International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article.

Assessment of Micronutrient Deficiency in Pediatric Patients at a Tertiary Care Centre

Virendra Yadav[1], Pawan Kumar[2*]

[1]Assistant Professor, [2*]Associate Professor, Department of Pediatrics, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh, India.

ABSTRACT

Background: Nutrition is required for normal growth of the body. Insufficient nutrition leads to wasting and deficiencies of essential vitamins and minerals. The present study was conducted to assess micronutrients deficiency in pediatric patients.

Materials & Methods: The present study was conducted on 246 Pediatric patients. Blood sample was obtained under standardized aseptic condition. For estimation of zinc and copper, atomic absorption spectroscopy method was used. Ferritin, folate and vitamin B12 were determined by electrochemiluminescence immunoassay, vitamin D by chemiluminescent immunoassay, and vitamins A and C by high-performance liquid chromatography.

Results: Out of 246 patients, male child were 132 and female child were 114. The value of zinc was 72.4 µg/dL, copper 0.94 µg/dL, serum folate 11.2 nmol/L, Vit A 0.78 µmol/L, Vit D 75.2 nmol/l, Vit C 11.8 µmol/L, Vit B12 156 pmol/L, ferritine 16.2 µg/L, HGB 110.4 g/l and MCV 81.4 fl.

Conclusion: Micronutrients play a necessary for normal growth of children. There was nutrients deficiency in children.

Key words: Micronutrients, Copper, Zinc.

***Correspondence to:**

Dr. Pawan Kumar,
Associate Professor,
Department of Pediatrics,
Santosh Medical College and Hospital, Ghaziabad, UP, India.

Article History:

Received: 19-11-2019, **Revised:** 11-12-2019, **Accepted:** 03-01-2020

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2020.6.1.028	

INTRODUCTION

Nutrition is required for normal growth of the body. Insufficient nutrition leads to wasting and deficiencies of essential vitamins and minerals. The food consumption habits of the children changed during the last few decades, and they now consume too much fat, especially saturated fats, and sweetened beverages.[1] They do not eat enough fruits or vegetables and consequently do not consume enough fiber. Most schoolchildren of low socioeconomic families consume less milk, cheese, meet, vegetables and fruits. Only a fifth of children consume the recommended daily amount of fruits and vegetables. The calcium and iron intake among children is also low. One of the main reasons for the pediatric pandemia of obesity is the consumption of large amounts of soft drinks rich in sugar, accompanied by a lack of physical activity.[2]

There are numerous nutrients called micronutrients, needed in minute amounts. They are required in the production of enzymes, hormones and other substances. They also help to regulate growth activity, cognitive development and functioning, and the activity of the immune and reproductive system. Besides, micronutrient deficiencies (MD) and especially iron deficiency, is believed to be one of the main underlying causes of anaemia.[3]

Children are more prone to develop deficiency as in today's life the inadequate intake of food is the biggest challenge among mothers. Inadequate dietary intakes, increased losses from the body, and/or increased requirements are the key causes of micronutrient deficiencies. Zinc, iodine, iron, selenium, copper, vitamins A, E, C, D, B2, B6, B12 and folate are important micronutrients. MD play a vital role in children as there appropriate growth and development is require sufficient intake of micronutrients.[4] The present study was conducted to assess micronutrients deficiency in pediatric patients.

MATERIALS & METHODS

The present study was conducted in the Department of Pediatrics, Santosh Medical College and Hospital, Ghaziabad, UP, India. It included 246 Pediatric patients of both gender visited to department with nutrition deficiency. Parents were informed regarding the study and written consent was obtained. Ethical clearance was taken from institutional ethical committee.

General information such as name, age, gender etc was recorded. Height and weight of each patient were recorded in case history performa. Blood sample was obtained under standardized aseptic

condition. For estimation of zinc and copper, atomic absorption spectroscopy method was used. Ferritin, folate and vitamin B12 were determined by electrochemiluminescence immunoassay, vitamin D by chemiluminescent immunoassay, and vitamins A and C by high-performance liquid chromatography. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

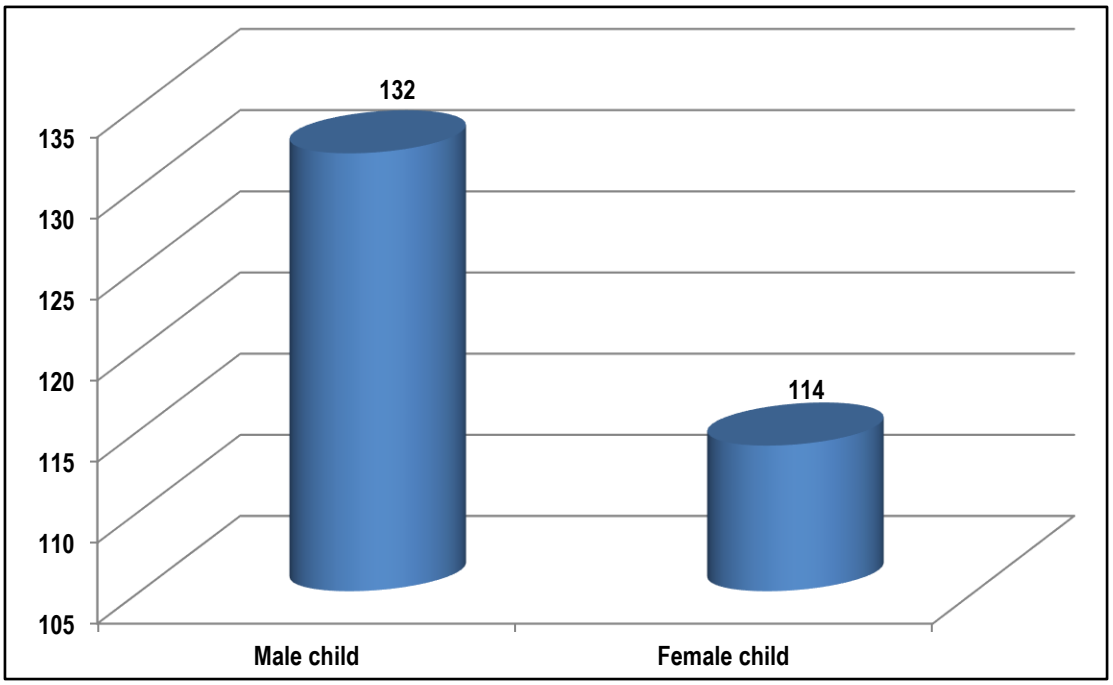
Table I: Distribution of patients

Total- 246		
Gender	**Male Child**	**Female Child**
Number	132	114

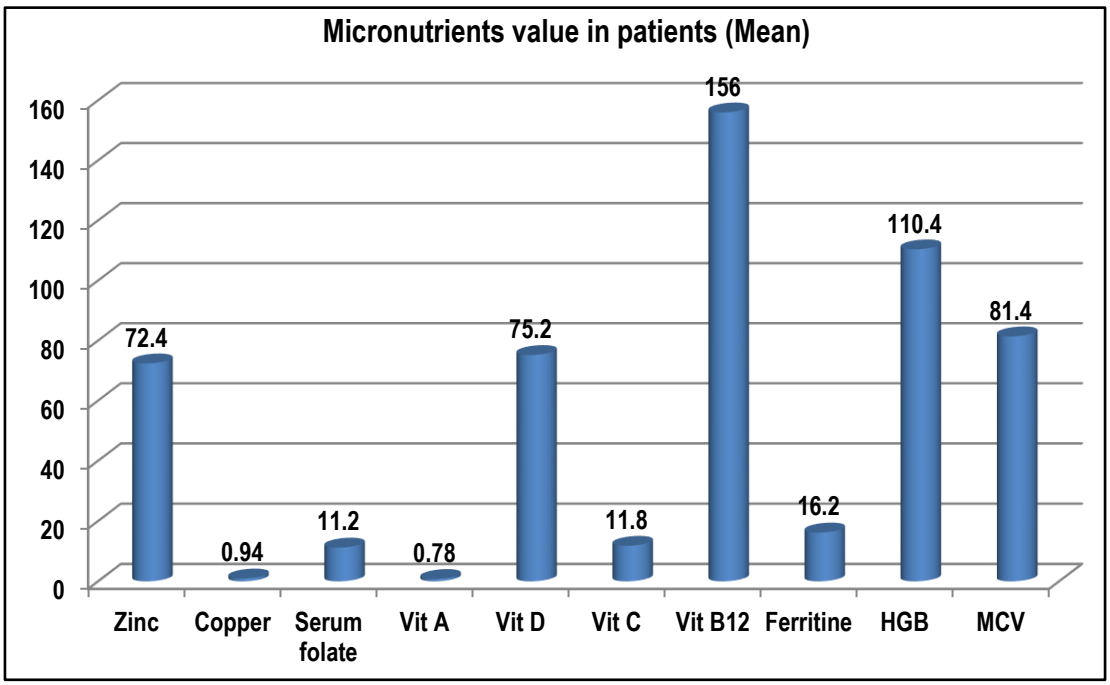
Table II: Micronutrients value in patients

Micronutrient	Mean
Zinc	72.4 µg/dL
Copper	0.94 µg/dL
Serum folate	11.2 nmol/L
Vit A	0.78 µmol/L
Vit D	75.2 nmol/l
Vit C	11.8 µmol/L
Vit B_{12}	156 pmol/L
Ferritin	16.2 µg/L
HGB	110.4 g/l
MCV	81.4 fl

Graph I: Distribution of patients



Graph II: Micronutrients value in patients



RESULTS

Table I, graph I shows that out of 246 patients, male child were 132 and female child were 114.

Table II, graph II shows that value of zinc was 72.4 µg/dL, copper 0.94 µg/dL, serum folate 11.2 nmol/L, Vit A 0.78 µmol/L, Vit D 75.2 nmol/l, Vit C 11.8 µmol/L, Vit B_{12} 156 pmol/L, ferritin 16.2 µg/L, HGB 110.4 g/l and MCV 81.4 fl.

DISCUSSION

Micronutrient deficiencies ('hidden hunger') are highly prevalent and affect far beyond the known effects like anemia, goiter, asymptomatic to devastating, often hard to recognize, mimic many diseases, have fewer signs but gamut of symptoms, and can involve multiple system. Only few have practicable laboratory diagnosis.

Hence they need high index of suspicion and a detailed dietary history for diagnosis. It has potential to affect economic and overall development, as affected populations are unable to achieve full mental and physical potentials, have low work capacity, and are prone to infections.[5] The present study was conducted to assess micronutrients deficiency in pediatric patients.

In this study, out of 246 patients, male child were 132 and female child were 114. Micronutrient deficiencies and infectious diseases often coexist and exhibit complex interactions. Several micronutrients have immunomodulating functions and thus influence the susceptibility of a host to infectious diseases and the course and outcome of such diseases. Moreover, changes in levels of acute phase proteins such as C - reactive protein (CRP) are associated with increased plasma levels of some micronutrients, such as ferritin, and decrease of others, such as retinol.[6]

We found that value of zinc was 72.4 µg/dL, copper 0.94 µg/dL, serum folate 11.2 nmol/L, Vit A 0.78 µmol/L, Vit D 75.2 nmol/l, vit C 11.8 µmol/L, vit B_{12} 156 pmol/L, ferritine 16.2 µg/L, HGB 110.4 g/l and MCV 81.4 fl. Vitamin A deficiency (VAD) or hypovitaminosis A leads to nyctalopia (night blindness) is one of the first signs of VAD. Xerophthalmia, keratomalacia, and complete blindness can also occur since vitamin A has a major role in phototransduction.[7]

The successful experience of food fortification in many countries emphasizes the safety and efficacy of this approach.[8] Food fortification is vital in prevention of chronic diseases, and its implementation will bring long-term economic savings in health costs and will contribute to the health and nutritional habits of the population. It has been observed that > 2 billion population is suffering from vitamin A, iodine and zinc deficiency. The deficiency is more in developing countries as they have not adopted community health programme. Recent studies have shown that micronutrient malnutrition is very widespread, probably one of the main nutritional problems in the world and a major contributor to childhood morbidity and mortality. It is essential to address nutrient and activity deficiencies as these may lead to chronic long-term health problems, such as obesity, coronary heart disease, type 2 diabetes, stroke, cancer, and osteoporosis. It is well documented that overweight children are more likely to become obese adults.[9]

In addition to fortification of breakfast cereals and some milk products, the recommendations of health ministries should include fortification of basic foods with iodine, iron, folic acid, vitamin A, vitamin B complexes (including B12), and vitamin D, in order to prevent birth defects as well as chronic diseases. National school feeding programs can be one of the means for nutritional education and food fortification as well as a means of alleviating food insecurity among children.[10]

Ahmed F et al discussed the successes and current challenges of existing intervention programmes. While the severity of various micronutrient deficiencies has declined since the 1980s, a significant proportion of preschool-age children remains with deficiencies in vitamin A (20·5 %), Zn (44·5 %) and vitamin D (39·6 %); about one-third of these children are anaemic, and 10·7 % of the children are Fe deficient. A high proportion of non-pregnant and non-lactating women is deficient in Zn (57 %) and I (42 %), while one-quarter of women live with anaemia and vitamin B12 and vitamin D (21 %) deficiencies. Nearly one-half of the pregnant and lactating women are anaemic. Suboptimal diets, poor hygiene, infection and infestation are identified as some of the key factors associated with high levels of deficiencies. Multiple approaches and interventions are being supported, and while some notable progress has been achieved, significant challenges continue, including those related to coverage, quality and compliance. It is concluded that although current intervention programmes have made some progress in controlling the severe deficiencies, micronutrient deficiencies remain a considerable problem.[11]

Wang J et al assessed the prevalence of anemia in different populations, and identifying the risk factors that render children susceptible to anemia is the first step in combating anemia effectively. In this cross-sectional study, a total of 1370 children under 3 years old were selected based on probability proportional to size sampling principles from poor counties of China. Basic characteristics data were collected by questionnaire; then anthropometrics and hemoglobin were measured in the field and anemia prevalence evaluated. Venous blood was drawn from children aged 12–35 months (N = 553) to evaluate micronutrient status. Logistic regression was used to identify the risk factors for children's anemia. Among children aged 0–35 months, the prevalence of stunting, low body weight and wasting was 17.5%, 8.6% and 5.1%, respectively, and 25.6% of the children were affected by anemia, with more anemic infants and younger children than older children (P <0.01). There were 26.5%, 12.8%, 14.1% and 20.0% of the children aged 12–35 months affected by iron deficiency, vitamin D deficiency, folic acid deficiency and vitamin B12 deficiency, respectively. For children aged 0–11 months who were breastfed, the mothers' anemic status was the only factor associated with the child's anemia (OR = 2.6; 95% CI: 1.2–5.4, P < 0.05). For children aged 12–35 months, multivariate logistic regression indicated that anemia was significantly associated with iron and vitamin B12 deficiency (OR = 5.3; 95% CI: 1.9–14.5, P < 0.01) and monotonous diet (OR = 2.3; 95% CI: 1.1–4.7, P < 0.05) after adjusting for age and gender. The prevalence of anemia was higher in children under 2 years old and requires urgent intervention.[12]

CONCLUSION

Micronutrients play a necessary for normal growth of children. There was nutrients deficiency in children.

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Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Virendra Yadav, Pawan Kumar. Assessment of Micronutrient Deficiency in Pediatric Patients at a Tertiary Care Centre. Int J Med Res Prof. 2020 Jan; 6(1):114-17.
DOI:10.21276/ijmrp.2020.6.1.028