

Original Research Article

Assessment of undernutrition by composite index of anthropometric failure among under five children in a slum of Kolkata, West Bengal

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ABSTRACT

Background: Under-nutrition is a major public health problem in India among under-five children. Composite index of anthropometric failure (CIAF) provides an overall estimate of under-nutrition as a single measure and helps in detection of children with multiple anthropometric failures.

Methods: This cross-sectional community-based study was done in Baghbazar slum of north Kolkata to determine the prevalence of under-nutrition among the under-five children and to find out the determinants of under-nutrition assessed by CIAF using multivariate analysis. WHO Z score system and the composite index of anthropometric failure (CIAF) were used to estimate the magnitude of under-nutrition.

Results: 41.2% children were diagnosed with anthropometric Failure. CIAF was more in female (43.1%) than male (39.1%). Multivariate analysis shows that low education level of mother, low socio-economic status (class III and below) and overcrowding were significantly associated with CIAF.

Conclusions: CIAF gives a better estimate of under-nutrition than the currently used weight for age Z score. The study shows the importance of proper infant and child feeding practices, family planning practices, appropriate maternal care, female literacy, improvement of economic condition, housing standards and proper treatment of illness in prevention of under-nutrition among under-five children.

Keywords: Composite index of anthropometric failure, Under-nutrition, Stunting, Under-weight

INTRODUCTION

Child under-nutrition is the major public health issue in many developing countries such as India. It also continues to be one of the principal causes of ill-health and premature mortality and morbidity among children of these countries.¹⁻³ The World Health Organization (WHO) has estimated that 60 % of the 10.9 million deaths that occur annually among children aged less than five years in the developing countries are associated with under-nutrition.⁴

The three conventional anthropometric indices of stunting (low height-for-age), wasting (low weight-for-height) and

under-weight (low weight for age) have generally been used for evaluating the nutritional status. It is now agreed that the conventional indices discussed above only allow for the categorization of children into the general categories of undernutrition and do not provide an opportunity to determine the overall prevalence of undernutrition that is associated with multiple failures.^{5,6} Hence, while some stunted children may not be affected with wasting and/or underweight, and other similar combinations, others might suffer from all three nutritional failures of stunting, under-weight and wasting.⁷ Subsequently, the use of the composite index of anthropometric failure (CIAF), which is an aggregated single anthropometric measure providing an overall estimate of undernourishment in children, has been

proposed. The magnitude of malnutrition using a single parameter along with its determinants will certainly help the health administrators and policy makers to act on all the modifiable factors for effective prevention and control of under-five children under-nutrition. With this background, a study was undertaken to estimate the prevalence of under-nutrition and determine its various risk factors among the under-five population in a slum of Kolkata.

METHODS

The study was a community based observational, descriptive study with cross-sectional design. The study was conducted in Baghbazar slum of north Kolkata, from August 2013 to July 2014. The study population consists of all the children of the study area who were below 5 years of age. Total enumeration of the study population was done. Total 97 children who were under-five years of age were included in the study.

Inclusion criteria

All the children in the study areas who were under-five years of age and whose mothers gave informed consent to participate in the study.

Exclusion criteria

Children who were severely ill or whose mother did not give consent to participate in the study.

Study techniques were interview with the mothers, anthropometric measurements of the children, review of medical records and environmental survey. Data were collected using a pre-designed and pre-tested schedule, salter type weighing machine, non-stretchable measuring tape, infantometer.

Method of data collection

After pre-testing the schedule necessary modification was done in the schedule. House to house visits were made in the study area with the help of public health nurse to identify the families with children under 5 years of age. Mother of each child was approached and purpose of the study was explained to them. Mothers were assured of the confidentiality and anonymity. Children were included in the study after obtaining informed consent from the mothers.

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. Weight was measured to the nearest 100 gm using a salter weighing machine. Height was measured using a non-

stretchable tape fixed to a vertical wall, with the participant standing on a firm surface and it was measured to the nearest 0.1 cm. Recumbent length was measured by using an infantometer. SPSS version 16 and WHO Anthro software were used for statistical analysis. Firstly, a bivariate analysis was done to ascertain the relationship of under-nutrition assessed by CIAF with other variables. Only those found to be significant were entered into a multiple logistic model. Diagnostic tests were done after modeling to assess goodness of fit and assumptions pertaining to logistic regression.

Definitions used

Underweight

Moderately underweight if weight for age between -2SD to -3SD and severely underweight if weight for age below -3SD (as per WHO standard).

Stunting

Moderately stunted if height/length for age between -2SD to -3SD and severely stunted if height/length for age below -3SD (as per WHO standard).

Wasting

Moderately wasted if weight for height/length between -2SD to -3SD and severely wasted if weight for height/length below -3SD (as per WHO standard).

Composite index of anthropometric failure

Peter Svedberg developed a model of six groups of children (A to F) to calculate composite index of anthropometric failure (CIAF).⁵ Nandy et al later modified the Svedberg's model by identifying an additional subgroup (group Y: children who are only underweight).³ The CIAF excludes those children not in anthropometric failure (group A) and includes all children who are wasted, stunted, or underweight, and their combinations (groups B-Y). It therefore provides a single measure with which the overall prevalence of under-nutrition can be estimated.

Overcrowding

If per capita floor space was less than 50 sqft.

RESULTS

Data of 97 children were collected and analyzed. The mean age of the under-five children was 34.8 months (SD-16.6 months). Among the study population 52.6% were males. All the children were Hindu by religion. Around 70.1 % of the study population belonged to lower socio-economic class (class III to V according to modified B.G. Prasad scale 2013 and 72.2% of the children were living in a joint family. Overcrowding was

present in 48.5% houses. Most of the mothers had education upto primary school (40.2%). 29.9% children had low birth-weight. Majority of the study subjects (76.3%) were exclusively breast-fed for 6 months. 30.9% children suffered from any disease in last 1 month. Mother's age at delivery was between 20 to 29 years in 72.2% subjects. Immunization status of all the children were up to date according to national immunization schedule.

Moderate wasting was present in 8.2% children. Severe wasting was seen in 4.1% children. Moderate stunting was present in 19.6% children and severe stunting was seen in 12.4% children. 11 children were moderately underweight and 6 children were severely underweight. Table 1, summing up the children in group B to Y

provides the CIAF to be 41.2 % (40 of 97 children). CIAF was more in female (43.1%) than male (39.1%) though the difference was not statistically significant.

In the bivariate analysis, the significant factors associated with CIAF among under-fives were low education level of mother (primary school or less), low birth weight of the baby, exclusive breast feeding of less than 6 months duration, presence of overcrowding, disease present in last 1 month, low socio-economic status (class III and below), age at child birth (30 years or more). Multivariate analysis (Table 2) showed that only low education level of mother (primary school or less), overcrowding and low socio-economic status (class III and below) were significantly associated with CIAF.

Table 1: Distribution of study population by CIAF (n=97).

Group	Anthropometric status	No. of children (%)	Male (%)	Female (%)
A	No failure	57 (58.8)	28 (60.9)	29 (56.9)
B	Wasting only	3 (3.1)	1 (2.2)	2 (3.9)
C	Wasting and underweight	6 (6.2)	3 (6.5)	3 (5.9)
D	Wasting, stunting and underweight	3 (3.1)	1 (2.2)	2 (3.9)
E	Stunting and underweight	8 (8.2)	6 (13)	2 (3.9)
F	Stunting only	20 (20.6)	7 (15.2)	13 (25.5)
Y	Underweight only	0 (0)	0 (0)	0 (0)
Total		97 (100)	46 (100)	51 (100)

Summing up the children in group B to Y provides the CIAF to be 41.2 % (40 of 97 children). Out of this 18 are male and 22 are female.

Table 2: Bivariate and multivariate logistic regression model of various factors with under-nutrition assessed by CIAF.

Independent variable (N)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
EBF duration (<6 months)	3.675 (1.37-9.83) *	2.388 (0.713 - 8)
Disease present in last month	3.068 (1.259-7.477) *	1.62 (0.484-5.422)
Mother education (illiterate and primary school)	5.979 (2.457-14.552) *	2.678 (1.935-7.665) **
Socio-economic status (class III and below)	5.091 (1.738-14.9) *	3.286 (1.915-11.8) **
Age at child birth (30 or more)	2.788 (1.119-6.944) *	2.23 (0.701-7.089)
Birth weight (low birth weight)	4.252 (1.69-10.697) *	2.51 (0.792-7.96)
Overcrowding present	4.667 (1.951-11.163) *	3.182 (1.082-9.355) **

For the multivariate model, the Hosmer-Lemeshow test gave a chi-square value of 4.128 ($p=0.728$, not significant) indicating good model fit. Nagelkerke R^2 was 0.896 showing that the variables included in the model predicted 89.6% of anthropometric failure.

DISCUSSION

40 children (out of 97) were diagnosed with anthropometric failure (41.2%). CIAF was more in females (43.1%) than males (39.1%). The prevalence of under-nutrition using composite index of anthropometric failure was much less than that observed by Mandal et al (73.1%) in Hooghly district of West Bengal, Mukhopadhyay et al (69.1%) and Shit et al (80.3%) in

Bankura district of West Bengal, Das et al (66.3%) in Purulia district of West Bengal, Sen et al (63.6%) in Darjeeling district of West Bengal, Anwar et al (62.5%) in rural Varanasi, Brahmabhatt et al (98.2%) in Dakshina Kannada region of Karnataka, Deshmukh et al (59.6%) in rural Wardha, Seetharaman et al (68.6%) in Tamilnadu.⁸⁻¹⁶ Anjum et al observed a prevalence of 25.58% of CIAF in Kashmir which is less than that of the current study.¹⁷ Nandy et al analyzed the NFHS-2 data (1998) and observed an overall prevalence of 59.8% anthropometric failure in our country.¹⁸ Prevalence of CIAF in other countries were 38.7% (Khan et al) in Bahawalpur region of Pakistan, 33.3% (Berger et al) in Nyanza province of Kenya and 55.5% (Lekprichakul et al) in Zambia.^{19,20} In the bivariate analysis, the significant factors associated

with CIAF were low education level of mother (primary school or less), low birth weight of the baby, exclusive breast feeding of less than 6 months duration, presence of overcrowding, disease present in last 1 month, low socio-economic status (class III and below), age at child birth (30 years or more). Multivariate analysis showed that only low education level of mother, overcrowding and low socio-economic status (class III and below) were significantly associated with CIAF. Shit et al also observed similar findings regarding education level of mother.¹⁰

CONCLUSION

This study re-inforce the importance of proper infant and child feeding practices, family planning practices, appropriate maternal care, female literacy, improvement in economic status of the family and housing standards and proper treatment of illness in prevention of under-nutrition among under-five children. CIAF provides the burden of under-nutrition in the community as a single measure and also helps in detecting children with multiple anthropometric failures. Efforts should be taken to have IEC (information, education and communication) activities targeted towards educating mothers. Formal and non-formal teaching can be given to them in the evening at community centers. Mothers can be self employed by self-help group formation for the improvement of economic condition of the families to some extent. Health workers should be involved in regular counseling regarding exclusive breast-feeding practices for 6 months, colostrum feeding, timely initiation of complementary feeding with proper quality and quantity. Co-morbidities arising from undernutrition and diseases like diarrhoea, ARI should be managed properly at health facilities.

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