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Study of zinc and iron levels in marasmic children

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ABSTRACT Severe micronutrient deficiencies often occur as a multiple deficiencies and co-exist with protein-energy malnutrition.(P.E.M) IN humans. The current study was done to assess the level of zinc and iron level in marasmic children. This study was done in children suffering from marasmus and compared with control. It was seen that zinc levels were decreased and iron levels were increased in children suffering from marasmus as compared to control. Increased oxidative stress leads to decreased antioxidant system.

KEYWORDS : P.E.M, Marasmus, Zinc , Iron

Introduction

Despite India's considerable social and economic progress malnutrition is widely prevalent problem in india and one of the most astonishing magnitudes. Malnutrition is considered to be a leading cause of child mortality in India. The term Protein-energy malnutrition is applied to a group of related disorder that includes marasmus, kwashiorkor and marasmic-kwashiorkor (1). The term marasmus is used as roughly equivalent to analictic depression a term coined by Rene Spitz to refer to a child who suffers from early loss of mother without suitable substitute(2). It is a condition caused by deficiencies in energy and protein. In addition to deficiencies of energy and protein children suffering from marasmus have found to be deficient in trace elements and vitamins (3). These are called as micronutrient as they are needed in miniscule amount. These substances are the magic wands that enable the body to produce enzymes, hormone and other substances for proper growth and development. They play a central role in metabolism and maintenance of tissue function. In India intake of trace elements, vitamins and minerals in daily diet is far from satisfactory and largely less than 50% of our 70% of Indian population (5).More than half of these deaths are caused by malnutrition by the lack of vitamin A, Zinc, iodine and folic acid(6).Trace elements such as iron, zinc, selenium are essential in daily diet because they have important role to play. PEM can develop due to deficiency of these trace elements (7). What is classified as PEM Shares many features with essential trace element deficiencies and there is possibility of two syndromes being superimposed on each other (8). The aim of this study was to study the serum level of zinc and iron suffering from marasmus belonging to weaker section of the society.

Materials and Methods-

The study was carried out in 125 marasmic children. Children of age (range1-4yrs) were selected on basis of clinical findings and anthropometric parameters.175 healthy children of the same group were selected as control. The study protocol and procedures were approved by ethical committee M.G.M.Medical College Indore,M.P. 2ml of blood was collected and transferred to plain vial for estimation of zinc and iron.

Method to determine Zinc

Zinc present in the sample is chelated by 5-Br-PAPAS (5- Bromo-2-pyridylazo)-5-(N-sulfopropylamine) phenol in the reagent. The formation of this complex is measured at wavelength of 560nm using Spectrophotometer (9).

Method to determine iron

In the measurement of serum iron, ferric iron is dissociated from its carrier protein, transferrin in an acid medium and simultaneously reduced to ferrous form. The ferrous iron is then complexed with chromogen, a sensitive indicator to produce a blue colour which absorbs at 595nm and OD was read on spectrophotometer (10).

Statistical analysis

Data was analyzed for mean and standard deviation. Difference in Parameter were tested for statistical significance at $p<0.05$.

Observation

PARAMETERS	CONTROL	MARASMUS	p-VALUE
zinc	100.48±9.059µg/dl	67.95±7.337µg/dl	<0.0001
iron	108.28±8.182µg/dl	113.04±11.543µg/dl	<0.0001

Discusssion

In our study there was significant lower mean zinc concentration in marasmic children as compared to control and is in accord with the previous study done(11,12).

Zinc is present in all body tissues and fluids. The total zinc content has been estimated to be 30mmol.Zinc has been shown to related to protein synthesis in microorganisms and animals. Studies done by Mills etal indicated that zinc influences the membrane transport and utilization of glucose(13).Zinc deficiency in infants and children results from inadequate dietary intake , impaired absorption, excessive excretion and an inherited defect in zinc metabolism. The most common cause of zinc deficiency is inadequate dietary intake(14). A high incidence of low biochemical indicies of zinc nutritive has been reported among pre-school children from low-income families .Children suffering from zinc deficiency developed a syndrome similar to acrodermatitis enteropathica including anal orifical skin,lesions, diarrhea, atopica and depression. The earliest and frequently only signs of zinc deficiency in infants and young children are decline in growth velocity which may be accompanied by obvious impairment of appetite. Pica may occur and abnormalities of taste be demonstrable, impaired cognitive function, behavioral problem, learning disability and neuron dystrophy may be seen (15).

Clinical features like poor wound healing, appeptite, impaired immune response, skin lesions are seen in children suffering from marasmus(16). Inadequate zinc intake may limit the growth of these children during recovery of malnutrition. This may be due to zinc is an integral part of DNA and RNA polymerase and its deficiency causes growth retardation in children perhaps mediated through an impairment of nucleic acid and protein metabolism.

Iron

The mean level of iron was higher in children with marasmus as compared to control and is in accord with the previous study done(17,18). Iron is one of the trace minerals that play a vital role in the body. The whole body contains about 4g of iron. ¾ of this is found in association with protein hemoglobin. In food iron occurs in two forms ferrous and ferric but absorption of iron is only in the ferrous state (19).

Iron is an integral component or essential cofactor for several metabolic processes which is deranged in PEM (19). Iron levels are increased in PEM children this could be due to release of iron from damaged tissue in the form of iron containing enzyme or perhaps the utilization of these were lowered and availability was increased due to disease. The consequences of iron deficiency are nutritional anemia, lower resistance to infection, reduced learning abilities, stunded growth, fatigue and reduced productivity (20). Iron deficiency also causes pyschomotor changes in children.

Malnutrition is closely related to poverty. The diets are heavily contaminated with fecal bacteria,the poorest families prepare food infrequently and retain unconsumed food for later use. The bacteria growing in the paps and gruels secrete sidephore in order to obtain iron for themselves,whether feed sidephore is adequate to explain iron overload of malnourished children remains to be investigated. Elevated iron stores increase possible occurance of free iron in vivo.This is associated with lipid peroxidation,production of cytotoxic compound and subsequent membrane damage (21).

Conclusion

After 6 months of life iron and zinc requirements of infants must be provided by complementary foods so that bodily demand of these micronutrients can be met.

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