Original Article

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Assessment of Under Nutrition Using Composite Index of Anthropometric Failure (CIAF) amongst Toddlers Residing in Urban Slums of Raipur City, Chhattisgarh, India

Community Medicine Section

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ABSTRACT

Introduction: Several indicators have been used for measurement of under nutrition in the past. They are overlapping and none individually provide a comprehensive number of under nourished in the community. The effort has been to discuss the use of an alternative indicator of malnutrition – the composite index of anthropometric failure (CIAF).

Aim: To study the prevalence of under nutrition of Toddlers using CIAF and compare the prevalence of under nutrition obtained by primitive indicators and CIAF.

Materials and Methods: Cross-sectional community based study was carried out in urban slums of Raipur (C.G) during Jan 01,2014 to Sept 30, 2014 using sample size of 602. Slums were selected by multistage random sampling and the subjects were selected by convenient sampling, i.e. starting from a random point house to house survey was carried out until desired number of subjects (According to PPS) were covered assuming that slum population is evenly distributed. Attendant of Toddlers were interviewed with semi structured proforma and Height and Weight were measured by measuring tape and Salter's weighing machine respectively. Informed consent was obtained. MS excel was used for data analysis after compilation.

Results: Girls and boys were 50% each. By CIAF the prevalence of under nutrition was found to be 62.1% while, Underweight, Stunting and Wasting showed it to be 45.2%, 46.6% and 17.8% respectively.

Conclusion: Primitive indices under estimate the burden of under nutrition and CIAF should be used a screening tool for assessing under nutrition.

Keywords: Anthropometric failure, Composite Index, Indicators of Under nutrition, Toddlers, Under nutrition

INTRODUCTION

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system and neurological and cognitive development. Poor nutrition in the first 1,000 days of children's lives can have irreversible consequences. Globally, about one in four children under five-year-old are stunted, 16% are underweight and 8% are wasted [1]. The Millennium Development Goal target is to halve it by 2015. On present trends these targets will be missed by 30 million children [2]. The World Bank estimates that India is ranked second following Bangladesh in producing the malnourished children [3]. India accounts for about 40% of undernourished children in the world, which contribute to high morbidity and mortality in the country [4]. In addition it is estimated that more than one-third of under five deaths are attributable to under nutrition [5]. This implies persistence of poverty and malnutrition in the country. In spite of its remarkable economic growth in the past decade, India's progress in reducing child malnutrition has been exclusively slow. The latest CAG (Comptroller and Audit General) report on Integrated Child Development Scheme (ICDS) shows that malnourishment rate of Chhattisgarh has decreased from 54% in 2006-07 to 38% in 2010-11 [6]. Still a long way to go for achieving MDG with four years to go. The three most commonly used internationally recommended anthropometric indicators are stunting (low height-for-age), underweight (low weight- for-age) and wasting (low weight-for-height) (WHO, 1995). Underweight is used as a composite of stunting and wasting, but does not distinguish between the two. However, in a population, there will be different degrees of overlap between each indicator – i.e. some underweight children will also experience stunting and/or wasting, some stunted children might not be underweight, and some children might simultaneously experience all three forms of anthropometric failure – stunting, wasting and underweight. As a result none of these conventional indicators used on their own can truly reflect the *overall* burden of under-nutrition. An alternative indicator – the composite index of anthropometric failure (CIAF) – has been proposed by Svedberg, (2000) [7] and used successfully by Nandy et al., [8]. Nutritional surveys aid long-term planning in health and development; to provide input for programme management and evaluation; and to give timely warning of the need for intervention to prevent critical deteriorations in food consumption. Most of these undernourished children are underprivileged and many reside in slums. Slums are those areas which are characterized by insecure residual status, poor structural quality of house, overcrowding, inadequate access to safe water and sanitation [9]. Therefore, slum dwellers are more vulnerable to infections which results in deterioration of their nutritional status. Hitherto, data are lacking on under nutrition [10] as assessed by World Health Organization (WHO). Thus, the present study was undertaken to assess the prevalence of under nutrition using Composite index of Anthropometric Failure (CIAF) amongst toddlers of urban slums of Raipur city. Comparison was made with the primitive indices for estimation of burden of Under nutrition in the community.

MATERIALS AND METHODS

A cross-sectional community based study was carried out amongst Toddlers in slums of Raipur city, Chhattisgarh (C.G). List of slums was obtained from Muncipal Corporation, Raipur. Slums were

sampled by multistage simple random sampling. Two wards were selected randomly from each zone and two slums were picked from each ward randomly. With 8 zones available 32 slums were selected. Households were selected by convenient sampling. Considering that distribution of population within slum is homogenous house to house survey was carried out starting from a random point and moving with right thumb until the desired number of subjects was obtained. Sample size was estimated using Emergency Nutritional assessment (ENA) software by SMART [11]. Sample size was 400 with confidence interval of 95%. It was made 600 considering design effect (DE) of 1.5. Size was divided amongst 32 slums according to PPS as mentioned below.

For example, Adarsha nagar has a population of 1,268 and total cumulative population of 32 slums is 51,187. Number of subjects from Adarsh nagar = 600*1,268/51,187 = 15(Rounded off). Similarly size for each slum is calculated and subjects were selected accordingly from respective slums. After rounding off for all the slums 602 was obtained. Household survey was carried out to locate toddlers and were measured for height, weight with other basic information like age and sex. Weight was measured with Salter,s weighing scale and height with a marking on the wall with measuring tape. Strict guidelines were followed for the measurements (Trained with manual of UNICEF for anthropometric measurements). Informed consent was obtained by the informat before hand.

Data was checked for its completeness and correctness before it was compiled and analysed using Microsoft Excel.

RESULTS

In current study, out of 602 Toddlers 50% were male, (50.7%) were of 12-23 months and rest were of 24-35 months [Table/Fig-1].

Age/Sex	Male	Female	Total
12-23months	149(49.5)	156(51.8)	305(50.7)
24-35months	152(50.5)	145(48.2)	297(49.3)
Total	301(50)	301(50)	602(100)

[Table/Fig-1]: Age and sex structure of toddlers in urban slums of raipur

Group	Anthropometric status [7,8]	Male (%)	Female (%)	Total (%)	CIAF
A	No failure	113(37.5)	115(38.2)	228(37.9)	62.1%
B	Wasting only	5(1.7)	1(0.3)	6(1)	
C	Underweight + Wasted	26(8.6)	20(6.7)	46(7.6)	
D	Underweight+ Stunted+ Wasted	39(13)	16(5.3)	55(9.1)	
E	Underweight+ Stunted	53(17.6)	78(25.9)	131(21.8)	
F	Stunting only	52(17.3)	44(14.6)	96(16)	
Y	Underweight only	13(4.3)	27(9)	40(6.7)	
Total		301(100)	301(100)	602(100)	

[Table/Fig-2]: Table showing subgroups of anthropometric failure

As shown in [Table/Fig-2], CIAF is 62.1% and group wise distribution is as follows, No failure (A)- 37.9%, wasting only (B)- 1%, underweight + wasted (C)- 7.6%, underweight + stunted + wasted (D)- 9.1%, underweight + stunted (E)- 21.8%, stunting only (F)- 16%, underweight only (Y)- 6.7%.

[Table/Fig-3] depicts that measurement of underweight (45.2%), stunting (46.8%), wasting (17.8%) under-estimates the burden of malnourishment. Composite index of Anthropometric failure (CIAF) (62.1%) better estimate the burden of Under-nutrition in the community compared to underweight or Stunted or wasted alone.

DISCUSSION

CIAF has certain advantages and disadvantages as well. In the current study Underweight which is known to be proxy for Stunting and Wasting was found to be 45.2% while CIAF was 62.1%. S Nandy et al., showed prevalence of Underweight of India to be 47.1% In the year 2005 which is higher compared to current study while CIAF was only 59.9% for under three children [8]. CIAF was found to be 65.25% for Toddlers in a study by N Seetharaman et al., and underweight was found to be 46.6% [12]. A study by GC mandal et al., showed 71.7% CIAF which is higher compared to current study while prevalence of Underweight was found to be 60.9% [13]. A cross sectional study conducted in Bankura, West Bengal, S Shit et al., showed 78.1% CIAF among Toddlers higher compared to current study while Underweight were only 38.5% which is lesser compared to that of current study [14]. Even in study by S das et al., Underweight (41.25%) was found to be lesser than CIAF (48.3%) and the margin was found to be lesser compared to other studies and the current one as well [15]. Dasgupta et al., showed CIAF of 32.7% which is far low compared to current study while Underweight weight was few (17.7%) as well for under 5 children [16]. (Comparision has been shown in [Table/Fig-4]).

Weight for age	No	%		CIAF
Normal	330	54.8	Underweight	62.1%
Under weight	201	33.4	45.2%	
Severely underweight	71	11.8		
Height for age				
Normal	320	53.2	Stunted	62.1%
Stunted	167	27.7	46.8%	
Severely stunted	115	19.1		
Weight for height				
Normal	495	82.2	Wasted	62.1%
Wasted	76	12.6	17.8%	
Severely wasted	31	5.2		

[Table/Fig-3]: Comparison of primitive indices with Composite Index of Anthropometric Failure (CIAF)

Name of the study	Place of Study	Prevalence of Under weight	Prevalence of Under nutrition according to CIAF
Current study	Raipur (C.G)	45.2%	62.1%
S Nandy et al., 2005 [8]	India	47.1%	59.9%
N seetharaman et al., 2007 [12]	Coimbatore	46.6%	65.25%
G C Mandal et al., 2009 [13]	West Bengal	60.9%	71.7%
S Shit et al., 2012 [14]	Bankura (W.B)	38.5%	78.1%
S Das et al., 2009 [15]	-	41.25%	48.3%
Dasgupta et al., 2014 [16]	Rural W.B	17.7%	32.7%

[Table/Fig-4]: Comparison of two indices from several studies

In addition to height for age (HA) and weight for height (WH), the CIAF classification uses weight for age (WA) — a measure that does not differentiate acute, chronic, and past (recent or remote) under nutrition. The CIAF classification introduces two new groups of children (Group B and Group C) [17]. Group B has normal HA and WA but low WH, an improbable anthropometric combination; group C, (with higher HA but low WH and WA, is of little immediate concern and can be considered “healthy”, presumably growing up to become thin tall adults [18]. Other groups, A, D, E, F and Y in the CIAF classification are covered by the Waterlow classification [19]. The CIAF classification does not address the limitations of the Waterlow classification [18]. Firstly, it does not satisfy the long felt need for a combined clinical and anthropometric classification that would be useful for clinical as well as community health work [17].

Lastly, although in the Waterlow classification wasting means low WH, as a clinical sign it means visible loss of subcutaneous fat and skeletal muscles. Low WH is observed with clinical wasting in cases of acute under nutrition and in chronic under nutrition of marasmic, but not mild to moderate or severe (florid kwashiorkor) types where

fat masks muscle wasting, if present. Hence, low WH may or may not be associated with clinical wasting, and wasting in the waterlow classification should be differentiated as anthropometric wasting. In their paper, Nandy et al., do not seem to have appreciated this difference and have incorrectly stated that "wasting is an indicator of acute under nutrition" [17]. The CIAF classification introduces two new groups (B and C), A, D, E, F and Y were covered in Waterlow classification. It does not address the limitation of the Waterlow classification. Failed to satisfy the long felt need for a combined clinical and anthropometric classification that would be useful for clinical as well as community health work [20].

From the perspective of policy makers it is must to know over all burdens so that sufficient attention is paid through resource allocation. Conventional indicators do provide information on different aspects of under nutrition. This is important to clinicians and fields workers who need to respond differently in different situations. The CIAF takes the differences between the three conventional indicators into account, and so is more able to provide an indication of changes in under nutrition. It might also be noted that underweight may be exaggerating the magnitude of change. While underweight in India and Peru suggests falls in relative terms of around 11%, the CIAF shows progress may be more limited, with relative falls of only 6 and 4%, respectively. This raises serious questions about the use of underweight as an indicator for monitoring progress towards the first MDG [8].

LIMITATIONS

Cannot be commented on trend as it is a cross-sectional study CIAF does not mention the severity of Under nutrition. It does not determine micro nutrient deficiencies and Clinical correlation is not possible as well.

CONCLUSION

CIAF better estimate the burden of Under nutrition in the community compared to conventional indicator, Under weight. It should be used as a tool for screening systems of Under nutrition and monitoring of Nutritional programmes and Results of CIAF should be based for policy making on Nutrition CIAF should be used as a indicator for tracking achievement of MDG.

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