Original Article

Anthropometric Assessment of Children (1-6 Years) Attending Anganwadi in Rural Field Practice Area of Gulbarga Institute of Medical Sciences, Kalaburagi

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Abstract

Context/Background: Undernutrition is conventionally assessed by prevalence of stunting, underweight and wasting. These methods even though widely used, do not give single measure of assessment of undernutrition. CIAF (Composite measure of anthropometer failure) gives single, comprehensive figure, as it identifies all the children experiencing anthropometric failure. Stunting Index, Underweight Index and Wasting index further identifies severity of individual parameter in relation to total undernutrition.

Aims/Objectives: To estimate prevalence of undernutrition among 1–6-year children by conventional methods like stunting, underweight and wasting along with other methods like CIAF and anthropometric indices like Stunting Index (SI), Underweight Index (UI) and Wasting Index (WI).

Methodology: A community based cross-sectional study was undertaken among 206 children belonging to 5 anganwadi centres in rural field practice area of department of community Medicine, GIMS Kalaburagi Karnataka.

Results: Overall prevalence of stunting was 51.9%, underweight was 35% and wasting was 20%. CIAF (Composite Index of Anthropometric failure) was 65.5%. Stunting Index, Underweight Index and Wasting Index was 0.79, 0.53 and 0.30 respectively. Stunting was widely prevalent among boys and girls suffered more from wasting and underweight.

Conclusions: CIAF should be widely used in assessing undernutrition in community along with Anthropometric Indices.

Key-words: CIAF, Stunting Index, Underweight Index, Wasting Index, Undernutrition.

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Introduction

Malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related non-communicable diseases. Globally in 2020, 149 million children under 5 were estimated to be stunted (too short for age), 45 million were estimated to be wasted (too thin for height), and 38.9 million were overweight or obese. Around 45% of deaths among children under 5 years of age are linked to undernutrition.[1]

Childhood undernutrition is a critical public health and development challenge in many developing countries. Pre-school children are most vulnerable to the effect of protein energy malnutrition (PEM) and their nutritional status is considered to be a sensitive indicator of community health.[2] Children have the right to a caring, protective environment and to nutritious food and basic health care to protect them from illness and promote growth and development.[3]

Conventionally childhood undernutrition is assessed by anthropometric indicators like stunting, wasting and underweight. However, Svedberg et al (2000) pointed these conventional indicators do not provide single figure of overall estimate of malnutrition in children. Svedberg argues that stunting, wasting and underweight are not independent entities and there is underestimation of anthropometric failure. CIAF (Composite Indicator for Anthropometric Failure) is an indicator which identifies all the undernourished children of population by single figure.[4] However, a recent report has highlighted some shortcomings of CIAF (Bhattacharya, 2006). Although CIAF is a useful composite measure, it fails to highlight the individual contribution and importance of stunting, underweight and wasting relative to the overall prevalence of undernutrition. Bose and Mandal (2010) proposed new indices, Stunting Index (SI), Underweight Index (UI) and Wasting Index (WI) which give relative significance and severity of these measures with respect to the total prevalence of undernutrition. This is in contrast to rates of Stunting, Underweight and Wasting which are absolute measure. The CIAF on the other hand indicates total undernutrition and does not provide any information on the prevalence of ST, UW and WS relative to total undernutrition. We feel that these three new indices, SI, UI and WI provide information on the significance of the problems of ST, UW and WS with respect to and relative to total under nutrition.[5]

As malnutrition and poverty are high in Northern Karnataka region, a baseline study to assess nutritional status of young children is needed especially in rural areas by these new indicators. This study will help provide clear information and identify accurately children with malnutrition, which will contribute in better planning and policy making.

Objectives:

1. To estimate the prevalence of Stunting, Wasting and Underweight among 1-6-year children in RHTC Hire-Sawalgi.
2. To assess undernutrition among 1–6-year children using CIAF and anthropometric indices i.e., Stunting Index (SI), Underweight Index (UI) and Wasting Index (WI).

Methodology

A community based cross-sectional study was conducted in Rural Health and Training Centre, Hiresawalgi, which is the rural field practice area of Gulbarga institute of medical sciences Kalaburagi. There are five anganwadi centres in the Hiresawalgi village with population of 5641. This study was conducted from February 2022 to May 2022 for a period of 4 months. All the 292 children between age group 1 to 6 years registered in 5 Anganwadis were included in the study. All efforts were taken to cover maximum number of children and 206 were included in the study using the inclusion and exclusion criteria. Children who could not be contacted even after repeated 3 visits at the time of examination were taken as exclusion criteria for the study.

Data collection:

Parents were given prior information regarding visit by team, through ASHA worker, so that mothers bring their children to anganwadi centre and undergo examination. After explaining objectives of study, verbal consent was taken from parents. The information regarding the child's name, parents name, age, sex, date of birth was collected from the Anganwadi register. Anthropometric measurements were measured using standardised instruments.

Electronic weighing machine was used to measure the body weight of children more than 2 years of age and Salter's weighing scale was employed to record the weight of children less than 2 years of age, weight was measured nearest 500 gm. Length of children less than 2 years was measured using infantometer and height of children more than 2 years will be measured using stadiometer. Height recorded to nearest of 1 cm.

Calculation:

The measurements of study subjects will be compared to WHO Z-score simplified field charts to find the prevalence of stunting, underweight, wasting. Z score is defined as the deviation of the value of an individual from the mean of the reference population divided by the standard deviation of the reference population. Subjects with a Z score of between -2SD to -3SD for height for age, weight for height and weight for age were respectively considered to be moderately stunted, wasted and underweight. Subjects with a Z score of less than 3SD for height for age, weight for height, and weight for age were respectively considered severely stunted, severely wasted and severely underweight.[6] Svedberg Model with addition of one more group by Nandy et al, consists of one group with no anthropometric failure and six subgroups with anthropometric failure. These groups are given in greater detail in Table 1. The CIAF excludes those children not in anthropometric failure (i.e., group A) and counts all children who have wasting, stunting, or are underweight (i.e., groups B to Y). It therefore provides a single measure with which to estimate the overall prevalence of undernutrition.

Table 1: Classification of children with anthropometric failure (CIAF)

Group	Description	Wasting	Stunting	Underweight
A	No Failure	No	No	No
B	Wasting Only	YES	No	No
C	Wasting & Underweight	Yes	No	Yes
D	Wasting Stunting Underweight	Yes	Yes	Yes
E	Stunting & Underweight	No	Yes	Yes
F	Stunting Only	No	Yes	No
Y	Underweight Only	No	No	Yes

Bose and Mandal (2010) proposed Stunting Index (SI) = Stunting/CIAF, Underweight Index (UI) = Underweight/CIAF and Wasting Index (WI) = Wasting/CIAF.[5]

Statistical analysis: Data entry was done in Microsoft excel sheet Version 2019 and analysis was done using open epi software.

Ethical Committee Clearance: Reference no: GIMS/KLB/PHARMA/IEC/ 129/2022-23, dated:26-2-2022.

Results

In this study, mean age of boys were 3.41 years and girls were 3.46 years. It is observed that overall stunting is found to be 51.9% among this severe stunting was almost 20%. Stunting was higher among boys (57.4%) as compared to girls (47.3%). Underweight is more common among girls (35%) than boys (30.9%). Girl children have higher proportion of underweight compared to boys. Among girl children, wasting was higher which was statistically significant.

Out of 206 subjects, 65.5% of children experienced anthropometric failure, among this CIAF for boys and girls was 68% and 63% respectively. 34.5% of children experienced single failure and 20.9% had double anthropometric failure.10.2% of children suffered triple failure, who are greatest risk of morbidity. Stunting Index, Underweight Index and Wasting Index was found to be 0.84,0.45,0.20 for boys and 0.75.0.61,0.39 for girls respectively.

Table 2: Prevalence of Stunting, Underweight and Wasting

	Boys		Girls		Total		
	N	%	N	%	N	%	
Moderate Stunting	34	36.2	33	29.5	67	32.5	
Severe Stunting	20	21.3	20	17.9	40	19.4	
Overall Stunting	54	57.4	53	47.3	107	51.9	Chi Square=2.09
Normal	40	42.6	59	52.7	99	48.1	P=0.23
Moderate Underweight	16	17.0	28	25.0	44	21.4	
Severe Underweight	13	13.8	15	13.4	28	13.6	
Overall Underweight	29	30.9	43	38.4	72	35.0	Chi Square=1.27
Normal	65	69.1	69	61.6	134	65.0	P=0.26
Moderate Wasting	8	8.5	21	18.8	29	14.1	
Severe Wasting	5	5.3	7	6.3	12	5.8	
Overall Wasting	13	13.8	28	25.0	41	19.9	Chi Square=4
Normal	81	86.2	84	75.0	165	80.1	P=0.04*
Total	94	100	112	100	206	100	

* Statistically significant

Table 3: Groups of anthropometric failure among children

Group name	Description	Boy	Girl	Total
A	No failure	30	41	71
B	Wasting Only	3	3	6
C	Wasting and Underweight	2	12	14
D	Wasting Stunting Underweight	8	13	21
E	Stunting Underweight	14	15	29
F	Stunting Only	32	25	57
Y	Underweight Only	5	3	8
	Total	94	112	206

Table 4: Gender Wise distribution of CIAF and Anthropometric Indices

	Boys	Girls	Total
CIAF/Total	64/94=0.68	71/122=0.63	135/206=0.65
Stunting Index	54/64=0.84	53/71=0.75	107/135=0.79
Underweight Index	29/64=0.45	43/71=0.61	72/135=0.53
Wasting Index	13/64=0.20	28/71=0.39	41/135=0.30

Discussion

In this study, we have tried to assess undernutrition among children in rural areas by both conventional methods and other methods like CIAF (Composite Index of Anthropometric Failure and Anthropometric Indices like Stunting Index, Underweight Index and Wasting Index. Stunting, which is indicator of chronic malnutrition is most commonly prevalent condition in both genders (57.4% -Boys & 47.3%-Girls) and across all age groups, with more prevalence among boys. Stiller et al and Laxmaiah et al also showed stunting to be on higher side in tribal (60%) and rural (61.6%) communities in India.[7,8] 35% of children were underweight, with more prevalence among girl children. Murarkar et al also reported similar finding in rural slums of Maharashtra.[9] However, higher underweight around 50% was found by Laxmaiah et al, Biswas et al and Stiller et al.[8,10,7] A significantly

higher proportion of wasting was seen among girl children (25%) compared to boys (13.8%).

The prevalence of undernutrition in this study by CIAF is 65.5%, this figure is much higher when compared to that measured by conventional methods like stunting, underweight and wasting. CIAF is a disaggregate figure and measures total number of children affected by anthropometric failure. Conventional indicators cannot reflect the anthropometric failure rate in population because they cannot distinguish the occurrence of combined forms of undernutrition. Biswas et al, Stiller et al in Adivasi children of West Bengal also showed similar CIAF of 60.40% and 61.6% respectively.[10,7] However, high CIAF of 73.1% was reported by Bose and Mandal in West Bengal.[11] CIAF of 48.3% and 42.1% was found by Islam et al in Bangladesh and Permatasari et al in Indonesia.[12,13] CIAF unmasks hidden burden of undernutrition in community and is more sensitive indicator.

We also tried to assess undernutrition by Stunting, Index, Underweight Index and Wasting Index as suggested by Bose and Mandal et al so as to find relative severity or contribution with respect to total undernutrition. Boys were more affected by chronic malnutrition as suggested by Stunting Index (0.84) and Underweight Index (0.45). If converted to percentages, among total boys in anthropometric failure (CIAF=64), 84 % of them were suffering from stunting and 45% from underweight. Among girls in anthropometric failure (CIAF=71) ,75% of girls were stunted ,61% were underweight and 39% were wasted. Girl children suffered from both chronic and acute malnutrition. Similar results SI, UI and WI were reported by studies of datasets of Nandy et al and Seetharaman et al.[5]

Table 5: Comparison of SI, UI and WI of different studies

Reference	Sample (n)	SI	UI	WI
Nandy et al (2005)	24396	0.756	0.788	0.266
Seetharaman et al (2007)	405	0.723	0.681	0.294
Bose et al	1012	0.364	0.866	0.684
Our study	206	0.79	0.53	0.30

Conclusions

In the rural and underprivileged communities, undernutrition continues as major public health problem. CIAF needs to be used more frequently in estimating undernutrition in community, as it unmasks undernutrition and gives correct number of children suffering from anthropometric failure

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References

1. World Health Organisation. Factsheets-Malnutrition. Available from URL: https://www.who.int/news-room/fact-sheets/detail/malnutrition. [Accessed on 4/7/2022]
2. Prasot RM, Verma SK, Kashyap S, Kanaujiya MK. An epidemiological study of Protein Energy Malnutrition (PEM) among 1-6 years children in rural Lucknow, Uttar Pradesh, India. IOSR J Dental Med Sci. 2014 Mar;13(3):10-4.
3. Vikaspedia. Nutrition and Child Growth. Available from URL: https://vikaspedia.in/health/nutrition/nutrition-and-growth. [Accessed on 4/7/2022]
4. Nandy, S., Svedberg, P. The Composite Index of Anthropometric Failure (CIAF): An Alternative Indicator for Malnutrition in Young Children. In: Preedy VR, editor. Handbook of Anthropometry. Ist edition. New York: Springer; 2012. p.127-137.
5. Bose K, Mandal GC. Proposed New Anthropometric Indices of Childhood Undernutrition. Mal J Nutr. 2010;16(1): 131-136.
6. World Health Organization. WHO child growth standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. Geneva: World Health Organization; 2006.

7. Stiller CK, Golembiewski SKE, Golembiewski M, Mondal S, Biesalski HK, Scherbaum V. Prevalence of Undernutrition and Anemia among Santal Adivasi Children, Birbhum District, West Bengal, India. Int J Environ Res Public Health. 2020;17(1):342.

8. Laxmaiah A, Rao KM, Brahmam GN, Kumar S, Ravindranath M, Kashinath K, Radhaiah G et al. Diet and nutritional status of rural preschool children in Punjab. Indian Pediatr. 2002 Apr;39(4):331-8.

9. Murarkar S, Gothankar J, Doke P, Pore P, Lalwani S, Dhumale G et al. Prevalence and determinants of undernutrition among under-five children residing in urban slums and rural area, Maharashtra, India: a community-based cross-sectional study. BMC Public Health. 2020 Oct 16;20(1):1559.

10. Biswas, Sadaruddin, Bose K, Mukhopadhyay Bhadra M. Prevalence of Undernutrition among Pre-School Children of Chapra, Nadia District, West Bengal, India, Measured by Composite Index of Anthropometric Failure (CIAF). Anthropologischer Anzeiger.2009; 67(3): 269–79.

11. Mandal GC, Bose K. Assessment of Overall Prevalence of Undernutrition Using Composite Index of Anthropometric Failure (CIAF) among Preschool Children of West Bengal, India. Iran J Pediatr.2009;19(3):237-43.

12. Islam MS, Biswas T. Prevalence and correlates of the composite index of anthropometric failure among children under 5 years old in Bangladesh. Matern Child Nutr. 2020;16(2): e12930.

13. Permatasari, T.A.E., Chadirin Y. Assessment of undernutrition using the composite index of anthropometric failure (CIAF) and its determinants: A cross-sectional study in the rural area of the Bogor District in Indonesia. BMC Nutr.2022;8:133.