



A comparative study of blood levels of vitamin C and superoxidase dismutase in patients with stroke and normal healthy subjects

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Abstract

It has been well postulated that acute stroke is associated with increase oxidative stress in the form of free radical generation. In order to prevent toxicity of free radicals, these should immediately get neutralized. The most important antioxidant that causes neutralization of these free radicals are superoxidase dismutase (SOD) and vitamin C. The aim of the present study was to compare blood levels of SOD and vitamin C in patients of stroke with that of healthy volunteers. Estimation of SOD and vitamin C was done in 30 cases and 30 controls by calorimetric method. We found statistically significant decrease in blood levels of SOD and vitamin C in patients of stroke as compared to that of healthy volunteers. We concluded that patients of stroke are at high risk of developing oxidative stress and its related toxic consequences. So while treating these patients extra emphasis should also be given on reduction of oxidative stress in the form of antioxidant supplementation.

Key words: stroke, oxidative stress, Superoxide dismutase, vitamin C

Introduction

Obesity may be defined as abnormal growth of adipose tissue due to an enlargement of fat cell size (hypertrophic A stroke also known as Brain Attack is defined as sudden loss of neurological function resulting from focal disturbances of cerebral blood flow, due to ischemia or hemorrhage. It is the major cause of morbidity and mortality around the world, especially in elderly population. Over 300 risk factors have been identified too be associated with stroke. Some of these are old age, cardiovascular diseases, hypertension, diabetes, hypercholesterolemia, alcohol consumption and smoking. It has been posulated that stroke is associated with increased oxidative stress due to increased production of free radicals. Various mechanisms responsible for increased production of free radicals are mitochondrial dysfunction, increased migration of neutrophil and leukocyte at the site of damage, excessive stimulation of NMDA receptors due to glutamate release, autooxidation of catecholamines and metabolism of free fatty acids particularly arachidonic acid released from cell membrane of damage tissues.¹ These free radicals have tremendous potential to cause damage to major classes of biomolecules such as lipids, nucleic acids and proteins and thus altering their function. Normally the free radicals generated are neutralized by various substances in the body such as superoxidase dismutase (SOD), catalase, glutathione, vitamin C and E. These substances which protect the body from oxidative stress are known as antioxidants. Out the several antioxidants in the body SOD and vitamin C are considered as most powerful antioxidants.² Since it has been observed that stroke is associated with increased oxidative stress, there must be a decrease a antioxidant levels in the body. Considering the above mechanism, the present study was undertaken to compare blood levels of SOD and vitamin C in patients with stroke and normal healthy volunteers.³

Aims and objectives

To estimate blood levels of SOD and vitamin C in patients with acute stroke and normal healthy volunteers.

To compared and analyze the values of SOD and vitamin C in both the groups.

Materials and methods

The present study was a cross section study. The study protocol was submitted to institutional ethics committee and approval was obtained. 30 patients within the age group of 60-70 diagnosed of stroke by clinical and radiological

examination were selected. 30 controls within similar age group were selected from the relatives of patients. The study protocol was explained to all the participants and written informed consent was obtained. Fasting blood samples of all the subjects were collected in the morning from cubital vein. Serum was separated by centrifugation at 3000 rpm for 10 minutes. Blood levels of SOD were measured by method described by Markland S and modified by Nandi et al. Blood levels of vitamin C were estimated by method described by Ayeqyaw.⁴

Results and Discussion

Table 1: Table showing demographic and baseline characteristics

Criteria	Controls (group I)	Cases (group II)
Mean age in years	69.56	68.06
Sex	15 M/15 F	15 M/15 F
Smoking habits	Non smokers	Non smokers
Drinking habits	Non alcoholics	Non alcoholics

All the baseline parameters showed non significant difference between control and cases. So both the groups are comparable.

Table 2: comparison of SOD in controls and cases

Study group	Mean SOD in units/ml	SD	T value	P value
Group I	3.36	0.141	12.6	<0.001
Group II	2.29	0.445		

Table 3: comparison of vitamin C in controls and cases

Study group	Mean Vitamin C in mg/dl	SD	T value	P value
Group I	1.47	0.204	18.8	<0.001
Group II	0.691	0.101		

Discussion

The present study was undertaken to estimate and compare blood levels of SOD and vitamin C in patients with stroke and normal healthy age and gender matched controls. Study was conducted in 30 stroke patients (15 males and 15 females) and 30 controls (15 males and 15 females). We found statistically significant decrease in blood levels of both SOD and vitamin C in patients having stroke as compared to that of controls. These clearly indicate that patients of stroke are having higher oxidative stress as compared to controls. Similar findings were stated by Yokoyama T et al, Hussain MM et al and Spranger M et al.^{5,6,7}

Vitamin C is a cofactor in several metabolic activities and represents the major water soluble antioxidant in human body. Vitamin C is considered as one of the most important antioxidant in human plasma and it is the first antioxidant utilized during the lipid peroxidation. The significant reduction of blood levels of ascorbic acid seems to be related to exhaustion of this antioxidant by the challenge of free radical stress. Superoxide dismutase is the antioxidant enzyme that catalyses the neutralization of superoxide anion. All mammalian tissue contains SOD. This antioxidant is the most powerful antioxidant and causes rapid neutralization of free radicals especially superoxide anion.

Conclusion

In the present study we found that there are decrease blood levels of SOD and vitamin C in patients with stroke indicating increase oxidative stress. It has also been postulated that oxidative stress also contributes to pathogenesis of brain damage. Considering all these factors while treating patients with stroke emphasis should also be given on supplementation of antioxidants along with other treatment modality. This will definitely help in improving health status of patients of stroke.

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