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Effect of social factors on nutritional status among rural Bengalee preschool children from Eastern India

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Abstract

Undernutrition among under-5 children is one of the main barriers of national development in rural India. It is seen as deeply rooted in environmental factors such as poverty and poverty related factors. However, there exists scanty information on the social factors which increased risk of undernutrition. The aim of the present study was to report the prevalence of undernutrition. More importantly, it attempted to identify social factors which increased risk of undernutrition among the preschool children. The present cross-sectional study was carried out among 673 preschool children (323 boys and 350 girls) aged 1–5 years in Chapra block in Nadia district, West Bengal, India.

Anthropometric measurements including height and weight were taken using standard techniques. Boys were taller and heavier at all ages than girls. The values of standardized weight-for-age were markedly below mean for reference population and in most of age classes also below -2 standard deviations (SD). The overall (age and sex combined) rates of underweight, stunting and wasting were 54.4 %, 39.2 % and 22.10 % , respectively. Hindu children were less deviated from reference mean than Muslim children, for both features. The mean values of both these variables increased from lower to higher level of parental education.

Our study revealed that religion, caste and parents' educational status were significant risk factors for undernutrition. Enhancement of educational level of the parents should be promoted, more specifically among Muslims and lower caste people, to reduce the prevalence of preschool undernutrition.

Keywords; India; Undernurition; Social factors; Preschool children.

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Introduction

Children under five have special nutritional needs because of their extensive growth and development (Bishnoi et al., 2004). The legacy of malnutrition, especially among preschool children is a major public health problem and a huge obstacle to overall national development (Bishnoi et al., 2004). Undernutrition among pre-school children is an important public health problem in rural India (Dolla et al., 2005) including West Bengal (Mustaphi and Dobe, 2005). However, there is limited information of the growth patterns and prevalence of undernutrition among preschool children in India (Bose et al., 2007).

India has shown nearly 10 % of annual economic growth but rates of child undernutrition remain very high. The NFHS-3 data also shows 48% of children under the age of five, are stunted due to chronic undernutrition (NFHS-3). This figure provides important evidence of the undernutrition problem that must be addressed. It is well established that undernutrition is associated with poor health outcomes among preschool children. It also poses a considerable nutrition problem, the health consequences of which are less understood. Many stunted children will never achieve their full growth potential and will mature in to stunted adolescents and adults (Martorell et al., 1994). However, they mask the variation in proportions of underweight and stunted children that exists from country to country, including different life styles and socio-economic status.

Less is known about social factors which increased risk of underweight and stunting in children. Undernutrition is seen as deeply rooted in environmental factors, such as poverty and poverty related factors (de Onis et al., 1990). These factors are also described as immediate, underlying and basic causes (UNICEF 1990). In any attempt to improve nutritional status it is therefore important to assess the relationship between environmental factors including socio-demographic variables with the risk of undernutrition.

Anthropometric measurement is a practical and immediately applicable technique for assessing children's development patterns during the first five years of life. Anthropometry is useful in assessing not only growth patterns but it also provides useful insights into the nutrition and health situation of the entire population. Anthropometric indicators are less accurate than clinical and biochemical techniques when it comes to assessing individual nutritional status. In field situations, where resources are severely limited, however, anthropometry can be used as an inexpensive, easy to perform and non-invasive (Blössner et

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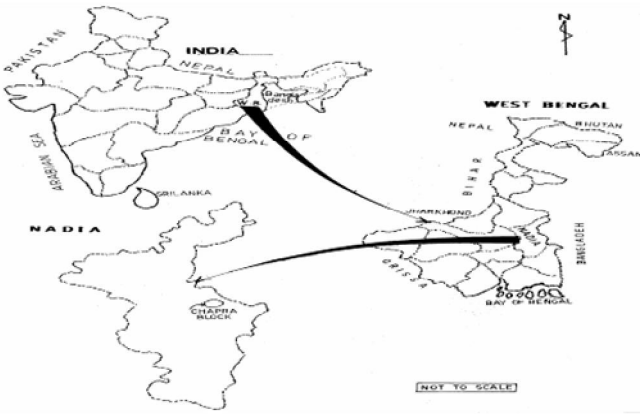
al., 2006) tool to identify individuals at risk of undernutrition, followed by a more elaborate investigation using other techniques. Similarly, growth monitoring permits the detection of individuals with faltering growth, who can then be appropriately referred to specialized care. Changes in trends over time with respect to the nutritional situation can be evaluated in countries where national food and nutrition surveillance systems have been developed, or where nationally representative cross-sectional surveys have been conducted some years apart using identical, or nearly identical, methodologies.

The aim of the present study was to report the prevalence of undernutrition among 1-5 year old ICDS children of Bengalee ethnicity from Chapra block, Nadia District, West Bengal, India. More importantly, it attempted to identify social factors which increase risk of undernutrition among these children.

Material and Methods

This cross sectional study was undertaken between June 2009 to August, 2009, at Chapra Block, Nadia District, West Bengal, India. The study area is situated (Coordinate: 23º31´ N to 23º52´ N and 88º35´ E to 88º 58´ E) at the India–Bangladesh international border (Fig1), 140 km from Kolkata, the provincial capital of West Bengal**.** The area is remote and mostly inhabited by Bengalee Muslims. All preschool children (1–5 years old) living in Chapra Block are enrolled at these centers.

Figure 1. The study area



Thirty (30) centres were randomly selected out of 335 centers of the Chapra Block, Nadia District. A total of 689 children (330 boys and 359) aged 1–5 years were measured, out of whom 16 individuals (7 boys and 9 girls) were excluded because of missing data. The

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final sample size was 673 children (323 boys and 350 girls). Formal ethical approval was obtained from Vidyasagar University and ICDS authorities prior to the commencement of the study.

Ages of the children were ascertained from the ***Anganwadi*** registers and subsequently confirmed by parents of the children. For analyses, age was grouped in to one year intervals. Social information was obtained by questionnaire distributed and completed by the parents. The following social factors were included in the analysis: religion (Hindu, Muslims), caste (General, Schedule Caste, Other Backward Caste), father's and mother's education level (without formal schooling, primary, secondary).

Height and weight were measured by one researcher (SB) on each subject following the standard techniques (Lohman et al., 1988). Technical errors of measurements (TEM) were found to be within reference values (Ulijaszek & Kerr. 1999) 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. The United States National Centre for Health Statistics (NCHS) (Hamill et al., 1979; WHO, 1983) age and sex specific – 2 z-scores were followed to define stunting, underweight and wasting, 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 was followed for assessing severity of undernutrition.

The WHO (1995) classification for assessing severity of undernutrition.

Undernutrition 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

For anthropometric data, a software package based on National Center for Health Statistics (NCHS) database as provided with Epi Info-16 software was used. The distribution of height and weight were not significantly skewed therefore not necessitating their normalization (for all d values of Kolmogorow-Smirnow test, $p > 0.05$). Between sexes differences in means of height and weight were tested by student's t-test. Oneway ANOVA

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(Scheffe's Procedure) analyses was undertaken to test for age differences in mean height in each sex. Two-way analysis of variance was used in order to assess the sex and age differences. All analyzed features and three standardized indices were dependent variables and age groups, religion, caste and parents education were independent factors. Statistica 7.1 was used for all statistical analysis (StafSoft 2005).

Results

Table 1 presents the means, sample size and standard deviations of anthropometric variables and derived variables for each age group in boys and girls, respectively. Generally, boys are taller and heavier at all ages than girls. Height and weight showed gradual increase with age in both sexes. Significant sex differences were observed in height and weight among all ages except 1 and 5 years of age.

Table 1. Mean height (cm) and Weight (kg) of the subjects.

	Height (cm)					Weight (kg)				
Age (yrs)	Boys		Girls		t values	Boys		Girls		t values
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
1	76.31 (72)	4.15	75.59 (74)	6.19	0.82	8.78 (72)	1.18	8.64 (74)	1.55	0.62
2	85.31 (14)	4.18	83.72 (68)	4.09	2.28*	10.68 (74)	1.39	10.18 (68)	1.19	2.30*
3	92.78 (84)	5.26	90.79 (94)	4.72	2.66*	12.41 (84)	1.59	11.53 (94)	1.49	3.81*
4	98.86 (72)	4.40	97.52 (77)	3.60	2.03*	13.96 (72)	1.65	12.88 (77)	1.35	4.40**
5	101.20 (21)	5.68	102.19 (37)	3.80	-0.80	14.01 (21)	1.69	13.93 (37)	1.28	0.20

Numbers are presented in parentheses., * p < 0.05 ** p < 0.01.

Table 2.1 to 2.3 presents means and standard deviations of standardized weight-for-age (table 2.1), height-for-age (table 2.2) and weight-for-height (table 2.3) by age in boys and girls. The values of standardized weight-for-age were markedly below mean for reference population and in most of age classes, also below -2 SDS. In boys, the mean value significantly changed with age with the lowest value at age 5. In girls, the mean value was stable and the lowest value was at age 3 years. For height-for –age the mean values by age were markedly below average for reference, both in boys and girls. The mean significantly

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changed with age in boys, reaching the lowest value at age 5. In girls, there were no significant changes with age. For weight-for-height the mean values were below average in all age classes in boys and girls. The mean significantly changed with age in boys, reaching the lowest value at age 1 year. In girls, there were no significant changes with age.

Table 2. Standardized weight-for-age (2.1), height-for-age (2.2), and weight-for-height (2.3) of boys and girls in age classes.

Table 2.1

	Boys			**Girls**		
Age	N	Mean	SD	N	Mean	SD
1	72	-2.33	0.93	74	-1.81	1.26
2	74	-2.04	1.01	68	-2.05	0.82
3	84	-1.87	0.87	94	-2.16	0.92
4	72	-1.82	0.76	77	-2.14	0.77
5	21	-2.44	0.75	37	-2.12	0.62
	F = 4.82 p<0.001			F = 1.85 p>0.05		

Table 2.2

	Boys			**Girls**		
Age	N	Mean	SD	N	Mean	SD
1	72	-2.09	1.12	74	-1.57	1.63
2	74	-1.39	1.19	68	-1.49	0.94
3	84	-1.57	1.27	94	-1.69	1.18
4	72	-1.67	0.87	77	-1.71	0.87
5	21	-2.32	1.20	37	-1.79	0.77
	F = 5.36 p<0.001			F = 0.63 p>0.05		

Table 2.3

	Boys			**Girls**		
Age	N	Mean	SD	N	Mean	SD
1	72	-1.58	0.87	74	-1.17	1.19
2	74	-1.39	0.97	68	-1.31	0.77
3	84	-1.28	0.74	94	-1.40	0.84
4	72	-1.14	0.78	77	-1.47	0.76
5	21	-1.51	0.60	37	-1.46	0.70
	F = 2.95 p<0.05			F = 1.35 p>0.05		

The overall (age and sex combined) rates ***(table 3)*** of underweight, stunting and wasting were 54.4 %, 39.2 % and 22.10 % respectively. Similar rates of underweight (Boys = 54.5%, Girls = 54.3%) and wasting (Boys = 21.98 %, 22.29 %) were found in both sexes. The rate of stunting (age combined) was higher among boys (43.4%) compared with girls (35.4 %). Boys aged 5 years had higher prevalence rate of underweight (76.2 %) compared to girls

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(45.9 %) at 1 year age. Similarly, boys aged 5 years had higher prevalence rate of stunting (61.9 %) compared to girls (28.9 %) at 4 years age. More or less similar rates of wasting (sex combined) were found in all ages except at age of 3 years. Higher rates of wasting were observed at the age of 1 year among boys and at the age of 4 years among girls. Based on World Health Organization (WHO, 1995) classification of severity of malnutrition, the overall prevalence of underweight, stunting and wasting were very high (≥ 30 %), high (30 – 39 %), and very high ((≥ 15 %) respectively.

Table 3. Prevalence of underweight, stunting and wasting by age classes in boys and girls.

Age (years)	N	Underweight			Stunting			Wasting		
		Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)
1	n1=72, n2=74	51 (70.83)	34 (45.95)	85 (58.22)	41 (56.90)	35 (47.30)	76 (52.05)	23 (31.94)	13 (17.57)	36 (24.66)
2	n1=74, n2=68	42 (56.76)	36 (52.94)	78 (54.93)	24 (32.43)	21 (30.88)	45 (31.69)	19 (25.68)	13 (19.12)	32 (22.54)
3	n1=84, n2=94	36 (42.86)	55 (58.51)	91 (51.12)	33 (39.29)	31 (32.98)	64 (35.96)	11 (13.10)	23 (24.47)	34 (19.10)
4	n1=72, n2=77	31 (43.06)	46 (59.74)	77 (51.68)	29 (40.28)	23 (29.87)	52 (34.90)	14 (19.44)	20 (25.97)	34 (22.82)
5	N1=21, N2=37	16 (76.19)	19 (51.35)	35 (60.34)	13 (61.90)	14 (37.84)	27 (46.55)	4 (19.05)	9 (24.32)	13 (22.41)
	Total	**176 (54.49)**	**190 (54.29)**	**366 (54.40)**	**140 (43.34)**	**124 (35.43)**	**264 (39.20)**	**71 (21.98)**	**78 (22.29)**	**149 (22.10)**

n1=Boys, n1=Girls, Percentages are presented in parentheses

Table 4 presents the results of two-way analysis of variance. All the social factors had significant effect on weight-for-age and height-for-age. Children brought up in Hindu families deviated less from reference mean than children from Muslim families, for both features. The mean values for both variables increased significantly from lower to higher level of parental education.

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Table 4. Results of two-way analysis of variance assessing effects of social factors on standardized weight-for-age, height-for-age and weight-for-height in pooled boys and girls.

	Weight-for-age		Height-for-age		Weight-for-height	
	F	**p**	**F**	**p**	**F**	**p**
Religion	8.88	0.0030	26.90	0.0000	0.04	0.8375
Age	0.30	0.8762	3.83	0.0044	0.26	0.9040
Interaction	0.83	0.5086	2.12	0.0773	1.23	0.2967
Caste	3.04	0.0480	6.76	0.0012	0.86	0.4230
Age	0.58	0.6804	2.23	0.0648	0.22	0.9295
Interaction	1.46	0.1702	1.42	0.1853	1.44	0.1772
Father's education	3.92	0.0203	5.01	0.0069	2.77	0.0636
Age	0.97	0.4228	3.23	0.0122	0.64	0.6337
Interaction	1.53	0.1439	0.32	0.9599	1.83	0.0686
Mother's education	3.25	0.0395	7.00	0.0009	0.65	0.5182
Age	1.04	0.3882	2.99	0.0185	0.64	0.6345
Interaction	1.07	0.3825	0.78	0.6249	1.27	0.2580

Discussion

In India, more than a third of all deaths in children aged five years or younger is attributable to undernutrition (NFHS-3. 2006). Undernourished boys and girls do not perform as well in school as compared to their well-nourished peers, and as adults they are less productive and earn lower wages. Widespread child undernutrition greatly impedes India's socio-economic development and potential to reduce poverty. A recent study estimated that about 53% of all deaths in young children are attributable to being underweight (Caulflied et al., 2004). Although the majority of underweight children live in developing countries, mainly in Asia and Africa, it has been seen to be increasing in Africa and decreasing in Asia (Ramalingaswami et al., 1997).

The rates of underweight and wasting were higher except stunting than that reported from India (47 %, 46% and 16 %) respectively, by UNICEF (UNICEF, 2006). Results on underweight and wasting indicated that, among these children, there existed high level of chronic under nutrition due to prolonged food deprivation. Some studies showed higher prevalence of underweight and wasting than present study (Mandal et al. 2008; Singh et al. 2006). On the other hand, some studies have showed that the prevalence of underweight were lower than the present study (Alasfoor. 2007 ; el-Sayed 2001) while Bloss et al. (2004) showed that the prevalence of stunting was higher than the present study but prevalence of

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underweight and wasting were lower than present study. The present study also showed that boys and girls were equally affected nutritionally, as previously reported by Bharati et al. 2008.

Our study also revealed that social factors (religion, caste and parents' educational status) had significant effect of weight-for-age and height-for-age. Children brought up in Hindu families deviated less from reference mean than children from Muslim families, for both features. Shifting from lower to higher level of parental education, the mean value increased for both features. Similarly, children from lower caste (SC and OBC) group (in social hierarchy) deviated more from reference mean than children from general caste group. Muslim religion, lower social status and low parents' educational status were significant risk factors for undernutrition. It has been reported earlier that higher socio-economic status were correlated with better growth, as was a high consumption of imported and local high quality foods such as cereals, legumes (Mueller et al., 2001). A recent study from India (Bharati et al., 2008) had also reported that low level of mother education was a significant risk factor for undernutrition. Socio-economic and behavioural factors, are more influential in determining childhood nutritional status(Rajaram et al., 2007; Rao et al., 2006) and also Socio-economic environment is responsible for poor nutritional status of lower caste pre-school children (Kumari 2005). Moreover low parents' educational status was a strong risk factor of child undernutrition among children in Indonesia and Bangladesh (Semba et al., 2008, Rahman et al., 2009). Our study also reports similar findings among the children. Education is often associated with higher socio-economic status and high socioeconomic condition was associated with low prevalence of undernutrition (Nawal et al. 2001, Rahman and Chowdhury 2007). A recent study has also demonstrated that religion and caste were strong predictors of undernutrition (Mandal and Sen 2010).

Moreover, parents' educations (both FES and MES), religion and caste were strongly associated with underweight among the subject. Lower parents' education indicates lesser awareness among parents to meeting nutritional requirements of their child. Similarly, Muslim as well as lower caste (SC, OBC) parents had lesser awareness about nutritional requirements of their child.

It is clear that the nutritional status of the subjects of our study was 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.

Additional governmental funding is mandatory and requires political and administrative willingness to reduce the rates of undernutrition. Unless and until such proactive measures are taken, it is unlikely, that in future, there would an appreciable decline in these rates. Therefore, we suggest that similar studies should be undertaken among children of other populations of West Bengal as well as other parts of India and that rural children should be given priority. Moreover overall development, enhancement of level of education and low gender inequality are the key factors for improvement in the health status of Indian children.

The findings of our study have important implications for public health policy-makers, planners and organizations seeking to meet national and international developmental targets. Of paramount importance is not only to increase the amount of food supplementation given to children but also promote of educational level of the parents, more specifically among Muslims and lower caste people.

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