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PREVALENCE OF MALNUTRITION AMONG UNDERFIVE CHILDREN IN A SEMI URBAN AREA IN KOTTAYAM, KERALA

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HOW TO CITE THIS ARTICLE:

Binu Areekal, Tony Lawrence, Jose Joseph, Ajan M. J, Ajith R. "Prevalence of Malnutrition among Underfive Children in a Semi Urban Area in Kottayam, Kerala". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 24, June 16; Page: 6762-6771, DOI: 10.14260/jemds/2014/2816

ABSTRACT: BACKGROUND: Malnutrition is the most important nutritional disorder of underfives causing a great amount of mortality and morbidity in the world especially in developing countries. **OBJECTIVE:** The study was done to find out the prevalence of malnutrition among underfive children in Ettumanoor block, Kerala. **SETTING AND DESIGN:** The setting was anganwadi areas of Ettumanoor block and the study was cross sectional in nature. **METHODS:** Among the 191 anganwadis in Ettumanoor block 30 were selected by the cluster sampling technique using probability proportional to size method. A total of 20 children from 30 clusters were taken to reach the sample size. Height was measured using a measuring tape with a sensitivity of 0.5cm and weight was measured using a weighing machine with a sensitivity of 100grams for children up to 2 years and 500grams for older children. Malnutrition was assessed using Z scores obtained from WHO reference tables. **STATISTICAL ANALYSIS:** Data was entered in Microsoft excel and was analyzed using SPSS 16.0 version. **RESULTS AND CONCLUSIONS:** The present study found that 31.5% of the study population was underweight, 21.8% stunted and 14.6% wasted. Out of the total 6.4% were severely underweight, 4.9% were severely stunted and 2.8% severely wasted. The prevalence of mild and severe under nutrition increases up to 12-24 months and then decreases. Thus the prevalence of severe underweight, stunting and wasting is comparatively low but the prevalence of mild underweight, stunting and wasting is unacceptably high.

KEYWORDS: Prevalence, malnutrition, under nutrition, Kerala.

INTRODUCTION: Nutrition is a fundamental pillar of human life, health and development across the entire life span. From the earliest stages of fetal development, at birth, through infancy, adolescence, and on into adulthood and old age, good nutrition is essential for survival, physical growth, mental development, performance, health and well-being. 'Malnutrition means "badly nourished" but it is more than a measure of what we eat, or fail to eat. Clinically, malnutrition is characterized by inadequate intake of protein, energy, micronutrients and by frequent infections or disease.

Although often an invisible phenomenon, malnutrition casts long shadows, affecting close to 800 million people – 20% of all people in the developing world.¹ It is estimated that in 2010 around the world, 55 million preschool-age children were wasted, of whom about 40 million were moderately acutely malnourished.⁽²⁾ Of the 7.6 million deaths annually among children under 5 years of age, approximately 20% can be attributed to child underweight.⁽³⁾ Geographically, more than 70% of the protein energy malnourished (PEM) children live in Asia, 26% in Africa and 4% in Latin America and the Caribbean. Out of those 70% in Asia, maximum number of PEM is in Southeast Asia which includes India.²

In India almost half of children under five years of age (48 percent) are stunted and 43 percent are underweight. The proportion of children who are severely undernourished is also

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notable, 24% according to height-for-age and 16 percent according to weight-for-age as per NFHS-3. Wasting is also quite a serious problem in India, affecting 20 percent of children under five years of age.⁽⁴⁾ Even though severe under nutrition is more pronounced in states like Bihar, Madhya Pradesh, Orissa, Uttar Pradesh and Rajasthan, even in well endowed states like Kerala, Goa and Sikkim the levels of mild under nutrition is unacceptably high.⁽⁴⁾ In Kerala 23% of children are under weight, 27% stunted and 16 % wasted.⁵

The group most vulnerable to malnutrition and its adverse effects is children below five years, who constitute a special risk group in any population. Their nutritional requirement is disproportionately higher for body weight than older children and adults.⁹ There is strong evidence that malnutrition is associated with impaired growth, delayed mental development, poor school performance and reduced intellectual capacity.^{7, 8, 9, 10} Thus even mild malnutrition in children can affect their long term intellectual ability, brain development and can predispose them to infections push them further into severe malnutrition.

Kerala also known as the 'God's own country' is blessed with good health indicators. Some of our health indices are even comparable with western countries. With limited resources and high literacy status especially among women it has been able to reduce the levels of severe malnutrition below 1% but the levels of mild malnutrition are still unacceptably high.⁵ It has been reported that the average moderately malnourished child in the 6-24 months category looks entirely normal, but is too small for age, has lowered resistance to infection and the only outward sign is the frequent desire to feed. This condition called Invisible PEM which can only be found out through growth monitoring and surveillance.⁽⁶⁾ It is high time that attempts are made to resolve the problem of mild under nutrition in children so that they do not become victims of severe under nutrition and its consequences in the future.

Not many studies have been done on under nutrition in Kerala especially in Kottayam district. As a result data on under nutrition from this district is lacking. The present study attempts to find out the prevalence of under nutrition in Ettumanoor block, Kottayam district.

MATERIALS AND METHODS: The study was cross sectional in nature. The study was conducted in Ettumanoor Block area covering an area of 141.72 Square km with 6 panchayats under it. The total population of the block is 2.1 lakhs with 1,05,987 males and 1,04,055 females.¹¹ The area is semi urban in nature with most of the people belonging to the middle and low socioeconomic classes.¹¹

The sample selection was done by the cluster sampling technique. Ettumanoor block has 191 functioning anganwadis (unit of delivery of services of the ICDS program) catering to about 2.1 Lakh population. Out of these 191 anganwadi areas 30 anganwadi areas were selected for the study. The method of selection of clusters was the one followed in the expanded programme on immunization coverage pattern, in which the probability of inclusion being proportional to clusters size.¹² The population of each anganwadi was ascertained and the cumulative population was found to be 2,11,401. This cumulative population was divided by the number of clusters (30) and the sampling interval was found to be $2,11,401/30 = 7047$. Using the random number table a number less than the above number was found out (2482). The cluster which contained this number was taken as the first cluster. Later sampling interval was added to this number to find out the other clusters ($2482 + 7042 = 9529$). The cluster with the cumulative population equal to 9529 was taken as the 2nd cluster. This process was continued until 30 clusters were selected.

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Sample size: The sample size was calculated using the formulae $Z\alpha^2 pq \times / L^2$ where 'p' is the prevalence of factor under study (Under nutrition), 'q' is (1-p) and 'L' is maximum permissible error which is taken as 5%. 'Design effect' is the factor taken for adjusting for heterogeneity of the population in cluster sampling and to adjust the difference in precision between a simple random sample and a cluster sample was taken as 2. The prevalence of malnutrition as per NFHS-3 survey was 23% for Kerala⁵. Thus for calculating the sample size a prevalence of 23% was taken. Thus the calculated sample size was $1.96 \times 1.96 \times 0.23 \times 0.77 / 0.05^2$ which was found to be 273 taking a maximum of 20% as beta error. This was multiplied by the design effect of 2 and a sample size of 546 was obtained. To round off, 20 children per cluster, that is a total of 600 children was taken as the sample size.

Data Collection: In each of the 30 clusters selected 20 children had to be selected to complete the sample size. After reaching each the cluster first house was selected randomly using the bottle neck method. Once the first house was identified the next house was selected on the basis of front door of which house is closest. In each house information was collected from the mother whenever available with the help of a structured interview schedule after getting informed consent. In the absence of the mother it was collected from a reliable close family member. In certain clusters, from the last family investigator was forced to take all the eligible children available without restricting to the required number of 20. Thus the total number of children taken into the study was 610.

Anthropometric Measurements: The weight of the child was measured using a spring balance with a precision of 500 grams for older children (2-5 years) and an infant weighing machine with lowest gradation unit of 100 grams for younger children. The children were made to remove their footwear and light clothing was allowed during weighing. The reading was taken after making sure that the child was not in contact with any other object. In case of very restless children every attempt was made to weigh the children alone but if had failed the method of 'Double weighing' that is weighing the mother and child together first and then weighing the mother alone to obtain the weight of the baby. For measuring the height the child was made to stand on level surface, shoes was removed and the 'Frankfurt plane' was maintained and the height measured. In children less than 2 years who could not stand, lying down length was measured after making sure that both knees were extended.

To find out the prevalence of under nutrition among the study population three indices were used namely; weight for age, height for age and weight for height. Values less than or equal to -3 Standard deviation (SD) from reference population (WHO)¹³ was taken as severe malnutrition and values below or equal to -2SD to -3SD was taken as Mild malnutrition. Values in between -2SD and +2SD was taken as Normal and above +2SD were taken as over nourished (WHO classification). To find the individual Z scores Epiinfo 3.2.2 version software was used. Further analysis was done using SPSS 16.0 version. Chi square was used for testing the significance.

RESULTS: The following results were obtained from the current study in Ettumanoor block.

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Age Group	Sex of the child		Total
	Male	Female	
0 - 6 months	16(5.1%)	8(2.7%)	24(3.9%)
6- 12 months	13(4.2%)	23(7.7%)	36(5.9%)
12-24 months	54(17.4%)	41(13.7%)	95(15.6%)
24-36 months	59(19.0%)	65(21.7%)	124(20.3%)
36-48 months	99(31.8%)	93(31.1%)	192(31.5%)
48-60 months	70(22.5%)	69(23.1%)	139(22.8%)
Total	311(100.0%)	299(100.0%)	610(100.0%)

Table 1: Distribution of study population according to age and sex

The Majority of children were found in the 36-48 months followed by 48-60 months category and 24-36 months category.

Nutritional Status	Weight for age	Height for age	Weight for height
Severe under nutrition	39 (6.4%)	30 (4.9%)	17 (2.8%)
Mild Under nutrition	153 (25.1%)	103 (16.9%)	72 (11.8%)
Normal	409 (67%)	467 (76.6%)	515 (84.4%)
Over nourished	9 (1.5%)	10 (1.6%)	6 (1%)
Total	610 (100%)	610 (100%)	610 (100%)

Table 2: Showing the prevalence of malnutrition in the study population

Fig. 1: Showing the prevalence of malnutrition in the study sample

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In the present study 31.5% of the study population was underweight, 21.8%stunted and 14.6% wasted. Out of the total 6.4% were severely underweight, 4.9% severely stunted and 2.8% severely wasted. The proportion of stunting among male children was 24.4% out of which 4.8% severely stunted and 19.6% mildly stunted and among female children was 19% with 5% severely stunted and 14% mildly stunted. The proportion of wasting among male children was 14.8% out of which 2.6% severely wasted and 12.2% mildly wasted and that among female children was 14.4% with 3% severely wasted and 11.4% mildly wasted.

Fig. 2: Histogram showing the distribution of Z score (weight for age) in study population

It is evident from the histogram that the majority of children fall below the 50th percentile or having a Z weight for age less than '0'. The mean of the distribution is again on the negative side (-.43) with a standard deviation of 1.22 which again confirms the above statement. 95% confidence limits = (-2.65 to -0.21). These figures clearly indicate that under nutrition rather than over nutrition is the problem of the study population.

Z wt/age Nutritional Status	Age of the child						Total
	0 - 6 months	6 - 12 months	12 - 24 months	24 - 36 months	36 - 48 months	48 - 60 months	
Severe Underweight	0	4	11	5	11	8	39
	0%	11.1%	11.6%	4.0%	5.7%	5.8%	6.4%
Mild Underweight	2	7	27	41	41	35	153
	8.3%	19.4%	28.4%	33.1%	21.4%	25.2%	25.1%

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Normal	22	24	56	76	138	93	409
	91.7%	66.7%	58.9%	61.3%	71.9%	66.9%	67.0%
Over weight	0	1	1	2	2	3	9
	0%	2.8%	1.1%	1.6%	1.0%	2.2%	1.5%
Total	24	36	95	124	192	139	610
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3: Nutritional status (weight for age) of the study population according to age

It can be seen from the table and the line diagram that the % of children severely underweight increases as age advances up to 12-24 months and then declines as per the present study.

Z Ht/age Category	Age of the child						Total
	0 - 6 months	6 - 12 months	12 - 24 months	24 - 36 months	36 - 48 months	48 - 60 months	
Severe Stunting	0	1	13	3	6	7	30
	0%	2.8%	13.7%	2.4%	3.1%	5.0%	4.9%
Mild Stunting	5	9	16	21	34	18	103
	20.8%	25.0%	16.8%	16.9%	17.7%	12.9%	16.9%
Normal	19	26	64	99	148	111	467
	79.2%	72.2%	67.4%	79.8%	77.1%	79.9%	76.6%
Over nourished	0	0	2	1	4	3	10
	0%	0%	2.1%	.8%	2.1%	2.2%	1.6%
Total	24	36	95	124	192	139	610
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4: Nutritional status(Height for age) of the study population according to age

The mean z height for age was -0.91 with a standard deviation of 1.3(95% C.I (-1.67 to1.69). Here again the majority of children are below the 50th percentile and it can be seen that the prevalence of stunting increases up to the 12-24 months category and then decreases as in the case of underweight.

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Z Wt/Ht	Age of the child						Total
	0 - 6 months	6 - 12 months	12 - 24 months	24 - 36 months	36 - 48 months	48 - 60 months	
Severely Wasted	0	1	6	2	3	5	17
	0%	2.8%	6.3%	1.6%	1.6 %	3.6%	2.8%
Mild wasting	0	3	14	16	23	16	72
	0%	8.3%	14.7%	12.9%	12.0%	11.5%	11.8%
Normal	24	30	74	105	164	118	515
	100.0%	83.3%	77.9%	84.7%	85.4%	84.9%	84.4%
Over Nutrition	0	2	1	1	2	0	6
	0%	5.6%	1.1%	.8%	1.0%	0%	1.0%
Total	24	36	95	124	192	139	610
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5: Nutritional status(weight for height) of the study population according to age

The mean z weight for height of the study population was -1.08 with a standard deviation of 1.15 (95% C.I = -2.23 to 0.07) again showing that the majority of children are below the 50th percentile. In this case also the prevalence of wasting increases up to 12-24 months and then decreases

DISCUSSION: It can be seen from table 1 that all age groups have been properly represented in the study sample. The underfive Sex ratio was found to be 962 females per 1000 males which is comparable to the under six sex ratio of Kottayam (973) as per 2011 census but lower than that was obtained as per census 2011 for Kerala (1084).²⁰ In the present study 31.5% of the study population was underweight, 21.8% stunted and 14.6% wasted. Out of the total 6.4% were severely underweight, 4.9% severely stunted and 2.8% severely wasted. In a study conducted by the NNMB in 2002 in Kerala along with 8 other states has put the prevalence of malnutrition in Kerala at 40.3% out of which 7.7% severely malnourished.¹⁴ In other studies in Kerala like the National family health survey in 1999 prevalence of underweight was 26.6 with 4.7% of them severely underweight, stunting at 29.4% with 12% of them severely stunting and 19.9% wasting with 3.8% of them severely wasted. In other studies in India like the one conducted by B. Aneja P. Singh et. al in Delhi in 2000 has given the prevalence of malnutrition among under fives as 26% with 6% of them severely malnourished¹⁵. In another study conducted by A. Laxmaiah et.al in Punjab in 2001 shows that about a half of the preschool children (50.3%) were undernourished (<2SD weight for age); 60% were stunted (<2SD height for age) and 12% were wasted (<2SD weight for height ¹⁶In another study

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conducted in Kerala by Meena Karunakaran et al in 1981 has put the prevalence of malnutrition in Kerala at 59.1%¹⁷ Stunting was about 60%, underweight about 55% wasted 34.5% in a study conducted by R.J. Yadav and Padam Singh in 1999.¹⁴ Shally Awasthi, Rohini Das et.al conducted a study in Uttar Pradesh in 2003 the prevalence was 67.3% underweight and (87.6%) stunting¹⁸ Thus the prevalence of severely malnourished children in our study is also low but the proportion of children mildly malnourished is unacceptably high.

It can be seen from the table-3 that the percentage of children severely underweight increases as age advances up to 12-24 months and then declines as per the present study. It is similar to the all India trend as shown in NFHS-3. The prevalence of mildly underweight seems to be increasing till 24-36 months category and then decreases. Similar trends are also seen in study conducted by S. K. Ray, A. O. Biswas, S. Kumar A et.al in West Bengal in 1997²¹ and Vasan P.S et.al¹⁹

Even though as per table 4 the prevalence of mild and severe stunting increases up to 12-24 months but after this the prevalence seems to be decreasing. But according to the NFHS reports which has taken children only up to 3 years the prevalence increases with age up to 3 years. The same trend has been seen for the prevalence of wasting in the study sample.

CONCLUSIONS: The present study found that 31.5% of the study population was underweight, 21.8% stunted and 14.6% wasted. Out of the total 6.4% were severely underweight, 4.9% severely stunted and 2.8% severely wasted. The prevalence of mild and severe under nutrition increases up to 12-24 months and then decreases. Thus the prevalence of severe underweight, stunting and wasting is comparatively low but the prevalence of mild underweight, stunting and wasting is unacceptably high.

LIMITATIONS: Even after repeated attempts only mothers of 589 children could be personally met. In rest of the 21 children immediate reliable relative was the source of information.

RECOMMENDATIONS: The major governmental intervention that can be done to reduce the prevalence of under nutrition among underfives is to strengthen the ICDS programme so that it will cover the full target age group (0-6). Intensive Nutrition education should be given to all mothers right from when they are pregnant, lactating and rearing their children. Improving the maternal nutritional status is another sure way to reduce under nutrition in children. Practicing exclusive breast feeding up to 6 months along with age appropriate complementary feeding and immunizing children will. Along with all these strict monitoring and surveillance of nutritional status of underfive children go a long way in reducing the menace of under nutrition.

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Date of Submission: 13/06/2014.
Date of Peer Review: 14/06/2014.
Date of Acceptance: 16/06/2014.
Date of Publishing: 16/06/2014.