Research Article

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Predictors of anthropometric failure among under five slum children of Jammu, India

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ABSTRACT

Background: Under nutrition continues to be a major public health problem in India despite years of efforts and huge resources invested to tackle the situation. Accurate assessment of the magnitude is important for allocation of resources and monitoring of trends. Of the various measures recommended, Composite index of anthropometric failure (CIAF) provides the burden of under nutrition in a single measure and helps in detection of children with multiple anthropometric failures in community. Research with simultaneous use of Z scores and CIAF in under nutrition is limited.

Methods: This cross-sectional community based study was done in urban slums to determine the prevalence of under-nutrition and its determinants using Z Scores and CIAF. 250 under five children registered with eight randomly selected anganwadis from urban slums Jammu, J&K, India were studied.

Results: Of 250 children studied, 183 (73.2%) were suffering from under-nutrition (one or the other form of anthropometric failure)according to CIAF. 38.8%, 20.4% and 42.8% under-fives were classified as underweight, wasted and stunted respectively by conventional indices. Morbidity, age at weaning and children with more than three siblings were found independent predictors of anthropometric failure on multivariate logistic regression.

Conclusions: CIAF seems to provide an accurate reflection of under-nutrition than the currently used weight-for-age Z score. The study underscores the importance of appropriate physical environment and proper infant and child feeding practices in prevention of under nutrition.

Keywords: CIAF, Diarrhea, Feeding practices, Under nutrition, Z-score

INTRODUCTION

Nutrition is a desperately neglected aspect of maternal, newborn, and child health despite the fact that it is a major risk factor for many diseases. Under-five children in particular are most vulnerable to ill effects of under nutrition such as acute morbidities, delayed overall development and even death. The prevalence of underweight among children in India is amongst the highest in the world accounting for nearly 22 percent

disease burden.² A framework developed by UNICEF recognizes that environmental, economic, social factors pivoting around poverty play crucial role in under nutrition. Unsatisfactory infant and young child feeding practices further aggravates the situation.³ Underweight a commonly used composite measure of anthropometry does not adequately distinguish between stunting and wasting and therefore requires careful interpretation.⁴ While stunting (Low height for age) is an indicator of chronic under nutrition due to prolonged food deprivation

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and/or illness, wasting (low weight for height) is an indicator of acute under nutrition, an end result of more recent food deprivation and /or illness. An alternative indicator CIAF (Composite Index of anthropometric failure) was proposed by Svedberg in 2000 which was later modified by Nandy S et al.^{5,6} Although CIAF is also a composite measure, it addresses the issue of overlap among various categories of under nutrition. The CIAF includes all children who are wasted, stunted or underweight, and their combinations (groups B–Y).

Considering the above, the authors decided to generate more evidence by studying under nutrition using both CIAF and conventional indices as well as to determine its association with various sociodemographic factors, feeding practices and common morbidities among under five children in urban slums of Jammu region.

METHODS

250 under five children were needed to be studied in order to estimate the magnitude of under nutrition with relative precision of 20%, 80% power, 95% confidence (alpha 0.05), non-response rate of 10% and design effect of 2. The required number of children registered with eight randomly selected anganwadis from urban slums of Jammu, India was studied. Age of selected child was assessed by any of the documents available with the parents like date of birth certificate, immunization card, delivery discharge slip or horoscope. In case no records were available, a regional local events calendar was used to assist the mother/caregiver recall. Information on sociodemographic variables, immunization coverage and infant and child feeding practices were collected on a predesigned proforma. Standard WHO definitions of diarrhoea, acute respiratory infections and measles were used to elicit history of morbidities.⁷ History of passage of worms in stool with or without pica was taken as criteria for worm infestation. Blood samples of children older than one year of age were taken for haemoglobin estimation and children were categorised to be suffering from mild, moderate and severe anaemia as per WHO criteria.⁸ Dietary history was collected by 24 hour dietary recall method. All the children were physically examined using a predetermined checklist to elicit any signs of malnutrition. The children requiring attention were further investigated and managed accordingly.

Weight and height of all the study children was taken as per standard WHO Guidelines on Anthropometry. Thereafter for every child, Z scores for weight for age, height for age and weight for height were calculated using WHO Anthro software (version 3.2.2). Children whose z-scores for each indicator fall below –2 standard deviations of the WHO multicenter growth reference study reference population median were classified as stunted, wasted or underweight. The composite index of anthropometric failure was constructed.

Data analysis

Data analysis was carried out with the help of computer software SPSS Version 17.0 and Epi infoTM version 7.1.5 (CDC Atlanta). Data reported as percentages and means for qualitative and quantitative variables respectively. Association with anthropometric failure was reported as Crude OR with corresponding 95% Confidence Intervals. Statistical significance of associations was evaluated using Chi square tests. Logistic Regression was performed using step wise method and Adjusted OR with 95% Confidence Interval were calculated to determine the independent effect of variables found significant on univariate analysis. A p value of <0.05 was considered as statistically significant. All p values reported are two tailed.

RESULTS

Out of 250 children, 152 (60.8%) were males and 98 (39.2%) were females with male to female ratio of 1.5:1 (Figure 1). The mean age of children was 24.5 months. Regarding feeding practices, majority (88%) were breast fed. Nearly two third children (61.6%) were given colostrum. Only 30.5% children were exclusively breast fed. Nearly half of the children (56%) were weaned at 6 months of age (Table 2). Wasting was commonly observed in infants while majority of underweight children were 13-24 months old. A higher proportion of stunted children were seen in 25-36 months age group. More females were underweight and stunted while more males were wasted. CIAF categorized 73.2% children in one or other form of anthropometric failure. It was observed that children, whose mothers were illiterate, having more than three siblings, living in unsatisfactory conditions and with faulty feeding practices were at higher risk of anthropometric failure (Table 2 and 3). Nearly two fifths children were observed to have diarrhoea and ARI (39.6% and 38.4% respectively) while children suffering from measles and worm infestations were 12.4% and 10% respectively.

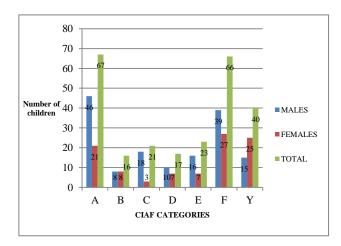


Figure 1: Distribution of surveyed children as per CIAF categories.

Table 1: Association of anthropometric failure with sociodemographic and physical environment characteristics.

	No failure	Single failure	Multiple failure	Crude odds ratio (OR)				
Characteristic	(N=67)	(N=122)	(N=61)					
Socioeconomic status								
Upper	2(2.9%)	1(0.8%)	1(1.6%)					
Upper middle	6(8.9%)	2(1.6%)	2(3.3%)	OR=1.70 (0.17-16.9)				
Lower middle	32(47.9%)	51(41.8%)	10(16.4%)	OR=4.2(0.42-42.23)				
Upper lower	26(38.8%)	66(54.2%)	40(65.6%)	Ref=1				
Lower	1(1.5%)	2(1.6%)	8(13.1%)					
*For calculation of OR categories Upper middle and Lower middle were clubbed as 'middle' and Upper lower and Lower were clubbed as 'lower.								
Chi square (8) p<0.005								
Literacy of mother								
Illiterate	17(25.4%)	32(26.2%)	48(78.7%)	OR=2.27 (1.23-4.33)				
Literate	50(74.6%)	90(73.8%)	13(21.3%)	Ref=1				
Chi square (2) p<0.001								
Number of siblings								
More than three	14(20.9%)	53(43.4%)	40(65.6)	OR=3.89 (2.04-7.72				
Three	53(79.1%)	69(56.6%)	21(34.4%)	Ref=1				
Chi square (2) p<0.001								
Overcrowding								
Present	25(37.3%)	39(31.9%)	40(65.6%)	OR=1.27 (0.71-2.2)				
Absent	42(62.7%)	83(68.1%)	21(34.4%)	Ref=1				
Chi square (2) p<0.001								
Indoor smoke								
Present	29(43.3%)	70(57.4%)	51(83.6%)	OR=2.54(1.43-4.54)				
Absent	38(56.7%)	52(42.6%)	10(16.4%)	Ref=1				
Chi square (2) p<0.001								
Excreta disposal								
Insanitary	13(19.4%)	92(75.4%)	41(67.2%)	OR=10.9 (5.58-22.43)				
Sanitary	54(80.6%)	30(24.6%)	20(32.8%)	Ref=1				
Chi square (2) p<0.001		, ,						

Table 2: Association of anthropometric failure with feeding practices.

Feeding practice	No failure (N=67)	Single failure (N=122)	Multiple failure (N=61)	Crude OR				
Initiation of breast feeding								
Within 1-6 hours	27(40.3%)	38(31.1%)	10(16.4%)	OR=7.04 (3.0-16.2)				
After 6 hours	15(22.4%)	66(54.1%)	34(55.7%)	OR=10 (2.94-34.0)				
Not Breastfed	5(7.5%)	13(10.7%)	12(19.7%)	Ref=1				
Within one hour	20(29.8%)	5(4.1%)	5(8.2%)					
Chi square(6) p<0.001								
Colostrum								
Given	47(70.1%)	74(60.7%)	33(54.1%)	Ref=1				
Not given	20(9.9%)	48(39.3%)	28 (45.9%)	OR=1.66(0.91-3.08)				
Chi square(2) p =0.16								
Exclusive breastfeeding								
Yes	29(43.3%)	32(26.2%)	06(9.8%)	Ref=1				
No	33(49.3%)	77(63.1%)	43(70.5%)	OR=2.77(1.49-5.14)				
Chi square(2) p <0.001								
Age at weaning								
At 6 months	37(55.2%)	25(20.5%)	12(19.7%)	Ref=1				
Less than or more than 6 months	30(44.8%)	97(79.5%)	49(80.3%)	OR=4.86(2.65-8.89)				
Chi square(2)p<0.001								
Breast feeding during diarrhoeal episode								
Yes	6 (8.9%)	23 (18.8%)	12(19.8%)	REF=1				
No	3 (4.8%)	31 (25.4%)	24(39.3%)	OR=3.14(0.73-13.3)				
Chi square(2)p=0.18								

160 out of 250 children i.e. 64 % children were anaemic. The percentage of children suffering from mild, moderate and severe anaemia was 33.2%, 30% and 0.8% respectively. Children with anthropometric failures had manifold higher risk of common co morbidities with ORs ranging from 1.4 to 34.3 (Table 3).

Morbidity (adjusted OR 52.013 (9.49-284.81), age at weaning (adjusted OR 3.57 (1.65-7.71) and children with more than three siblings (adjusted OR 5.4 (1.5-14.3) were found independent predictors of CIAF on multivariate logistic regression.

Table 3: Association of morbidities with anthropometric failure.

	Diarrhoea	ARI	Measles	Worm infestation	Anaemia
No failure	9	2	1	2	39
Single Failure	54	51	18	6	80
Multiple failure	36	43	12	17	41
P value	< 0.001	< 0.001	< 0.001	< 0.05	0.3
OR	6.23(2.01-13.3)	34.3(8.16-144.3)	12.9(1.72-96.8)	4.67(1.07-20.3)	1.4(0.78-2.4)

DISCUSSION

Conventional indicators of under nutrition provide important information on different aspects of under nutrition but since they overlap, they fail to accurately reflect overall burden of under nutrition in the community. CIAF (Composite Index of anthropometric failure) has been demonstrated as valid measure across different regions and settings. 11,12

The present study has estimated burden of under nutrition using both conventional indicators and CIAF. Though the figures for under nutrition observed in the present study using conventional indicators compares well with the figures reported by NFHS-3, UNICEF, HUNGaMA report, CIAF estimated maximum burden of stunted children and identified 73.2% children to be suffering from one or the other form of under nutrition. ¹³⁻¹⁵ This finding lend credence to evidence many other studies and conclude that conventional indicators underestimate the true picture of under nutrition in the community. ¹⁶⁻¹⁸ However, lower figures reported by other investigators presents a contrarian picture thus leaving too much ground for empiricism and subjective interpretation. ^{19,20}

Children living in poor housing and environmental conditions, having less educated mothers, suffering from common morbidities and faulty feeding practices were more likely to have anthropometric failure as corroborated by various studies. ^{21,22} Since literate mothers on the other hand have adequate health knowledge, lower fertility, and tend to make full use of available health care services, thus resulting in lower rates of undernourished children. ²³

Some researchers have reported higher levels of under nutrition among children having more than three siblings. Disaggregated figures employing CIAF has provided an elaborate picture of magnitude of different

forms of under nutrition. The impact of different combinations of underweight, wasting and stunting on morbidities and feeding practices has been analysed.

Children experiencing triple failure had the greatest morbidity risk.⁶ The relationship is two way as new episode of morbidity puts the child at higher risk of multiple anthropometric failure.

Results indicate that use of Composite Index will facilitate community health workers, public health experts and policy makers will not only help in estimating complete burden of undernourished children but will help in triaging children to receive the intervention considered most desirable.

Limitations

Anthropometric indices serve as a proxy for classifying an individual as malnourished. It fails to discriminate whether the condition is due to poor nutrition or underlying illness. We have tried to overcome this by studying the effect of morbidity on anthropometric failure.

CONCLUSION

The Composite Index of Anthropometric Failure (CIAF) provides the total burden of under-nutrition in the community which would otherwise be underestimated if conventional indices were solely relied upon. Children with unsatisfactory living conditions, feeding practices having illiterate mothers and suffering from morbidities had more risk of being in state of anthropometric failure.

Recommendations

Calculation of CIAF requires measurement of height in addition to weight which can be incorporated in routine

growth monitoring activities in ICDS and other nutritional alleviation programmes. By prioritizing interventions for children with multiple failures, morbidity and mortality among under-fives can be further reduced.

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Institutional Ethics Committee

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