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Influence of Micronutrient Deficiency on the Prevalence of Respiratory Diseases among Children (6-12yrs)

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Abstract: *The study entitled "Influence of micronutrient deficiency on the prevalence of respiratory diseases among children 6-12 years" was conducted to assess the nutritional status of the children. Majority of the socio economic variables such as age, area of residence, family income are found to have an impact on the nutritional status of the children with respiratory diseases.*

Method: *In this study anthropometric, bio-chemical, clinical and nutritional assessment was done for 100 children with respiratory diseases from thiruvananthapuram district of Kerala. The data regarding the socio economic status, nutritional status and health status were collected using suitably structured schedule. The nutrient intake was assessed by 24 hour recall method. The hemoglobin levels and calcium levels of the subsamples were analyzed biochemically. The results were statistically analyzed.*

Result: *Nutritional anthropometry of the children with respiratory diseases indicates that 77% of the children were underweight. The biochemical analysis of blood samples indicates that 75% were having iron deficiency anemia. Mean nutrient intake of both male and female children with respiratory diseases indicates that both of them are deficient in all nutrient s consumption with respect to RDA.The statistical analysis by t-test reveals that for males fat consumption and riboflavin consumption were significant at 0.01 levels. For the females it was found that t-test analysis shows protein, fat, iron, vitamin C and riboflavin consumption were significant at 0.01 levels.*

Conclusion: *From the study it was found that the majority of the children with respiratory diseases are underweight and they show micronutrient deficiencies. Adequacy of food and nutritional intake had direct impact on nutritional status of the children with respiratory diseases. It is to be concluded that micronutrient deficiency has an influence on the prevalence of respiratory diseases among children 6-12 years of age.*

I. Introduction

Micronutrients are the essential chemicals in food that the body needs for normal functioning and good health that must come from the diet because they either cannot be made in the body ; or cannot be made in sufficient quantities(1).Micronutrient deficiencies can have major adverse health consequences, contributing to impairments in growth, immune competence, mental and physical development and poor reproductive outcomes that cannot be reversed by nutrition interventions (2).Severe micronutrient deficiency often presents with distinct signs and symptoms, and can be life threatening .It is however, a rare condition .Marginal micronutrient deficiency, in contrast is much more prevalent, affecting health, growth, and development in an insidious way. The most vulnerable groups in population include children, pregnant and lactating women (3).

Micronutrient status has been implicated as risk factors in acute respiratory infections. Respiratory diseases have been associated with increased risk of developing vitamin A deficiency and in turn, vitamin A deficiency has been associated with increased risk of developing respiratory diseases in preschool children. The initial association between low serum retinol levels and pneumonia may be explained by vitamin A that is lost in the urine during these infections probably by mechanisms similar to those for diseases (4).

Children with low plasma zinc concentrations in an urban slum setting had a mean prevalence rate of acute lower respiratory infections that was 3-5 folds higher than children with normal plasma zinc concentrations. Zinc is important not only in growth but also in the immune function of children, which is affected in zinc deficient children suffering diarrheal and respiratory diseases. Selenium deficiency may be a risk factor for the development of respiratory infections, particularly pneumonia among critically ill patients and malnourished children. It is known that selenium serum concentrations drop in premature infants after birth, especially in those who develop respiratory distress syndrome (5).

Other micronutrients may also play a role in susceptibility of children to pneumonia and other acute respiratory infections. In case control study done in Ethiopia, children with clinical or radiological evidence of rickets had probability of pneumonia 13 times higher than did children without rickets, suggesting that vitamin D or calcium deficiency may also be a risk factor for pneumonia. In a case control study done in Indian children, a low serum level of vitamin D was associated with severe acute lower respiratory infections, adjusting for other risk factors. Poor dietary calcium intake may potentiate the deficiency of vitamin D(6).

Reports of micronutrient status of children with respiratory distresses are not available in Thiruvananthapuram district of Kerala. Thus the present work was undertaken to study the influence of micronutrient deficiency on the prevalence of respiratory distresses among children (6-12yrs).

Significance of the study:

In a recent study conducted by National Institute of Allergy and Infectious diseases (USA)(May 2010),supplementation with various micronutrients (vitamin A, vitamin D,zinc,iron and folic acid) on incidence, morbidity and mortality of lower acute respiratory infections (ARI) in children resulted in a 20% reduction in mortality and ARI incidence. Respiratory diseases are most common health complication among children (6-12 years). It was found that pneumonia represents 17% of mortality rate, with under nutrition contributing to 44%of those deaths. The major risk factors contributing to mortality and disease burden due to Acute Respiratory Infections (ARI) in children are stunting, under weight and low birth weight. Hence an attempt is made here to study the influence of micronutrient deficiency on the prevalence of respiratory diseases among children 6-12 years.

Objectives of the study:

- To assess the socioeconomic status of the children with respiratory diseases.
- To assess the nutritional status of the children with respiratory diseases.
- To assess the micronutrient status of the children with respiratory diseases.

II. Review Of Literature

The literature related to the present study are as follows:

According to Taylor and Camargo (2011) Several studies have documented the impact of vitamin D and other micronutrients on host responses to upper and lower respiratory tract infections, such as influenza and tuberculosis. These studies include observational as well as micronutrient intervention studies. Other studies have been conducted to understand the mechanisms by which micronutrients alter immune responses. However, critical information gaps and challenges remain. According to Bhan et al (2001) Malnutrition increases morbidity and mortality and affects physical growth and development, some of these effects resulting from specific micronutrient deficiencies. While public health efforts must be targeted to improve dietary intakes in children through breast feeding and appropriate complementary feeding, there is a need for additional measures to increase the intake of certain micronutrients. Our understanding of the prevalence and consequences of iron, vitamin A and iodine deficiency in children and pregnant women has advanced considerably while there is still a need to generate more knowledge pertaining to many other micronutrients, including zinc, selenium and many of the B-vitamins. For iron and vitamin A, the challenge is to improve the delivery to target populations. According to Lanata et al (2003) Acute respiratory infections are the most important single cause of global burden of disease in young children globally and a major cause of child mortality. A recent review of studies reporting the incidence of acute lower respiratory infections (ALRI) in young children in the developing world was carried out by the WHO Child Health Epidemiology Reference Group in order to inform global burden of disease estimates. The review highlighted the low number of community-based longitudinal studies of ALRI incidence in young children which met minimum quality criteria. It underscored the need to give attention to issues of study design and the reporting of a basic minimum dataset which describes circumstances under which the studies were being conducted and the key design features of the study which may influence the ALRI estimate. This paper aims to provide methodological guidelines for the design, conduct, and reporting of epidemiological studies of ALRI in under-5s in developing countries.. According to Baqui et al (2003) Given the high prevalence of micronutrient deficiencies and infectious diseases in infants in developing countries, an evaluation of the efficacy of different micronutrient formulations on infant morbidity is a priority. The efficacy of weekly supplementation of four different micronutrient formulations on diarrhea and acute lower respiratory infection (ALRI) morbidity was evaluated in Bangladeshi infants. In a double-blind, randomized, controlled community trial, 799 infants aged 6 mo were randomly assigned to one of the following 5 groups:1) 20 mg elemental iron with 1 mg riboflavin, 2) 20 mg elemental zinc with 1 mg riboflavin, 3) 20 mg iron and 20 mg zinc with 1 mg riboflavin, 4) a micronutrient mix (MM) containing 20 mg iron, 20 mg zinc, 1 mg riboflavin along with other minerals and vitamins and 5) a control treatment, 1 mg riboflavin only. Health workers visited each infant weekly until age 12 mo to feed the supplement and to collect data on diarrhea and ALRI morbidity. Hemoglobin, serum ferritin and serum zinc levels of a sample of infants were measured at 6 and 12 mo. Compared with the control group, at 12 mo, serum ferritin levels were higher in the iron + zinc group, and serum zinc levels were higher in the zinc and iron + zinc groups. Simultaneous supplementation with iron + zinc was associated with lower risk of severe diarrhea, 19% lower in all infants and 30% lower in less well-nourished infants with weight-for-age Z-score below −1. Iron + zinc supplementation was also associated with 40% lower risk of severe ALRI in less well-nourished infants. MM supplementation was associated with a 15% higher risk of diarrhea in all infants and 22% higher risk in less well-nourished infants. Intermittent simultaneous supplementation with iron + zinc seems promising; it will be useful to determine whether higher doses would provide greater benefits.

According to Magnus et al (2011) The study from the Norwegian Mother and Child Cohort Study (MoBa) suggests that children delivered by Caesarean section have an increased risk of asthma at the age of three. This was particularly seen among children without a hereditary tendency to asthma and allergies. Data from more than 37 000 participants in the MoBa study were used to study the relationship between delivery method and the development of lower respiratory tract infections, wheezing and asthma in the first three years of life. Children born by planned or emergency Caesarean section were compared with those born vaginally. The results indicate that children born by Caesarean section have a slightly elevated risk for asthma at three years, but have no increased risk of frequent lower respiratory tract infections or wheezing. The increased risk of asthma among children delivered by Caesarean section was higher among children of mothers without allergies.

According to Camargo et al (2010) The vitamin D levels of newborn babies appear to predict their risk of respiratory infections during infancy and the occurrence of wheezing during early childhood, but not the risk of developing asthma. Results of a study in the January 2011 issue of Pediatrics support the theory that widespread vitamin D deficiency contributes to risk of infections. "Our data suggest that the association between vitamin D and wheezing, which can be a symptom of many respiratory diseases and not just asthma, is largely due to respiratory infections," says Carlos Camargo, MD, DrPH, of the Massachusetts General Hospital (MGH), who led the study. "Acute respiratory infections are a major health problem in children. According to Romieu (2001) The results presented in this review suggest that the impact of nutrition on obstructive lung disease is most evident for antioxidant vitamins, particularly vitamin C and, to a lesser extent, vitamin E. By decreasing oxidant insults to the lung, antioxidants could modulate the development of chronic lung diseases and lung function decrement. Antioxidant vitamins could also play an important role in gene-environment interactions in complex lung diseases such as childhood asthma. Data also suggest thatomega-3 fatty acids may have a potentially protective effect against airway hyperreactivity and lung function decrements; however, relevant data are still sparse. Although epidemiologic data suggest that consumption of fresh fruit may reduce risk of noncarcinogenic airway limitation, there are no clear data on which nutrients might be most relevant. While some studies evaluate daily intake of vitamin C, other studies use fruit consumption as a surrogate for antioxidant intake. Given the dietary intercorrelations among antioxidant vitamins, particularly vitamin C, beta-carotene, and flavonoids, as well as other micronutrients, it may be difficult to isolate a specific effect. Some population subgroups with higher levels of oxidative stress, such as cigarette smokers, may be more likely to benefit from dietary supplementation, since some studies have suggested that antioxidant intake may have a greater impact in this group. Studies of lung function decrement and COPD in adults suggest that daily intake of vitamin C at levels slightly exceeding the current Recommended Dietary Allowance (60 mg/day among nonsmokers and 100 mg/day among smokers) may have a protective effect (20). In the Schwartz and Weiss (85) and Britton et al. (87) studies, an increase of 40 mg/day in vitamin C intake led to an approximate 20-ml increase in FEV1. Daily mean vitamin C intakes in these studies were 66 mg and 99.2 mg, respectively, and the highest intake level (178 mg/day) was approximately three times the Recommended Dietary Allowance. Although the amplitude of the effect was modest, if these effects accumulate over 20-30 years, they could have a meaningful impact on the rate at which pulmonary function declines, particularly in symptomatic subjects (85). According to Bhaskaram (2008) Micronutrient deficiencies and infectious diseases often coexist and exhibit complex interactions leading to the vicious cycle of malnutrition and infections among underprivileged populations of the developing countries, particularly in preschool children. Several micronutrients such as vitamin A, beta-carotene, folic acid, vitamin B12, vitamin C, riboflavin, iron, zinc, and selenium, have immune modulating functions and thus influence the susceptibility of a host to infectious diseases and the course and outcome of such diseases. Certain of these micronutrients also possess antioxidant functions that not only regulate immune homeostasis of the host, but also alter the genome of the microbes, particularly in viruses, resulting in grave consequences like resurgence of old infectious diseases or the emergence of new infections. These micronutrient infection and immune function interactions and their clinical and public health relevance in developing countries are briefly reviewed in this article. According to Roth et al (2008) Inadequate nutrition and acute lower respiratory infection (ALRI) are overlapping and interrelated health problems affecting children in developing countries. Based on a critical review of randomized trials of the effect of nutritional interventions on ALRI morbidity and mortality, we concluded that: (1) zinc supplementation in zinc-deficient populations prevents about one-quarter of episodes of ALRI, which may translate into a modest reduction in ALRI mortality; (2) breastfeeding promotion reduces ALRI morbidity; (3) iron supplementation alone does not reduce ALRI incidence; and (4) vitamin A supplementation beyond the neonatal period does not reduce ALRI incidence or mortality. There was insufficient evidence regarding other potentially beneficial nutritional interventions. For strategies with a strong theoretical rationale and probable operational feasibility, rigorous trials with active clinical case-finding and adequate sample sizes should be undertaken. At present, a reduction in the burden of ALRI can be expected from the continued promotion of breastfeeding and scale-up of zinc supplementation or fortification strategies in target populations.

III. Study Procedures

Research design: An appropriate data gathering tool was devised with due reference to the objectives of the present study. In the present study well structured interview schedules were developed for data gathering.

Study population and Sampling: The present study was conducted in Thiruvananthapuram district of Kerala. The subjects were selected from rural and urban areas of Thiruvananthapuram district. A total of one hundred children with respiratory diseases in the age group of 6-12 years were selected by purposive sampling method.

Conduct of Study: Interview method of data collection was adopted for the study. For this the respondents were interviewed using a suitably structured schedule. Clinical examination was conducted to identify any deficiency symptoms. Anthropometric measurements such as weight, height, head circumference, chest circumference and mid upper arm circumference were taken by using universally accepted method. Nutritional assessment was done by 24hour recall method.In the study, schedules were developed to collect information from the respondent, dietary habits, frequency of food consumption, were also assessed through the well structured schedule.

Statistical Analysis: The data was analyzed using descriptive statistics. Statistical analysis was done by using statistical test such as mean, standard deviation and t test.

IV. Result And Discussion

The results of the study is presented and discussed under the following headings:

Socioeconomic status of the respondents.

Percentage distribution of the sample according to gender.

Percentage distribution of the sample according to gender was given in the table 1.Table 1 revealed that there were 54% males and 46% females among the children with respiratory diseases.

Table 1.Percentage distribution of the sample according to gender.

Gender	Count	Percent
Male	54	54.0
Female	46	46.0

Percentage distribution of the sample according to age.

From the fig 1 it was found that majority (20%) of the children with respiratory diseases belong to age group of 11-12 years, followed by 9-10 years (19%) and 10-11 years (17%) , then 8-9 years (16%) and 7-8 years (15%) . About 13% of the respondents were of 6-7 years of age.

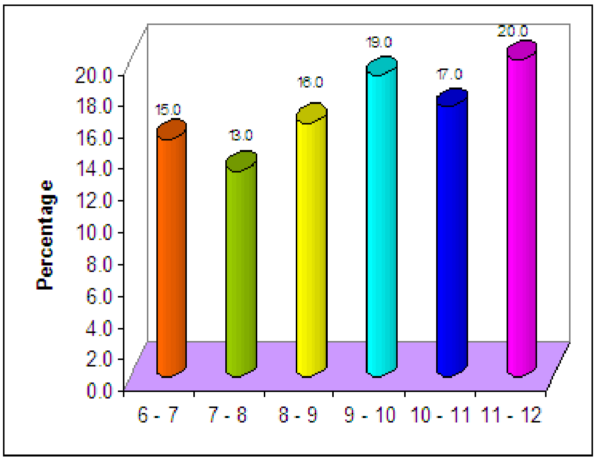


Fig1. Percentage distribution of the sample according to age

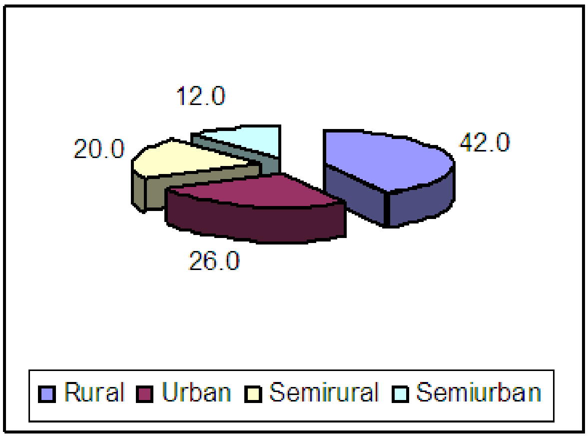


Fig2. Percentage distribution of the sample according to location of house.

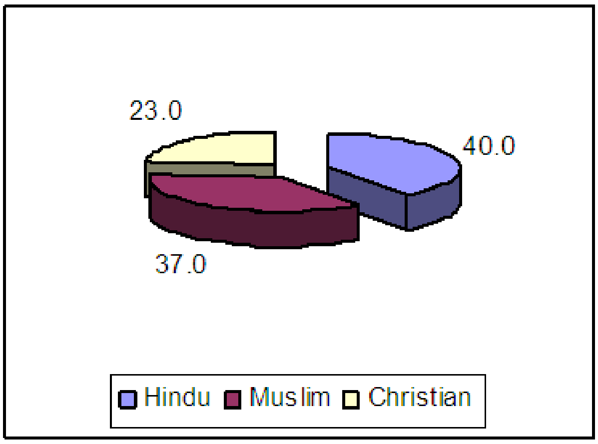


Fig3. Percentage distribution of the sample according to religion

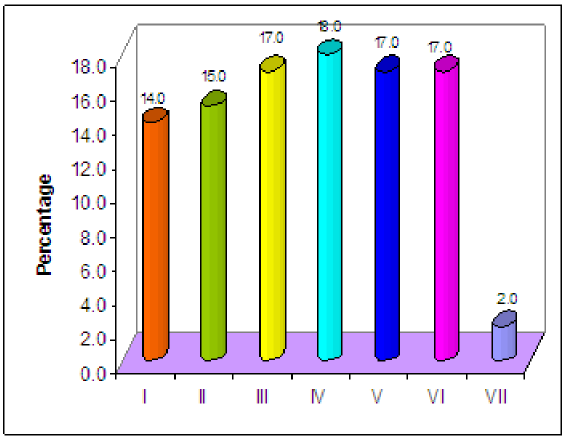


Fig4. Percentage distribution of the sample according to educational status

Table 2 Percentage distribution of the sample according to monthly income.

Monthly income	Count	Percent
5000-8000	34	34
9000-12000	43	43
13000-16000	23	23

From the table it was observed that majority of the children with respiratory diseases belong to the families with a family income of rupees 9000-12000 (43%) that is middle income followed by the income range of rupees 5000-8000 (34%) that is low income and rupees 13000-16000 (23%)that is high income.

Nutritional status of the respondents.

Food habits of the respondents. Food habits of an individual have a profound influence on his or her nutritional status. Table 6 represents the food habits of the children with respiratory diseases.

Table 3 Food habits of the sample.

Particulars	No: of respondents				Total
	Urban	Semi urban	Rural	Semi rural	
Pure vegetarian	1	2	1	1	5
Lacto vegetarian	3	2	1	2	8
Ovo vegetarian	2	1	2	1	6
Pesco vegetarian	1	2	1	3	7
Non vegetarian	35	19	15	5	74
Total	42	26	20	12	100

It was observed that majority of the children with respiratory diseases 74% were non vegetarians followed by lacto vegetarians 8% and pescovegetarians 7% and ovovegetarians 6% and then pure vegetarians 5%.

Details of skipping meals

Table 4 Details of skipping of meals by the sample.

	No: of respondents				
Details	Urban	Semi urban	Rural	Semi rural	Total
Dinner	17	10	7	6	40
Breakfast	1	11	8	4	24
No skipping	24	5	5	2	36
Total	42	26	20	12	100
Reason for Skipping					
Lack of time	9	7	1	1	8
Dislike	6	11	6	5	28
Lack of appetite	3	3	8	4	18
Nil	24	5	5	2	36
Total	42	26	20	12	100

The details of reasons for skipping meals by the children with respiratory diseases is given in Table.7.It was found that majority of the children (40%) skip dinner while 24% skip breakfast. It was found that 36% does not skip meal. Reasons for skipping meals indicated that 28% children with respiratory diseases skip meal due to dislike, 18% due to lack of time and due to lack of appetite also 18%.

Mean nutrient intake of the respondents.

24 hour recall method was conducted to assess the mean nutrient intake of the children with respiratory diseases and the results were given in table 8 and 9.

Table 5 Mean nutrient intake of male children.

Nutrient	Mean	Nutrient	Intake		RDA	Mean	% of RDA Met
	Urban	Semi urban	Rural	Semi rural			
Energy(kcal)	2000.0	1879.3	1780.0	1785.3	2190	1861.2	84.9
Protein (gm)	35.0	31.8	30.4	30.0	39.9	31.8	79.6
Fat (gm)	30	28.08	26.0	25.4	35	27.37	78.2
Calcium(mg)	625.0	549.6	530.2	521.04	800	556.46	69.5
Iron(mg)	19.0	18.04	17.0	18.0	21	18.01	85.7
Vitamin A(mg)	585.0	564.6	520.0	525.0	600	548.6	91.4
Vitamin C(mg)	39.0	38.82	39	38.7	40	38.88	97.2
Riboflavin(mg)	0.9	1.0	0.9	0.8	1.3	0.9	69.2

From the Table it was observed that the nutrient intake of the male respondents was deficient with respect to RDA. It was found that the energy intakes of the male children were found to be deficient with respect to RDA that is only 84.9% met. Protein (79.6%) and fat (78.2%) intake was also found to be less with respect to the RDA. Calcium is found to be least met with RDA that is it was only met 69.5%. Iron intakes of the respondents were found to be met only 85.7%

Vitamin A and Vitamin C was found to be met 91.4% and 97.2% respectively. Riboflavin was also found to be least met that is only 69.2%. Mean nutrient intake of the respondents reveals that they were deficient in nutrient consumption.

Table 6 Mean nutrient intake of female respondents.

Nutrient	Mean Nutrient Intake				RDA	Mean	% of RDA Met
	Urban	Semi urban	Rural	Semi rural			
Energy(kcal)	1716.0	1710.0	1680.0	1650.0	2010	1689.0	84.0
Protein (gm)	34.0	32.0	27.6	28.8	40.4	30.6	75.7
Fat (gm)	30.0	29.0	27.7	26.9	35	28.4	81.1
Calcium(mg)	571.0	580	565.2	569.0	800	563.8	70.4
Iron(mg)	20.0	18.0	18.0	19.5	27	19.0	70.3
Vitamin A(mg)	540.0	525.0	531.0	514.0	600	527.6	87.9
Vitamin C(mg)	37.0	36.0	38.0	35.0	40	36.5	91.2
Riboflavin(mg)	0.8	0.9	1.0	0.7	1.2	0.8	66.6

It was observed from the table that the intake of the female children with respiratory diseases was below the RDA levels. Energy intake of female children was found to be met 84% with RDA.Protein (75.7%) and fat (81.1%) intake was also found to be less met with RDA.

Minerals calcium and iron was also found to be consumed less by the respondents that is only 70.4% and 70.3% respectively met with RDA. Vitamin A (87.9%) and Vitamin C (91.2%) intake was also found to be less.

	Nutrient intake	Mean	SD	N	Standard	t	LS
Male	Calorie	1701.5	225.4	54	2190	0.071	NS
	Protein	31.8	7.9	54	39.9	0.950	NS
	Fat	27.4	4.5	54	35	2.828	0.01
	Calcium	556.5	60.2	54	800	0.494	NS
	Iron	18.0	3.9	54	21	1.414	NS
	Vitamin-A	548.7	83.8	54	600	0.054	NS
	Vitamin-C	43.9	8.0	54	40	0.448	NS
	Riboflavin	1.0	0.2	54	1.3	57.216	0.01
Female	Calorie	1689.0	109.8	46	2010	0.181	NS
	Protein	30.6	3.1	46	40.4	6.839	0.01
	Fat	28.4	3.1	46	35	4.557	0.01
	Calcium	563.8	48.8	46	800	0.674	NS
	Iron	19.0	2.5	46	27	8.368	0.01
	Vitamin-A	527.6	31.2	46	600	0.504	NS
	Vitamin-C	36.5	1.9	46	40	6.264	0.01
	Riboflavin	0.8	0.2	46	1.2	109.407	0.01

Riboflavin intake was found to be met least that is 66.6%.

Table 7 Comparison of nutrient intake with standard based on gender

**: - Significant at 0.01 level *: - Significant at 0.05 level

Statistical analysis of the nutrient intakes by male and female respondents were given in the table 10. The mean nutrient intake of the male respondents was found to be 1701.5 Kcal. Standard deviation of calories is 225.4. The t-test value is 0.071. it is not significant. The mean protein intake was 31.8 and standard deviation is 7.9. The t-test value is 0.950 and it is not significant. The mean fat intake was 27.4 and standard deviation is 4.5. the t-test value is 2.828 and it is significant at 0.01 level. The mean intake of calcium is 556.5 and the standard deviation is 60.2. The t-test value is 0.494 and it is not significant. The mean iron intake is 18 and standard deviation is 3.9. The t-test value is 1.414 and it is not significant. The mean vitamin A intake is 548.7 and standard deviation is 83.8. The t-test value is 0.054 and it is not significant. The vitamin C mean intake is 43.90 and standard deviation is 8.0. T he t-test value is 0.448 and it is not significant. The riboflavin mean intake is 1.0 and standard deviation is 0.2. The t-test value is 57.216 and it is significant at 0.01 levels.

The mean calorie intakes of female respondents were found to 1689.0 and standard deviation is 109.8. The t-test value is 0.181 and it is not significant. The mean protein intake is 30.6 and standard deviation is 3.1. The t-test value is 6.389 and it is significant at 0.0.1 level. The mean fat intake is 28.4 and standard deviation is 3.1 . The t-test value is 4.557 and it is significant at 0.01 levels. The mean calcium intake is 563.8 and standard deviation is 48.8. The t-test value is 0.674 and it is not significant. The mean iron intake is 19.0 and standard deviation is 2.5. The t-test value is 8.368 and it is found to be significant at 0.01 levels. The mean vitamin A intake is found to be 527.6 and standard deviation is 31.2.The t-test value is 0.504 and it is not significant. The mean vitamin C intake is36.5 and standard deviation is 1.9. The t-test value is 6.264 and it is significant at 0.01 level. The mean riboflavin intake is 0.8 and standard deviation is 0.2. The t- test value is 109.47 and it is found to be significant at 0.0.1 level. **: - Significant at 0.01 levels

Table 8Comparison of nutrient intake based on gender

Nutrient intake	Male			Female			t	p
	Mean	SD	N	Mean	SD	N		
Calorie	1701.5	225.4	54	1689.0	109.8	46	0.34	0.733
Protein	31.8	7.9	54	30.6	3.1	46	0.99	0.326
Fat	27.4	4.5	54	28.4	3.1	46	1.33	0.186
Calcium	556.5	60.2	54	563.8	48.8	46	0.66	0.509
Iron	18.0	3.9	54	19.0	2.5	46	1.48	0.141
Vit-A	548.7	83.8	54	527.6	31.2	46	1.61	0.111
Vit-C	43.9	8.0	54	36.5	1.9	46	6.1**	0.000
Riboflavin	1.0	0.2	54	0.8	0.2	46	4.13**	0.000

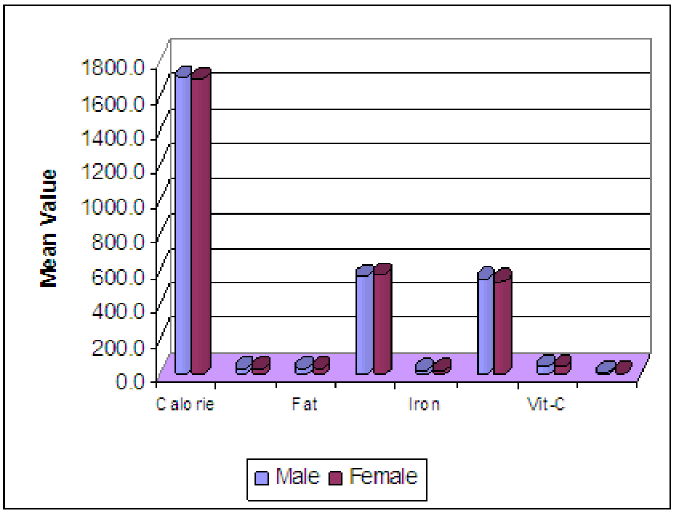


Fig.5 Comparison of nutrient intake based on gender.

Statistical analysis of the comparison of mean nutrient intake of male and female children with respiratory distresses was given in the table 11 and fig 5. It was found that by the t-test the vitamin C and riboflavin intake of the respondents when compared were found to be significant at 0.01 levels.

Table 9 Percentage distribution of the sample according to nutritional anthropometry

		Count	Percent
Height	110 - 129	36	36.0
	130 - 149	43	43.0
	150 - 169	21	21.0
	Mean ± SD	135.2 ± 135.23	

Weight	<=30	46	46.0
	31 - 40	47	47.0
	41 - 50	7	7.0
	Mean ± SD	31.2 ± 31.16	
BMI	Under weight	77	77.0
	Normal weight	18	18.0
	Over weight	5	5.0
	Mean ± SD	17.3 ± 17.30	
Head circumference	40 - 49	44	44.0
	50 - 59	56	56.0
	Mean ± SD	49.1 ± 49.06	
Chest circumference	40 - 59	22	22.0
	60 - 79	63	63.0
	80 - 99	15	15.0
	Mean ± SD	67.8 ± 67.76	
Mid upper arm circumference	<25	86	86.0
	>=25	14	14.0
	Mean ± SD	21.4 ± 21.41	

Nutritional anthropometry of the children with respiratory distresses reveals that 77% of the children were under weight. The children having normal weight is found to be 18%. 5% of the children are overweight. Nutritional anthropometry indicates that 77% of the children were under nourished irrespective of gender or age.

Micronutrient status of the respondents.

Table 10 Percentage distribution of the sample according to clinical assessment.

		Count	Percent
Eyes	Normal colour	66	66.0
	Short sight	12	12.0
	Long sight	11	11.0
	Night blindness	11	11.0
Tongue	Normal	44	44.0
	Pale but coated	39	39.0
	Red	17	17.0
Teeth	Normal	58	58.0
	Chalky	22	22.0
	Caries	20	20.0
Hair	Normal	56	56.0
	Discolored	19	19.0
	Gray hair	12	12.0
	Spares and brittle	13	13.0
Skin	Normal	64	64.0
	Dry & rough	16	16.0
	Oily	16	16.0
	Wrinkled	4	4.0
Nails	Pink	50	50.0
	Pale	34	34.0
	Pale & spoon shaped	16	16.0
	No	58	58.0

It was observed from the table 16 that the clinical analysis of eyes shows that 66% of the respondents have normal eyes while 12% suffer from short sight, 11% has long sight and 11% of the children have night blindness. Diseases of eyes show the deficiency of vitamin A.

The clinical examination of the tongue reveals that 44% of the respondents have normal tongue.39% of the children has pale but not coated tongue while 17% of them has red tongue.

From the table clinical examination of the teeth of the respondents reveals that 58% have normal teeth while 22% has dental caries and 20% of them have chalky teeth. Dental disorders show deficiency of calcium and vitamin D.

The clinical examination of the hair shows that 56% of the respondents have normal hair while 19% has discolored hair and 12% have grey hair and 13% has sparse and brittle hair. Brittle and discolored hair shows deficiency of vitamin E and B12.

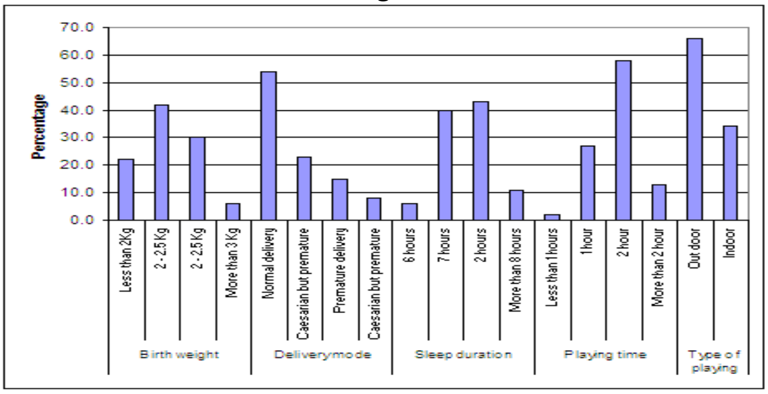
The table reveals that clinical analysis of skin shows that 64% of the respondents have normal skin while 16% have dry and rough skin and 4% have wrinkled skin and 16% have oily skin. Skin disorders also show deficiency of vitamin E.

It was observed from the table the clinical examination of nails shows that 50% has normal pink nails while 34% have pale nails and 16% has spoon shaped nails. Pale and spoon shaped nails shows deficiency of vitamins.

Percentage distribution of the sample according to clinical assessment

According to the fig 6 from the data 22% o f the children were of low birth weight that is below 2Kg.42% of the children were between 2- 2.5 Kg birthweight.30% of the children were having birth weight between 2.5 -3 Kg. About 6% of children were having birth weight above 3Kg.

Fig.6



54% of the children were born out of normal delivery where as 23% were born by caesarian. 15% were of premature delivery and 8% were caesarian but premature.

From the fig it was found that 6% of the children sleeps daily 6 hours while 40 % of them sleeps 7 hours daily and 43% sleeps daily 8 hours .Only 11% of the children sleeps more than 8 hours.

It was found that 58 % of the children plays daily 2 hours while 27% of the children plays 1hour daily and 13% children plays more than 2 hours and 2 % children plays below 1 hour daily.66% of the children plays outdoor games while 34% plays indoor games

Biochemical analysis of the sample.

Table .11 Percentage distribution of the sample according to hemoglobin levels.

Haemoglobin	Count	Percent
Abnormal	15	75.0
Normal	5	25.0
Mean ± SD	12.3 ± 0.7	

The percentage distribution of the sub sample according to the hemoglobin content of blood reveals that 75% of the sub samples are below normal ranges. That is they have anemia. This indicates the respondents are iron deficient

Table .12 Percentage distribution of the sample according to calcium.

Calcium	Count	Percent
Abnormal	5	25.0
Normal	15	75.0
Mean ± SD	9 ± 0.8	

The biochemical analysis of the calcium content of blood reveals that 75% of the sub samples have normal calcium ranges. Only 5% is deficient in calcium

Respiratory distresses among the respondents.

Table .13 Respiratory distresses among the respondents.

Details	Count	Percent
Influenza	9	9.0
Pneumonia	20	20.0
Asthma	37	37.0
Bronchitis	35	35.0
Tuberculosis	6	6.0
Allergy	29	29.0

From the data collected it was found that 37% of the samples are suffering from asthma, while 35% are suffering from bronchitis. Pneumonia is prevalent among 20% of the samples. 29% of the respondents have allergy. Influenza is found among 9% of the samples. Tuberculosis which is least found among the respondents is 6%.

V. Summary And Conclusion

In this study the general information revealed that 54% of the children with respiratory diseases are males and 46% are females. 20% of the children with respiratory diseases belongs to age group 11-12 years. The socio economic status of the children reveals that most of the children that is 43% belong to middle income families where 34% belong to low income families.

The food habits of the children reveal that majority, 74% where non-vegetarians. Details of skipping meal indicate that 40% of the children skip dinner while 24% skips breakfast. The reason for skipping shows that 28% of the children skip meals due to dislike while 18% due to lack of appetite.

Nutritional anthropometry of the children with respiratory diseases indicates that 77% of the children were underweight. The biochemical analysis of blood samples indicates that 75% of them are having low hemoglobin levels. This shows iron deficiency. Clinical analysis of eyes shows that 54% of the children with respiratory diseases have eye diseases. That is they may be deficient in vitamin A. The clinical examination of hair shows that 64% of the children have sparse, brittle or discolored hair. This may be due to vitamin deficiencies. The clinical examination of teeth reveals that 42% of the children with respiratory diseases have dental disorders. This indicates deficiency of minerals.

Mean nutrient intake of both male and female children with respiratory diseases indicates that both of them are deficient in all nutrient s consumption with respect to RDA. The statistical analysis by t-test reveals that for males fat consumption and riboflavin consumption were significant at 0.01 levels. For the females it was found that t-test analysis shows protein, fat, iron, vitamin C and riboflavin consumption were significant at 0.01 levels.

From the study it was found that the majority of the children with respiratory diseases are underweight and they show micronutrient deficiencies. It is to be concluded that micronutrient deficiency has an influence on the prevalence of respiratory diseases among children 6-12 years of age.

VI. Recommendations and Suggestions

1. Micronutrient supplementation for children with respiratory diseases.
2. The study can be done more extensively by finding the zinc status of the children with Respiratory diseases.
3. The study can be done extensively by finding the vitamin D, calcium and vitamin C status of the children with respiratory diseases.

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