A Pilot Study on the Assessment of Nutritional Status In The School Going Children (6-11 Years) In Rural Areas of Coonoor, Nilgiris District

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Abstract: *Malnutrition is India's silent emergency and among India's greatest human development challenges. The crisis of malnutrition is real and its persistence has profound and frightening implications for children, society and the future of the human kind. Malnutrition affects children's chances of survival, increases their susceptibility to illness, reduces their ability to learn and makes them less productive in later life. In this study, a group of 300 respondents consisting of both sexes were selected and subjected to anthropometric, biochemical and clinical analysis. The results were compared and discussed based on gender as well as age distribution.*

Keywords: Gomez classification, Mid upper arm circumference, angular stomatitis, malnutrition, serum total protein.

1. Introduction

Malnutrition is an impediment in national development and hence assumes the status of national problem. Malnutrition refers to a number of conditions each with its specific cause related to the deficiency of one or more nutrients. In the present context malnutrition is specified in terms of Protein Energy Malnutrition, which signifies an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function. Malnutrition affects children with dire consequences ranging from physical development to cognitive growth and immunity against infections. Nutritional status is the condition of health of an individual as influenced by nutrient consumption and utilization in the body.

Monitoring growth and nutritional status during infancy and childhood is therefore of primary importance. Thinness can be a marker of malnutrition. Thinness in school children and adolescents is largely under studied, contrasting with the vast amount of literature on infant malnutrition (**Pascal *et al.,* 2011**). Anthropometric indicators are mostly used to measure malnutrition in children. Screening and assessment for nutritional risk should be a routine part of clinical evaluation. Goals of nutritional assessment are to determine the risk or presence of malnutrition and to provide guidelines for short- and long-term therapy.

Nutritional assessment goals are to evaluate the child's nutritional status, risk of undernutrition or overweight and to provide guidelines for therapy and monitoring. Early nutritional support can improve nutritional status, minimize morbidity and may prevent clinical deterioration.

The anthropometric indicators like weight and weight for age was measured and compared to the standards to classify based on the Gomez classification into the grades of malnutrition. The mid upper arm circumference was also measured. The biochemical analysis – serum total protein was done to all the respondents. The clinical signs of malnutrition especially protein energy malnutrition along with micronutrient deficiencies were assessed by a physician.

2. Review of Literature

In the study done by **Sunil (2014)** on malnutrition among primary school children in Hyderabad, Andhra Pradesh, India, prevalence of underweight was 28.9%. **Rachana Bhoite *et al.,* (2011)** in their study Magnitude of Malnutrition and Iron Deficiency Anemia among Rural School Children: An Appraisal , found the prevalence of underweight was 70%.

Almost one third (31 per cent) of children in Tamilnadu were found to be stunted or too short for their age, which indicates that they have been undernourished for a period of time: 22 per cent are wasted or too thin for their height which may result from inadequate recent food intake or recent illness and 30 per cent were underweight which takes into account both acute and chronic underweight. Seven out of every ten children have iron deficiency anaemia (**National Family Health Survey, 2008).**

Almost two third of children in Tamil nadu were found to be anemic and about one third undernourished , which make them more susceptible to serious illness. A study conducted by National Institute of Nutrition (2002) , revealed that micronutrient deficiencies were widely prevalent even in the middle income groups. Subclinical deficiency was found in folate, calcium and riboflavin.

3. Methodology

This study was approved by the ethics committee of Kovai Medical Centre and Hospitals. The study was executed in the schools of rural areas in Coonoor, Nilgiri district. This area was approachable and familiar to the investigator. 300 student respondents in the age group of 6- 10 years from three different schools comprising of both sexes (**boys n=**

131; girls n=169) were selected for the study. They were subjected to a pilot study analysing the anthropometric measurements (Weight, Weight for age and MUAC), biochemical analysis (serum total protein level) and clinical signs and symptoms.

4. Results and Discussion

Table 1: Distribution Based On The Age And Gender Of The Respondents, N=300

Age group	Boys		Girls		Total	
	N	%	N	%	N	%
6-7	22	42.3	30	57.7	52	17.3
7-8	23	41.1	33	58.9	56	18.7
8-9	22	41.5	31	58.5	53	17.6
9-10	25	39.1	39	60.9	64	21.4
10-11	39	52	36	48	75	25
Total	131	43.7	169	56.3	300	100

The respondents for the study were selected from three schools comprising a total of 300 respondents of both sexes. The children selected for the study belonged to the age group of 6 to 11 years, 43.7 per cent were boys (n=131) and 56.3 percent were girls (n=169). The age was separated into five groups based on their age as 6-7 years (17.3 per cent; n^b = 22 and n^g = 30) ; 7-8 years (18.7 per cent; n^b = 23 and n^g = 33) ; 8-9 years (17.6 per cent; n^b = 22 and n^g = 31) ; 9-10 years (21.4 per cent; n^b = 25 and n^g = 39) and 10-11 years (25 percent; n^b = 39 and n^g = 36).

In all the age groups the percentage of girls was higher than that of boys except for 10-11 years children were boys were 4 per cent higher than girls among the respondents of the study. The male to female ratio was found to be (0.98 : 1) .This is in closely in par with the data specified in the study done among school children in Nepal were the percentage of girls (51 per cent) was more compared to boys (49 per cent) male to female ratio of 0.96 : 1(**Joshi et al., 2011**). This ratio was also similar to that observed in **Kaski district** 0.97:1.

Anthropometric Measurements of the Respondents

Anthropometric measurements of the respondents were assessed and presents. The anthropometric measurements included weight, weight for age and mid upper arm circumference.

Table 2: Mean and standard deviation of weight for boys (n=300)

Age (Yrs)	Male	NCHS Standard	Weight for age	% deficit
6-7	17.8 ± 3.27	21.2	84.1	16
7-8	18.5 ± 2.82	23.5	78.7	21.3
8-9	21.1 ± 3.10	26	81.3	18.7
9-10	22.6 ± 3.52	28.9	78	21.8
10-11	26.3 ± 5.45	32.4	81.2	18.8

Table 3: Mean and standard deviation of weight for girls (N=300)

Age (Yrs)	Female	NCHS Standard	Weight for age	% Deficit
6-7	17.2 ± 2.91	20.1	85.5	14.4
7-8	19.1 ± 2.82	22.6	84.7	15.5
8-9	21 ± 3.56	25.7	81.7	18.3
9-10	22.1 ± 2.87	29.5	74.9	25.1
10-11	26.7 ± 5.52	33.6	79.4	20.5

The mean of weight of both sexes were measured using a weighing balance and compared to the NCHS Standards. This is used to analyse weight for finding the grade of malnutrition using Gomez classification. The mean of weight for all age group for boys and girls indicated them to be under Grade I undernutrition which is a sign of mild malnutrition.

The lowest values with maximum deficit was observed in 9 to 10 years of age in both boys (21.8 per cent) and girls (25.1 per cent). The boys had the mean in Gomez classification as 80.66 with a deficit of 19.32 per cent which was comparatively lower than the level obtained as mean for girls 81.24 with a deficit of 18.76 per cent.The lowest deficit was observed in the age group of 6-7 years in boys (16 per cent) and girls (14.4 per cent).

This result in consonance with the results obtained in the study done by **Vandana Sati** (2012) specifying that there were observations of deficit in weight on comparison to standards.

Table 4: Distribution based on Gomez classification (N=300)

Gomez Classification	N	%
Normal	63	21.1
Grade I Under nutrition	127	42.3
Grade II Under nutrition	97	32.3
Grade III Under nutrition	13	4.3

The above table shows the distribution of respondents based on the different grades of undernutrition specified under GOMEZ classification. The results indicate that 21.1 per cent of the respondents belonged to normal category and remaining were undernourished at various levels. The maximum percentage almost half belonged to the group of grade I undernutrition which is mild malnutrition. (42.3 per cent) . This proves the high prevalence of mild malnutrition among the respondents and severe malnutrition which is grade III was minimum of about 4.3 per cent among the respondents. Keeping this in mind the experimental group was selected from mildly malnourished group for the supplementation study.

Table 5: Mean and standard deviation of MUAC (N=300)

Age (Yrs)	Male	Female
6-7	15.83 ± 1.45	15.49 ± 1.49
7-8	15.61 ± 1.25	16.00 ± 1.35
8-9	16.45 ± 1.45	16.65 ± 1.62
9-10	16.99 ± 1.42	16.71 ± 1.70
10-11	17.67 ± 1.88	17.77 ± 1.94

The Mid Upper Arm Circumference level was measured for both girls and boys were measured for all the respondents and compared with each other as well as their mean. The table depicts that the MUAC mean was similar for both sexes (16.51 and 16.52). The highest mean MUAC was obtained at 10- 11 years in both boys and girls (17.67 and 17.77).

Biochemical Assessment of the Respondents

The biochemical analysis was done for all the respondents (n=300) and the total protein level was analysed and based on this the respondents for control and experimental group were selected for the supplementation study.

Table 6: Mean and standard deviation of total protein
(normal 6.5-8.5g/dl) N=300

Age (Yrs)	Male	Female
6-7	6.63 ± 0.36	6.97 ± 0.42
7-8	6.76 ± 0.11	6.77 ± 0.48
8-9	6.75 ± 0.46	6.68 ± 0.46
9-10	6.85 ± 0.52	6.81 ± 0.36
10-11	6.72 ± 0.32	6.84 ± 0.44

Serum total protein level was estimated for all the samples by following the Biuret method. The normal range of serum total protein lies between 6.5 – 8.5 g/ ml. The above table indicates the Mean Score of total protein for the age groups between 6-11 of boys and girls. In 6-7 age group the mean score for boys were 6.63 ± 0.36 and for girls 6.97 ± 0.42, in 7-8 age had similar total protein mean as 6.8g and in 8-9 years the mean was higher in boys than in girls. It was maximum in 10 -11 years of age.

Table 7: Clinical Signs and Symptoms Of The Respondents

Clinical Symptoms	Boys (n=131)				Girls (n=169)			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
Dryness of hair	34	26	97	74	24	14.2	145	85.8
Angular stomatitis	12	9.2	119	90.8	8	4.7	161	9.5
Cheilosis	42	32.1	89	67.9	33	19.2	136	80.5
Glossitis	-	-	131	100	-	-	169	100
Pale skin	39	29.8	92	70.2	27	16	142	84
Ridged nails	49	37.4	82	62.6	52	30.8	117	69.2
Tooth decay	22	16.8	109	83.2	18	10.7	151	89.3

The clinical signs and symptoms were analysed for all the respondents of both sexes. The symptoms like dryness of hair, angular stomatitis, cheilosis, glossitis, pale skin, ridged nails and tooth decay were commonly observed in the respondents. The commonly seen sign was cheilosis that was upto 32.1 per cent of the boys and pale skin was observed upto 29.8 per cent and ridged nails were seen upto 37.4 per cent. In girls ridged nails were observed and was 30.8 per cent. Other signs were observed only in minimal levels.

Gilchrist and Buxton(1935) observed for example, that the nails of poorly nourished children grew more slowly and structure was also altered due to lack of calcium. In 1970s **Vasantha et al.,** demonstrated that Kwashiorkor a severe protein/ calorie deficiency, was associated with skin biochemical changes in children, thus providing an explanation for the occurrence of cutaneous lesions of this syndrome. More recently the reduction of total melanin content of scalp hair has been reported to be a characteristic of malnutrition in children (**McKenzie et al., 2007**).

5. Conclusion

A pilot study was conducted in order to analyse the nutritional status of the selected respondents (N=300). The group consisted of both boys (n=131) and girls (n=169). The main focus was on measuring the weight and comparing with the Gomez classification and the clinical signs and symptoms were assessed and total protein levels were measured biochemically. The maximum percentage almost half belonged to the group of grade I undernutrition which is mild malnutrition. (42.3 per cent) and severe malnutrition which is grade III was minimum of about 4.3 per cent among the respondents. This indicates the increased need for studies to be done on the mild malnourished children and improve their nutritional and health status.

6. Future Scope

A protein rich product can be formulated and a supplementation study can be done as a continuation of this pilot study with detailed analysis on the growth and development of a selected group of malnourished children.

7. Acknowledgement

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Author Profile

Ms. R. Bhargavi is a PG research scholar studying in Dr. NGP Arts and Science College, Coimbatore and this study was done as a part of her M.Sc Final year project.

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