHZ score by age and sex.

Age (year)	HAZ Boys	HAZ Girls	WAZ Boys	WAZ Girls	WHZ Boys	WHZ Girls
2	-0.6 (1.6)	-0.9 (2.1)	-2.3 (1.4)	-2.2 (1.2)	-1.9 (1.2)	-1.8 (1.1)
3	-1.0 (1.7)	-0.9 (1.5)	-2.1 (1.0)	-2.3 (1.0)	-1.8 (1.2)	-2.0 (1.0)
4	-1.0 (1.2)	-1.2 (1.2)	-2.0 (0.8)	-2.3 (0.8)	-2.0 (0.9)	-2.0 (0.9)
5	-1.5 (1.2)	-1.3 (1.0)	-2.5 (0.8)	-2.3 (0.8)	-2.3 (0.8)	-2.0 (0.9)
6	-1.7 (1.0)	-1.4 (1.1)	-2.5 (0.8)	-2.1 (0.7)	-2.1 (0.8)	-1.8 (0.8)
Total	**-1.1 (1.4)**	**-1.1 (1.4)**	**-2.3 (1.0)**	**-2.3 (0.9)**	**-2.0 (1.0)**	**-1.9 (0.9)**

HAZ = Height-for-age Z-score; WAZ = Weight-for-age Z-score; WHZ = Weight-for height Z-score

Table 5. Prevalence (%) of stunting, underweight and wasting by age and sex.

Age (year)	Stunting			Underweight			Wasting		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
2	17.6	33.7	25.7	70.3	60.9	65.6	48.6	45.7	46.9
3	28.8	23.6	26.4	49.6	64.2	56.3	44.8	51.9	48.1
4	18.2	29.8	24.5	55.5	70.2	63.5	51.8	45.8	48.5
5	29.6	25.8	27.6	67.8	62.9	65.3	64.3	51.6	57.7
6	31.6	29.5	30.5	78.9	60.6	69.5	52.6	39.3	45.8
Total	**24.9**	**28.2**	**26.6**	**62.2**	**64.4**	**63.3**	**52.4**	**47.4**	**50.0**

Stunting: HAZ ‹ - 2; Underweight: WAZ ‹ - 2; Wasting: WHZ ‹ - 2

Discussion

The underfed still outnumber the overfed in the developing world among Asian, African and Latin American populations. In spite of the economic advances in the region, undernutrition remains a significant problem in many Asian countries [28]. Undernutrition is a major public health problem and continues to be a cause of ill-health and premature mortality among children in developing countries like India [29, 30]. The most commonly used indicators of undernutrition among children are stunting (low height for age), wasting (low weight for height) and underweight (low weight for age). Stunting is an indicator of chronic undernutrition, the result of prolonged food deprivation and/or disease or illness; wasting is an indicator of acute undernutrition, the result of more recent food deprivation or illness; underweight is used as a composite indicator to reflect both acute and chronic undernutrition, although it cannot distinguish between them [1].

These indices are compared against an international reference population developed from anthropometric data collected in the United States by the NCHS [26, 27]. Children whose measurements fall below –2 z-scores of the reference population median are considered undernourished, i.e. to have stunting, wasting or to be underweight. These indices reflect distinct biological processes, and their use is necessary for determining appropriate interventions [1].

The results of the present study clearly indicated that, based on WHO classification of severity of malnutrition, the overall prevalence of stunting was medium (20 – 29), whereas those of underweight (≥ 30 %) and wasting (≥ 15 %) were very high, in both sexes. The rates of underweight were much higher than that reported from India (47%) by UNICEF [31]. Results on stunting indicated that, among these children, there existed medium level of chronic undernutrition due to prolonged food deprivation. The rate of stunting was less than reported (46%) by UNICEF (31) from India. In case of wasting; it was also observed that there existed a very high rate of undernutrition that was indicative of more recent food deprivation. The rate was much higher than those reported (16%) by UNICEF [31] from India. Wasting, an indicator of acute undernutrition is the result of more recent food deprivation or illness [1].

Studies on underweight, which is used as a composite indicator to reflect both acute and chronic undernutrition, demonstrated that the level was also very high. These findings suggested widespread adverse nutritional experience of the subjects. The rates of underweight and wasting of the children of the present study were much higher than those reported in an earlier study [17] on ICDS children from Chapra, West Bengal which had reported rates of 31.0 % and 9.4 %, respectively. However, both studies found similar rates of stunting, i.e., 23.9 % [17] and 26.6 % (present study).

It has been recently suggested [29] that since undernutrition is a function of both food deprivation and disease, which are in turn the consequences of poverty, anthropometric indices can serve only as proxies for evaluating the prevalence of undernutrition among children. Efforts to reduce undernutrition, morbidity and mortality depend on reducing poverty and raising people's living standards by improving the quality of homes and by increasing access to clean drinking water and adequate sanitation. Such interventions have positive impacts on public

health, and implementing these also goes some way towards fulfilling people 's basic human rights [29]. However, in the context of the present study, it should be noted that ICDS offers supplementary nutrition to young children and controlling of other related factors of undernutrition such as access to clean drinking water and adequate sanitation are not within its ambit.

From the results of the present study we can conclude that the nutritional status of the subjects is not satisfactory and 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. This requires additional government funding and will help to reduce the prevalence of undernutrition. Such a measure will go a long way in improving the public health of the population.

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