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Assessment of Nutritional Status and Its Determinants among Fewer than 5 Children in a Rural Area of Southern India

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ABSTRACT

Background: Globally malnutrition possesses a double burden in the forms of undernutrition and obesity. The most adverse form of human deprivation is undernutrition among under five children. A child who is underweight may be stunted, wasted or both. The study was conducted to assess the nutritional status of under-five children and to identify the determinants of nutritional status among them.

Methodology: This is a community based cross-sectional, analytical study conducted on 330 under-five children. Data was collected using a pre tested semi-structured questionnaire containing socio-demographic particulars, details pertaining to the mother, details pertaining to the child and anthropometric measurements.

Results: In this study, majority (60%) were males. Around 16.4%, 26.4% and 32% of Under 5 children were underweight, wasted and stunted respectively. During the last 1 year about 33.6% and 73.6% had history of acute diarrhoeal infection and acute respiratory tract infection. Variables significantly associated with underweight, stunting and wasting were female gender, nourishment of mother, exclusive breastfeeding (p value < 0.05). Underweight was associated (p value <0.05) with wasting and stunting.

Conclusion: Stunting and wasting rates were higher compared to the National and regional rates given inNFHS-5 data.

Keywords: Undernutrition, Malnutrition, Growth, Wasting, Stunting

INTRODUCTION

Health and wellbeing of a child depends on the growth and nutritional status.[1] The Nutritional status of the children of a country has a direct bearing on its economic growth and development.[2] As per the definition given by World Health Organization (WHO) malnutrition is defined as a "pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients".[3] Globally malnutrition possesses a double burden in the forms of undernutrition and obesity.[4] The most adverse form of human deprivation is undernutrition among under five children. "Silent emergency" is the name given by United Nations children's fund (UNICEF) for the various forms of undernutrition namely underweight, wasting and stunting.[5]

Low weight-for-age in children is known as underweight. A child who is underweight may be stunted, wasted or both. As weight is easy to measure, this is the indicator for which most data have been collected in the past. Evidence has shown that the mortality risk of children who are even mildly underweight is increased, and severely underweight children are at even greater risk of dying due to malnutrition.[6,7]

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Nearly 80% of the world's undernourished children live in 20 countries.[8] Globally about 151 million children under 5 years of age (22.2%) were affected by stunting, 50.5 million (7.5%) children were affected by wasting and 38.3 million (5.6%) children were affected by overweight in the year 2017.In India about 60 million children are underweight and the factors contributing to malnutrition include poverty, socio demographic factors and sociocultural factors.[9,4] Inspite of having different types of programmes like Mid-day Meal Scheme, ICDS etc. to prevent malnutrition among children in our country, there is a high prevalence of moderate to severe forms of malnutrition in our country. There is a disparity in the prevalence of malnutrition between the States and between the urban and rural areas within the States in India.

According to NFHS-5 data, the prevalence of underweight, stunting and wasting among children less than 5 years of age in India was 27.3%, 30.1% and 18.5% respectively in urban areas. Whereas in rural areas 33.8%, 37.3% and 19.5% of under 5 children were underweight, stunted and wasted.[10] Similar trend was also seen in Tamilnadu, rural areas reporting more undernourished children compared to the urban areas as per NHFS-5 data.[11] However, there are not many studies done in rural India, especially in Tamil Nadu related to these aspects. There is a need to assess the nutritional status of children in rural Tamil Nadu so; this study area was chosen for this study. With this available background the current study was planned to assess the nutritional status of under-five children and its influencing factors. Based on the results obtained from this study various measures could be formulated for preventing malnutrition in children as well as improving their health status.

MATERIALS AND METHODS

This was a community based cross-sectional, analytical study. The study was conducted in Veerapandi area, which is the field practice area attached to Vinayaka Missions Kirupananda Variyar Medical College and Hospitals, Salem. Children <5 years of age, residing permanently in the study area constituted the study population. The study was carried out for a period of 12 months (November 2020 to October 2021)

Sample size: The sample size was calculated based on a previous study conducted by Priyanka R et al in the year 2016.[2] Prevalence of underweight was found to be 28.3% in that study which was taken as the reference value for the sample size calculation for this study. The sample size was calculated using the formula: $N = Z^2ápq / [L]$ 2 (where Z = 1.96, p-28.3, q-71.7, L-5) Adding 5% non-response rate to the above obtained sample size, the final sample size was rounded off to 330.

Sampling method: There were 1528 children under 5 years of age in the study area as per the local records maintained in the Anganwadi centres. The list of under five children in the study area formed the sampling frame for this study. Simple random sampling method using computer generated random numbers were used to select the study samples.

Inclusion criteria and Exclusion criteria: Children below 5 years of age residing permanently in Veerapandi area whose mother consented for the study were included for the study and children whose mother were not willing to participate in the study; children who were not able to be contacted even after 2 visits and children with severe illnesses were excluded from the study.

Study tool: Data was collected using a pre tested semi-structured questionnaire. The questionnaire consisted of the following information's Socio-demographic characteristics, relevant antenatal, Intranatal and postnatal history, characteristics of the mother and anthropometric measurements (Height, Weight and Mid arm circumference).

Statistical analysis: Data was entered in MS Excel and analysed using SPSS Version 22. Descriptive variables were expressed in frequency and percentages and Chi-square test was used to test the association. P value < 0.05 was considered as statistically significant.

Informed consent and Ethical clearance: Informed consent was obtained from the mothers of under five children and proper institutional Ethical Committee (IEC) clearance was obtained before initiating the study.

Operational definition

Underweight: Weight for age < –2 standard deviations (SD) of the WHO Child Growth Standards median[12]

Stunting: Height/Length for age < –2 SD of the WHO Child Growth Standards median[12]

Wasting: Weight for height/length< –2 SD of the WHO Child Growth Standards median[12]

RESULTS

Nearly half (49%) of the study participants belonged to 1-3 years of age. Majority 60% of them were Males and about 50.9% of them were from Joint family. In this study, about 35.5% of the mothers of under 5 children had high school education and 69.1% of the mothers were unemployed and only 2.8% were involved in skilled occupation.

On assessing the nutritional status of Under 5 children, 16.4%, 26.4% and 32% were underweight, wasted and stunted respectively. Among the study participants 5.6% were severely underweight and 13.5% were stunted severely. Also, 16.5% and 2.9% had moderate and severe wasting respectively.

Table 1: Socio-demographic characteristics of under 5 children (N-330)

Variable	Children (%)
Age	
<1 year	84 (25.5)
1-3 years	162 (49)
>3 years	84 (25.5)
Gender	
Male	198 (60)
Female	132 (40)
Family type	
Nuclear	162 (49.1)
Joint family	168 (50.9)
Socioeconomic status	
Upper	9 (2.7)
Upper middle/Lower middle	153 (46.4)
Upper lower/Lower	168 (50.9)
Education of the mother	
Primary school	30 (9.1)
Middle school	87 (26.4)
High school	117 (35.5)
Graduate and above	96 (29)
Occupation of the mother	
Unemployed	228 (69.1)
Unskilled	81 (24.5)
Semiskilled	12 (3.6)
Skilled	9 (2.8)

Table 2: Nutritional status of the under 5 children (N-330)

Nutritional status	Children (%)
Underweight	
Moderate	36 (10.8)
Severe	18 (5.6)
Total	54 (16.4)
Wasting	
Mild	54 (16.5)
Moderate	23 (7)
Severe	10 (2.9)
Total	87 (26.4)
Stunting	
Moderate	61 (18.5)
Severe	44 (13.5)
Total	105 (32)

Table 3: Antenatal care and service utilization among mothers of under 5 children (N-330)

Variable	Children (%)
No of antenatal visits	
< 4	15 (4.5)
4-7	261 (79.1)
> 7	54 (16.4)
IFA tablets taken up to the prescribed duration	
Yes	261 (79)
No	69 (21)
Mother was immunized for tetanus	
Yes	324 (98.2)
No	6 (1.8)
Mother was undernourished	
Yes	63 (19)
No	267 (81)

In this study, majority 79.1% of the mothers underwent 4-7 antenatal visits and only 79% of them took their IFA tablets up to the prescribed duration (Table 3). Almost 61.8% delivered their baby by normal vaginal delivery. About 27.3 had a birth order of 2-3 and 17.2% were born with a birth weight of < 2.5 kg. During the postnatal period, 84.6% of the mothers had undergone 4-7 postnatal visits and almost 92.7% of the Under 5 children were fully immunised up to age.

In our study, variables significantly associated with underweight were female gender (p value - < 0.0001, Odds ratio – 5.11), undernourishment of mother (p value -< 0.0001, Odds ratio – 27.30), exclusive breastfeeding (p value - < 0.0001, Odds ratio – 0.008), birth order (p value –0.0005, Odds ratio – 6.42), low birth weight (p value - <0.0001, Odds ratio - 60.90), History of acute respiratory tract infection in the last 1 year (p value- 0.0001, Odds ratio – 7.43), wasting (p value -<0.0001, Odds ratio –9.83), stunting (p value - <0.0001, Odds ratio – 10.44),

Whereas, variables significantly associated with both wasting and stunting were female gender [(p value - < 0.0001, odds ratio – 10.44), (p value –0..004, odds ratio –1.99)] undernourishment of mother [(p value - < 0.0001, odds ratio – 75.05), (p value –0.003), odds ratio – 1.81)], exclusive breastfeeding [(p value - < 0.0001, odds ratio – 0.03), (p value - 0.0001, odds ratio – 0.02)] and worm infestation in the last 1 year [(p value - 0.011, odds ratio – 2.38), (p value - < 0.0001, odds ratio – 8.74)].Variable like Socioeconomic status, education of mother and history of acute diarrhoeal disease in the last year were not significantly associated with nutritional status (P value > 0.05).

DISCUSSION

Socio-demographic characteristics of the study population: Nearly half (49%) of the study participants belonged to 1-3 years of age in the current study. Whereas in studies by Priyanka R et al and Reddy VB et al 35.3% and 41% of the children respectively belonged to 1-3years of age.[2,10]Majority 60% of them were Males in our study. Similarly, male preponderance was seen in studies by Senthilkumar SK et al and Padmanabhan PS et al studies where 51.4% and 56.4% were males.[3,11]In the present study, only 35.5% of mothers had studied up to high school. Similarly, in Priyanka R et al study 30% of mothers had high school education and 13.3% had education degree and above.[2] Galgamuwa LS study recorded that 38% of the mothers had secondary or above education.[12] Whereas about 50% had no formal education, 28% had education up to 9th standard and only 5% had completed graduation in Reddy VB et al study.[10]

This difference could be due to the difference in study settings. The proportion of the study population belonging to lower socio-economic status was 17.3% in the present study when compared to the findings of the study done by S.K. Senthilkumar, 83%

belonged to lower socio-economic status and 65.5% belonged to lower socioeconomic status in Yadav SS et al study.[3,9]

Nutritional status of the children

Underweight: In the present study, 16.4% was the prevalence of underweight among Under 5 children. Underweight prevalence was 10.1% and 17.3% in studies by Upadhyay RP et al and Anitha SS et al which were comparable to our study.[13,14] Whereas the prevalence of underweight was higher compared to our study in studies by Sharma A et al, Padmanabhan PS, Senthilkumar SK et al, Bisai S et al, Rahman MS et al, Galgamuwa LS, Reddy VB et al, Priyanka R et al and Suganya E et al the underweight prevalence was 83%, 46.4%, 41.3% 40.4%, 36%, 33%, 32.7%, 28.3% and 28%,[15,11,3,16,17,12,10,2,18]The lower prevalence of underweight in the present study when compared to majority of studies in India could be due to the following reasons, study setting, better maternal literacy rate, better availability of health services, good Immunisation coverage rate and higher exclusive breastfeeding rate for the first six months of life

Table 4: Natal and Postnatal care among mothers and their under 5 children (N-330)

Variable	Children (%)
Mode of delivery	
Normal vaginal	204 (61.8)
Cesarean section	126 (38.2)
Birth order	
1	207 (62.7)
1-3	90 (27.3)
> 3	33 (10)
Birth weight	
< 2.5 kg	57 (17.2)
2.5-4 kg	252 (76.4)
> 4 kg	21 (6.4)
No of postnatal visits	
< 4	9 (2.7)
7-Apr	279 (84.6)
> 7	42 (12.7)
Fully immunized up to age	
Yes	306 (92.7)
No	24 (7.3)
Acute diarrheal disease during the postnatal period	
Yes	96 (29)
No	234 (71)
Acute respiratory tract inf during postnatal period	
Yes	63 (19.1)
No	267 (80.9)

Table 5: Association between selected variables and underweight among under 5 children (N-330)

Variable	Underweight		P value	Odds ratio (CI)
	Yes (n= 54) (%)	No (n= 276) (%)		
Gender of the child				
Female	39 (72.2)	93 (33.9)	<0.0001*	5.11 (2.68-9.75)
Male	15 (27.8)	183 (66.1)		
Socioeconomic status				
Upper/Middle class	24 (44.4)	138 (50)	0.455	0.8 (0.44-1.43)
Lower class	30 (55.6)	138 (50)		
Education of the mother				
≤ High school	36 (70.4)	198 (71.7)	0.453	0.78 (0.42-1.46)
> High school	18 (29.6)	78 (28.3)		
Mother undernourished				
Yes	34 (72.2)	29 (8.7)	<0.0001*	27.3 (13.18-56.53)
No	20 (27.8)	247 (91.3)		
Birth order				
≤2	50 (55.5)	182 (73.2)	0.0005*	6.42 (2.25-18.31)
>2	4 (44.5)	94 (26.8)		
Low birth weight				
Yes	42 (77.8)	15 (5.4)	<0.0001*	60.9 (26.65-139.11)
No	12 (22.2)	261 (94.6)		
Exclusive breastfeeding given				
Yes	15 (27.8)	270 (97.8)	<0.0001*	0.008 (0.003-0.023)
No	39 (72.2)	6 (2.2)		
History of acute respiratory tract infection in the last 1 year				
Yes	51 (94.4)	192 (69.6)	0.0001*	7.43 (2.25-24.50)
No	3 (5.6)	84 (30.4)		
History of acute diarrheal disease in the last 1 year				
Yes	23	88	0.309	0.74 (0.41-1.31)
No	31	188		
History of worm infestation in the last 1 year				
Yes	6 (16.7)	36 (12)	0.697	0.833 (0.33-2.08)
No	48 (83.3)	240 (88)		
Wasting present				
Yes	37 (92.6)	50 (14.1)	<0.0001*	9.83 (5.13-18.86)
No	17 (7.4)	226 (85.9)		
Stunting present				
Yes	41 (88.9)	64 (20.7)	<0.0001*	10.44 (5.27-20.69)
No	13 (11.1)	212 (79.3)		

*P Value < 0.05 is statistically significant, CI – Confidence Interval

Table 6: Association between selected variables and wasting among under 5 children (N-330)

Variable	Wasting		P value	Odds ratio (CI)
	Yes (n= 87) (%)	No (n= 243) (%)		
Gender of the child				
Female	51 (58.7)	81 (33.3)	<0.0001*	2.83 (1.71-4.68)
Male	36 (41.3)	162 (66.7)		
Socioeconomic status				
Upper/Middle class	42 (48.2)	120 (49.3)	0.91	0.97 (0.59-1.58)
Lower class	45 (51.8)	123 (50.7)		
Education of the mother				
≤ High school	57 (65.5)	177 (72.8)	0.198	0.7 (0.41-1.19)
> High school	30 (34.5)	66 (27.2)		
Mother undernourished				
Yes	57 (65.5)	6 (2.5)	<0.0001*	75.05 (29.81-188.88)
No	30 (34.5)	237 (97.5)		
Birth order				
≤ 2	64 (73.5)	170 (70)	0.525	1.19 (0.68-2.07)
> 2	23 (26.5)	73 (30)		
Low birth weight				
Yes	20 (23)	37 (15.2)	0.102	1.66 (0.90-3.05)
No	67 (77)	206 (84.8)		
Exclusive breastfeeding given				
Yes	48 (55.2)	237 (97.5)	<0.0001*	0.03 (0.01-0.07)
No	39 (44.8)	6 (2.5)		
History of acute respiratory tract infection in the last 1 year				
Yes	54 (62.1)	189 (77.8)	0.004*	0.46 (0.27-0.79)
No	33 (37.9)	54 (22.2)		
History of acute diarrheal disease in the last 1 year				
Yes	33 (37.9)	78 (32.1)	0.323	1.29 (0.77-2.15)
No	54 (62.1)	165 (67.9)		
History of worm infestation in the last 1 year				
Yes	18 (20.6)	24 (9.9)	0.011*	2.38 (1.22-4.64)
No	69 (79.4)	219 (90.1)		
Child is Underweight				
Yes	37 (42.5)	17 (7)	<0.0001*	9.83 (5.13-18.86)
No	50 (57.5)	226 (93)		
Stunting present				
Yes	27 (31)	78 (32.1)	0.954	0.98 (0.57-1.67)
No	58 (69)	165 (67.9)		

* P Value < 0.05 is statistically significant, CI – Confidence Interval

Wasting: In the present study, 26.4% was the prevalence of wasting among Under 5 children. Compared tour study lesser prevalence was noted in studies by Upadhyay RP et al, Dinesh PV et al, Reddy VB et al, Senthilkumar SK and Padmanabhan PS et al in these 12.2%, 18.3%, 21.8%, 23.6% and 11% respectively was wasting prevalence.[13,19,10,3,11] Whereas higher wasting prevalence was noted in studies by Bisai S et al, Suganya E et al and Sharma A et al wasting prevalence was respectively 34%, 38.5% and 63%. [16,18,15]

Stunting: In the present study, 32% was the prevalence of stunting among Under 5 children. Similarly in studies done by Galgamuwa LS et al, Suganya E et al, Bisai S et al and Senthilkumar SK et al respectively 27.7%, 28%, 29.8% and 32.5% was stunting prevalence. [12,18,16,3]Higher wasting prevalence was recorded in studies by Reddy VB et al, Dinesh VP, Sharma A et al and Padmanabhan PS et al stunting prevalence was 38.3%, 40%, 54% and 71.3% respectively.[10,19,15,11] Lower prevalence of stunting in our study when compared to the above studies could be due to difference in study setting, higher exclusive breastfeeding rate and higher maternal educational status.

Determinants of nutritional status: In our study, underweight, stunting and wasting were significantly associated with female gender, nourishment of mother, exclusive breastfeeding. Whereas, birth order and low birth weight were significantly associated with underweight and wasting. Underweight was significantly associated with wasting and stunting. But wasting was not significantly associated with stunting. Similar to our study female children were more malnourished in studies by John J et al and Sharma A et al.[1,15] In our study birth weight was a influencing factor of nutritional status of a child which was also supported by studies by John J et al, Priyanka R et al and Rodriguez-Lianes JM et al.[1,2,20] Exclusively breastfeed children were less prone for undernutrition was the finding in our study which was comparable to studies by Suman C et al and John J et al.[21,1] Maternal education was not significant in our study which was similar to studies by Mathad V et al and John J et al.[22,1]Whereas as in contrary to our study Socio economic status was significantly associated with malnutrition in studies by Bhanderi D, Sengupta P et al and John J et al.[23,24,1]

Table 7: Association between selected variables and stunting among under 5 children (N-330)

Variable	Stunting		P value	Odds ratio (CI)
	Yes (n= 105) (%)	No (n= 225) (%)		
Gender of the child				
Female	54 (51.4)	78 (34.7)	0.004*	1.99 (1.24-3.19)
Male	51 (48.6)	147 (65.3)		
Socioeconomic status				
Upper/Middle class	50 (47.6)	112 (52.4)	0.714	0.91 (0.57-1.45)
Lower class	55 (52.4)	113 (47.6)		
Education of the mother				
≤ High school	70 (25.7)	164 (16)	0.247	0.74 (0.45-1.22)
> High school	35 (74.3)	61 (84)		
Mother undernourished				
Yes	27 (25.7)	36 (16)	0.003*	1.81 (1.03-3.19)
No	78 (74.3)	189 (84)		
Birth order				
≤ 2	85 (80.1)	149 (66.3)	0.006*	2.16 (1.23-3.79)
> 2	20 (19.9)	76 (33.7)		
Low birth weight				
Yes	27 (25.7)	27 (12)	0.002*	2.53 (1.40-4.59)
No	78 (74.3)	198 (88)		
Exclusive breastfeeding given				
Yes	63 (60)	222 (98.7)	< 0.0001*	0.02 (0.006-0.06)
No	42 (40)	3 (1.3)		
History of acute respiratory tract infection in the last 1 year				
Yes	71 (67.6)	172 (76.5)	0.091	0.64 (0.38-1.07)
No	34 (32.4)	53 (23.5)		
History of acute diarrheal disease in the last 1 year				
Yes	36 (34.2)	75 (33.3)	0.864	1.04 (0.63-1.70)
No	69 (65.8)	150 (66.7)		
History of worm infestation in the last 1 year				
Yes	56 (34.2)	26 (2.6)	< 0.0001*	8.74 (4.99.-15.31)
No	49 (65.8)	199 (97.4)		
Child is underweight				
Yes	35 (33.3)	19 (8.4)	< 0.0001*	5.42 (2.91-10.08)
No	70 (67.7)	206 (91.6)		
Wasting present				
Yes	26 (24.8)	61 (27.2)	0.652	0.88 (0.51-1.50)
No	79 (75.2)	164 (72.8)		

*P Value < 0.05 is statistically significant, CI – Confidence Interval

CONCLUSION

In our study, 26.4% and 32% of the under 5 children were wasted and stunted respectively which were higher compared to the National and Tamilnadu rates of wasting and stunting given in NFHS-5. Whereas, 16.4% were underweight this was lower than the national and Tamilnadu rates given in NFH5-5. Female gender and undernourished mother were associated with higher rates of underweight, wasting and stunting. Children who were exclusively breastfed were associated with lower rates of underweight, wasting and stunting. Birth order (>2) and low birth weight were associated with higher rates of underweight and stunting. History of acute respiratory tract infection in the last1 year was associated with higher rates of wasting and stunting whereas, Underweight and wasting rates were higher in children who had history of worm infestation in the last1 year.

Measures to combat and prevent malnutrition should be focused towards the influencing factors of undernutrition in the locality. Low birth weight children can be prevented by improving the nutritional status of the women during pregnancy: availment of supplementary nutrition under the ICDS, improving the quality of ante natal care and early detection of anaemia and correction in pregnant women. Proper care of the girl child without any sex discrimination is crucial in curbing undernutrition. Periodic health education programmes emphasizing about the importance of breast milk, early initiation of breastfeeding, exclusive breastfeeding, proper time of initiation of weaning foods and detrimental effects of prelacteal feeds.

Sensitization of the mothers on regular basis on the nutrition of children by community health worker on regular basis plays an important role. Avoiding recurrent respiratory and diarrhoeal infections by maintenance of proper sanitation, hygiene and proper housing standards with periodic deworming will help in overcoming the problem in the locality.

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