Antioxidant Status and Oxidative Stress in the Circulation of Younger and Elderly Human Subjects

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Abstract Extensive research has demonstrated the protective properties of antioxidants, which scavenge reactive oxygen species and their precursors, as well as up-regulate enzymes involved in the repair of cellular damage. Several case–control studies have showed higher blood levels of antioxidants and decreased oxidative stress in younger individuals when compared with older ones. Cell damage caused by free radicals appears to be a major contributor in aging and degenerative diseases of aging such as cancer, cardiovascular disease, cataracts, compromised immune system, rheumatoid arthritis and brain dysfunction. The objective of this study was to determine the variation of Circulating levels of selected antioxidants (enzymic and non enzymic) and oxidative stress marker in younger and older humans. The results showed that a majority of the younger age group participants showed a significant increase in enzymic and nonenzymic antioxidant status and

a decrease in oxidative stress when compared with the older age group.

Keywords Free radicals · Antioxidants · Oxidative stress · Reactive oxygen species

Introduction

Oxygen radicals are continuously formed in all living organisms, with deleterious effects that lead to cell injury and death. Production of oxidative species occurs under physiological conditions at a controlled rate, but it is dramatically increased in conditions of oxidative stress [1, 2]. Free radicals have been implicated in the pathogenesis of at least 50 diseases. Fortunately, free radical formation is controlled naturally by various beneficial compounds known

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Table 1 't' value of comparison between Group I and Group II

Comparison between	Parameter	Result		Significance <i>P</i> value
		Group I	Group II	
Group I vs Group II	Catalase (IU/L)	16.2 ± 5.8	2.6 ± 0.7	<0.05
	Glutathione (mg/dL)	35.5 ± 9.0	20.0 ± 8.5	<0.05
	Albumin (g/dL)	4.3 ± 0.4	2.8 ± 0.43	<0.05
	Ascorbic acid (mg/dL)	0.97 ± 0.15	0.46 ± 0.11	<0.05
	Malondialdehyde (nmol/mL)	16 ± 4.5	100 ± 17	<0.05

All values with $P < 0.05$ are treated as significant

as antioxidants. Antioxidants are capable to stabilize, deactivate or scavenge free radicals before they attack cells. Antioxidants are absolutely critical for maintaining optimal cellular and systemic health and well-being of the body. Antioxidant action includes free radical scavenging capacity, inhibition of lipid peroxidation, metal ion chelating ability and reducing capacity [3].

Extensive research has demonstrated the protective properties of antioxidants, which scavenge reactive oxygen species and their precursors, as well as up-regulate enzymes involved in the repair of cellular damage. Several case-control studies have showed higher blood levels of antioxidants and decreased oxidative stress in younger individuals when compared with older ones. Cell damage caused by free radicals appears to be a major contributor in aging and degenerative diseases of aging such as cancer, cardiovascular disease, cataracts, compromised immune system, rheumatoid arthritis and brain dysfunction [4]. The objective of this study was to determine the variation of Circulating levels of selected antioxidants (enzymic and non enzymic) and oxidative stress marker in younger and older humans.

Materials and Methods

The work has been carried out at the Department of Medical Biochemistry, School of Health Sciences, Kannur University. Ethical committee Clearance has been obtained for the conduct of this study. An informed consent for the study was obtained from each participant. A clinical proforma was given to each participant to collect data such as weight, diet pattern and, previous history of illness. A log book was maintained for the participants. The participants were divided into two groups based on their age group. As Group I healthy humans of the age group 18–30 (35) and as Group II healthy humans of age >50 (35) were taken. Participants suffering from any diseases that may interfere with the study were excluded. 3 mL blood sample was taken for the analysis from the participants. Serum/plasma was separated and assayed using standard methods. The analysis of each i.e. catalase (method of Maehly and

Chance) [5], glutathione (DTNB method) [6], albumin (BCG method) [7], ascorbic acid (2, 6-dichlorophenol-indophenol method) [8] and malondialdehyde (method of Buege et al.) [9] was done using standard methods. The statistical analysis was performed using Software Package for Social Sciences (Table 1).

Results and Discussion

The results showed that a majority of the younger age group participants showed a significant increase in enzymic and nonenzymic antioxidant status and a decrease in oxidative stress when compared with the older age group.

Oxidative stress arises when there is an imbalance between oxygen free radical formation and their removal on scavenging by antioxidants. Excess generation of free radicals cause damage to cellular biomolecules which results in lipid peroxidation to prevent free radical damage the body has a defense system of antioxidants. Antioxidants act as scavengers of free radicals and promote cell to apoptosis [10, 11]. This study is aimed to evaluate the status of selected enzymic and nonenzymic antioxidants and oxidative stress marker in younger and older humans. Statistical analysis showed significant increase in antioxidant status and a decrease in oxidative stress in a majority of the younger humans when compared to older ones. The result obtained emphasize the need of more detailed study involving more number of samples to evaluate the role of these antioxidant parameters in ageing. The present study is continued with more cases and administration of functional foods containing antioxidants to both groups so as to derive a relation ship between dietary antioxidant consumption and levels of antioxidants and oxidants in younger and older humans.

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