

Age and Sex Variations in Undernutrition of Rural Bengalee Primary School Children of East Midnapore District, West Bengal, India

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INTRODUCTION

Childhood is a period of rapid growth after infancy. Among children the nutritional requirements increase because the growth rate increases. The monitoring of childrens' nutritional status is a fundamental tool for the evaluation of their health condition. It offers an unique opportunity to objectively assess the health of a population. Anthropometry has been used during childhood and adolescence in many contexts related to nutritional status (World Health Organization, 1995). It is well recognized worldwide that anthropometric measurements are essential to diagnosis of undernutrition. Due to its simplicity and low cost, anthropometric evaluations give simple and reliable estimation of undernutrition prevalence. Measures obtained from anthropometry can be sensitive indicators of health, development and growth in infants and children. Thus, anthropometric examination is an almost mandatory tool in any research on health and nutrition condition in childhood (Rao, 1970; Bose and Mukhopadhyay, 2004).

One of the major health problems in many developing countries including India is widespread prevalence of undernutrition among primary school children. The scourge of undernutrition is even more acute among rural children. Recent studies worldwide have investigated the nutritional status of school children among various ethnic groups (Tejas et al., 2001; Marins and Almeida, 2002). Several recent studies have investigated nutritional status of children from different regions of India (Abel and Sampathkumar, 1978; Rao et al., 1978; Rao et al., 2000; Laxmaiah et al., 2002) including rural areas (Prakash et al., 1973; Joseph et al., 2002). However, there is very little information on the nutritional status of Bengalee children from West Bengal (Rao, 2001; de Onis et al., 2001; Woodruff and Duffield, 2002; Bhadra et al., 2004). Considering this, the present study attempted to evaluate the prevalence and age-sex trends of undernutrition among 5-9 year old rural Bengalee children of

Nandigram, East Midnapore District, West Bengal, India.

MATERIALS AND METHODS

Study Population and Sampling: The present study was carried out during the period November 2003 - March 2004 in Nandigram area of East Midnapore District, West Bengal. The data were collected from three primary schools and necessary approval was obtained from the school authorities prior to the commencement of the study. All eligible students were invited to participate in the survey and the response rate was 80%. All subjects belonged to Bengalee ethnic group.

A total of 549 students (291 boys and 258 girls) aged 5-9 years participated in the present study. The study was cross-sectional in nature. All subjects completed a pre-tested questionnaire containing a number of specific questions on age, ethnicity and socio-demographic profile etc. Authentication of age and ethnicity were verified from the school records.

Anthropometric Measurements: A total of fourteen anthropometric measurements (height, weight, eight circumferences and four skinfolds) were made in the present field survey but only two basic variables (height and weight) have been used in the present report. All anthropometric measurements were taken following the standard techniques (Lohman et al., 1988).

Assessment of Nutritional Status: Nutritional status was evaluated using the age and sex specific cut-off points of 5th percentile values of height and weight (Hamill et al., 1979) based on the United States National Center for Health Statistics (NCHS). Two commonly used undernutrition indicators, i.e., stunting (height-for-age, H/A) and underweight (weight-for-age, W/A) were used to characterize the nutritional status of the subjects. Stunting (insufficient height relative to age) is a good indicator of chronic undernutrition while underweight (insufficient weight relative to age) indicates present acute undernutrition. This cut-off point has been

utilized by several recent studies worldwide on undernutrition among children and adolescents (World Health Organization, 1995; Abel and Sampathkumar, 1998).

Statistical Analyses: The distribution of height and weight were normal and thus parametric statistics were performed. Technical errors of measurements (TEM) were calculated and the results were found to be within reference values (Ulijaszek and Kerr, 1999). Therefore, TEM was not incorporated in statistical analyses. Means, standard deviations and percentiles (5th) were the basic statistics computed for anthropometric variables. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Version 7.5.1, 1996).

RESULTS

Table 1 represents that the mean height and weight of the present sample. The mean height and weight (both sex combined) were 116.61 cm ($\pm$ 10.52) and 18.86 kg ($\pm$ 4.00). In general, boys were slightly taller (+ 1.20 cm) and heavier (+ 0.33 kg) than the girls. Height and weight reflected a clear-cut positive linear age trend from 5 to 9 years in both the sex groups (Fig. 1). However, boys had greater mean values of height and weight than the girls at age 5 years. Thereafter, the increase with age was similar in both sexes.

The overall (both sex combined) frequency of stunting (29.7%) and underweight (53.4%) was very high among the studied children (Table 2). The frequency of stunting (boys = 29.6%, girls = 29.8%) as well as underweight (boys = 54.6%; girls = 51.9%)

Table 2: Frequency (%) of undernutrition* by age and sex of rural Bengalee children of Nandigram, East Midnapore, West Bengal, India.

Age (years)	Sex	n	Undernutrition prevalence (%)	
			Stunting	Underweight
5	Boys	92	28 (30.4)	60 (65.2)
	Girls	83	34 (41.0)	53 (63.9)
6	Boys	62	17 (27.4)	32 (51.6)
	Girls	56	13 (23.2)	24 (42.9)
7	Boys	47	11 (23.4)	17 (36.2)
	Girls	41	05 (12.2)	10 (24.4)
8	Boys	57	16 (28.1)	30 (52.6)
	Girls	44	13 (29.5)	23 (52.3)
9	Boys	33	14 (42.4)	20 (60.6)
	Girls	34	12 (35.3)	24 (70.6)
5-9	Boys	291	86 (29.6)	159 (54.6)
	Girls	258	77 (29.8)	134 (51.9)
5-9	Boys+Girls	549	163 (29.7)	293 (53.4)

* Based on NCHS 5th percentile values (Hamill et al., 1979).

demonstrated negligible sex variations. In general, combining all ages, the prevalence of stunting was a little higher among girls (+ 0.2%), on the contrary, underweight was slightly greater among boys (+ 2.7%). At all ages the prevalence of underweight was higher than stunting in both the sex groups. The prevalence of stunting and underweight gradually decreased from 5 to 7 years of age. Thereafter, there was a sudden increase at 8 years of age in both sexes (Fig. 2).

DISCUSSION

Improved child health and survival are considered universal humanitarian goals. In this respect, understanding the nutritional status of

Table 1: Mean, standard deviation and 5th percentiles of height and weight by age and sex of rural Bengalee children of Nandigram, East Midnapore, West Bengal, India.

Age (years)	Sex	n	Height Mean (SD)	Weight Mean (SD)	5 th Percentiles	
					Height (cm)	Weight (kg)
5	Boys	92	108.41 (7.03)	15.99 (2.17)	95.12	12.33
	Girls	83	105.66 (6.21)	14.92 (1.82)	96.04	12.00
6	Boys	62	115.00 (9.51)	17.94 (2.97)	96.21	13.08
	Girls	56	113.81 (6.96)	17.99 (2.87)	102.63	14.00
7	Boys	47	121.06 (6.66)	20.22 (2.67)	110.94	16.20
	Girls	41	121.45 (5.94)	20.46 (3.14)	112.10	16.00
8	Boys	57	124.83 (7.19)	21.78 (3.11)	114.72	17.85
	Girls	44	124.20 (7.78)	21.89 (4.25)	112.83	16.75
9	Boys	33	126.99 (7.43)	23.05 (3.60)	116.08	18.00
	Girls	34	127.48 (6.86)	22.74 (3.11)	114.70	18.50
5-9	Boys	291	117.18 (10.39)	19.02 (3.80)	101.40	13.80
	Girls	258	115.98 (10.66)	18.69 (4.21)	98.50	13.00
5-9	Boys+Girls	549	116.61 (10.52)	18.86 (4.00)	99.00	13.50

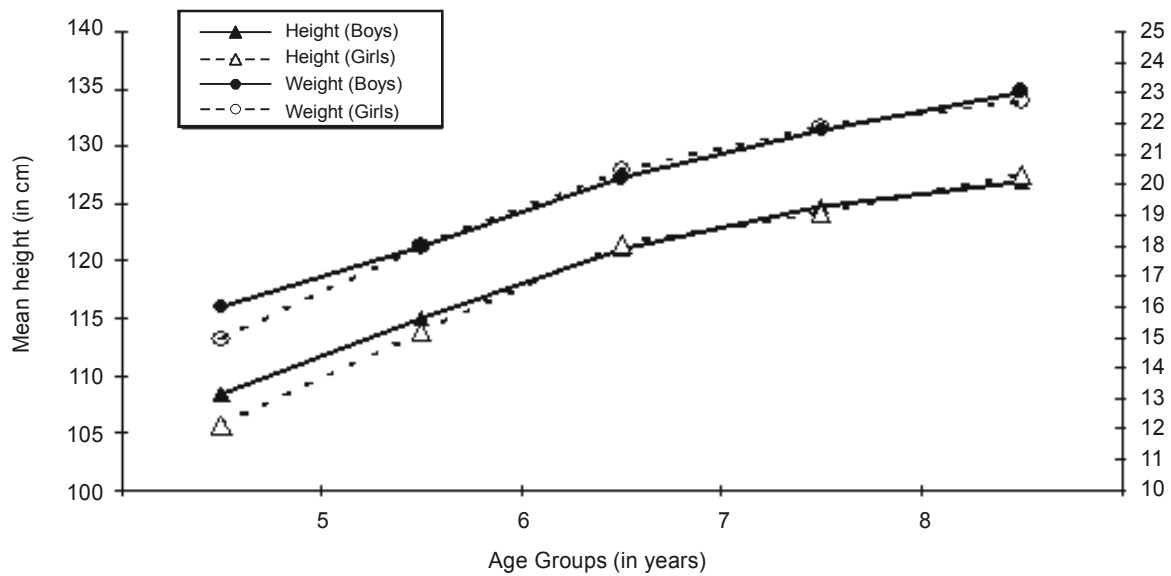


Fig. 1. Distribution of height and weight by age and sex of the studied children



Fig. 2. Distribution of stunting and underweight by age and sex of the studied children

children has far-reaching implications for the better development of future generations. The present study assessed the nutritional status of children aged 5-9 years using the two anthropometric measures, height-for-age and weight-for-age, among rural Bengalee primary school children of Nandigram, East

Midnapore District, West Bengal, India.

The subjects nutritional status were determined and compared with the United States National Center for Health Statistics (NCHS) reference (Hamill et al., 1979) and other researchers (World Health Organization, 1986, 1995). Relative to undernutrition

levels identified in other Third World countries (World Health Organization, 1986, 1995; International Rescue Committee, 1997) rural Bengalee children of the present study had very high rates. The levels of stunting (29.7%) and underweight (53.4%) of the Bengalee children were higher than those reported in most other populations except Nepal, Guatemala and Yemen (World Health Organization, 1986). These findings suggest widespread adverse nutritional experience of the subjects. Importantly, it was observed that the level of present acute undernutrition (underweight) was significantly higher as compared to chronic undernutrition (stunting) among the rural Bengalee children. This indicated that the nutritional intake being currently consumed by the studied sample is inadequate. It is therefore imperative that efforts be made to increase the dietary intake of these children in the form of nutritional supplements. In conclusion, the study recommends more area-specific policies for the development of nutritional intervention programmes. Such programs can be effective tools in reducing the prevalence of undernutrition. Since the majority of India's population resides in rural areas, successful reduction of the prevalence of undernutrition of rural children would go a long way to improve the general health status of Indian children.

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KEYWORDS Height, Weight, Percentiles, Stunting, Underweight, Rural, Children, Sex Differences, Bengalees, India

ABSTRACT High prevalence of low birth weight, high morbidity and mortality in children, and poor child health are major nutritional concerns in India. In addition, the Indian population is passing through a nutritional transition and is expected to witness higher prevalence of adult non-communicable diseases such as diabetes, hypertension and coronary heart disease according to the 'fetal origin of adult disease hypothesis'. Although nationwide intervention programmes are in operation over the past two decades, the situation has

not changed greatly. Clearly, there is a need for examining several issues of nutritional significance for effective planning of interventions. In particular, maternal nutrition and fetal growth relationship, long term effects of early life undernutrition, interactions of prenatal nutritional experiences and postnatal undernutrition are some of the major issues. Malnutrition (undernutrition or overnutrition) is a problem at varying proportions in developing countries, and anthropometry is a simple tool to assess its magnitude in children. This community-based cross-sectional study was undertaken to determine the magnitude of undernutrition among 549 school children (boys = 291 and girls = 258) aged 5-9 years of rural areas of East Midnapore district of West Bengal in India. The collected data was analyzed using the recommended indices of height-for-age (stunting) and weight-for-age (underweight) based on the NCHS standard. Prevalence of stunting (overall = 29.7%, boys = 29.6%, girls = 29.8%) and underweight (overall = 53.4%, boys = 54.6%, girls = 51.9%) was alarming among the children studied. There was no significant sex difference in nutritional status. Moreover, the age variations in stunting and underweight demonstrated similar age-trends for both sexes. Relative to undernutrition levels identified in other Third World countries, rural Bengalee children of the present study had very high rates. Thus, this study provided evidence that undernutrition is still a leading problem among rural Bengalee primary school children of West Bengal and this has not improved in spite of nutrition intervention programmes which are currently in operation.

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