

## Research Article

# Evaluation of oxidative stress in severe acute malnourished children at malnutrition treatment centre of Sardar Patel Medical College, Bikaner, Rajasthan, India

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## ABSTRACT

**Background:** Malnutrition represents one of the most severe health problems in India. Free radicals play an important role in immunological response, which induces the oxidative surplus in severe acute malnutrition. Severe dietary deficiency of nutrients leads to increased oxidative stress in cellular compartments. The goal of this study was to evaluation of oxidative stress in severe acute malnourished children at malnutrition treatment centre of S. P. Medical College, Bikaner, Rajasthan, India.

**Methods:** The cross sectional study was conducted after the approval of ethical committee, in the Department of Biochemistry and Paediatrics at Sardar Patel medical College of Bikaner. The present study included 100 children between the age of 6 months to 5 years with the help of Paediatrician. Serum Lipid peroxide was measured by precipitating lipoproteins with trichloroacetic acid and boiled with thiobarbituric acid which reacts with Malondialdehyde to give pink colour as per Kei satoh's method.

**Results:** Significantly increased levels of serum malondialdehyde ( $p < 0.001$ ) were found in the patients as compared to those in controls.

**Conclusion:** Deficiency of various nutrients in severe acute malnutrition leads to generation of heavy oxidative stress.

**Key words:** Malnutrition, MDA, SAM, 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 functions.<sup>1</sup> 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 (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. MDA is used to assess oxidative stress and free radical damage. Increased oxidative stress occurs in the tissue of PEM. Enhanced lipid peroxidation could be early marker of PEM.<sup>2-4</sup>

## METHODS

The cross sectional study was conducted after the approval of ethical committee, in the Department of Biochemistry and Paediatrics at Sardar Patel medical College of Bikaner. 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 according to the diagnostic criteria proposed by WHO and admitted to the malnutrition treatment center, Bikaner. Fifty samples of healthy children were taken as controls. The controls were age and gender matched to cases, with 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.

After obtaining prior consent, venous blood was collected from the subjects under aseptic condition by venipuncture using 5 ml sterile disposable syringe and needle. About 4 ml of blood was collected, 2 ml was poured in to sterile heparinised bulb and remaining blood was taken in a sterile plain bulb and was allowed to clot. Serum was separated by centrifugation at 3000 rpm for 10 min. at room temperature. The sample was stored at 40 c before analysis and all the samples were analyzes on the same day of collection.

All the methods were standardized first and standard graphs were obtained. Serum lipid peroxide was measured by precipitating lipoproteins with trichloroacetic acid and boiled with thiobarbituric acid which reacts with malondialdehyde to give pink colour as per Kei satoh's method.<sup>5</sup>

Statistical analysis was carried out using SPSS software, version 20. The results were expressed as mean SD. Students't' test was applied for statistical analysis, p value (p <0.001) were considered as highly significant.

## RESULTS

Table 1 shows significantly increased levels of MDA is noticed in SAM patients p <0.001 as compared to healthy controls.

**Table 1: MDA level among controls and patients.**

Parameters	Controls Mean±SD	SAM Children Mean±SD	p value
MDA (nmol/ml)	1.52±0.24	2.96±0.63	<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 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 Perampalli, Bosnak and Ghone et al.<sup>6-8</sup>

Catal F et al and Anuradha J et al reported that significantly increased level of serum MDA in patients with malnutrition as compared to controls.<sup>9,10</sup> 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.

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