ORIGINAL RESEARCH ARTICLE

Assessment of Nutritional Status Using Composite Index of Anthropometric Failure (CIAF) Among Under-Five Children from An Urban Slum of Southern India: A Cross-Sectional Study

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ABSTRACT

Introduction: NFHS-5 Telangana reports underweight, stunting, and wasting among under 5 children as 31.8%, 33.1%, and 21.7% respectively. Composite Index of Anthropometric Failure is an aggregate indicator that excludes children with anthropometric failure and includes children who are wasted, stunted, or underweight, and their combinations. The objectives were to determine the prevalence of anthropometric failures and to find its determinants among under-five children in an urban slum area of Hyderabad.

Methodology: A cross sectional study was conducted among 310 under 5 children residing in the urban-slum area of Hyderabad. Probability proportionate to size sampling was used. Using questionnaire and standard operating procedures, socio-demographic profile, health details and nutritional assessment was done. Statistical analysis was done using SPSS version 26.

Results: The prevalence of anthropometric failure is noted to be 39.6%. The prevalence of stunting, underweight and wasting were found to be 20.7%, 26.8% and 12%, respectively. The illiteracy of father [AOR:2.94(CI: 1.31-6.62); p-value=0.009], low birth weight [AOR:2.024(CI: 1.253-3.26); p-value=0.004], not exclusively breastfed [AOR:4.291(CI:1.55-11.904); p-value=0.005] and deficient calorie intake [AOR: 2.079(CI:1.103-3.906); p-value=0.023] were found to be the significant predictors of Anthropometric failure.

Conclusion: Under nutrition is an important public health problem with 40% prevalence in urban slum of Telangana. Enhancing the literacy of fathers, reduction in low birth weight, better IYCF practices and providing calorie adequate diet will aid in enhancing children's nutritional status.

Key words: Composite Index of Anthropometric failure; CIAF; Under 5 years; Urban slum; malnutrition; underweight; stunting; wasting

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INTRODUCTION

Nutrition is a fundamental pillar of human life. Sustainable development goals target 2.2 aims to end all forms of malnutrition by 2030. Under-nutrition is a major contributor to mortality among children younger than 5 years in developing countries including India and has major effects on the realm of public health.[1,2] According to the National Family Health Survey-5, the children under 5 years who are underweight, stunted, and wasted are 31.8%, 33.1%, and 21.7% respectively in the state of Telangana. In urban areas of Telangana underweight, stunting and wasting is reported as 25.8%, 28.1% and 20% respectively.[3] Hence, addressing the challenge of under-nutrition in children is essential to ensure optimal growth, development, overall health, and disease prevention.

Nutritional assessment is done by several methods like anthropometric measurements, dietary assessments, clinical examination, functional assessment, vital statistics, and ecological studies. Through ICDS, in Anganwadi's, under-nutrition is conventionally determined through weight-for-age charts: WHO growth standards. Weight for age estimation reflects both acute and chronic malnutrition but misses out on children who are stunted & wasted.[4,5] An aggregate indicator, the Composite Index of Anthropometric Failure (CIAF), can help in addressing this concern. The CIAF excludes those children who aren't in anthropometric failure and includes all children who are wasted, stunted, or underweight, and their combinations, therefore providing us a single measure with which the overall prevalence of under-nutrition can be estimated.[6,7,8]

The National Nutrition Strategy of India and the National Nutrition Mission, Prime Minister's Overarching Scheme for Holistic Nourishment (POSHAN Abhiyaan) emphasizes on tracking progress in reducing child anthropometric failure. But considering the vulnerable population in urban slum of South India, there is a scarcity of available literature and the used tools of assessments are varied. Although there are many studies regarding the prevalence of under nutrition among under-five children, only a few have utilized CIAF to quantify under nutrition among children in Telangana, especially in an urban slum population. With this background, the study will aim to find the prevalence of anthropometric failure along with its determinants among under-five children in the urban slum of Hyderabad.

METHODOLOGY

An analytical cross-sectional study was conducted in the urban slum area of Hyderabad over a period of 6 months starting from June 2022. Study population included all under-five children residing in the urban-slum area of Hyderabad. Children of unwilling mothers & children in the absence of their mother during data collection were excluded from the study. The study population belonged to Dravidian ethno linguistic group who speaks Telugu language and are native to Indian state, Telangana.

Sample Size: Considering the prevalence of Anthropometric failure as 56% as per the study conducted by Junaid Khan and Sumit Kumar Das in 2020[9] with 10% relative precision at a 95% confidence interval, the sample size was calculated as 309 using the formula $N= Z^2Q/Pe^2$, where P 56%; Q 100-p; Relative precision 10. Thus, the calculated sample size was (N) 309.

Sampling Procedure: Sampling was done from an urban slum area in Telangana, having a population of 10300 spread over 27 bastis having 16 Anganwadis. The population of under 5 age group in the urban slum area is 9965 approximately. A list of all Anganwadis in the area with their population covered were prepared. Probability Proportionate to size technique was utilized for sampling till the sample size of 310 was reached. All the 16 anganwadis under an urban slum area were proportionally sampled according to size of the under-five population of the area served by anganwadis. From the list of under five children in each Anganwadi children were randomly sampled till the required sample size was reached.

Study Tools: Predesigned pretested semi-structured questionnaire was used to collect data on socio-demographic profile, immunization details, and disease details. Anthropometric measurements like weight, height, mid-upper arm circumference was obtained using standard procedure using properly calibrated portable weighing machine, baby weighing machine, non-stretchable measuring tape and infantometer. Weight was measured to the nearest 0.1 kg using a standard weighing scale. Height and MUAC were calibrated using non-stretchable tape, wherein height was measured fixed to a vertical wall, with the participant standing on a firm/level surface, and it was measured to the nearest 0.1 cm. Recumbent length in infants was measured using an infantometer. WHO-ANTHRO software v3.2.2 was used to calculate Weight-for-Height Z-score (WHZ), Height-for-Age Z-score (HAZ), and Weight-for-Age Z-score (WAZ).[10]

Ethical Considerations: Approval was taken from the Institutional Ethics Committee-Biomedical Research before commencing data collection. All information collected during the study was kept confidential. Case record forms were coded. Written informed consent was taken from mothers of each under-5 child before the interview (EC/NEW/INST/1527/2022/07/006).

Data collection: Face-to-face interviews of the mothers of the under-five children were done with the help of a pre-designed, pretested, semi-structured questionnaire. For assessing nutritional status, clinical examination, dietary assessment & an-

thropometric measurements were carried out following standard operating procedures.

Dietary assessment was done through a 24-hr dietary recall method conducted in a standardized way. The mother was interviewed about the food consumed by the child in the previous day according to his/her meal patterns including information on food consumption outside the household. Standardized tools were used to capture the quantity & volume of the food. The nutrient composition was estimated along with calorie, protein, and fat count per day, any deficit was recorded using ICMR-NIN RDA 2020.[11]

Standard definitions: Wasting (acute malnutrition) is defined as a WHZ of < -2. Severe wasting is considered if WHZ is < -3 OR if MUAC <11.5 cm.

Stunting (chronic malnutrition) is defined as a HAZ of < -2. Severe stunting is considered if HAZ is < -3.

Underweight (acute and chronic malnutrition) is defined as WAZ of < -2. Severe underweight is considered if WAZ is < -3.

Mid-upper arm circumference (MUAC) (23): Measured value more than 12.5 were considered normal; 11.5-12.5cm were considered moderate acute malnutrition and those with mid upper arm circumference less than 11.5cm were categorized as severe acute malnutrition

Composite Index of Anthropometric Failure (CIAF): According to CIAF classification, children can be divided into following seven groups: [6]

Table 1: Classification according to Composite Index of Anthropometric Failure

Group	Description	Wasting	Stunting	Underweight
Group A	No failure	No	No	No
Group B	Wasting only	Yes	No	No
Group C	Wasting and underweight	Yes	No	Yes
Group D	Wasting, stunting, and underweight.	Yes	Yes	Yes
Group E	Stunting and underweight	No	Yes	Yes
Group F	Stunting only	No	Yes	No
Group Y	Underweight only	No	No	Yes

RESULTS

Socio-demographic details: Mean age of the study participants is 30.7 months (SD=16.213months). Majority of children (57.4%) included in the study were males. Majority of parents of children included in the study are literate, 94.2% of mothers and 90.3% of fathers. Among the mothers of the study participants, 137 (44.2%) acquired education till intermediate and above. Regarding occupational status of father, majority i.e., 59.7% (185) were involved in Unskilled labor. Majority (80.3%) of mothers were Homemakers. The Mean monthly income of the family is Rs. 21,811.29 (SD=Rs.11,921.43) and it ranged from Rs. 7500 to Rs. 60000. The majority (76.8%) of the study participants belong to the Upper middle class according to the Modified Kuppuswamy Scale. Majority of the children belonged to nuclear families (88%) with a mean family size of 4.42 (SD=1.37).

Delivery, Health care details: Majority (44.8%) of the study participants were 1st born children. Among the children included in our study 43.9% were born with low birth weight and 1.6% were very low birth weight. Some proportion of children (7.7%) had neonatal ICU admissions at the time of birth due to conditions including jaundice, premature birth, neonatal pneumonia, etc. In the two weeks preceding to sample collection, 52.6% of the study sample had respiratory infections, while 13.9% of all participants had gastrointestinal disorders. A large majority (95.5%) of the study sample had no prior history of worm infestation and 89% of the subjects hadn't had a deworming in the previous six months. 92.9% of the participants in our study were not detected of any nutritional deficiencies in the past.

Table 2: Anthropometric Details of study participants as per WHO Growth Standards

Variables	Participants (%)
Weight for Age	
Normal	227 (73.2)
Underweight	76 (24.5)
Severe Underweight	7 (2.3)
Height for Age	
Normal	246 (79.4)
Stunting	51 (16.5)
Severe Stunting	13 (4.2)
Weight for Height	
Normal	274 (88.4)
Wasting	33 (10.6)
Severe Wasting	3 (1)
Mid Upper Arm Circumference	
Normal (>12.5cm)	299 (96.5)
Moderate Acute Malnutrition (11.5-12.5cm)	9 (2.9)
Severe Acute Malnutrition (<11.5cm)	2 (0.6)

Table 3: The proportion of various groups of anthropometric failure among study participants

Groups	Description	Participants
Group A	No failure	187 (60.3)
Group B	Wasting only	5 (1.6)
Group C	Wasting and underweight	24 (7.7)
Group D	Wasting, stunting, and underweight.	7 (2.3)
Group E	Stunting and underweight	22 (7.1)
Group F	Stunting only	35 (11.3)
Group Y	Underweight only	30 (9.7)
Total		310 (100)

Figures in parenthesis indicate percentage.

Table 4: The association between socio-demographic factors, feeding practices, health and disease related factors with anthropometric failure

Variables	Anthropometric Failure		Chi square	Df	p value	OR (95% CI)
	Failure (%)	No Failure (%)				
Age						
<12months	24 (42.1)	33 (57.9)	0.578	2	0.749	1
13-35 months	48 (37.2)	81 (62.8)				0.82(0.43-1.54)
36-59months	51 (41.1)	73 (58.9)				0.96(0.51-1.81)
Gender						
Males	69(38.8)	109(61.2)	0.146	1	0.703	1.09(0.69-1.73)
Females	54(40.9)	78 (59.1)				
Father's Education						
Illiterate	18 (60)	12 (40)	5.731	1	**0.017**	**2.50(1.16-5.40)**
Literate	105 (37.5)	175(62.5)				
Mother's Education						
Illiterate	7(38.9)	11(61.1)	0.005	1	0.944	0.97(0.36-2.56)
Literate	116(39.7)	176(60.3)				
Father's Occupation						
Skilled & Professional	86(45.5)	103(54.5)	6.865	1	**0.009**	**1.90(1.17-3.09)**
Unemployed & Unskilled	37(30.7)	84(69.4)				
Mother's Occupation						
Homemakers	104(41.6)	146(58.4)	1.995	1	0.158	1.45(0.80-2.61)
Employed	19(31.7)	41(68.3)				
SES						
Upper	18(34)	35(66)	0.872	1	0.350	0.74(0.40-1.38)
Middle	105(40.9)	152(59.1)				
Type of family						
Nuclear	107(39.2)	166(60.8)	0.223	1	0.637	0.85(0.04-1.69)
Joint	16(43.2)	21(56.8)				
Baby cried immediately after birth						
No	1(50)	1(50)	0.090	1	0.765	0.66(0.04-10.6)
Yes	122(39.6)	186(60.4)				
Birth Weight						
Normal	56 (33.1)	113 (66.9)	6.643	1	**0.010**	**1.83(1.15-2.89)**
Low Birth Weight	67 (47.5)	74 (52.5)				
Any neonatal admission						
No	110(38.5)	176(61.5)	2.282	1	0.131	1.89(0.82-4.37)
Yes	13(54.2)	11(45.8)				
Child immunized for age						
No	5(55.6)	4(44.4)	0.976	1	0.323	0.52(0.14-1.96)
Yes	118(39.2)	183(60.8)				
Respiratory illness in the past 2 weeks						
No	55(37.4)	92(62.6)	0.598	1	0.439	1.20(0.76-1.89)
Yes	68(41.7)	95(58.3)				
Gastrointestinal illness in the past 2 weeks						
No	108(40.4)	159(59.6)	0479	1	0.489	0.79(0.40-1.55)
Yes	15(34.9)	28(65.1)				
History of worm infestation						
No	117(39.5)	179(60.5)	0.062	1	0.803	1.15(0.39-3.39)
Yes	6(42.9)	8(57.1)				
Early initiation of breast feeding (within 1 hour)						
Yes	3(30)	7(70)	0.404	1	0.525	0.64(0.16-2.54)
No	120(40)	180(60)				
Exclusive breastfeeding till 6months of age						
Yes	109(37.6)	181(62.4)	8.213	1	**0.004**	**3.87(1.45-10.4)**
No	14(70)	6(30)				
Age of initiation of Complementary feeding						
<6 months	11(61.1)	7(38.9)	3.668	1	0.055	1.23(0.47-3.21)
≥ 6months	112(38.4)	180(61.6)				
Calorie						
Deficit	105(42.5)	142 (57.5)	4.075	1	**0.044**	**1.85(1.01-3.38)**
Adequate	18(28.6)	45 (71.4)				

Feeding practices: Initiation of breastfeeding occurred within an hour of birth in 96.8% of the study participants. Among 310 children, 290 (93.5%) was breastfed exclusively until they were 6 months old. The majority of the study participants (48.7%) had started complementary feeding at 6 months, followed by more than 7 months (45.5%). In our study, mean duration of breast feeding in months was

18.16±8.31 months and the mean age of initiation of complementary feeding was 6.82±1.83 months.

According to the 25-hour recall method, 79.7% of the participants had calorie deficit in their dietary intake. While fat and protein were present among 70.3% and 35.8% of the study participants respectively.

Nutritional status of study participants (Table 2): In this study, we've found that 27.8% of study participants were underweight and 2.3% were severely underweight. The study participants with stunting which represents chronic under-nutrition included 20.7% and 4.2% were severely stunted. 12% of the participants had wasting and 1% was severe wasted. Assessed by MUAC, 9% of the study participants had moderate acute malnutrition, while 0.6% had severe acute malnutrition.

Composite Index of Anthropometric failure (Table 3): According to CIAF, almost 40% of study participants have anthropometric failure. Among those children with anthropometric failure, Underweight, stunting and wasting alone was present among 9.7%, 11.3%, 1.9% of the study participants respectively. 7.7% had wasting and underweight. 7.1% were stunted and underweight. Among the children included in our study, 2.3% had all three components of anthropometric failure i.e., they were wasted, stunted and underweight.

The determinants of anthropometric failure among under-five children (Table 4): Among the socio demographic factors in this study, we discovered a strong association between the father's educational background and line of work and the anthropometric failure of the children. Compared to literate fathers, higher proportion of anthropometric failure was observed among illiterate with a p value of 0.017. And when considering the occupation of fathers, those doing skilled and professional labor had higher proportion of children with anthropometric failure compared to unemployed and unskilled labor (p value=0.009). Among the health-related factors, birth weight was found to have statistically significant association with higher proportion i.e. 47.5% among low birth weight compared to children born with normal birth weight (33.1%) with p value 0.010. Among the feeding practices, a statistically significant association was found between anthropometric failure and exclusive breast feeding till 6 months of age (p value<0.05). Higher proportion of anthropometric failure was found among children who were not exclusively breast fed compared to the rest with p value 0.004. An association was found between calorie and protein deficit in the diet and anthropometric failure, with p= 0.04 and 0.016 respectively. Compared to children on adequate calorie diet as per RDA (28.6%) higher proportion of anthropometric failure (42.5%) was found among calorie deficit group. Similarly, higher proportion of anthropometric failure (48.6%) was found among children having a protein deficit in diet (p value=0.016) compared to those taking adequate protein.

Table 5: Predictors of Anthropometric failure through multivariate logistic regression

Variables	Adjusted OR (95% CI)	P value
Birth Weight		
Normal (0)	Ref	**0.006**
Low Birth Weight (1)	2.05 (1.23-3.41)	
Father's Education		
Literate (0)	Ref	**0.04**
Illiterate (1)	2.42 (1.00-5.82)	
Calorie Intake		
Adequate (0)	Ref	**0.014**
Deficit (1)	2.351 (1.19-4.66)	
Exclusive Breast Feeding till 6 months of age		
Yes (0)	Ref	**0.005**
No (1)	4.59(1.59-13.28)	
Age		
<12 months (0)	Ref	0.263
13-35 months (1)	1.53(0.73-3.22)	
36-59months (2)	1.28(0.62-2.62)	0.507
Gender		
Males (0)	Ref	0.884
Females (1)	0.96(0.58-1.59)	
Fathers Occupation		
Skilled & Professional (0)	Ref	0.065
Unemployed & Unskilled (1)	1.67(0.97-2.87)	
Mothers Occupation		
Homemakers (0)	Ref	0.102
Employed (1)	0.581(0.30-1.11)	
Age of initiation of Complementary feeding		
≥ 6months (0)	Ref	0.752
<6 months (1)	1.18(0.43-3.21)	
Any neonatal admission		
No (0)	Ref	0.540
Yes (1)	1.33(0.53-3.34)	

Multivariate analysis to find predictors of anthropometric failure (Table No.5): To find the predictors of anthropometric failure among under five children considering the confounding factors multivariate logistic regression was done using enter method. All the variables that came significant in univariate analysis as well as variables which gave a p value <0.25 along with age and gender of the study participants were included in model. Forward stepwise method was used to run the logistic regression command. Out of 10 variables included, i.e., Age, sex, father's education and occupation, mother's occupation, birth weight, neonatal hospital admissions, exclusive breast feeding, age of initiation of complementary feeding and calorie intake, 4 variables came to be significant predictors of anthropometric failure (p value <0.05). Exclusive breast feeding not being provided for 6 months (p value=0.005) , Father's being illiterate (p value=0.049), calorie intake being less that RDA (p value=0.014) and Birth weight being <2.5 kg (p value=0.006) were significant predictors of Anthropometric failure. It was found that those children who were not exclusive breast fed till 6 months of age were found to be having 4.59(1.59-13.28) times higher odds of having anthropometric failure compared to their counterparts. Similarly, uneducated fathers were having 2.42 (1.00-5.82) times higher odds of having children with anthropometric failure compared to educated fathers. Chil-

dren with deficient calorie intake were 2.351 (1.19-4.66) times having higher odds of having anthropometric failure compared to those on adequate calorie diet. Children born low birth weight(<2.5Kg) were found to have 2.05 (1.23-3.41) times higher odds of having anthropometric failure compared to those born with normal birth weight.

Discussion

The present study has applied the CIAF scale for estimating the overall burden of child under nutrition and identifying its covariates. CIAF excluded those children who aren't in anthropometric failure and included all children who were wasted, stunted, or underweight, and their combinations, therefore provided us a single measure with which the overall prevalence of under-nutrition could be estimated. Anthropometric failure in children is often seen to comprehend the impact of nutritional deprivation, which depends on a variety of circumstances, with inadequate food, both in terms of consumption and composition, standing to be a significant underlying determinant.

According to the current study, 40% of children suffer from anthropometric failure. The prevalence of stunting, representing chronic malnutrition was found to be 20.7%, while underweight and wasting representing acute malnutrition were found to be 26.8% and 12%, respectively. These rates were consistent with studies conducted by Aparajita Dasgupta et al[7]. According to the National Family Health Survey (NFHS)-5, Telangana reported rates of undernutrition of 25.8%, for underweight, 28.1% for stunting, and 20% for wasting for children under the age of five in urban areas, which are similar to our study. Similar prevalence rates were noted in Bangladesh[12], Ethiopia[13] and Pakistan[14] as well. The studies by Sabu Ulahannan Kochupurackal et al[15], Angeline Jeyakumar et al[16], Waleed Rasheed et al[17], Garima Guptaet et al[8], Subhadeep Shit et al[18] reported higher prevalence rates. Higher prevalence was also noted in a community-based cross-sectional study conducted by Aida H Al-Sadeeq et al[19] in South Yemen. The variations with other research that have been identified could be caused by the different methodologies. The sampling of under 5 children in the present study was done from registered children from Anganwadis of an urban slum, while majority of other studies had done the sampling through house-to-house survey. One of the major functions of anganwadis under ICDS is growth monitoring, finding malnutrition using weight for age criteria and taking corrective measures like providing the extra nutritional requirements as supplementary nutrition. Hence, our study summaries the prevalence of undernourishment among registered anganwadi children in an urban slum.

Under-5 children evaluated for anthropometric failure using the CIAF, allowed us to divide the undernourished children into other subgroups with combination of acute and chronic malnutrition. We see that 39.6% of the kids had anthropometric failures of one kind or another. Among those children with anthropometric failure, 14.8% had dual anthropometric failure (Category C & E) and 2.3% had all three components of anthropometric failure i.e., they were wasted, stunted and underweight (Category D). Among those with anthropometric failure, 11.3% and 9.7% participants were stunted (Group F) and underweight (Group Y) respectively. We can identify 26.8% of the children from subgroups C, D, E, and Y by using low weight for age (underweight) as the only criterion for under nutrition (as in anganwadis), but miss out identifying the children in subgroups B and F who were stunted and wasted but not underweight. Because of this, 12.8% of these kids would have been wrongly categorized as normally nourished.

The determinants of composite index of anthropometric failure among urban slum children in the present study were exclusive breast feeding not being provided for 6 months, fathers being illiterate, Calorie intake being deficient as per RDA and birth weight being <2.5kgs. According to the study's findings, infants who are exclusively breastfed have a lower risk of developing anthropometric failure which coincides with other studies such as Itishree Pradhan et al[20]. The author analyzed the feeding practices and their associations with under nutrition among children aged 6-23 months in the 124 districts of India and stated that appropriate breastfeeding lowered the odds of children being undernourished. Additionally, in a community-based cross-sectional study conducted in rural West Bengal, lesser duration of breast-feeding was found to be an independent predictor of anthropometric failure[7]. Among the limited existing literature of the determinants of CIAF, a cross-sectional community-based study done by Deepika Dewan[21] in urban Jammu identified early weaning as a significant predictor. Calorie intake being deficient as per RDA was found to be a significant predictor of anthropometric failure in our study. Contrary to this, a study by William Joe et al[22] examined the association between anthropometric based and food based nutritional failure among children in India and noted weak to null correlation between anthropometric failures and food failures. A prospective observational study conducted by Shailendra Meena et al[23] with a nutritional education intervention in the urban and rural ICDS projects of Bhopal district, Madhya Pradesh using audiovisual aids noted almost 6% reduction in moderate underweight upon nutritional intervention and 4% reduction in severe underweight in urban areas.

A community-based, cross-sectional study was carried out in ten states of India by Indrapal I Meshram et al[24] where children with birth weight less than 2.5 kg had Anthropometric failure in 47.5% of cases. Similar finding was observed in a study conducted in Palghar district of Maharashtra, India among tribal children less than 5 Years of age conducted by Ange-

line Jeyakumar et al[16]. Author noted that children who had birth weight >2.5 kg had lesser odds [AOR: 0.63(0.4-0.9] of anthropometric failure. Similarly, Aparajita Dasgupta et al. found low birth weight to be an independent predictor of anthropometric failure[7]. Another community based cross sectional study done in a rural district of Ethiopia by Lamirot Abera et al[25] further identified birth weight as a determining factor of anthropometric failure which was in consonance with our results.

Mother's education[9,13,16,26] was found to be significant predictor in many studies conducted in India. According to authors, mothers' knowledge of children's nutritional needs and skill in conducting growth assessments was protective against the anthropometric failure. In our study, fathers' education came out to be a significant predictor of CIAF. It was observed that uneducated fathers were having higher odds of having children with anthropometric failure compared to educated fathers. The rationale for this finding may be that educated fathers are better able to provide for the family's nutritional needs since they may be more aware of what their children need in terms of nutrition. Many studies found age of child, mother's age, unimmunized kids, high birth order, large family size, nuclear family, low SES, early initiation of breast feeding, maternal early marriage, domestic violence and morbidities to be predictors of CIAF which have not been found in our study.[9,13,15,16,21,26]

Conclusion

Under nutrition is an important public health problem in India. The prevalence of under nutrition as per CIAF in the urban slum of Hyderabad is noted to be 39.6% and is associated with illiteracy of father, low birth weight, exclusive breastfeeding and calorie deficient diet. Improving fathers' education, Reduction in low birth weight, ensuring exclusive breast feeding to children and providing children with a calorie adequate diet as per RDA will aid in enhancing children's nutritional status. Composite Index of Anthropometric Failure (CIAF) provides a single, aggregated assessment of under nutrition in the community which would otherwise be underestimated if conventional indices were solely relied upon. The use of this tool by field-level workers like ASHAs and Anganwadi workers under supportive supervision of auxiliary nurse midwives will improve the diagnosis of under nutrition and help in the early initiation of treatment. The public health experts and policy makers can more effectively quantify the burden of undernutrition at the national level by using the CIAF as a tool.

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