Assessment of Nutritional Status of Underfive Children in a Low Socio-Economic Urban Community of Guntur city in AP State

Prasada Rao Udaragudi[1], Samson Sanjeeva Rao Nallapu[2], TSR Sai[3]

[1]Assistant Professor, [2]Professor, [3]Professor & Head of Dept.Dept. of Community Medicine, NRI Medical College

Abstract

Introduction: Under nutrition profoundly affects children's survival, growth and development. Various classifications of malnutrition in children use different cut off points for malnutrition making it difficult to compare data. The Composite Index of Anthropometric Failure (CIAF) is an alternative classification system which incorporates stunting, wasting and underweight. **Objective:** To identify malnutrition in underfive children in a low socio-economic urban area of Guntur city. **Methods:** This cross-sectional study was carried out during 2017 and 2018 at Israilpet in Guntur city of Andhra Pradesh. Weights and heights were measured for 740 underfive children (367 boys and 373 girls) according to WHO guidelines. The data collected was entered into MS Office Excel and analysed data is presented in the form of tables. Important findings are subjected to statistical tests at 5% Level of Significance. **Results:** Using WHO standards, 4.1% boys and 1.9 % girls are lesser than 3 standard deviations from the median and therefore can be considered severely malnourished. 10.4 % boys and 8.8% girls were moderately malnourished. Only 1 girl was more than +3 SDs and is obese. The infant age group has the highest prevalence of malnutrition (33.7%). Stunting is overall 10.0 % while wasting is 39.6%. Anthropometric failure taking into consideration all three aspects of malnutrition i.e. wasting, stunting and underweight is 53.9% (boys 54.2% and girls 53.7%) **Discussion:** The response to child under nutrition in India has been limited to food supplementation not taking into consideration the multidimensional nature of malnutrition. Stunting is a significant form of under-nutrition but goes largely unrecognized. CIAF could recognize more undernourished children than the z score-based classification. **Conclusion:** Using low weight-for-age as the only criterion may underestimate the true prevalence of under nutrition. It is also seen that under nutrition in the first year of life is significantly higher both in boys and girls.

Keywords: *Malnutrition, stunting, wasting, underweight, anthropometric failure, CIAF*

Introduction

Globally, almost 200 million underfive children suffer from stunting, wasting, or both. According to the UNICEF, there is 38% and 21% moderate to severe wasting and stunting respectively in underfives in India.[1] The National Family Health Survey - 4 showed that 38.4% of underfives are stunted (height for age), and 21% are wasted (weight for height).[2] Good nutritional status of pre-school children is the foundation for lifelong physical and mental health. Poverty, disease and malnutrition form important components of a vicious cycle.

Anthropometry is a practical tool for evaluating the nutritional status of children.[3] Body measurements are sensitive over the full spectrum of malnutrition while biochemical and clinical indicators are useful only when a child is at least moderately malnourished.[4] As weight is easy to measure it is the most common indicator used.

Corresponding Author:
Samson Sanjeeva Rao Nallapu,
Professor, Dept. of Community Medicine, Chinakakani, Mangalagiri Mandal, Guntur District, Andhra Pradesh, 522503 Mobile: 9000443884
E mail: samson.nallapu@yahoo.com

To grade malnutrition, there are various classifications such as IAP and Gomez (weight for age), McLaren and Waterlows (weight for height). These classifications use different cut off points making it difficult to compare data. They do not address all the three indices of under nutrition i.e. stunting, wasting and underweight. Stunting is due to long-term nutritional deprivation. It results in delayed mental development and reduced intellectual capacity. Wasting is due to acute under nutrition, due to insufficient food intake or a high incidence of infectious diseases.[5]

Not only does nutritional status indicate the well-being of the child but also the overall development of the region.[3] Anthropometric failure (AF) is represented by the conventional indicators of malnutrition i.e. stunting, wasting and underweight. When used individually or in combination, conventional indices fail to depict the overall magnitude of under nutrition. The Composite Index of Anthropometric Failure (CIAF) is an alternative classification system which includes all children with stunting, wasting and underweight and gives an overall prevalence of malnutrition.[6,7]

Objective: To gather anthropometric measurements of underfive children in a low socio-economic urban area of Guntur city and identify the optimum classification of malnutrition.

Methodology

This cross-sectional study was carried out from 2017 to 2018 in the catchment area of the Urban Health Center (UHC) at Israilpet in Guntur city of Andhra Pradesh. Institutional Ethical Committee (IEC) clearance of the NRI Medical College was taken. A pilot study helped to design a semi-structured questionnaire for mothers of underfive children. A sample of 740 underfive children was taken based on the prevalence found in the pilot survey, NFHS 4 and DLHS 4 reports for Guntur District. A house to house survey was done and all the under five children available at the time of visit in 6 Anganwadi areas were included in the study. Children's heights and weights were measured as per the WHO guidelines on anthropometry. Separate growth charts were used for boys and girls as per WHO guidelines.[8, 9] Data collected was entered into MS Office Excel and analyzed with Epi Info version 3.4.3. The data is presented in the form of tables and percentages. Significant findings are subjected to tests of significance to look for associations between variables at 5% Level of Significance.

Results

Using WHO weight for age standards, under nutrition (both <SD 2) was seen in 14.4% <5 boys and 10.7% <5 girls (Chi square 2.33, p 0.12). Severe malnutrition was seen in 4.3% boys and 1.9% of the girls (Chi square 3.13, p 0.07). Only 1 girl was more than +3 SDs and is obese. Malnutrition in infant age group (25.9%) is higher than all the other age groups (7.9%). This difference is statistically significant (Chi Square 42.2, p <0.000001). It is seen that there is a statistically significant difference in malnutrition (< SD 2) between male infants (33.7%) and female infants (16.4%) (Chi square 7.1, p 0.008) (Tables 1 & 2). Median weights are seen in 44.7% boys and 55.5% girls (Chi square 8.65, p 0.003)

Stunting is overall 10.0 % (8.9% mild, 0.9% moderate and 0.2% severe). Wasting is seen to be 39.2% (Mild 30.1%, Moderate 8.2% and severe 0.9%). The difference between boys and girls with stunting or wasting is not statistically significant.

Of the underfive children, it is seen that 53.9% (boys 54.2% and girls 53.7%) are in failure (Table 3). The WHO measurement shows the least amount of malnutrition while the CIAF model shows the most practical and relevant finding (Table 4). Looking at BMI in 406 children in the 3 years to 5 years age group, it is seen that a total 47.5% were below the 5th percentile (Table 5).

Table 1: Distribution of under nutrition by WHO classification in <5 Male children

Age in years	- SD3 (%)	- SD2 (%)	- SD1 (%)	Median	+ SD1 (%)	+ SD2 (%)	+ SD3 (%)	Total
1	14 (13.5)	21 (20.2)	23	40	5	1	0	104
2	1 (1.4)	2 (2.8)	22	39	5	2	0	71
3	0	6 (7.5)	39	34	1	0	0	80
4	0	7 (11.9)	23	28	1	0	0	59
5	0	2 (3.8)	26	23	2	0	0	53
Total	15	38	133	164	14	3	0	367

(Chi Square 45.38, deg of freedom 4, p <0.00000001)

Table 2: Distribution of under nutrition by WHO classification in <5 Female children

Age in years	- SD3 (%)	- SD2 (%)	< -SD 1 (%)	Median	> SD 1 (%)	+ SD2 (%)	+ SD3 (%)	Total
1	4 (3.6)	11 (12.4)	26	46	1	0	1	89
2	1(1.2)	3 (3.6)	26	51	2	0	0	83
3	1(1.2)	6 (7.2)	21	52	3	0	0	83
4	1 (1.8)	9 (16.1)	21	25	0	0	0	56
5	0	4 (6.5)	25	33	0	0	0	62
Total	7	33	119	207	6	0	1	373

(Chi Square 10.98, deg of freedom 4, p 0.027)

Table 3: Calculation of CIAF (Composite Index of Anthropometric Failure) in Boys and Girls				
Category	**Type of Anthropometric Failure**	**Boys (%)**	**Girls (%)**	**Total (%)**
A	No failure	168 (45.8)	173 (46.3)	341 (46.1)
B	Wasting only	122 (33.2)	126 (33.7)	248 (33.5)
C	Underweight & Wasting	7 (1.9)	9 (2.4)	16 (2.2)
D	Wasting, Stunting & Underweight	15 (4.1)	11 (2.9)	26 (3.5)
E	Stunting & Underweight	0	0	0
F	Stunting only	24 (6.5)	24 (6.4)	48 (6.5)
G	Stunting and overweight	0	0	0
H	Overweight only	0	1 (0.27)	1 (0.1)
Y	Underweight only	31 (8.4)	29 (7.8)	60 (8.1)
	Total	367	373	740
CIAF = 1-A / A + B + C + D + E + F + G + Y = 1-A/1 = 1-A				
CIAF for Boys = 1 - 0.458 or 54.2% CIAF for Girls = 1 - 0.463 or 53.7%				
Overall CIAF = 1 - 0. 461 = 53.9%				

Table 4: Comparing the different classifications of malnutrition (All grades)				
S.No	**Classification**	**Boys (%)**	**Girls (%)**	**Both Boys & Girls (%)**
1	IAP (mild, moderate & severe)	60 (16.3)	58 (15.5)	118 (15.9)
2	Gomez (mild, moderate & severe)	157 (42.8)	161 (43.2)	318 (42.97)
3	WHO < -2 Standard deviations	53 (14.4)	40 (10.7)	93 (12.6)
4	Anthropometric Failure - CIAF	199 (54.2)	200 (53.6)	399 (53.9)

Table 5: Distribution of >2 years children according to BMI and age			
Age in years (Boys & Girls)	**<5th percentile (%)**	**5th to 95th percentile (%)**	**Total**
3	92 (56.4)	79 (43.6)	163
4	52 (45.2)	61 (54.8)	115
5	43 (37.4)	66 (62.6)	115
Total	187 (47.6)	206 (52.4)	393
Chi Square 5.65, deg of freedom 2, p 0.05			

Discussion

In India, child malnutrition is mostly the result of high levels of exposure to infection and inappropriate feeding and caring practices.[10] The existing response in India has been skewed towards food-based interventions with little emphasis on the multidimensional nature of malnutrition in children.[11] Underweight, stunting, wasting and overweight are indicators that are used to measure nutritional imbalance.[12] Sahu et al in a review showed that the prevalence of under-nutrition among under-five children in India was high and varied widely across the country.[13]

Bhandari et al state that almost 60% of children were below 2 standard deviations.[14] Patnaik et al found that under-nutrition in Bhubaneswar was 28.2%.[15] Srivastava et al found that 31.7% boys and 23.2% girls were underweight. Stunting was seen in 17.9 % boys and 20.1% girls.[16] Thakur et al found an overall prevalence of malnutrition as 56.2%. (Boys 57.1 and girls 42.9%) They also state that all grades of malnutrition are more common in infants.[3]

Wasting in children is a symptom of acute under nutrition which also impairs the immune system leading to increased susceptibility to infectious diseases and increased severity and duration of disease.[17] Stunting is a frequent form of under-nutrition, yet it is poorly recognized. 38% children under-five years in India are stunted.[18] Stunting leads to decreased mental aptitude, decreased learning potential and poor school performance. There is also an increased risk of nutrition-related chronic diseases in the future. Preventing stunting is essential in the long run to ensure healthy, educated and productive adults.

Seetharaman et al found 68.6% of the children to be in a state of anthropometric failure while the WHO and IAP scoring showed malnutrition as 49.6% and 51.4% respectively.[19] Savanur et al found that prevalence of underweight, stunting and wasting was 35.7%, 33.8% and 18.5% respectively. However as per CIAF, 47.8% children were undernourished. Of these, a third of them had single anthropometric failure while half of them had dual failure and 17.1% had multiple failures.[6] CIAF is useful in assessing the overall magnitude of under nutrition and identifying children with multiple anthropometric failures. In another study of slum children in West Bengal, the prevalence of low weight for age was 41.6%, whereas CIAF was 80.3%. [20] A study done in Raipur showed that by CIAF the prevalence of under nutrition was found to be 62.1%.[21] In a study done in Yemen, CIAF identified under nutrition in 70.1% of underfive children, while conventional anthropometric indices revealed 55.1% underweight.[22] Kaissie et al found 36.3 % stunting, 12.1% wasting and 24.9% underweight while the prevalence of total under nutrition in the children was 45.96%. [23]

The multi-dimensional nature of malnutrition and the three anthropometric indicators of children are equally important. Short-term nutritional interventions are unlikely to succeed in an environment where the causes of malnutrition are multidimensional and interrelated. Focused interventions are needed for improving the nutritional status of underfive children to ensure ideal growth and development and also reducing

morbidity and mortality.[24] By using CIAF classification, undernourished children can be distributed into different groups to identify children with multiple anthropometric failures for and prioritized management.[25]

Conclusion

Anthropometric failure takes into consideration all three aspects of malnutrition i.e. wasting, stunting and underweight. Using low weight-for-age as the only criterion may underestimate the true prevalence of under nutrition. It is also seen that under nutrition in the first year of life is significantly higher both in boys and girls. A relook at infant feeding practices is necessary.

Acknowledgement: The authors wish to thank the Management of NRI Medical College, Staff of the UHC, Israilpet, Guntur and the Anganwadis working in Israilpet for their help and cooperation. We are grateful to all the mothers and children who took part in this study.

Conflict of Interest: Nil.

Source of Funding: *Self.*

Ethical Clearance: Institutional Ethical Committee (IEC) clearance taken.

References

1. UNICEF, The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. UNICEF, New York.
2. NFHS 4, India Fact sheet, National Family Health Survey (NFHS-4) 2015 -16, GOI – Ministry of health and family Welfare. http://rchiips.org/nfhs/pdf/NFHS4/India.pdf
3. Thakur MS, Naik JD, Jailkhani SMK, Langre SD, Pandey VO, Anthropometric Assessment and Morbidity Profile of under Five Children Attending Immunization Clinic at Urban Health Centre, Sch. J. App. Med. Sci., 2014; 2(1C):352-356
4. Ogunrinade S.A, The Incidence of Malnutrition in Children (Age 0 – 5 Yrs.), Journal of Agriculture and Life Sciences, 2014; 1(2): 77 – 85. Available at http: //jalsnet.com/ journals/ Vol_1_ No_2_ December_ 2014/ 10.pdf.
5. WHO, Malnutrition in children, WHO Nutrition Landscape Information System (NLiS), 2019, Available at: https://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=391&lang=EN
6. Savanur M, Ghugre PS, Magnitude of undernutrition in children aged 2 to 4 years using CIAF and conventional indices in the slums of Mumbai city, Journal of Health Population and Nutrition, 2015;33(3):1 to 7
7. Nandy S, Svedberg P, The Composite Index of Anthropometric Failure (CIAF): An Alternative Indicator for Malnutrition in Young Children. Chapter Number:6 - Neonatal anthropometry: a tool to evaluate the nutritional status, and to predict early and late risks.2012:127-137, Edition:1, Springer, Editors: V. R. Preedy, DOI: 10.1007/978-1-4419-1788-1_6.
8. World Health Organization, The use and interpretation of Anthropometry - Report of WHO Expert committee. WHO Tech Rep Series 854. WHO, Geneva. 1995.
9. WHO, Child Growth Standards, Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age, Geneva: WHO; 2006. Available at https://www.who.int/childgrowth/standards/Technical_report.pdf
10. Ali SS, Dhaded, Goudar S. The impact of nutrition on child development at 3 years in a rural community of India. *Int J Prev Med*. 2014;5(4):494-499.
11. Gragnolati M, Shekar M, Gupta MD, Bredenkamp C, Lee Y, India's Undernourished Children: A Call for Reform and Action, 2005, The International Bank for Reconstruction and Development / The World Bank 1818 H Street, NW Washington, DC 20433
12. World Health Organization, Nutrition - Stunting in a nutshell. 2016, Available at: http://www.who.int/nutrition/healthygrowthproj_stunted_videos/en/
13. Sahu SK, Kumar SG, Bhat BV, Premarajan KC, Sarkar S, Roy G, Joseph N, Malnutrition among under-five children in India and strategies for control. J Nat Sci Biol Med, 2015; 6(1):18-23.
14. Bhandari TR, Chhetri M, Nutritional Status of Under Five Year Children and Factors Associated in Kapilavastu District, Nepal. J Nutrition Health Food Sci, 2013; 1(1): 6.
15. Patnaik L, Pattnaik S, Kumar V, Sahu T, Morbidity pattern among under 5 children of in an urban slum area of Bhubaneswar City, Odisha. Indian Journal of Maternal and Child Health, 2012;14(2).

16. Srivastava DK, Tripathi D, Gour N, Jain PK, Singh CM, Srivastava AK, Kumar S, Rani V, Morbidity profile of underfive children in urban slums of Etawah District, Indian Journal of Community Health, 2012;24 (2): 153-157.
17. WHO, Malnutrition in children, WHO Nutrition Landscape Information System (NLiS),2019.Available at: https://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=391&lang=EN
18. UNICEF India, Evaluation report, India: Reducing Stunting in Children Under Five Years of Age: a comprehensive evaluation of UNICEF's strategies and programme performance – India Country Case Study. 2017. http://unicef.in/whatwedo/10/stunting
19. Seetharaman N, Chacko T V, Shankar S, Mathew A C, Measuring malnutrition -The role of Z scores and the composite index of anthropometric failure (CIAF). Indian J Community Med, 2007; 32:35-9
20. Shit S, Taraphdar P, Mukhopadhyay DK, Sinhababu A, Biswas A, Assessment of nutritional status by composite index for anthropometric failure: A study among slum children in Bankura, West Bengal, Indian journal of public health, 2012; 56: 305-7.
21. Boregowda GS, Soni GP, Jain K, Agrawal S, Assessment of Under Nutrition Using Composite Index of Anthropometric Failure (CIAF) amongst Toddlers Residing in Urban Slums of Raipur City, Chhattisgarh, India, Journal of Clinical and Diagnostic Research. 2015 Jul, Vol-9(7): LC04-LC06, DOI: 10.7860/JCDR/2015/12822.6197
22. Al-Sadeeq AH; Bukair AZ; Al-Saqladi A-WM. Assessment of under nutrition using Composite Index of Anthropometric Failure among children aged < 5 years in rural Yemen. East Mediterr Health J. 2018;24(12):1119–1126. https://doi.org/10.26719/2018.24.12.1119
23. Kassie, GW, Workie DL, Exploring the association of anthropometric indicators for under-five children in Ethiopia. BMC Public Health,19,764 (2019).
24. Tiwari R, Ausman LM, Agho KE, Determinants of stunting and severe stunting among under-fives: evidence from the 2011 Nepal Demographic and Health Survey. BMC Pediatr, 2014; 14:239.
25. Ramkumar S, Vijayalakshmi S, Kanagarajan P, Patil R, Lokeshmaran A, Z-Score and CIAF–A Descriptive Measure to Determine Prevalence of Under-Nutrition in Rural School Children, Puducherry, India, Journal of Clinical and Diagnostic Research. 2018 May, Vol-12(5): LC24-LC27, DOI: 10.7860/JCDR/2018/22224.11560