

Original Research Article

Correlates of childhood undernutrition: a cross-sectional study from an underserved area of eastern part of India

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ABSTRACT

Background: Undernutrition, comprising of underweight, wasting and stunting are pose significant public health problem globally with highest prevalence in India among Southern Asian region of UNICEF. Nearly 1/3rd of slum dweller children have been found to have one or multiple forms of growth failures in eastern part of India.

Methods: A community-based cross-sectional study was conducted among children <10 years in a tribal village by house-to-house surveying for 2 months with questionnaire containing socio-demographic information, history on illness, nutrition, immunization, anthropometric measurements with expressing any failure in Composite Index of Anthropometric Failure (CIAF). Following the survey health check-up camps were organized and nutritional supplementation is being given to children.

Results: Out of total 43 children, 90.7% were found to have single or multiple forms of anthropometric failures. In binary logistic regression, parental education to illiterate or just literate, deprivation of child from exclusive breastfeeding, non-maintenance of minimum dietary diversity, frequent illness and reduction of feed during illness were found to have significant association with anthropometric failure. On clinical examination in health camps, children were detected to have various respiratory, gastrointestinal, dermatological diseases.

Conclusions: In agency of local health care providers, initiatives are needed targeting this underserved population to bring them under government-led schemes to combat childhood undernutrition.

Keywords: Anthropometric failure, Immunization, Undernutrition, Underserved population

INTRODUCTION

Under the goal 2 of Sustainable Development Goals (SDG), target 2.2 states to “end all forms of malnutrition by 2030”.^{1,2} In malnutrition, undernutrition consists of underweight, wasting and stunting. According to WHO growth references, underweight is considered when an individual has body weight less than -2SD, wasting is weight for height (or length) less than -2SD and stunting is height for age less than -2SD than the standard.^{2,3}

Globally estimated 42.8 million and 150.2 million children are suffering from wasting and stunting respectively as recorded by UNICEF/WHO/World Bank in 2024.^{4,5} Southern Asian region of UNICEF, where India also falls has the highest prevalence of wasting (14.1%) and stunting (32.3%).⁶ Undernutrition poses various acute and chronic effects on individual, families and as a whole the entire community and nation by frequent morbidities, high mortality, and in turn adversely affecting socio-economic growth and development.

To combat undernutrition since 1961 India is running with various initiatives to provide supplementary nutrition to vulnerable groups. But various forms of undernutrition is still prevalent nationwide which has been reflected by National Family Health Survey 5 (NFHS-5) as 27.3%, 18.5% and 30.1% underweight, wasted and stunted under five age group children.^{7,8} A Comprehensive National Nutritional Survey (CNNS) 2019 also reported 24% and 26.4% underweight and stunted adolescents.^{8,9} A study found prevalence of stunting, wasting, and underweight was 24.1%, 15.4%, and 22.3%, respectively from urban slums of West Bengal.¹⁰ A study in Kolkata slums also revealed 44.5%, 16.5% and 56.7% underweight, wasting and stunting respectively.¹¹

WHO has set global nutrition targets of 40% reduction of stunting and wasting to less than 5% by 2025.¹² But it is still far away from achievement as evidenced by reports of death of children from various parts of even metropolitan cities. This study was conducted to find out prevalence and correlates of undernutrition among slum dwellers of an urban area of West Bengal.

METHODS

Study type and study design

This was a community-based cross-sectional study.

Study setting and study duration

The study was conducted in a hamlet settlement ('para'), which is part of a village of north 24 Parganas district of West Bengal. The village is situated in a suburban locality. According to local people the inhabitation by these tribal migrant people was started few decades back when the then government allowed them to develop dwellings in these fallow lands. The settlement constitutes 65 households and 270 residents who are outside the government records. The study was conducted as survey for 2 months (January to February 2026), followed by health check-up camps at end of February and 1st week of March, 2026 and supplementary nutrition which is being provided as a continued activity.

Study population

For the survey: all the households with at least one child <10 years of age.

For the health camp: all children attending for health check up.

Exclusion criteria

Households where no responsible adult respondent were present.

Sample size

From a study in the state of current study, prevalence of any form of composite index of anthropometric failure was found as 68.9%¹¹, L (error)=15% and at 95% C.I., $Z_{(1-\alpha/2)}^2=(1.96)^2$. So, minimum sample size was calculated as 37, assuming 10% of non-response rate, sample size was 41. However, the sample size attained was 43.

Study tools and study variables

The data collection proforma containing as follows: a) Housing environment-type of house (pucca/katcha/mixed), number of persons living in a single room, source of water, purification of water done at household level (and if yes, type of filter), type of latrine, method of garbage disposal, possession of livestock and their illness, if any (in last 3 months), breeding places of flies and mosquitoes in surrounding, b) Education and occupation of parents, socio-economic status of family following updated B.G. Prasad scale 2025,^{13,14} c) Family health and illness history-any illness following illness of livestock, any water or food borne illness (in previous 1 month).

History and anthropometric measurements of the child includes a) Age (in months), sex, birth weight (as per MCP card or recalled by caregivers), duration of exclusive breast feeding, any current illness (within last 15 days), b) Maternal information-mother's age, age of the mother at first pregnancy, number of children, c) Dietary diversity of the child-following Infant and Young Child Feeding (IYCF-2007) Practices, food intake consisting of ≥ 4 food groups out of seven in previous 24 hours, d) Immunization history upto 24 months of age.

Weight of baby with weighing machine in grams and height in measuring tape in cm. were measured by standard procedures.

Composite Index of Anthropometric Failure (CIAF) has been used. This was developed by Professor Peter Svedberg and Shailen Nandy. CIAF groups anthropometric failure of children in 7 categories as, A=no failure, B=wasting only, C=wasting and underweight, D=wasting, stunting and underweight, E=stunting and underweight, F=stunting only and Y=underweight only.¹⁵

Methods of data collection

A non-government organization (NGO) working in the village and vicinity was informed about unexplained death of few children in that particular habitation in last few months. As they are not in any governmental records, the entire settlement area is profoundly underprivileged. On obtaining Ethical clearance from one of the researchers affiliated Institution, the NGO started survey by house-to-house visits by their trained health workers.

Interviews were taken of adult responsible family member, for children, mothers or immediate caregivers were interviewed and all children of the family aged less than 10 years were thoroughly assessed for recent and/or ongoing illnesses and examined for signs of malnutrition and anthropometric failure. In health camps medical officers examined all children by history taking, clinical examination and treatment was done accordingly. Data were double checked and entered in SPSS v.22.0 (IBM, New York) and used for descriptive like, mean, SD and inferential as binary logistic regression analysis.

RESULTS

Out of total number of participants in survey, more than 50% were found to live in mixed type of houses having concrete walls with tiles, asbestos, tin or hatched roof with rampant problem of overcrowding (81.4%). More than 2/3rd of households use municipality tap water for domestic purpose and water purification is minimal (9.3%) even for drinking water. Majority people use community latrine, maintenance of those at least by regular cleaning is minimal and proper garbage disposal facility is very less (Table 1).

Table 1: Environmental characteristics of the families of study participants (n=43).

Variables	Categories	No. (%)
Type of house	Katcha	15 (34.9)
	Pucca	5 (11.6)
	Mixed	23 (53.5)
Number of persons living in single room	≤2	8 (18.6)
	>2	35 (81.4)
Source of water	Borewell	15 (34.9)
	Mineral water	2 (4.6)
	Municipality tap	26 (60.5)
Water purification at HH level	Yes	4 (9.3)
	No	39 (90.7)
Type of latrine	Own separate	12 (27.9)
	Community latrine	31 (72.1)
Method of garbage disposal	Municipality vats	14 (32.6)
	Throw indiscriminately	29 (67.4)
Possession of any livestock	Yes	24 (55.8)
	No	19 (44.2)

Mean age of children was 7±2.06 years, 31 (72.1%) were male and 12 (27.9%) females. Regarding educational status, 81.4% fathers and 74.4% mothers were educated up to primary level. Occupation of fathers was mostly as labor in garments factory, shoe factory, bidi maker, construction workers etc. and mothers were found mostly housemaids, helpers in construction works and homemakers. Among the participants, 67.5% belonged to lower and 32.5% to lower middle income families (Table 2).

Table 2: Socio-demographic characteristics of the participants (n=43).

Variables	Categories	No. (%)
Father's education	Illiterate/just literate	6 (13.9)
	Primary	35 (81.4)
	Secondary and above	2 (4.7)
Mother's education	Illiterate/just literate	11 (25.6)
	Primary	32 (74.4)
Father's occupation	Unemployed	1 (2.3)
	Labor	29 (67.5)
	Service/business	13 (30.2)
Mother's occupation	Homemaker	34 (79.1)
	Labor	7 (16.3)
	Service/business	2 (4.6)
Socio-economic status (acc. to B.G. Prasad scale 2025)	Lower middle	14 (32.5)
	Lower	29 (67.5)
Any illness from livestock in last 1 month	Yes	4 (9.3)
	No	39 (90.7)
Any water or food borne illness in last 1 month	Yes	15 (34.9)
	No	28 (65.1)
Immunization status of the child	Up-to-date	8 (18.6)
	Incomplete	35 (81.4)

Regarding exclusive breastfeeding 76.7% of children got deprived of it and out of those 23.3% who were responded to breastfed exclusively, on in-depth questioning predominant breastfeeding was revealed in reality. Minimum dietary diversity was absent in 86.1% and for 79.1% mothers or caregivers of children told that during illness food is given in reduced amount and frequency. Out of the total 43 children, only 9.3% were found to have no failure whereas 11.7% had triple and 20.9% and 23.3% were found to have multiple failures and 34.9% had at least one form of anthropometric failure (Table 3).

Pearson chi square test was done to find out associated factors of anthropometric failure. Binary logistic regression was done with factors found significant at 20% level. Statistically significant findings were found in cases of father's education at illiterate or just literate (AOR 1.54, C.I. 1.04-4.37), mother's education up to illiterate or just literate (AOR 1.98, C.I. 1.33-11.46), no practice of exclusive breastfeeding for 6 months (AOR 1.07, C.I. 0.92-9.45), not maintaining minimum dietary diversity (AOR 2.97, C.I. 1.69-14.49), frequent diarrhea or respiratory illness (AOR 1.56, C.I. 1.28-8.44) and reduction of feeding during the times of illness (AOR 2.01, C.I. 1.22-10.76). Lower-middle socio-economic status in comparison to lower was found not to have significant association (Table 4).

In health camp on clinical examination children were found to have various disease conditions like, upper respiratory tract infections, allergic rhinitis, gastroenteritis, painless bleeding per rectum, anaemia,

extra-pulmonary tuberculosis, worm infestation, eczema etc. Few children were detected to live in contact with TB patients, some were found as detected cases of congenital heart disease.

Table 3: Feeding history and composite index of anthropometric failure (CIAF) among study participants (n=43).

Variables	Categories	No. (%)
Exclusive breastfeeding	Done for 6 months	10 (23.3)
	Done for <6 months	25 (58.1)
	Not done	8 (18.6)
Minimum dietary diversity	Maintained	6 (13.9)
	Not maintained	37 (86.1)
Feeding during illness	Reduced	34 (79.1)
	Not reduced	9 (20.9)
Composite index of anthropometric failure (CIAF)	No failure	4 (9.3)
	Wasting only	3 (6.9)
	Wasting and underweight	9 (20.9)
	Wasting, stunting and underweight	5 (11.7)
	Stunting and underweight	10 (23.3)
	Stunting only	7 (16.2)
	Underweight only	5 (11.7)

Table 4: Binary logistic regression showing relation between Composite index of anthropometric failure (CIAF) and correlates [no failure as baseline].

Variables	Categories	P value	AOR	95% C.I.	
				Lower	Upper
Father's education	Illiterate/just literate (n=6)	0.04	1.54	1.04	4.37
	Primary and above (n=37)		1.00	-	-
Mother's education	Illiterate/just literate (n=11)	0.003	1.98	1.33	11.46
	Primary (n=32)		1.00	-	-
Socio-economic status	Lower (n=29)	0.06	1.02	0.08	4.37
	Lower middle (n=14)		1.00	-	-
Exclusive breastfeeding	Not done (n=33)	0.001	1.07	0.92	9.23
	Done (n=10)		1.00	-	-
Minimum dietary diversity	Not maintained (n=37)	0.02	2.97	1.69	14.49
	Maintained (n=6)		1.00	-	-
Frequent illness	Present (n=27)	0.08	1.56	1.28	8.44
	Absent (n=16)		1.00	--	-
Feeding during illness	Reduced (n=34)	0.03	2.01	1.22	10.76
	Not reduced (n=9)		1.00	-	-

DISCUSSION

The area under survey is about 1 hour of driving distance from Kolkata metropolitan city. It is worth mentioning because “darkness lies at the foot of the lighthouse” has been proved by finding of more than 90% of children in the area in proximity to the metropolitan city were found to have single or multiple anthropometric failure and this can be considered as a proxy indicator of poverty, socio-economic deprivation and nutrient inadequacy.

Regarding the socio-demographics, type of houses of the participants and presence of overcrowding in current study were similar to the study by Jallel et al which might

be because of similarity in study settings.⁴ On practice of usage of safe and potable drinking water there is resemblance to study by Pal et al but a study from Somalia by Abdi et al, Ayele et al from Ethiopia who have improved sources of water, piped water or protected well and water treatment facilities are present.^{10,3,6} Non availability of sanitary latrine in household premises of the current study has not much supportive similarity to studies by Ayele et al and Pal et al.^{6,10} These environmental factors remain much responsible for frequent illness of children which cause nutritional failure and these children eventually become more prone towards falling sick frequently and thereby frequent illness and nutritional deficiency develop a vicious cycle.

Educational status indicates knowledge and awareness and occupation decides affordability of health and non-health stuffs. These two factors for parents greatly determine growth, development and overall well-being of children. Related studies all over the globe are in corroboration in regard to educational status and occupation of parents. The feeding pattern since birth, in infancy and childhood of the current study was found much poor than studies by Jana et al, Chawla et al, Abdi et al and similar to study by Roychoudhury et al from Kolkata slums.^{11,16,3,17} Absence of dietary diversity in the present study has similarity to study by Mitra et al from an underserved district of West Bengal where household food insecurity is rampant.² Anthropometric failure among current study participants was comparable to studies by Jana et al, Pal et al and Mitra et al.^{11,10,2} This further indicates inaccessibility of ongoing nutrition health programs for pauperized population in many places around.

In accordance to current study findings, parental education, SES, feeding pattern and frequent illness as significant contributors of anthropometric failure was found in studies by Abdi et al from Somalia, Ayele et al from Ethiopia, Jaleel et al and Jana et al from India, Gangurde et al from Maharashtra, Chawla et al from Haryana and Pal et al from India.^{3,6,4,11,18,16,10}

This study has few strengths and limitations. The most colossal thing about the study was it was conducted in a gross disadvantaged area yet in propinquity of a developed metropolitan city. House-to-house visit presented with witnessing dismal living condition and impoverished from any social security benefit. Recall and reporting biases especially on feeding practice in infancy, illness, income of family were there. Sample size was small but this was the advantage for the working group who has already started providing supportive services in the area despite their resource-restraint.

CONCLUSION

The study found more than 90% children less than 10 years of age in the setting to have any form of growth failure and among them 55.8% had multiple failures. This alarming public health concern has multi-pronged correlates as demographic, environmental, infant and young child feeding practices besides education and occupation of parents, socio-economic status of family. There are existing government programs to provide supplementary nutrition to these vulnerable groups but this particular setting is deprived of those services. Local healthcare providers and community stakeholders should identify the obstacles and arrange for nutrition and health education, availability of nutrition supplementation services, promotion of income-generating activities through health-sensitive planning inclusive of all forms of services like NGOs as that working in this setting would reduce undernutrition and promote well-being of this type of impoverished population.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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