

LETTER TO EDITOR

Assessment of Food Based Nutritional Failure and Its Association with Anthropometric Indices among Children under Five Years Old in Telangana, South India

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Dear Editor

The National Nutrition Strategy of India and the National Nutrition Mission, Prime Minister's Overarching Scheme for Holistic Nourishment (POSHAN Abhiyaan) have emphasized on tracking child anthropometric indices. Estimates from India's National Sample Survey household consumer expenditure survey for 2011-2012 showed that the calorie, protein, and fat intake of poor households severely decreased; while cereals accounted for 61% of the population's caloric intake (1). Exclusive breastfeeding was shown to provide essential amino acids, lipids and fat-soluble vitamins (2).

Our assessment on food based nutritional status and its association with anthropometric indices among children under five years old in Telangana, South India showed that 61% of children were above 2 years old, 57.4% were male and 78% belonged to Hindu religion. Among the fathers

and mothers of the children, educational level was above intermediate (48.1%, 44.2%, respectively). Illiteracy was present among 9.7% of fathers and 5.8% of mothers, and 98.7% of fathers and 19.7% of mothers were employed. Among mothers, 10.3% were in semiskilled and professional works. The Income of the families ranged from 7500 to 60000 Rs, while 19.4% earned less than 10000 Rs./month. The family size of children was mostly ≤ 4 (68.1%) and 88% belonged to nuclear families. Almost 34% of the households were overcrowded and 48.7% resided in households without a separate kitchen and 5.8% in houses without any independent bathrooms. Totally, 75.2% of individuals got their drinking water from municipal sources, 19.7% from bore-wells and 5.2% from cans; while 70.3% did not use any water purification, whereas 13.9% used filtration and 15.8% boiled water before drinking. Most participants (78.1%) lived near vector breeding grounds. Among the children,

Table 1: Association between weight for age and food based nutritional failures among children under five years old.

Variable		Food based nutritional failure No. (%)		Chi square	DF	P value	OR (CI)
		Absent	Present				
Weight for age	Normal	185 (81.5)	42 (18.5)	9.3	1	0.002	2.366 (1.349-4.149)
	Underweight	54 (65.1)	29 (34.9)				
Height for age	Normal	196 (79.7)	50 (20.3)	4.485	1	0.034	1.914 (1.043-3.514)
	Stunted	43 (67.2)	21 (32.8)				
Weight for height	Normal	214 (78.4)	59 (21.6)	2.161	1	0.142	1.741 (0.826-3.672)
	Wasted	25 (67.6)	12 (32.4)				
MUAC	Normal	234 (78.3)	65 (21.7)	6.467	1	0.011	4.320 (1.278-14.607)
	Moderate to severe acute malnutrition	5 (45.5)	6 (54.5)				

CI: Confidence interval, DF: Degree of freedom, MUAC: Mid-upper arm circumference, OR: Odds ratio

Table 2: The determinants of food based nutritional failure among children under five years old.

Variable		Food based nutritional failure No. (%)		Chi square	DF	P value	OR (CI)
		Absent	Present				
Age	<2 years	78 (64.5)	43 (35.5)	17.940	1	<0.001	0.315 (0.182-0.545)
	>2 years	161 (85.2)	28 (14.8)				
Gender	Males	134 (75.3)	44 (24.7)	0.781	1	0.377	0.783 (0.455-1.348)
	Females	105 (79.5)	27 (20.5)				
Father's education	Illiterate	20 (66.7)	10 (33.3)	2.046	1	0.153	1.795 (0.798-4.037)
	Literate	219 (78.2)	61 (21.8)				
Mother's education	Illiterate	16 (88.9)	2 (11.1)	1.505	1	0.220	0.404 (0.091-1.801)
	Literate	223 (76.4)	69 (23.6)				
Father's occupation	Skilled & professional	90 (74.4)	31 (25.6)	0.829	1	0.362	0.779 (0.456-1.333)
	Unemployed & unskilled	149 (78.8)	40 (21.2)				
Mother's occupation	Homemakers	192 (77.1)	57 (22.9)	0.000	1	0.992	1.003 (0.515-1.953)
	Employed	47 (77)	14 (23)				
SES	Upper	199 (77.4)	58 (22.6)	0.096	1	0.757	1.115 (0.559-2.225)
	Middle	40 (75.5)	13 (24.5)				
Type of family	Nuclear	209 (76.6)	64 (23.4)	0.378	1	0.539	1.312 (0.550-3.130)
	Joint	30 (81.1)	7 (18.9)				
Duration of breast feeding	>2 years	42 (91.3)	4 (8.7)	6.175	1	0.013	3.571 (1.234-10.332)
	<2 years	197 (74.6)	67 (25.4)				
Birth weight	>2.5 kg	133 (78.7)	36 (21.3)	0.540	1	0.463	1.220 (.551-2.801)
	1.5-2.5 kg	106 (75.2)	35 (24.8)				
Child immunization	No	5 (55.6)	4 (44.4)	2.436	1	0.119	0.358 (0.93-1.370)
	Yes	234 (77.7)	67 (22.3)				
Any hospitalization	No	230 (76.4)	71 (23.6)	2.754	1	0.097	0.764 (0.718-0.814)
	Yes	9 (100)	0 (0)				
Presence of any illness in the past 2 weeks	No	134 (87.0)	20 (13.0)	17.042	1	<0.001	3.254 (1.828-5.793)
	Yes	105 (67.3)	51 (32.7)				
History of neonatal admissions	No	217 (75.9)	69 (24.1)	3.127	1	0.077	0.286 (0.66-1.247)
	Yes	22 (91.7)	2 (8.3)				
Any nutritional deficiencies	No	226 (78.5)	62 (21.5)	4.348	1	0.037	2.254(1.031-6.177)
	Yes	13 (59.1)	9 (22.9)				

CI: Confidence interval, DF: Degree of freedom, OR: Odds ratio, SES: Socioeconomic status

54.7% were born with normal birth weight, 43.9% with low birth weight and 1.6% with very low birth weight. Among children, 7.7% reported history of neonatal intensive care unit (NICU) admissions for conditions such as jaundice, premature birth,

neonatal pneumonia, etc.; while 97.1% were completely immunized for the age. Two weeks before enrollment, 52.6% suffered from respiratory infections, and 13.9% from gastrointestinal disorders.

Totally, 93.5% of children were exclusively breastfed until 6 months old and 48.7% had started complementary feeding at 6 months age, followed by older than 7 months (45.5%); and 52.9% did not receive breast feeding after 2 years old. The mean duration of breastfeeding was 18.16 ± 8.31 months and the mean age of initiation of complementary feeding was 6.82 ± 1.83 months. Totally, 27.8% were underweight, and 2.3% were severely underweight; while 20.7% suffered from chronic under-nutrition among them 4.2% were severely stunted. A total of 12% had wasting status, out of them, 1% were in severe wasting condition. Assessed by mid-upper arm circumference (MUAC), 9% had moderate and 0.6% had severe malnutrition. Totally, 79.7% had calorie deficiency, 35.8% suffered from protein deficiency and 70.3% had fat deficits in their dietary intakes. Food based nutritional failure, calorie, protein and fat intakes were below recommended dietary allowance (RDA, 22.9% of children, Tables 1-3).

Joe *et al.* reported 78.2%, 27.4%, and 50.8% below RDA norms for calorie, protein, and fat intake, respectively among children (1). Among Anganwadi children in the urban area of Tumkur, Karnataka in the age group of 6-36 months, 89.29% reported a deficiency of calories and 64.73% were deficient in protein intake. In the age group of 37-72 months, 90.45% had a deficiency of calories, and 64.89% a

deficiency in proteins (3). Contrary to our findings, Joe *et al.* noted weak to null correlation between anthropometric indices and food failure (1). Meena *et al.* in Bhopal district, Madhya Pradesh observed a 6% reduction in moderate underweight after nutritional intervention and a 4% decline in severe underweight in urban areas (4). Similar to our findings, Acharya *et al.* stated that the children of higher age, second or higher birth order were significantly more likely to be fed with a minimum acceptable diet (5). Ghosh *et al.* demonstrated that older children were at a relatively lower risk of stunting (6).

The World Health Organization (WHO) indicators of breastfeeding illustrated negative correlation with height for age (HAZ), whereas indicators of diet diversity and overall diet quality were positively associated with HAZ in Bangladesh, Ethiopia, India and Zambia. These same complementary feeding indicators did not show consistent relationships with child stunting. Exclusive breastfeeding under 6 months of age was exhibited to be associated with a greater weight-for-length/height z-score (WHZ) in Bangladesh and Zambia, although CF indicators did not reveal any strong association with WHZ or wasting (7). In rural Bihar, India, Larson *et al.* displayed that among all children, the length-for-age z score, dietary diversity, and psychosocial stimulation were significantly correlated to motor

Table 3: Predictors of food based nutritional failure through multivariate logistic regression.

Variable	Reference category	Adjusted OR (CI)	P value
Age	<2 years (0)	4.689 (2.317-9.454)	<0.001
	>2 years (1)		
Father's education	Literate (0)	2.572 (0.891-7.429)	0.081
	Illiterate (1)		
Mother's education	Literate (0)	0.160 (0.016-1.577)	0.116
	Illiterate (1)		
Immunized	Yes (0)	2.451 (0.252-23.826)	0.440
	No (1)		
NICU admissions	No (0)	9.615 (1.48-62.5)	0.017
	Yes (1)		
Any hospitalization in the past	No (0)	9.92 (0)	0.999
	Yes (1)		
Any illness in the past two weeks	No (0)	4.559 (2.254-9.219)	<0.001
	Yes (1)		
Underweight	Absent (0)	2.6 (1.147-5.894)	0.022
	Present (1)		
Stunting	Absent (0)	1.6999 (0.789-3.655)	0.175
	Present (1)		
Wasting	Absent (0)	1.465 (0.520-4.131)	0.470
	Present (1)		
Moderate to severe acute malnutrition	Absent (0)	2.203 (0.475-10.216)	0.313
	Present (1)		
Exclusive breast feeding till 6 months of age	Yes (0)	4.376 (1.176-16.289)	0.028
	No (1)		

CI: Confidence interval, NICU: Neonatal intensive care unit, OR: Odds ratio

and mental development scores (8). In Cambodia, Hondru *et al.* suggested a link between acute and chronic malnutrition due to an acute illness that led to a chronic malnutrition (9). Debnath *et al.* among malnourished children under five years old in Pune, India reported a higher percentage of hospitalized children; while girls were more malnourished (10).

We can conclude a significant association between foods based nutritional failure and anthropometric indices for undernourished children. It is imperative to educate the population about nutrition and strengthen the Poshan Abhiyaan's current nutritional supplementation policy.

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Authors' Contribution

Concept and methodology: HPB, AM, PV, SP, and SLP. All authors participated in writing the draft and approval of the final version of the manuscript.

Conflict of Interest

None declared.

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