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Original Research Article

Assessment of under nutrition with composite index of anthropometric failure (CIAF) among under-five children in a rural area of West Bengal, India

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ABSTRACT

Background: Malnutrition among under-five children is an important public health problem in developing countries, and a major cause of morbidity and mortality in India, hence the present study was conducted to find out the nutritional status of under-five children and to elicit the factors associated with it.
Methods: This community based cross-sectional study was conducted among 142 under-five children during May to June 2017 in the areas under the jurisdiction of Nasibpur Primary Health Centre, Singur, West Bengal, India. Data on socio-demographic characteristics, feeding habits and other biological factors were obtained from structured questionnaire, followed by anthropometric measurement. Assessment of nutritional status of the children was done with the help of Composite Index of Anthropometric Failure (CIAF). Descriptive statistics and logistic regression were performed to analyse the data by using SPSS version 16.0.
Results: The mean (standard deviation) age of the sample was 28.4 (±15.2) months. About 36.1% children were found to have anthropometric failure using CIAF (wasting only 2.1%, wasting and underweight 14.5%, wasting, stunting and underweight 5.5%, stunting and underweight 6.3%, stunting only 4.9%, underweight only 2.8%). Education of mother [AOR = 3.6 (1.2–10.8)], birth order [AOR = 3.7 (1.4-9.9)], and exclusive breast feeding practice [AOR = 7.3 (2.9–18.1)] remained the significant correlates when adjusted with other variables in the multivariable analysis.
Conclusions: The high prevalence of malnutrition in the community requires multipronged approach regarding nutritional education, intensive information education and communication (IEC) activities for exclusive breast feeding through antenatal clinics and adoption of family planning methods.

Keywords: Composite index of anthropometric failure (CIAF), Nutritional status, Under-five children

INTRODUCTION

Under-five children constitute the most vulnerable segment of any community. Their nutritional status is a sensitive indicator of community health and nutrition. Any major deviation in the nutrient intake, either in quality or in quantity from its requirement can affect growth in many ways.[1] Malnutrition among under-five children is an important public health problem in developing countries, and a major cause of morbidity and mortality in India.[2] Scarcity of suitable food, lack of purchasing power of the family, poor personal hygiene, inadequate knowledge regarding what the baby should

eat, causes insufficient balance diet, resulting in malnutrition.[3]

Globally 5.6 million under-five children died in 2016, nearly 15000 every day, the underlying contributing factor is malnutrition which make children more vulnerable to severe diseases.[4] Presently under-five mortality in India is 29/1000 live birth and in West Bengal it is 26/1000 live births.[5] Under-nutrition is associated with 45% of child deaths.

The proposed Sustainable Development Goals (SDG 3.2) for all countries aims at reducing under-five mortality to at least as 25 per 1000 live births in every country by 2030.Currently, 79 countries have under-five mortality rate above 25. 30% of the World's malnourished children live in India. The target is end malnutrition by 2030.[6]

Globally 16% children are under-weight, 22.9% are stunted and 10.2% are wasted.[7] In India 35.7% are underweight, 38.4% are stunted and 28.5% are wasted.[7] In West Bengal 33.6% are under weight, 34% are stunted and 28.3% are wasted.[8] Lack of food is not the sole cause of malnutrition; there are many socio-demographic factors that seem to be important contributory factors in determining the nutritional status of children. Composite Index of Anthropometric Failure (CIAF) was first proposed by development economist Peter Svedberg in 2000, according to him children with wasting, stunting or underweight are all undernourished and in a state of anthropometric failure.[9]

Later Nandy et al modify the model by adding another subgroup Y.[10] Under-nutrition is substantially higher in rural areas than in urban areas, hence the present study was undertaken in rural area with the aim to find out the nutritional status of under-five children using the CIAF and WHO Z-score system to elicit the associated factors affecting their nutritional status.

METHODS

This was a cross-sectional, community based descriptive study on under-5 children (study population) conducted from May 2017 to June 2017 in the areas under the jurisdiction of Nasibpur Primary Health Centre, Singur, West Bengal, India, the rural field practice area of All India Institute of Hygiene and Public Health, Kolkata.

Ethical clearance was obtained from the Institutional Ethics Committee. Field visit was done at Dearah village (Muslimpara, Nandygram, Palpara and Gobindapur) and 144 mothers was interviewed, and their children was examined.

Inclusion criteria

All under-five children accompanied by mothers and are living in the same area for past 6 months or more.

Exclusion criteria

Children of unwilling mothers and whose mother were absent during data collection were excluded.

Sampling design

Sample size was calculated by using formula at 95% confidence level, N= (Z1-α/2)2 PQ /L2, considering prevalence of malnutrition in West Bengal as 34% (NFHS 4 data) and allowable absolute error (precision) of 10%, the minimum required sample size was 87. Nasibpur Primary Health Centre is one of the 2 primary health centres which cater to beneficiaries of 12 villages. Dearah village was selected randomly for this study out of the 12 villages. Line listing of all under-five children in Dearah village was done and 152 such children were identified. 8 children were excluded according to the exclusion criteria. So, the final sample size became 144 under-five children.

Study variables

Depended variable was Composite Index of Anthropometric Failure (CIAF). According to CIAF classification children can be divided into following seven groups:

- Group A: No failure
- Group B: Wasting only
- Group C: Wasting and underweight
- Group D: Wasting, stunting, and underweight
- Group E: Stunting and underweight
- Group F: Stunting only
- Group Y: Underweight only

Independent variables were socio-demographic factor (complete age of the child in months, gender of the child, religion, type of family the child belongs to, education of the mother, and monthly income of the family). Biological factors (type of delivery, birth order of the child, birth weight of the child). Hand washing practice with soap and water before handling baby and food and exclusive breast feeding practice among mothers were another important independent variables.

Operational definition

Underweight

Underweight is defined as Weight for Age Z-score (WAZ) of <-2. Severe underweight is considered if WAZ is < -3 of the WHO (2006) reference standards.[11]

Wasting

Wasting (acute malnutrition) is defined as a Weight for Height Z-score (WHZ) of <-2. Severe wasting is considered if WHZ is <-3 of the WHO (2006) reference standards.[11]

Stunting

Stunting (chronic malnutrition) is defined as a Height for Age Z-score (HAZ) of < -2. Severe stunting is considered if HAZ is < -3 of the WHO (2006) reference standards.[11]

Mid upper arm circumference (MUAC)

The cut-off points for MUAC of 13.5 cm was used for identifying children with under-nutrition, a MUAC of between 13.5 and 12.5 cm denoted moderate under-nutrition, and less than 12.5 cm denoted severe under-nutrition.[11]

Exclusive breastfeeding

"Exclusive breastfeeding" is defined as no other food or drink, not even water, except breast milk (including milk expressed or from a wet nurse) for 6 months of life, but allows the infant to receive ORS, drops and syrups (vitamins, minerals and medicines).[12]

Hand washing

Hand washing is the act of cleaning the hands with the use of clean, running water (warm or cold) together with soap, for the purpose of removing soil, dirt, and/or microorganisms for 20 second.[13]

Tools and techniques

The interview was conducted with a pre-designed and pre-tested schedule after obtaining informed written consent from willing mothers of the under-five children. The schedule was designed keeping in mind the objectives of the study. To ascertain reliability, objectivity, simplicity and to remove any ambiguity, necessary modifications were done by a group of experts of the institute where necessary corrections were made to enhance the face validity and content validity. Pretesting of the schedule was done by administering the questions to a small number of representative sample. Necessary modifications were made following their response. The schedule was then translated to Bengali. Also, utmost care was taken to make the language as simple as possible so that the respondents, even if illiterate, could understand the questions easily. Relevant data on the factors related to under-nutrition were obtained with the help of the schedule and review of health records. For assessing nutritional status, clinical examination and anthropometric measurements were carried out following standard operating procedures. The data included were weight, recumbent length (if the child is not able to stand without support), standing height and mid upper arm circumference (for children above 6 months). The age of each child was determined by reviewing the birth certificate or immunization card. Weight was measured with portable analogue weighing machine. Children aged less than 24 months are weighed while being hold by their mother, after which the mother's weight is subtracted to derive the weight of the child. Height is measured against a non-stretchable tape fixed to a vertical wall, with the participant standing on a firm surface, to the nearest 0.5cm. Recumbent length was measured by using an infant measuring board. Each measurement were done twice, and the mean of the two readings was recorded. Socioeconomic status was determined by using modified B.G Prasad's classification.

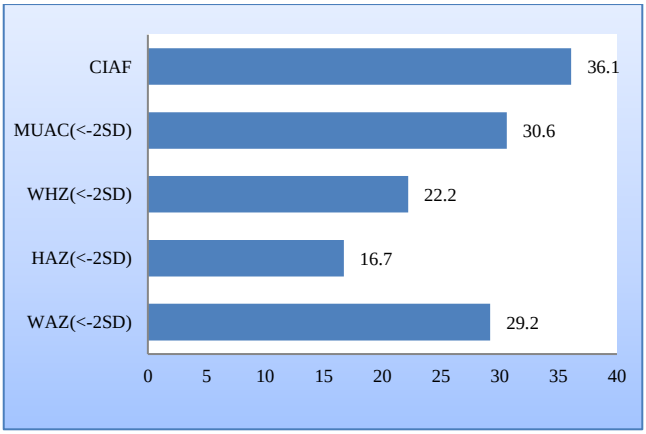
RESULTS

Table 1: Distribution of study participants according to their socio-demographic characteristics (n=144).

Characteristics	No (%)
Age (month)	
0-12	27 (18.8)
12-24	38 (26.4)
24-36	34 (23.5)
36-48	27 (18.8)
48-60	18 (12.5)
Gender	
Male	76 (52.8)
Female	68 (47.2)
Religion	
Hindu	70 (48.6)
Muslim	74 (51.4)
Type of family	
Nuclear	34 (23.6)
Joint	110 (76.4)
Mother's education	
Illiterate	8 (5.6)
Below Primary	13 (9)
Primary	21 (14.6)
Middle	46 (31.9)
Secondary	38 (26.4)
Higher secondary	13 (9)
Graduate	5 (3.5)
Per capita income [modified BG Prasad Scale Dec 2016]	
3139-6276(Class II)	6 (4.2)
1883-3138(Class III)	63 (43.8)
943-1882(Class IV)	70(48.5)
< 942(Class V)	5 (3.5)
Birth weight	
≥2.5 kg	107 (74.3)
<2.5 kg	37 (25.7)
Birth order	
1	71 (49.3)
2	60 (47.9)
≥3	4 (2.8)
Exclusive breast feeding	
Yes	87 (60.4)
No	57 (39.6)
Hand washing (with soap and water before handling food)	
Yes	38 (26.4)
No	106 (73.6)

Mean (SD) age of the under-5 children in the study was 28.4 months (±15.2 months), of which 47.2% were females and 52.8% were males. Most of the study population belonged to class III (43.8%) and class IV (48.5%) socioeconomic status according to modified BG Prasad Scale (Dec'2016), and 76.4% children were living in joint families. 38.9% of the mothers were educated up to Secondary and above. Around 25.7% of the children had birth weight below 2.5 kg. About 60.4% children were on exclusively breast-fed and 50.7% had birth order of second or more (Table 1).

About 36.1% children were diagnosed with under-nutrition according to CIAF whereas with standard anthropometric indices such as WAZ, WHZ, HAZ, and MUAC prevalence of malnutrition was found to be lower, that is, 29.2 % (underweight), 22.2% (wasting), 16.7% (stunting), and 30.6% (under-nutrition), respectively. Therefore, it is clear that standard anthropometric indices underestimate the prevalence of malnutrition when compared to CIAF (Figure 1).



WAZ weight for age; HAZ height for age; WHZ weight for height; MUAC mid upper arm circumference; CIAF composite index of anthropometric failure.

Figure 1: Assessment of nutritional status of children according to different anthropometric indices (n = 144).

Table 2: Bivariate and multivariable logistic regression of under-nutrition assessed by CIAF.

Independent variable	Total (N)	CIAF present n (%)	Odds Ratio (95% CI)	Adjusted Odds Ratio‡ (95% CI)
Religion				
Muslim	74	29 (39.2)	1.3 (0.6-2.6)	-
Hindu	70	23 (32.9)	1	
Gender				
Female	76	28 (41.2)	1.5(0.7-3)	-
Male	68	24 (31.6)	1	
Mother's literacy status				
<secondary	88	45 (51.1)	7.3 (2.9-17.9)	3.6 (1.2-10.8)*
≥secondary	56	7 (12.5)	1	
Socio-economic status				
Class IV and V	75	34 (45.3)	2.3 (1.1-4.7)	1.6 (0.6-4.2)
Class II and III	69	18 (26.1)	1	
Hand washing practice				
No	106	44 (41.5)	2.6 (1.1-6.3)	1.7 (0.5-5.7)
Yes	38	8 (21.1)	1	
Exclusive breast feeding				
No	57	37 (64.9)	8.8 (4-19.3)	7.3 (2.9-18.1)*
Yes	87	15(17.2)	1	
Birth weight				
<2.5	37	23 (62.2)	4.4 (2-7.7)	2.2 (0.7-6.2)
≥2.5	107	29 (27.1)	1	
Birth order				
≥2	73	41 (56.2)	6.9 (3.1-15.4)	3.7 (1.4-9.9)*
1	71	11 (15.5)	1	

Foot Notes: N is the total number of samples in each sub-group, n is the number of samples with under-nutrition in each sub-group
‡Adjusted odds ratio in multivariate analysis for each variable is adjusted for age and all other variables in the mode *Significant variables in multivariable regression analysis model, the Hosmer-Lemeshow test gave a Chi-square value of 9.537 (p=0.692, not significant) indicating good model fit Nagelkerke R2 was 0.511 showing that the variables included in the model predicted 51.1% of Anthropometric Failure, though this parameter has got its own limitations in a logistic regression.

Religion [OR = 1.3 (0.6–2.6)], Gender [OR = 1.5 (0.7–3)], Education of mother [OR = 7.3 (2.9–17.9)],birth weight [OR = 4.4 (2–9.7)], birth order [OR = 6.9(3.1–15.4)],Socio economic status[OR=2.3 (1.1-4.7)], Hand washing practice[OR=2.6 (1.1-6.3)] and Exclusive breast feeding practice [OR = 8.8 (4–19.3)]were significantly associated with nutritional status. The variables already found significant in bivariate analysis were entered into a multivariable logistic model. Strength of association of variables such as socio-economic status, and hand washing practice with soap and water before handling food and birth weight were attenuated, when adjusted with other variables but variables such as education of mother [AOR = 3.6 (1.2-10.8)], birth order [AOR = 3.7 (1.4-9.9)] and exclusive breast feeding [AOR = 7.3 (2.9 - 18.1)] stayed significant in the multivariable model (Table 2).

This table shows the knowledge about the symptoms of rabies; 24 (21.6%) told about madness followed by hydrophobia 16 (14.4%), bleeding 10 (9%), fever 2 (1.8%).

DISCUSSION

In present study, it is tried to explain child under-nutrition in terms of CIAF, aiming to evaluate the association of this index with their socio-economic and behaviour characteristics. In this study, prevalence of underweight among under-5 children were 29.2% and that of wasting was 22.2%, as compared to 31.5% underweight and 26.8% wasting in West Bengal. However, the proportion of stunting in this study was 16.7%, and considerably lower than that reported in India 38.4% and in West Bengal 32.5%.[7,8]

The present study showed that around 36.1% children were undernourished (assessed by CIAF) which is almost similar to previous report.[14] Though the higher rate reported by Gupta et al (62%), Rastogi et al (73.4%) and Dhok et al (58.59%).[15-17]

In the present study, malnutrition among female children compared to male and Muslim children as compared to Hindus were higher, but the association was found insignificant, similar findings were observed in the study by Singh, et al. Uttar Pradesh in northern India.[18]

Children from low socioeconomic class were significantly malnourished, and similar findings were reported by various other studies.[1,17,18]

In the current study, children who were from less educated mother and with more number of siblings were more likely to have anthropometric failure, Shit et al, Purohit et al, Maharashtra also observed similar findings regarding education level of mother and number of siblings in the family.[19,20]

In the present study, malnutrition was more among females than males, among Muslims than Hindus, among children of low socioeconomic status groups, among children of less educated mothers and among those children who were not exclusively breastfed. The study strongly points toward the importance of proper infant feeding practices, proper nutrition, maternal education, and improved living conditions for reducing malnutrition among under-five children. The high prevalence of malnutrition in the community requires a multipronged approach encompassing maternal and child health care, nutritional education, intensive IEC activities regarding exclusive breast feeding through antenatal clinics and adoption of family planning methods. Special emphasis on girl child education would go a long way for alleviation of child hood malnutrition of the future generations.

The present study had certain strength, i.e. this was a community-based study, standard operative procedures followed for all measurements, and it focused on assessment of under-nutrition using CIAF and their association.

Limitations in present study was due to cross-sectional study design the children were not followed up hence a longitudinal study may prove to be more useful in this regard.

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