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RESEARCH ARTICLE

ROLE OF SERUM ANTIOXIDANT STATUS IN ORAL CANCER AND POTENTIALLY MALIGNANT DISORDER - A PRE AND POST TREATMENT STUDY WITH SUPPLEMENTATION OF EXOGENOUS ANTIOXIDANT

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ABSTRACT

Objective The risk of malignant transformation of potentially malignant disorders is well established. Present study was undertaken to assess the values of antioxidants like malondialdehyde, superoxide dismutase, vitamin A and vitamin E in patients with these disorders and to analyze whether timely intervention with exogenous antioxidants brings these values, if deranged, within the normal range.

Material and Methods Our study comprised of 40 patients equally divided in two groups Group I included healthy controls and Group II with potentially malignant disorders. Serum vitamin A, vitamin E, MDA and SOD levels were assessed for group I and compared with group II. Group II patients were later administered with antioxidant therapy for six weeks, twice daily and were marked as group III post antioxidant therapy patients and the serum levels were reassessed and compared.

Results In group I the mean vitamin A level was 3.07±0.27, vitamin E was 9.89±0.75, MDA level was 2.92±0.36, SOD level was 189.45±14.17. In group II mean vitamin A level was 0.89±0.21, vitamin E level was 7.63±0.39, MDA level was 10.13±0.75, SOD level was 115.65±19.60. In group III mean vitamin A level was 1.09±0.11, mean vitamin E level was 8.04±0.53, mean MDA level was9.96±1.12, mean SOD level was 123.43±22.15.

Conclusion There was a significant reduction in serum Vitamin A, E and SOD levels in patients with potentially malignant disorders and a significant increase was seen after the administration of exogenous antioxidants. There was significant increase in serum MDA levels in patients with these disorders and antioxidant supplementation decreased the levels.

INTRODUCTION

The possible role of free radicals in causing disease is well known. Free radical damage can be prevented by antioxidants. These are nutrients and enzymes that inhibit the process of oxidation and are broadly classified as non enzymatic and enzymatic.[1]

Literature reveals a correlation between non enzymatic antioxidants and enzymatic antioxidants in potentially malignant and malignant disorders. Levels of non enzymatic antioxidants like vitamin A, vitamin E and enzymatic antioxidants like superoxide dismutase (SOD) have been found to be reduced in these disorders whereas enzymatic antioxidants malondialdehyde (MDA) levels are seen to be increased.[2,3,4]

The present study was undertaken to estimate the levels of these antioxidants in these disorders and to analyse whether supplementation with exogenous antioxidants bring these values if deranged, within normal range.

MATERIAL AND METHODS

Our study comprised of 40 patients equally divided in two groups Group I having healthy controls and Group II with potentially malignant disorders confirmed histopathologically. Serum vitamin A, vitamin E, MDA and SOD levels were assessed for Group I and compared with Group II. Group II patients were later administered with antioxidant therapy for six weeks, twice daily and marked as group III post antioxidant therapy patients. The serum levels were reassessed and compared. Antioxidant therapy was given in form of Capsule Factact LTX (Factis Biotech India, Bangalore) containing: Vitamin A: 5000 IU, Vitamin E: 50 IU, Green tea Extract: 200mg, Lycopene: 5000 mcg and Vitamin C: 100mg. Under aseptic conditions 5 ml of blood was collected from each individual in EDTA test tube and plasma was separated and preserved at -30 degree Celsius. Plasma was equally divided in three test tubes. In first test tube vitamin A was estimated by using ultraviolet spectrophotometer by the method given by Karmakar and Rajagopal 1952.[5] It was based on the principle that vitamin A has an absorption peak in the ultra-violet region and could be determined by reading the extinction at wavelength 325 millimicrons before and after irradiating with ultra-violet. Vitamin E was also estimated in plasma in second tube, by calorimetric method of P.P Nair and N.G Magar 1955[6] which is based on color reaction between phosphomolybdic acid and vitamin E. In third tube MDA was estimated by thiobarbituric acid (TBA) reaction in which TBA reacts with MDA to form a fluorescent product formed during decomposition of certain primary and secondary lipid peroxidation products. This method was suggested by Kei Satoh in 1978, which quantifies the end product of this process, that is MDA.[7] Erythrocytic SOD activity was estimated from packed RBC by pyrogallol auto-oxidation method of Marklund and Marklund 1974, in which auto-oxidation of pyrogallol occurrs at alkaline pH (8.5) by superoxide anion, reading of which can be determined on a spectrophotometer.[7]

The results obtained were statistically analyzed using SPSS version 16.0 and chi square test was used to determine the level of significance.

RESULTS

The mean vitamin A level in group I was 3.07±0.27, group II was 0.89±0.21 and group III was 1.09±0.11. The mean vitamin E level in group I was 9.89±0.75, group II was 7.63±0.39, and group III was 8.04±0.53. The mean MDA level in group I was 2.92±0.36, group II was 10.13±0.75, and group III was 9.96±1.12. The mean SOD activity in group I was 189.45±14.17, group II was 115.65±19.60 and group III was 123.43±22.15. (Table1 and Graph 1). Comparisons between group I and group III were also later made and the level of significance was calculated. (Table 2 and Graph 2).

DISCUSSION

Free radicals induced injuries are prevented by antioxidants. Disturbances in antioxidant defense mechanism are responsible for pathogenesis of potentially malignant disorders like leukoplakia, erythroplakia, oral sub mucous fibrosis which have a well recognized malignant transformation rate.[1] Literature reveals that fruits and vegetables are rich in antioxidants and have a chemo preventive action against these disorders.[2]

In our study the mean serum vitamin A, vitamin E and SOD levels, were found to be decreased in group II patients in comparison to group I patients. On comparison of their levels in group III patients with group I and II we found that the levels were significantly increased in group III as compared to group II but were less than group I. The level of significance (p value) for Vitamin A in group I was 0.000 and group III was 0.371, for Vitamin E in group I was 0.021 and group III was 0.412, for SOD level in group I was 0.000 and in group III was 0.676 (Table 2 and graph 2). Similar findings were noted by Lawal *et al* [2] in 2012 and showed low serum values of Vitamin A and E in patients with oral cancer. They also explained the possible role of vitamin A in potentially malignant and malignant disorders.

Vitamin A inhibits terminal differentiation of epidermal cells which in turn arrests and reverses the progression of leukoplakia. Vitamin E acts as a free radical scavenger and helps in maintaining membrane integrity.[2] Khanna *et al*[3] in 2005 found similar results in 60 patients with these disorders and found low levels of SOD in these patients as compared to healthy controls. However they did not find any change in SOD and MDA levels after antioxidant supplementation for 3 months. Soma *et al*[4] in 2004 also assessed erythrocyte SOD activity in 34 cases of OSMF and did not find any significant change in any stage of the disease. However after antioxidant therapy for 6 weeks they observed that there was a decrease in MDA levels and increase in beta carotene levels and explained that beta carotene, MDA and vitamin E can be used as markers for the assessment of progression of these disorders.

Our study also revealed increase in the mean serum MDA level, in group II patients as compared to group I patients. On comparison of levels in group III patients with group I and II we also found that the levels were significantly decreased in group III as compared to group II but were more than group I.

Table No 1 Comparison Between Group I Control, Group II and Group III.

	Group-I Control Group (mean)	Group-I Control group (S.D±)	Group-II Potentially malignant disorder (mean)	Group-II Potentially malignant disorder (S.D±)	Group-III Post-antioxidant therapy (mean)	Group-III Post-antioxidant therapy (S.D±)
Vitamin A	3.07	0.27	0.89	0.21	1.09	0.11
Vitamin E	9.89	0.75	7.63	0.39	8.04	0.53
MDA	2.92	0.36	10.13	0.75	9.96	1.12
SOD Activity	189.45	14.17	115.65	19.60	123.43	22.15

Table No 2 Comparison Between Group I Control and Group III Post Antioxidants Therapy.

	Group-I Control Group (mean)	P value	Group-III Post-antioxidant therapy (mean)	P value
Vitamin A	3.07	0.000	1.09	0.371
Vitamin E	9.89	0.021	8.04	0.412
MDA	2.92	0.000	9.96	0.492
SOD Activity	189.45	0.000	123.43	0.676

The level of significance (p value) for mean MDA level in group I was 0.000 and group III was 0.492 (Table 2 and graph 2). Similar results were found by BAL want Rai *et al*[8] in 2010, who stated that MDA is the stable end product of lipid per oxidation process and plays an important role in the pathogenesis of these disorders. Chole *et al*[9] in 2010 also found that the levels serum MDA levels were higher in oral cancer patients as compared to healthy controls and described it as a marker for both preventive and clinical interventions.

CONCLUSION

Based on our results we concluded that oxidative damage resulting in malignancies and pre malignancies are controlled by antioxidants by increasing the levels of Vitamin A, E, SOD and decreasing the level of MDA. Thus, this study gives benefits of enzymatic and non enzymatic antioxidants as valid biomarkers for patients who are at risk of developing cancer. Further these patients should be supplemented with diet rich in antioxidants which prevent the progression towards malignancy.

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