Section: Paediatrics

Original Research Article

AN OBSERVATIONAL STUDY ON PREVALENCE OF MICRONUTRIENT DEFICIENCY IN UNDER 5 CHILDREN IN RURAL AREAS OF PRAKASAM DISTRICT

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Abstract

Background: Micronutrients include vitamins and minerals which are required in small amounts i.e, <100mg/day for proper growth and development. According to WHO, 45 % of deaths in children aged <5 years are linked to undernutrition and 42 % of children aged <5 year are anaemic. The aim of this study is to find the prevalence of micronutrient deficiencies among under 5 children and to study the factors associated with micronutrient deficiencies. **Material & Methods:** This community-based cross-sectional study was conducted in the rural area of prakasam district over a period of two months which included all preschool children (< 5years) who are living in the district for at least six months. Data was collected using a validated, pretested and semistructured questionnaire and children were examined for micronutrient deficiency disorders like anaemia, iodine deficiency disorders (Goitre), vitamin A deficiency (Night blindness, Bitot's spots),etc. Data was analyzed using Ms Excel and SPSS software. **Results:** Majority of mothers(47%)of study population were of 21-25 years, 41.5% of fathers worked as semi-skilled workers and 31.5% of mothers had completed their secondary education. The overall prevalence of micronutrient deficiency was 77% and the prevalence of specific deficiencies were anaemia(64%), bleeding gums(40%), bitot's spots(0.75%) and goiter(0.5%). **Conclusion:** Majority of the under 5 children showed high prevalence of anaemia. This may be due to poor socio-economic status, lack of knowledge regarding proper feeding and hygiene practices, inadequate intake of vitamin-rich foods, underweight, wasting and stunting. By improving the nutritional status, one can prevent childhood undernutrition, overweight and obesity.

INTRODUCTION

Micronutrients include vitamins and minerals which are required in small amounts i.e, <100mg/day for proper growth and development of the human body.[1] Their deficiency impairs health, by causing malnutrition and undernutrition. One out of every four children aged less than five years or 146 million children in the developing world are underweight for their age and are at high risk of early death.It is estimated that around two billion people in the world are deficient in one or more micronutrients.[2] The main causes of childhood malnutrition are insufficient food, frequent infections, poor breastfeeding practices, delayed introduction of complementary foods and inadequate protein intake which were reported in the year 2006 by UNICEF.

Micronutrient deficiencies (hidden hunger) such as vitamin A deficiency (VAD), iron deficiency anaemia (IDA) and iodine deficiency disorders (IDD) have been major nutritional problems in developing countries and continue to be of public health significance in India (Vijayaraghavan 2002) and nearly half of the world's micronutrient

deficient population is found in India (USAID 2005). In India, to improve the nutritional status of the population various programmes have been launched over the years like Integrated Child Development Services (ICDS), Mid-Day Meal Programme, National Iodine Deficiency Disorders Control Programme (NIDDCP) and National Iron Plus Initiative (NIPI).

According to the Food and Agriculture Organisation report on the state of Food Security and Nutrition in the world, 2020, it is estimated that 189.2 million (14 per cent) people were undernourished in India,[3] and around 0.5 percent of total deaths in 2016 were contributed by Nutritional deficiencies.[4]

National surveys such as National Family Health Survey (NFHS), National Nutrition Monitoring Bureau (NNMB), Annual Health Survey (AHS) and District Level Household Survey (DLHS) have been carried out to assess the health and nutritional status of the population (dietary intake, anthropometric measurements and anaemia, etc).

Out of these, Anaemia is the most common micronutrient deficiency and it affects almost 50-60 per cent of preschool children and women. The prevalence of anaemia in under 5 children is 58.6 per cent.[5] Nutritional Anaemia can be caused due to the deficiencies of micronutrients such as Iron, Folic acid and vitaminB12, with Iron deficiency being the most common cause of Anaemia.

Vitamin A deficiency impairs vision in children. Iodine deficiency may result in metabolic problems such as Goitre, sometimes an endemic goitre as well as cretinism due to untreated congenital hypothyroidism. A recently published study projected that by 2050, the Prevalence of zinc deficiency would increase by 2.9 per cent due to anthropogenic co2,[6] Scurvy results from a deficiency of vitamin C in the diet.

According to previous studies, anaemia present in under 5 children is likely to be associated with anaemic mothers, children from low socioeconomic status, household food insecurity, living in urban areas, crowded conditions and multiple siblings, low maternal education level and female household heads. Moreover, children with poor nutritional status including wasting, stunting and underweight and those having inappropriate complementary food introduction are more likely to be anaemic.

During the first six months of life, though most babies are breastfed, 20-30 per cent of children are already malnourished. By 18-23 months, though many children are weaned from breast milk, 30 per cent of children are severely stunted and one-fifth of them are severely underweight.[7] This clearly shows that the onset of malnutrition affects them very early in their life.

Malnutrition not only affects later life but also future generations. By providing supplementary foods, food fortification and food-based approaches including diversification and nutrition awareness programmes and family health education are likely to reduce the burden of micronutrient deficiency in children.

Keeping in view the magnitude of micronutrient malnutrition among children, the current study is used to assess the nutritional status and prevalence of micronutrient deficiency among children under 5 years of age.

Aims and Objectives

The main objectives of the study are

1. To know the prevalence of micronutrient deficiencies among under 5 children.
2. To study the factors associated with micronutrient deficiencies.
3. To create awareness about the various programmes provided for children and the utilisation of said programmes among various levels of people.

MATERIALS AND METHODS

A community-based cross-sectional study was conducted in the rural area of prakasam district over a period of two months (august and September 2021.). All preschool children (< 5 years) who are living in the district for at least six months were included in the study. Severely ill and children suffering from any known chronic medical illness were excluded from the study.

Data was collected through a face to face interview by using a validated, pretested and semi structured questionnaire. The questionnaire consisted of socio-demographic and economic characteristics, health and dietary pattern related information. In Rural areas, blood collection was not feasible so clinical signs and symptoms were studied for micronutrient deficiency disorders like anaemia, iodine deficiency disorders (Goitre), vitamin A deficiency (Night blindness, Bitot's spots), vitamin C deficiency (bleeding gums), Riboflavin deficiency and vitamin D deficiency (Any skeletal abnormalities).

Immunization statuses of the children was considered as follows: fully immunized (A child who had taken all vaccines according to National Immunization Schedule (NIS) of age < 1year), completely immunized (A child who had taken all vaccines at that age according to NIS), partially immunized (if any one vaccine is not taken at that age according to NIS). Anthropometric measurements like Weight and Height were considered. The validation of the questionnaire was done before proceeding with the survey. Study tools included a questionnaire, Flexible measuring tape, an adult weighing scale.

The minimum sample size was determined using the sample size proportion formula (4PQ / L2): (P=58.6 per cent prevalence of anaemia in under 5 children (5), Q=100-p, L=5 per cent error). Finally, a minimum sample size of 388 was obtained and rounded to 400. Multistage stratified random sampling was employed to reach the study subjects.

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All the Mandals in the Prakasam district were listed out and one Mandal was selected by simple random method. In that Mandal, all the villages were listed and four villages were selected randomly by lottery method. The sample size was achieved from these four villages by taking one-fourth of the sample size from each village. In each village, one house was randomly selected and from that house, the right-hand rule was followed until the sample size was achieved. In households with more than one eligible study subject, one child was selected by lottery method. When mother and child were not available at the time of data collection, two repeated visits were done.

Institutional ethical committee approval was obtained before conducting the study. The informed consent was taken from the mother after briefly explaining the purpose of the study.

Data was entered in an MS.Excel spreadsheet and analysis was done by using SPSS (Statistical Package for Social Sciences). Results were represented in the form of Figures and Tables. Statistical tests were done wherever needed.

RESULTS

Data was collected from 400 under 5 children and the results were analyzed as follows.

In the present study, 50.5% of the children were males and majority belonged to 2-3 years age group (26.5%). About 47% of the children mother's age was between 21-25 years. More than half of the children (65%) belonged to upper Lower socio-economic scale (5-10) according to the modified kuppuswamy scale 2021.[Table 1]

In the present study, 38.5% of the children's fathers had completed their graduation or postgraduation and 31.5% of the children's mothers had completed their secondary education respectively. 41.5% of the fathers were semi-skilled workers and 76.5% mothers were housewives.

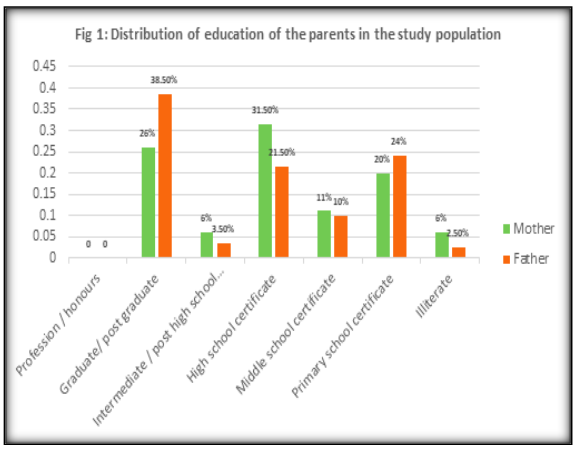

Figure 1: Distribution of education of the parents in the study participants

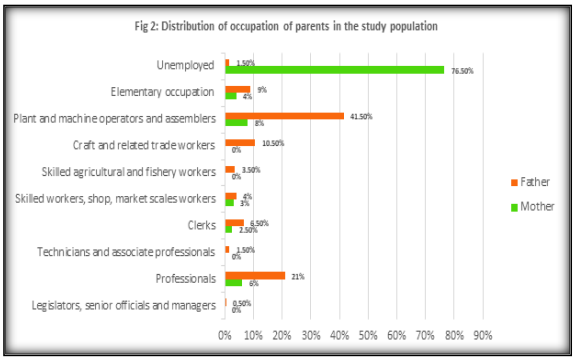

Figure 2: Distribution of occupation of parents in the study participants

About 64% of the children weighed normal at the time of birth. Majority (76%) had not taken exclusive breastfeeding for six months and started artificial feeding before 6 months and 66% were completely immunized. Majority (94%) had taken vitamin A Supplementation. [Table 2]

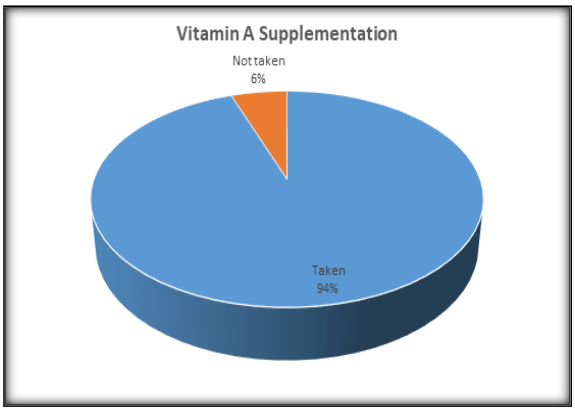

Figure 3: Distribution of vitamin A Supplementation among study participants

Weight and Height were measured by using an adult weighing scale and flexible measuring tape, respectively. About 44% were mildly underweight, 41% were normal weight, 10% were moderately underweight, 4.5% were obese and 0.5% were severely underweight [Table 3].About 47.5% were normal in the percentage of height for age, 44% were mildly stunted and 8.5% were moderately stunted. [Table 4]

Majority of the children (62%) were normal in the percentage of weight for height, 35% were mildly wasted, 2.5% were moderately wasted and 0.5% were severely wasted. [Table 5]

The overall prevalence of micronutrient deficiency was 77% and the prevalence of various micronutrient deficiencies were Anaemia (64%), bleeding gums (40%), bitot's spots (0.7%) and goiter (0.5%). One child may have one or more coexisting micronutrient deficiencies.

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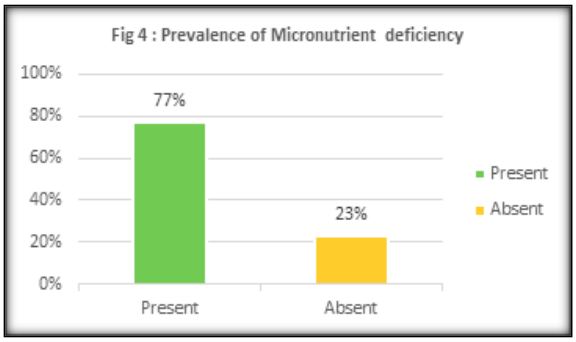

Figure 4: Prevalence of Micronutrient deficiency

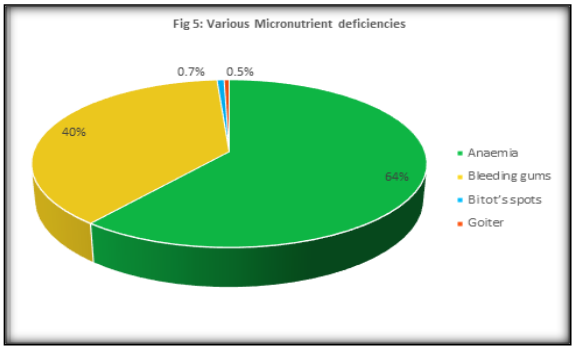

Figure 5: Various Micronutrient deficiencies

In the present study, the prevalence of micronutrient deficiency was found to be high in male children (39.25%) than female children (37.75%) but not statistically significant (p>0.05%). Children whose mother's aged 21 - 25 years have showed more micronutrient deficiency than the other age groups.

The present study has revealed that children whose mothers were currently unemployed and the family is dependent on a single individual i.e, the father's earnings were getting more micronutrient deficiencies. Upper - lower class of socioeconomic status was more affected with micronutrient deficiency.

Micronutrient deficiencies were more frequently seen in children who are not exclusive breastfed for 6 months(69%) than exclusive breastfed for 6 months(8%),and found to be statistically significant (p<0.05%). [Table 6].In this study, as most of the children had taken vitamin A supplementation so only three cases of bitot's spots were seen.

Majority of micronutrient deficiency was seen in mildly underweight (41.25%) and in mildly stunted (40.5%) children. The majority of micronutrient deficiency was seen in the normal percentage of weight for height (48%). [Table 7]

Table 1: Distribution of Socio-Demographic characteristics of study participants

Characteristics	Frequency (%)
Age of the child:	
6 months – 1 year	54(13.5%)
1.1 – 2 year	96(24%)
2.1 – 3 year	106(26.5%)
3.1 – 4 year	76(19%)
4.1 – 5 year	68(17%)
Sex:	
Male	202(50.5%)
Female	198(49.5%)
Maternal age(years):	
15 – 20	36(9%)
21 – 25	188(47%)
26– 30	140(35%)
31 – 35&>35	36(9%)
Socio – economic scale(SES):	
Upper (26 – 29)	0(0%)
Upper- middle (16 – 25)	68(17%)
Lower- middle (11 – 15)	62(15.5%)
Upper –lower (5 – 10)	260(65%)
Lower(<5)	10(2.5%)
Family size:	
1 – 3	46(11.5%)
4 – 6	320(80%)
>6	34(8.5%)

Table 2: Distribution of health related characteristics of study participants

Characteristics	Frequency (%)
Weight of baby at birth(kg):	
<2.5	84(21%)
2.5 – 3	256(64%)
>3	60(15%)
Exclusive breast feeding:	
Yes	96(24%)
No	304(76%)
Immunization status:	
Fully immunized	50(12.5%)
Completely immunized	264(66%)
Partially immunized	86(21.5%)
Unimmunized	0(0%)

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Table 3: Distribution of underweight among study participants

% Weight for age(underweight):	Frequency (%)
90 – 110(normal)	164(41%)
>110(obese)	18(4.5%)
75 – 90(mild)	176(44%)
60 – 75(moderate)	40(10%)
<60(severe)	2(0.5%)
Total	400

Table 4: Distribution of stunting among study participants

% Height for age(stunting):	Frequency (%)
>95(normal)	190(47.5%)
87.5 – 95(mild)	176(44%)
80 – 87.4(moderate)	34(8.5%)
<80(severe)	0(0%)
Total	400

Table 5: Distribution of Wasting among study participants

% Weight for Height(wasting):	Frequency (%)
>90(normal)	248(62%)
81 – 90(mild)	140(35%)
71 – 80(moderate)	10(2.5%)
<70(severe)	2(0.5%)
Total	400

Table 6: Distribution of micronutrient deficiency as per Exclusive Breast Feeding

Exclusive Breastfeeding	Yes	No
Yes	32(8%)	64(16%)
No	276(69%)	28(7%)
Total	308(77%)	92(23%)

Table 7: Distribution of micronutrient deficiency as per % Weight for Height

%Weight for Height (wasting)	Yes	No
>90(normal)	192(48%)	56(14%)
81 – 90(mild)	108(27%)	32(8%)
71 – 80(moderate)	6(1.5%)	4(1%)
<70(severe)	2(0.5%)	0(0%)
Total	308(77%)	92(23%)

DISCUSSION

Micronutrient malnutrition is a persistent problem among the low- and middle-income countries. Micronutrient deficiencies affect an estimated two billion people, or almost one-third of the world's population.[8] In India, around 0.5 per cent of total deaths in 2016 were contributed by nutritional deficiencies.[9]

The present study was conducted in rural area of Prakasam district where 400 children in the age group of 6 months to 5 years were included to assess the micronutrient deficiency. In this study, majority of the children in rural areas were affected by micronutrient deficiency.

Among 400 children, 308 (77%) of them showed micronutrient deficiency. The factors which were associated with micronutrient deficiency in our study were male child, maternal age 21 to 25 years, the upper-lower scale of Socioeconomic status, improper feeding habits, not taking exclusive breastfeeding for six months.

We examined the children based on clinical symptoms, anthropometric measurements. The signs of anaemia were pallor, pale tongue, fatigue, brittle nails and pale skin. The prevalence of anaemia in our study was found to be 64% and comparable with studies done by Avula Laxmaiah et al,[10] and NFHS-5,[11] done in rural Andhra Pradesh and Mbunga BK et al,[12] which was 69% and 65% and 68 % respectively. A recent survey executed by the WHO and the Ministry of Health and Family Welfare presented with the report that the prevalence of anaemia was 58.6 %, among children aged 6–59 months.[13]

The prevalence of bitot's spots in our study was found to be 0.75% which is almost similar to the study done by (0.8 %) Avula Laxmaiah et al.[10] There was a decrease in prevalence of vitamin A deficiency due to the wide practice of vitamin A prophylaxis. The prevalence of goiter in our study was found to be 0.5%, whereas in another study done byAvula Laxmaiah et al,[10] reported the prevalence to be 3.9% . This may be due to differences in the endemic areas for goiter in those areas.

The overall prevalence of underweight, stunting, and wasting in our study were found to be 54.5%, 52.5% and 38% whereas the study done by Meshram et al,[14] and NNMB(15) reported 64%, 61% & 29% and 25%, 29% & 16% respectively. According to the National Family Health Survey 5

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(NFHS 5) done on 2019-20 in Andhra Pradesh. Reported that 31.4%, 34.2%, 15.5% were underweight, stunted and wasted .The prevalence of severe underweight, severe stunting and severe wasting in our study were 0.5%, 0% and 0.5% whereas the study done by Apurva PA et al,[16] reported 10.2%, 24.7% and 5.4% respectively. In the present study, we created an awareness campaign regarding the National programmes i.e, Integrated Child Development Services (ICDS), Mid-Day Meal Programme, National Iodine Deficiency Disorders Control Programme (NIDDCP) and National Iron Plus Initiative (NIPI) provided by the government and its utilization to improve the nutritional status of the children.

CONCLUSION

The overall prevalence of micronutrient deficiency was 77% and majority of the under 5 children showed high prevalence of anaemia. This may be due to poor socio-economic status, lack of knowledge regarding proper feeding and hygiene practices, inadequate intake of vitamin-rich foods. Micronutrient deficiency is still a major public health problem. There is a need for sensitization of the community through health and nutrition education by appropriate behavioral change communication activities.

The anganwadi workers should observe the children monthly for any deficiencies to prevent further complications. The education of parents also plays an important role in reducing micronutrient deficiencies. The introduction of supplementary foods, encouraging the community to consume a variety of vitamin-rich fruits and vegetables and follow proper hygiene and feeding practices, and utilization the programmes provided by the government are essential to improve the nutritional status of the children. By improving the nutritional status, one can prevent childhood undernutrition, overweight and obesity.

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