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Evaluation of oxidative stress in severe acute malnourished children at Malnutrition Treatment Centre.

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Abstract

Malnutrition is one of the largest factors suppressing India's spectacular growth. This study was carried out to evaluate the effect of oxidative stress in severe acute malnourished children. Serum Malondialdehyde (MDA) level was determined in 50 severe acute malnourished (SAM) children (aged 6 months to 5 years) and 50 age and gender matched healthy controls. Mean serum MDA was found to be significantly raised in malnourished children as compared to healthy controls ($p<0.001$). From the present observations, it is evident that stress is created as a result of deficiency of nutrients in severe acute malnourished children. This stress leads to production of excess reactive oxygen species (ROS). These ROS leads to lipid peroxidation and consequent formation of MDA.

Keywords: Malnutrition, MDA, SAM, ROS, Oxidative stress.

Introduction

In a developing country like India, Protein energy malnutrition constitutes one of the major nutritional and health problems in children under five years of age. It has a significant contribution to the mortality and morbidity in this age group of children. World Health Organization (WHO) defines malnutrition as the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions1. Malnutrition is one of the largest factors suppressing India's spectacular growth. With vast forests and several of India's desert, Rajasthan is geographically the largest state in India and has a population of about 6.68 crore (provisional figure, Census 2011). There are a large number of tribal communities here and almost 30 percent of the state's inhabitants live below the poverty line, many in rural areas where they subsist on tiny farm plots. While high rates of malnutrition, child and maternal mortality have challenged this state, UNICEF and the State Government are making a positive impact with a range of programs. These include training thousands of village health workers to recognize and treat sick babies, and encouraging women to rest and eat well-balanced meals during pregnancy. New hospital units for sick newborns are also saving lives. Hence, there is need to understand the nature of antioxidants and their resultant benefits in the larger interest of the deprived population of developing countries. It is worth noting that the free radicals are very short lived and unstable, so they are difficult to measure. However, their detrimental effects can be measured by estimating their by products. Marker of oxidative stress is MDA, a byproduct of lipid peroxidation2.Oxidative stress can occur due to overproduction of reactive oxygen species (ROSs), decrease in antioxidant defenses or a combination of these

factors. Free radicals and other reactive speciesare produced in the body, primarily as a result of oxygen consumption. Antioxidants and antioxidant enzymes (e.g. superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPX) exert synergistic effects in scavenging free radicals. There has been growing evidence showing that malnutrition (e.g. dietary deficiency of protein, selenium or zinc) gives rise to oxidant stress and cell injury3-5. The aim of this study was to evaluate the effect of oxidative stress in severe acute malnourished children.

Materials and Methods

The present study included 100 children between the age of 6 months to 5 years with the help of Paediatrician. Out of 100, fifty children were diagnosed and suffering from severe acute malnutrition (SAM) according to the diagnostic criteria proposed by WHO and admitted to the malnutrition treatment centre. Fifty samples of healthy children were taken as controls. The controls were age and gender matched to cases, and the ratio of case to control was 1:1. Severe acute malnourished children having no clinical evidence of any infectious disease at the time of blood collection were taken as subjects. Children taking antioxidant supplements were excluded from the study. Informed consent was taken from parents of study participants. Five ml of venous blood was withdrawn from each subject and collected in plain bulb and allowed for spontaneous blood clotting for 20-30 minutes. Then the samples were centrifuged at 3000 rpm for 10 minutes at room temperature to separate serum from blood cells. The separated serum was stored at - 20º C in plain vials until assay. The analysis of all parameters was done using chemicals and reagents of analytical grade. Spectrophotometer was used for the measurement of the parameter Malondialdehyde. Malondialdehyde was measured by thiobarbituric acid reaction method.

Statistical analysis was carried out using SPSS software, version 20. The results were expressed as Mean±SD. p value of <0.001 was considered as highly significant.

Results

Table 1: MDA level among Controls and Patients

Parameters	Controls Mean±SD	SAM Children Mean±SD	p value
MDA (nmol/ml)	1.82±0.20	2.90±0.64	<0.001*

Table no.1 shows increased levels of MDA in SAM patients as compared to healthy controls, which were highly significant (p<0.001).

Discussion

In the present study, malnourished children were found to have less antioxidant levels and raised levels of products of oxidative damage. Malondialdehyde (MDA), a product of lipid peroxidation is generated in excess amounts. This oxidative stress and a possible consequential accelerated apoptosis may contribute to pathophysiology of malnutrition. A significant increase in the level of MDA in malnourished children as compared to controls indicates the occurrence of lipid peroxidation.

Lipid peroxidation leads to loss of membrane fluidity and integrity. Loss of membrane integrity, in case of mitochondria, undermine the efficiency with which the electron transport chain converts reducing equivalents to ATP, thus further aggravating the adverse effect of already reduced energy intake in malnourished children. The high levels of MDA are in agreement with those of other studies carried out by Khare M[2], Bosnak M[6] and Ghone RA et al[7].

Catal F et al (2007)[5] and Jain A et al (2008)[8] reported significantly increased level of serum MDA in patients with malnutrition as compared to controls. In such condition, depletion of endogenous antioxidants may be

expected. A peroxidative damage of lipids is indicated by the increase in serum MDA levels. Among the many peroxidative effects of Nitric Oxide (NO), protein modification by nitrosylation or oxidation of –SH groups has been reported. NO plays an important role in regulation of vascular tone and endothelial function, with respect to pathophysiology of malnutrition.

Conclusion

Based on this study, there is reasonable evidence for oxidative stress in severe acute malnourished children. The antioxidant levels are decreased in an attempt to combat the increased oxidative stress. Therefore, appropriate use of antioxidants may be helpful in controlling the lesions in the patients of severe acute malnutrition. There is ample scope to conduct further studies for identifying the natural resources, which may be used in the dietary plans of especially malnourished children, through the established chains of public health interventions by government, semi government and private health care providers.

References

1. WHO. Malnutrition-The Global Picture. Geneva: World Health Organization 2002. Available at http://www.who.int/home-page

2. Khare M, Mohanty C, Das BK. Jyoti A,Mukhopadhyay B, Mishra SP: Free Radicals and Antioxidant Status in, Protein Energy Malnutrition. International Journal of Pediatrics 2014:1-7.

3. Ashour MN, Salem SI, El-Gadban HM, Elwan NM, Basu TK. Antioxidant status in children with protein-energy malnutrition(PEM) living in Cairo. Egypt Eur J Clin Nutr 1999;53:669–73.

4. Tatli MM, Vural H, Koc A, Kosecik M, Atas A. Altered antioxidant status and increased lipid peroxidation in malnutrion children. Pediatr Int 2000;42:289–92.

5. Catal F, Avci A, Karadag A, Alioglu B, Avci Z. Oxidant and antioxidant status of Turkish marasmic children: A single center study. J Trace Elem. Med Bio 2007; 21(2):108-12.

6. Bosnak M, Kelekçi S, Yel S. Oxidative Stress in Marasmic Children: Relationships with Leptin. Eur J Gen Med 2010;7(1):1-8.

7. Ghone RA, Suryakar AN, Kulhalli PM. Bhagat SS.Padalkar RK, Karnik AC, Hundekar PS, Sangle DA. A Study of Oxidative Stress Biomarkers and Effect of Oral Antioxidant Supplementation in Severe Acute Malnutrition. J Clin Diagn Res 2013;7(10): 2146-48.

8. Jain A, Varma V, Agrwal BK, Jadhav AA. Serum zinc and malondialdehyde concentrations and their relation to total antioxidant capacity in protein energy malnutrition. Nurt Sci Vitaminol 2008; 54:392-95.