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Research Article

TO EVALUATE THE SERUM ASCORBIC ACID LEVELS IN FRESH MYOCARDIAL INFRACTION PATIENTS AND TO COMPARE THEM WITH NORMAL HEALTHY INDIVIDUALS

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ABSTRACT

Objective: Decreased serum magnesium and ascorbic acid has been associated with increased risk of myocardial infarction (MI). The present study was planned to evaluate the status of ascorbic acid in patients suffering from MI and to compare them with normal healthy individuals.

Methods: This retrospective study was conducted in the Department of Biochemistry in collaboration with the Department of Medicine, Government Medical College, Guru Nanak Dev Hospital, Amritsar. Fifty patients already diagnosed with MI, attending medicine OPD and IPD. Fifty healthy individuals with ages and sex-matched from the same population served as controls. Plasma acorbic acid levels and lipid profiles were also estimated.

Result: In our study, we observed that the difference between the plasma ascorbic acid levels of normal individuals and the patient of MI was statistically highly significant (p<0.001). It was also seen that the maximum number of subjects was found the age of 51–70 years in MI patients.

Conclusion: Decreased plasma ascorbic acid levels may be one of the causes of MI, so its supplementation may delay MI and its complications.

Keywords: Ascorbic acid, Lipid profiles, Myocardial infarction.

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INTRODUCTION

Myocardial infarction (MI) refers to tissue death of the heart muscle caused by ischemia, due to lack of oxygen supply. It is a type of acute coronary syndrome, which describes a sudden or short-term change in symptoms related to blood flow to the heart [1]. An estimated 17.9 million people died from cardiovascular diseases (CVDs) in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. A recent study highlighted that an increased intake of Vitamin C may significantly reduce the risk of cardiovascular mortality. Ascorbic acid is an important water-soluble antioxidant in human plasma [2] and has a protective role in the development of atherosclerotic heart disease by inhibiting low-density lipoprotein (LDL) oxidation [3]. The ability of Vitamin C to donate electrons also makes it a potent water-soluble antioxidant that readily scavenges free radicals such as molecular oxygen, superoxide, hydroxyl radical, and hypochlorous acid [4]. Atherogenesis can be inhibited by supplementation with antioxidants [5]. A number of prospective studies have reported, at least in some populations that low blood levels of ascorbic acid are independently associated with the risk of coronary heart disease, stroke, CVD death, and all-cause mortality. A meta-analysis of MI patients found that Vitamin C improved endothelial function [6]. Numerous studies revealed that ascorbic acid supplementation reduces the accumulation of total cholesterol on arterial walls [7]. Ascorbic acid deficiency could significantly increase the concentration of cholesterol. There is an evidence that ascorbic acid can act as a protective factor against atherosclerosis by inhibiting LDL oxidation and participating in the mobilization and excretion of cholesterol. Hence, ascorbic acid can reduce the development of atherosclerosis which leads to MI [8,9]. This study was conducted to assess the levels of ascorbic acid in myocardial patients and to compare the levels in healthy individuals.

METHODS

The present study was undertaken in the Department of Biochemistry and the Department of Medicine, Guru Nanak Dev Hospital, attached to Government Medical College, Amritsar. Fifty patients in the age group 30–90 years who had attended the emergency Wards of Guru Nanak Dev Hospital, Amritsar were selected for the study. After the approval of the Institutional Ethical Committee, the study was done. Written informed consent was taken by all the study participants. 5 mL venous blood was taken in a dry disposable syringe under aseptic conditions by vein puncture in the anticubital vein, in a sterile dry and acid-washed vial for biochemical analysis. The biochemical parameters like ascorbic acid and parameters of dyslipidemia like total cholesterol, triglycerides, high-density lipoprotein cholesterol, LDL cholesterol (LDL-C), and very LDL cholesterol (VLDL-C) were evaluated by kit

Table 1: Demographic biochemical parameters in MI patients and control

Parameters	Patient Mean±SD	Control Mean±SD	p-value
Total Cholesterol (mg/dL)	226.4±20.42	177.4±16.98	p<0.001
TG (mg/dL)	174.9±25.22	142.7±11.48	p<0.001
HDL-C (mg/dL)	40.76±4.8	52.1±6.04	p<0.001
LDL -c (mg/dL)	150±22.8	96.9±14.0	p<0.001
VLDL-C (mg/dL)	35.2±7.07	28.5±2.26	p<0.001
Ascorbic acid	0.41±0.11	1.18±0.31	p<0.001

p<0.001 – Highly significant, LDL: Low-density lipoprotein, HDL-C: High-density lipoprotein cholesterol, VLDL-C: Very LDL cholesterol

Table 2: Plasma ascorbic acid levels in controls and MI patients

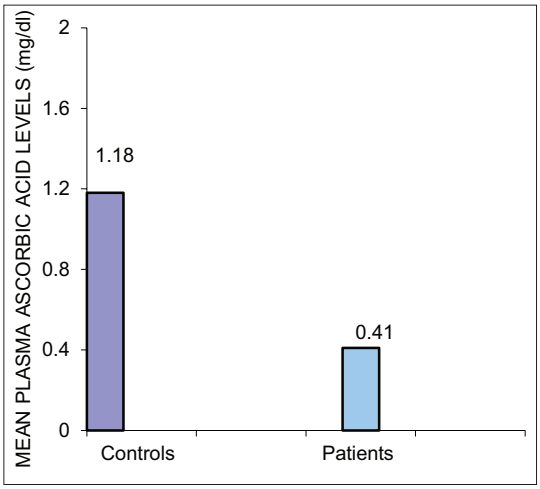
S. No.	Subjects	Number of cases	Plasma ascorbic acid			
			Range (mg/dL)	Mean (mg/dL)	SD	SE
1.	Controls	50	0.42–1.50	1.18	0.31	0.04
2.	Patients	50	0.21–0.62	0.41	0.11	0.02

highly significant (t=15.4; p<0.001)

Table 3: Plasma ascorbic acid levels in different age groups of controls and in MI patients

Plasma ascorbic acid conc. (mg/dL)							
S. No.	**Age group (in years)**	**Controls**			**Patients**		
		No. of subjects	**Range (mg/dL)**	**Mean±SD**	**No. of subjects**	**Range (mg/dL)**	**Mean±SD**
1.	Group I (30–50)	31	0.42–1.50	1.19±0.30	13	0.23–0.58	0.43±0.11
2.	Group II (51–70)	18	0.42–1.50	1.17±0.34	31	0.21–0.62	0.41±0.11
3.	Group III (71–90)	1	1.40	1.40±0	6	0.21–0.45	0.37±0.1

Group- I t=8.4; (p<0.001), Group- II t=10.86; (p<0.001), Group- III t=9.36; (p<0.001)



Graph 1: Plasma ascorbic acid levels in controls and MI patients

methods on semi-autoanalyzer. The changes in these parameters were compared with those of the control group, comprising 50 apparently healthy individuals of the same age group. The patients suffering from uncontrolled hypertension, gross congestive heart failure, myxoedema, proliferative diabetic retinopathy, suspected to be of aortic dissection, acute myocarditis or pericarditis with a skeletal muscle injury, myopathy, and muscular dystrophy renal failure were excluded from the study.

Statistical analysis

All the results of patients were compared with controls and results were expressed as mean±SD. Statistical significance was determined by Students t-test for unpaired data. The value of significance was evaluated with a p-value. Analysis of data was done on SPSS version 15.

RESULTS AND DISCUSSION

The present study was done on 50 patients who were suffering from MI and compared with 50 controls. Biochemical analysis of all these parameters has shown a significant high in both groups, depicted in Table 1. During the progression of atherosclerosis, the endothelium, which plays a main role in vascular homeostasis, undergoes major functional changes under the influence of oxidized or minimally modified LDL particles. LDL also plays a further role in the progression and initialization of the plaque [10]. Graundy has shown that high levels of LDL-C are a critical marker for the initiation and progression of the atheromatous plaque [11]. The same findings were seen in our study. It seems that serum triglyceride levels predispose a subject to an increased risk of MI. Increased serum triglyceride levels are a good predictor of mortality due to ischemic heart disease [12].

Table 2 depicts the plasma ascorbic acid levels in normal healthy individuals and in patients of MI under study. In normal individuals (n=50), the plasma ascorbic acid levels ranged from 0.42–1.50 mg/dL with a Mean±SD. of 1.18±0.31. In patients individuals (n=50), the plasma ascorbic acid levels ranged from 0.21 to 0.62 mg/dL with a Mean±SD. of 0.41± 0.11. It was observed that the difference between the plasma ascorbic acid levels of a normal individual and the patient of MI was statistically highly significant (t=15.4; p<0.001), with the levels of plasma ascorbic acid significantly lower in MI patients as compared to normal healthy individuals. The ascorbic acid was significantly low in MI patients compared to controls [13] as shown by our findings.

Table 3 thus, it was observed that the maximum number of subjects were in Group I, that is, 30–50 years in control, and Group II, that is, 51–70 years in patients. Plasma ascorbic acid levels were found to be affected by age in the patient group but the levels were not affected by age in the control group. It was also seen that the maximum number of subjects was found the age 30–50 years in control and 51–70 years in patients. Moreover, ascorbic acid levels show inverse relation with increasing age, more prone to MI [14,15]. It was observed that plasma ascorbic acid levels were low as age advanced. High risk for MI reveals that men, the elderly, smokers, diabetics, and hypertensives have lowered plasma ascorbic acid levels [16]. Although, it was observed from the present study that out of 50 individuals in controls 22 (44%) were males and 28 (56%) were females while in patients there were 19 (38%) males and 31 (62%) were females (Graph 1). Thus, it shows that MI is more prevalent in females [17].

CONCLUSION

Decreased plasma ascorbic acid levels may be one of the causes of myocardial infarction (MI) and its post-MI complications, so its supplementation may delay MI and its post- MI complications. Thus, plasma ascorbic acid may be done as a routine investigation for the assessment of MI and its complications.

AUTHORS CONTRIBUTIONS

The manuscript writing had accomplished by Jaswant Kaur and the data collection and analysis were done by Navdeep Kaur. The research was reviewed and edited by Jaspreet Kaur and statistical analysis was done by Navdeep Kaur. The manuscript was finalized and submitted for publication by Jaswant Kaur.

CONFLICTS OF INTEREST

The authors affirm no conflicts of interest.

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