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Undernutrition among Bauri Pre-School Children of Nituria Block, Purulia District, West Bengal, India

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ABSTRACT Childhood undernutrition is a major global health problem, especially in developing countries like India. It leads to increased morbidity and mortality among children. Our study assessed the prevalence of undernutrition among 2-6 year old pre-school children of Bauri caste of Nituria Block, Purulia, West Bengal, India. A community based cross sectional study was conducted among 219 pre-school children in five different villages. Height and weight measurements were made following standard techniques. Height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) <-2 z-scores were used to assess stunting, underweight and wasting, respectively, following the NCHS Guidelines. Severity of undernutrition was evaluated on the basis of classification of WHO recommendations. Result revealed that the mean HAZ, WAZ and WHZ were less than (negative value) those of NCHS for both sexes at all ages. Values ranged from -0.91 (HAZ for boys aged 5 years) to -2.05 (WAZ for girls aged 2 years). The overall (age and sex combined) rates of stunting, underweight and wasting were 37.0 %, 48.4 % and 21.5%, respectively. The present study clearly demonstrated that the nutritional situation of these children was serious.

INTRODUCTION

There is a growing consensus that poor nutritional status during childhood (or even in utero) can have long-lasting scarring consequences into adulthood, both in terms of health and mortality, and in terms of other measures of human capital such as schooling and productivity (Pelleter and Frongillo 2003). Substantial, but indirect, evidence suggests that improving nutrition in early childhood in developing countries is a long-term economic investment (Hoddinott et al. 2008). Moreover, considerable evidence suggests that malnutrition affects human performance, health and survival, including physical growth, morbidity, mortality, cognitive development, reproduction, physical work capacity and risks for several adult-onset chronic diseases ((Pelleter and Frongillo 2003).

Globally, it is estimated that among preschool-age children in developing countries 183 million are underweight, 226 million are stunted and 67 million wasted (Mitra and Tiwari 1997). India has the highest occurrence of childhood malnutrition in the world (Bamji 2003). One out of every three children less than five years of age in developing countries is malnourished. It is a major drain on developing countries' prospects for development because malnourished children require more intense care from their parents and are less physically and intellectually productive as adults. Given the fundamental importance of undernutrition to child survival and health, the evaluation of nutritional status, especially among rural children of various ethnic groups, has immense implications for policy makers and planners alike (Nandy and Miranda 2008).

Although studies evaluating nutritional status have been undertaken among non-tribal (Bisai et al 2008a) and tribal (Mishra and Mishra 2007; Bisai et al. 2008b) children from various parts of India, representative data on the nutritional status of Bauri preschool children is absent. In view of this, the present investigation studies the prevalence of undernutrition among 2-6 year old scheduled caste (Bauri) preschool children of Purulia District, West Bengal.

MATERIALS AND METHODS

Study Population

Bauri, a cultivating, earth-working, and palanquin-bearing caste of Western Bengal, whose features and complexion suggest that they may be of non-Aryan descent. However, some available evidence suggests an affiliation to any particular tribe now in existence. The Bauris are

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divided into nine sub castes. Some of them may perhaps be nothing more than different local names for what was originally the same sub-caste, but this point is not really very well researched. The Bauri admit into their caste members of any caste higher than themselves in social standing. Bauris profess to be Hindus of the Sakta sect, but in Western Bengal, at any rate, their connection with Hinduism is of the slenderest kind, and their favourite objects of worship are Manasa, Bhadu, Mansingh, Barpahari, Dharmaraj, and Kudrasini. The social rank of Bauri is very low (Risley 1891).

Study Area and Data Collection

A cross-sectional, community based study was conducted in five different villages (Ramkanali, Raghudi, Garponchokot, Mekatala and Rampur) of Nituria Block, Purulia district- that are situated about 250km from Kolkata city, the provincial capital of West Bengal. This study was carried out from January 2008 to April 2008. A total of 219 (130 boys and 89 girls) pre-school children aged 2-6 years were measured. Data were collected after obtaining the necessary approval from the parents, villages and block authorities and parents were informed about the objectives before the commencement of measurement. The institutional ethical committee approved the data schedule. Information on age, gender, weight and height was collected on a pre-tested questionnaire by house-to-house visit following interview and examination.

Anthropometric Measurements and Evaluation of Nutritional Status

Anthropometric measurements such as height and weight were made by a trained investigator (SD) following the internationally accepted standard techniques (WHO 1995). Height and weight measurements were recorded to the nearest 0.1 cm and 0.5 kg, respectively.

Three commonly used undernutrition indicators- stunting, underweight and wasting- were used to evaluate the nutritional status of the subjects. The United States National Center for Health Statistics (NCHS) (Hamill et al. 1979; WHO 1983) age- and sex- specific -2 z-scores was followed to define stunting, underweight and wasting. The following scheme was utilized:

Stunting: < -2 HAZ (z-score for height-for-age);

Underweight: < -2 WAZ (z-score for weight-for-age);

Wasting: < -2 WHZ (z-score for weight -for-height).

Where HAZ, WAZ and WHZ refer to height-for-age, weight-for-age and weight -for- height age- and sex- specific z-scores, respectively, of NCHS.

The WHO (1995) classification for assessing severity of malnutrition by percentage prevalence ranges of these three indicators among children is shown in Table 1.

Statistical Analyses

The distribution 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 Student's t- test. One-way (Scheffe's Procedure) analyses were undertaken to test for age differences in mean height and weight in each sex. All statistical analyses were undertaken using the Statistical package for social sciences (SPSS).

RESULTS

The distribution of the study subjects by age and sex is presented in Table 2. Of the 219 children measured, 130 (59.4%) were boys while 89 (40.6%) were girls.

The mean and standard deviations of height and weight by age and sex are presented in Table

Table 1: Classification of public health problem of undernutrition among children (WHO 1995).

Nutritional status	*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

Table 2: Distribution of study subjects by age and sex.

Age(years)	*Boys*	*Girls*	*Total*
2	22	14	36
3	19	21	40
4	30	14	44
5	38	23	61
6	21	17	38
Total	130	89	219

3. There was no significant sex difference in boys and girls height. Significant ($t = 2.173$, $p < 0.05$) sex difference in mean weight was observed at age 5 years. For both height (boys: $F = 56.321$; Girls: $F = 17.538$) as well as weight (Boys: $F = 37.709$; Girls: $F = 18.282$) there existed significant ($p < 0.001$) increasing age trends in both sexes. However, the growth in boys was more significant than in girls.

Table 4 presents the mean z-scores for height-for-age, weight-for-age and weight-for-height. Result 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 -0.91 (HAZ for boys aged 5 years) to -2.05 (WAZ for girls aged 2 years).

The frequencies of stunting, underweight and wasting are presented in Table 5. The overall (age and sex combined) rates of stunting, underweight and wasting were 37.0 %, 48.4 % and 21.5%, respectively. The rates of stunting, underweight and wasting were higher among boys (stunting = 23.7 %; underweight = 27.9 % and wasting = 12.3 %) compared with girls (stunting = 13.2 %; underweight = 20.5 % and wasting = 9.1 %). Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was high (30-39 %), whereas those of underweight (≥ 30 %) and wasting (≥15 %) were very high.

DISCUSSION

Children in developing countries bear most of the burden of childhood death and disease (Staton and Harding 2004a). The majority of this morbidity and mortality is linked with childhood undernutrition.

Undernutrition among children and adolescents is a serious public health problem internationally, especially in developing countries

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

Age (years)	*Height (cm)*		*t*	*Weight (kg)*		*t*
	Boys	*Girls*		*Boys*	*Girls*	
2	82.89(6.6)	85.92(10.5)	-1.068	10.07(1.3)	10.00(1.9)	0.125
3	87.78(6.4)	91.11(8.6)	-1.374	11.11(1.4)	11.67(1.8)	-1.091
4	95.26(7.7)	96.33(10.1)	-0.388	13.03(2.0)	13.03(2.5)	-0.157
5	104.74(7.0)	102.03(7.2)	1.449	15.23(2.6)	13.85(2.1)	2.173*
6	107.52(6.1)	108.44(7.5)	-0.416	16.26(2.2)	15.77(2.1)	0.704
Total	96.82(11.3)	97.25(11.5)	-0.269	13.41(3.0)	12.98(2.8)	1.070
	F = 56.321**	F= 17.538**		F= 37.709**	F= 18.282**	

Standard deviations are presented in parentheses.
*Significant sex differences ($p < 0.05$)
**Significant age differences ($p < 0.001$)

Table 4: Mean and standard deviation of HAZ, WAZ, WHZ scores by age and sex.

Age (years)	*HAZ*		*WAZ*		*WHZ*	
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
2	-1.17 (1.75)	-1.03 (3.11)	-1.77 (1.37)	-2.05 (1.53)	-1.22 (1.29)	-1.68 (0.80)
3	-1.63 (1.73)	-0.93 (1.77)	-2.00 (1.02)	-1.78 (1.12)	-1.39 (0.90)	-1.43 (0.90)
4	-1.19 (1.84)	-1.08 (1.68)	-1.70 (1.04)	-1.68 (0.97)	-1.36 (0.82)	-1.34 (0.81)
5	-0.91 (1.81)	-1.39 (1.62)	-1.77 (0.94)	-1.96 (1.05)	-1.56 (0.76)	-1.37 (1.06)
6	-1.42 (1.77)	-1.82 (1.53)	-1.79 (1.12)	-1.92 (0.94)	-1.21 (1.11)	-1.09 (0.61)
Total	-1.26 (1.78)	-1.25 (1.94)	-1.81 (1.10)	-1.88 (1.12)	-1.35 (0.98)	-1.38 (0.69)

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

Age (years)	*Stunting*			*Underweight*			*Wasting*		
	Boys	*Girls*	*Total*	*Boys*	*Girls*	*Total*	*Boys*	*Girls*	*Total*
2	30.6	16.7	47.2	36.1	27.8	63.9	13.9	13.9	27.8
3	25.0	12.5	37.5	22.5	20.0	42.5	10.0	10.0	20.0
4	31.8	6.8	38.6	31.8	11.4	43.2	9.1	9.1	18.2
5	13.1	11.5	24.6	24.6	19.7	44.3	16.4	11.5	27.9
6	23.7	21.1	44.7	26.3	26.3	52.6	10.5	0.0	10.5
Total	23.7	13.2	37.0	27.9	20.5	48.4	12.3	9.1	21.5

(Pelletier and Frongillo 2003; El-Ghannam 2003; Staton et al. 2004b). 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 low height for age, the result of prolonged food deprivation and/or disease or illness; wasting is an indicator of acute undernutrition, the result of more resent food deprivation or illness; underweight is used as a composite indicator to reflect both acute and chronic undernutrition although it cannot distinguish between them (WHO 1995).

These indices are compared against an international reference population developed from anthropometric data collected in the United States by the NCHS (Hamill et al. 1979; WHO 1983). 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 (WHO 1995). Undernutrition continues to be a cause of ill-health and premature mortality among children in developing countries like India (Nandy et al. 2005). The results of the present study clearly indicated that, based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was high (30-39 %), whereas those of underweight (≥30 %) and wasting (≥15 %) were very high.

Previous studies from Madhyamgram (Bose et al. 2008) and Midnapore Town (Bisai et al. 2008a) have reported higher prevalence of underweight than the present study (Fig. 1). However, a recent study (Bisai et al. 2008b) among Lodha children of Paschim Medinipur has reported a lower prevalence of 34.5%.

Since the nutritional status of the subjects of the present study is not satisfactory, it seems that there is scope for much improvement in dietary intake in the form of supplementary nutrition. Since malnutrition has many causes, only multiple and synergistic interventions embedded in true multisectoral programmes can be effective (Bhargava 2001). It has been stated that implementation is the biggest challenge slowing efforts to reduce childhood morbidity and mortality in developing countries (Staton and Harding 2004a). This important point must be

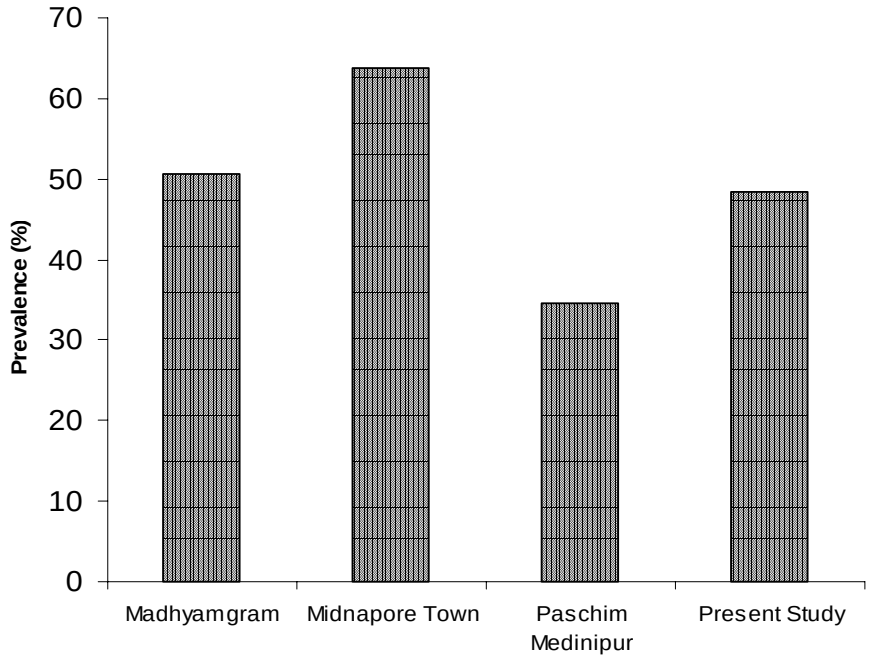

Fig. 1. Overall comparison of the prevalence (%) of undernutrition among preschool children.

borne in mind before the authorities plan effective strategies to reduce the prevalence the undernutrition among children in this population. Moreover, the data presented here can be utilised for comparisons with other datasets, especially among children of developing countries.

CONCLUSION

The present study revealed that preschool Bauri children were experiencing severe nutritional stress. Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was high (30-39 %), whereas those of underweight (≥30 %) and wasting (≥15 %) were very high. To overcome this problem there is an immediate requirement for appropriate steps to be taken to improve nutritional status of this ethnic group in Purulia.

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