MICRONUTRIENTS DEFICIENCY IN PROTEIN CALORIC MALNUTRITION

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ABSTRACT

Objective: To know about micronutrients deficiency in Children with protein caloric malnutrition compared to standard values.

Methods: This cross sectional study was conducted at department of pediatric Khyber Teaching Hospital Peshawar from January 2017 to December 2017.Total of 100 patients who were diagnosed as PCM using Z scoring were included in the study. Data was calculated by non probability sampling technique using predesigned questionnaire including questions of interest. The data was analyzed with SPSS 18. For continuous variables like Hb level, ferritin level mean and SD was calculated while for categorical variables frequency and percentage was calculated. For comparison of Hb and Ferritin level with standard value one sample T test was used.

Results: Out of total 100 study population 44 were male,56 females, 40 from urban while 60 from rural area. Age of the patients showed that children of group ranging from 8 - 14 months have maximum number of micronutrient deficiency, after 20 months, it slightly decreased but by 30 months again the number of children increases. Though there is downfall at 35 months but raises again by 40 months of life. When different variables of our study population were compared with standard normal level we found a significant difference between hemoglobin (Mean 8.118 ±2.4, p<0.001), ferritin (Mean 186.27 ±373, p 0.01),zinc(Mean 77.08 ±21.9, p<0.001), and calcium level(Mean 6.9 , p <0.001).

Conclusion: We found a significant difference between hemoglobin, ferritin, zinc and calcium level of our study population and standard values.

Key Words: Micronutrients, Children, protein caloric malnutrition.

INTRODUCTION

Micronutrient are important for the normal development of all human beings. Children and women in their reproductive age are more prone to have micronutrient deficiency. It affects directly as well as indirectly the quality of life. Research has shown very close relationship between fetal malnutrition and the development of chronic non communicable diseases later in life[1]. Micronutrient deficiency is an important issue in the developing world and is also responsible for under five deaths. These deaths are potentially preventable with policies and programs as well as political decision. Deficiencies of vitamin A, iron and Iodine are three nutritional problems that have frequently serious consequences. Deficiencies of Calcium and Zinc is also an important issue as they are related to the increasing number of patients with osteoporosis and diarrhea respectively[2]. Using fortified food have shown its effectiveness in decreasing the incidence of deficiencies of various micronutrients.[3,4]

Deficiencies of major micronutrient like vitamins or minerals such as Zinc, Iron and Vitamin A, can be due to long-term shortages of nutritious food or by infections. They may also cause illnesses like diarrhea which cause loss of nutrients through feces or vomit. In developed countries Micronutrient deficiencies affect more than 2 billion people of all ages. Vitamins, minerals such as zinc, iron, and calcium are important micronutrients. It is very important to know that micronutrient deficiencies are associated with ten percent of all children's deaths.[5,6]

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One of the main serious international problems is deprivation of food that lead to longstanding shortages in growth and development, function of the immune system, motor development and cognitive, behavioral performance. Greatest attention has been directed in the past towards the undesirable results associated with insufficient proteins, which can play important role in cognitive, motor, growth and development of the child. Iron and iodine deficiencies have been directly linked with cognitive and motor retardation.[7]

Other important micronutrient is iron. Iron is essential for the growth process of a child. Iron transports oxygen to the body from the lungs that helps muscles to use and store O2. If the diet of the child lack iron, the child might develop iron deficiency. In children iron deficiency cause anemia due to poor iron stores which in turn lead to decrease number of healthy red blood cells. If left untreated, it can cause delayed physical and mental growth in children. [8,9,10]

Low intake of calcium can cause rickets in children. Calcium and vitamin D intake is necessary to prevent rickets though this is not proven by the data available. It is important to take sufficient calcium in childhood for the development of healthy bones and important way to reduce the risk of osteoporosis later on in adulthood .[11]

An effective strategy to prevent micronutrient deficiency is most successful with social changes in the society. Effective planning and innovative communication, that gives public awareness about nutrition interventions and practices to cultural ideas.[12,13]. The integration of nutrition of the child with the survival of the child is imperative, given the high rate of infant mother deaths in Pakistan. Interventions of nutritional program must be integrated with maternal health strategies, newborn and child health. The role to address some fundamental determinants of the mother and child under nutrition in Pakistan cannot be emphasized enough without addressing issues of human rights, accountability, and mother's education.

MATERIALS AND METHODS

This cross sectional study was conducted at department of pediatric Khyber Teaching HospitalPeshawar from January 2017 to December 2017.Total of 100 patients who were diagnosedas PCM using Z scoring were includedin the study.All PCM children from 6 month to 60 months who were admitted in Children Department at Khyber Teaching Hospital, Peshawar whose age was less than five years from different ethnic groups of Khyber Pakhtunkhwa were included. Those having family history of genetic disorders, Children with Haemoglobinopathies (thalassemia, sickle cell anemia),children taking any drugs which can affect absorption of various micronutrients and patients from residents other than Khyber Pakhtunkhwa province were excluded from the study. After taking informed consent from the volunteer parents, all children were examined. Information regarding variables like address, age, sex, weight, height, ethnic origin (cast & tribe) were gathered. The physical examination included; pulse, pallor, jaundice, koilonychia, goiter, skin rashes and eye changes. Subject's family history of any major/organic disease were noted. Patients were categoriesed as poor when their monthly earning was Rs. 7000/month or more, while very poor when their earning was less than Rs. 7000. Average income was up to 30 thousand per month, while people earning more than 30 thousand were placed in the rich category. Their mothers were properly interviewed for their baby's food habits and number of pregnancies with spacing, any history of malnutrition/anemia. Any history of genetic disorders,recent use of drugs/radiation were noted. Laboratory investigations included Serum ferritin Hemoglobin (Hb), serumzinc, and calcium and blood glucose. Data was calculated by non-probability sampling technique using predesigned questionnaire including questions of interest. The data was analyzed with SPSS 18. For continuous variables like Hb level and ferritin level mean and SD were calculated while for categoric variables frequency and percentage were calculated. For comparison of Hb and Ferritin level with standard value one sample T test was used.

RESULTS

Out of total 100 study population 44 were male,56 females, 40 from urban while 60 from rural area. Age of the patients showed that children of group ranging from 8 - 14 months have maximum number of micronutrient deficiency, after 20 months, it slightly decreased but by 30 months again the number of children increases. Though there is downfall at 35 months but raises again by 40 months of life. Details of different baseline characteristics given in table 1.

Table 1: Baseline Characteristics:

Variables		Frequency	Percentage
Gender	Male	44	44
	Female	56	56
Residence	Urban	40	40
	Rural	60	60
Mother education	Uneducated	92	92
	5th	0	0
	Matric	6	6
	bachelor	2	2
Socioeconomic status	Poor	52	52.0
	very poor	18	18.0
	Average	28	28.0
	Rich	2	2.0
Family Type	nuclear	58	58.0
	Joint	42	42.0
Birth History	Normal	76	76
	low birth weight	24	24
Time of Breast Milk offered after birth	2 hours	60	60
	6 hours	20	20
	12 hours	10	10
	24 hours	10	10

When different variables were compared with standard normal level we found a significant difference between hemoglobin,ferritin, zinc and calcium level of our study population and standard values, detail given in table:2.

Table 2: Different variables and its significance.

Variable	Mean ±SD	Test Value	P Value
Hemoglobin	8.118 ±2.4	12	<0.001
Ferritin	186.27±373.8	127	0.11
Glucose	113.08±42.373	100	0.003
zinc level	77.08±21.930	87.5	<0.001
Calcium	6.924±.000	10	<0.001

DISCUSSION

Qudsia and coworker set the objectives in their research “Comparative analysis of Serum Iron, Serum Ferritin and Erythrocyte levels of folate between breastfed, enriched milk and cow's milk fed babies”. Nutrients that are needed essentially is iron and folic acid for hematopoiesis. Commonly diets are always deficient in micronutrients that lead to nutritional anemia. They determined the serum iron, serum ferritin and the red cell folate in fortified milk, human milk and cow's milk fed babies. Serum iron, serum ferritin and red cell folate concentrations were determined using colorimetric and enzyme immunoassay techniques. The results showed the average serum iron, red cell folate and serum ferritin in the study group 120.9±68.4µg/dl, 109±71.7ng / ml and 1044.1±409.2ng/ml respectively. The Group of fortified milk shows significantly decreased serum iron in compared to controls, while red cell folate and ferritin serum showed insignificant change.[14,15]

Bains, et al (2015) researched on Iron and status of zinc in six months to two years old children of low income families residing in rural areas of Punjab. In India they suggested that iron and zinc are 2 micronutrients which are insufficient in food for the population of developing countries. The goal and objectives of research was to assess the iron and zinc level of up to two year old children in low-income families residing in rural areas of Punjab. Method, that they adopted for

Ludhiana district of Punjab, India, was to randomly select more than four hundred households of agricultural laborers and small farmers for obtaining a sample of 312 children (6 months to 5 years). The percentages of adequacy of iron in up to two years and then up to five year-old children were less than twenty percent and less than forty percent respectively when compared to the estimated average requirements of World Health Organization and Food and Agriculture Organization. The zinc adequacy was only seven percent and 25.3 percent, respectively. Serum zinc values were less than the normal values in fifteen percent, whereas up to eighty percent of children had low serum iron and serum ferritin levels.. Anemia was found in 55.8 percent children. Iron-deficiency anemia was a more serious problem.. The iron and zinc status pose a thoughtful threat to the physical and mental growth of these children.[16,17]

Bhutta, Salam, and Das., (2013) suggested in their research The challenges of micronutrient malnutrition in developing countries "that Malnutrition remains one of the major public health challenges in developing countries. Major risk factors of malnutrition such as sub-optimal breastfeeding and deficiencies of vitamins and minerals (vitamin A and zinc) are responsible for one third of deaths of children of less than five years and had less than fifteen percent of the global total burden. Several strategies have been implemented to complement the micronutrients, its education for mothers, dietary modification, supplementation and fortification. Supplementation is most practiced for intervention while fortification can also be potentially cost-effective both at homes and schools. These strategies require further research.[18]

Fernández. (2012) worked on calcium and tetany secondary to rickets. Hypocalcaemia is not much common in children in developed countries but recently the incidence has increased. The reason behind this is less exposure to sunlight, over clothing ,diet lacking in calcium, genetic factors and exclusive breastfeeding. The administration of calcium and vitamin D as well as changes in food standards, will help in overcoming this problem[19]

Simon (2013) advised in ‘Effect of disposition of daily zinc and iron with multiple micronutrients to children such as minerals and vitamins in Pakistan "a randomized trial group gave powder iron and zinc. Micronutrients recommended as a policy to avoid nutritional anemia and other shortages in micronutrients in children. Effects of the provision of two preparations of micronutrients, with or without zinc powder were noted. They did a test of group randomized in urban sites and land of Sindh, Pakistan. A baseline review recognized 256 clusters that have been assigned at random (within national and urban strata by virtual random numbers) to one of three groups: non-supplemented control (group A), micronutrient powder without zinc (group B), or micronutrient powder with 10 mg zinc (group C). Primary outcomes were development, episodes of diarrhea, acute lower respiratory tract infection, temperature, and incidence of admission to hospital. Powder of micronutrient reduces anemia (lack of iron)in young children. But the excessive burden of diarrhea and respiratory diseases related with the use of micronutrient powder and very mild effect on growth recommend that a careful risks and benefits assessment must be made in populations having underweight children and increased incidence of diarrhea [20]

CONCLUSION:

We found a significant difference between hemoglobin, ferritin, zinc and calcium levels of our study population and standard values.

Authors contributions:

Conception and design : Syed Kaleem Ur Rahman
Collection and Assembly of Data: Syed Kaleem Ur Rahman, Asma Waheed
Analysis and interpretation of data: Rifaq Zeb, Asma Waheed
Drafting of the article: Syed Kaleem Ur Rahman, Rifaq Zeb
Critical Revision of the article: Rifaq Zeb, Mukhtar Ahmad Afridi
Statistical Expertise: Rifaq Zeb

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