

## Serum fatty acid in patients with acute myocardial infarction in Gorgan

Abdoljalal Marjani\*

Department of Biochemistry and Biophysics, Metabolic Disorders Research Center, Gorgan Faculty of Medicine, Golestan University of Medical Sciences, Golestan Province, Iran

**Abstract:** *Introduction:* The present study aimed to assess serum fatty acid in patients with acute myocardial infarction in Gorgan, Iran. *Material and Methods:* The study conducted on the thirty and five subjects with acute myocardial infarction who were referred to the intensive Coronary Care Unit in 5th Azar in Gorgan. *Results:* The content of palmitoleic acid (16:1) was significantly higher in serum fatty acid of the patients than of the control groups ( $P=0.019$ ), whereas oleic acid (18:1), linoleic acid (18:2),  $\alpha$ -linolenic acid (18:3), arachidonic acid (20:4) and Eicosapentaenoic acid (EPA) were significantly higher in the control groups than the patients ( $P<0.0001$ ,  $P=0.013$ ,  $P=0.042$ ),  $P=0,001$  and  $P=0.022$  respectively). *Conclusion:* This study showed that the content of polyunsaturated fatty acids in serum fatty acid component was decreased in acute myocardial infarction patients. These results suggest that there may be some protective effects of poly unsaturated fatty acid against myocardial infarction.

**Keywords:** Fatty Acid, Acute Myocardial Infarction, Gorgan

### Introduction

One of the most reasons of mortality and morbidity in the world is acute myocardial infarction (AMI). It is difficult for heart to continue its function without adequate blood stream. It has been shown that there are many risk factors for coronary heart disease, like hypertension, dyslipidaemia, obesity, diabetes, and family story [1]. There is an elevation in the incidence of acute myocardial infarction in many countries. It forms most reason of death in the middle aged and old people. Coronary heart disease could prevent with identification of associated risk factors. It has been shown that coronary heart disease is the most reason of death in Iranian population. In Iran, coronary heart disease and myocardial infarction cause about 40% and 50% of total deaths every year, respectively [2]. It is reported that there is increasing in the number of patients with myocardial infarction [3]. Blood pressure regulation [4-6], lipid and glucose metabolism [7-9], platelet aggregation [10-11] and red blood cell structural changes [12-13] are different physiological and biochemical processes that can affect by fatty acid composition. There is less data on the composition of serum fatty acid in acute myocardial infarction patients. It is reported

that the risk of coronary heart disease depended on fatty acid consumption [14]. Some studies have been shown an association between fatty acids and risk of coronary heart disease [14-16]. A study indicates that there is association between the free fatty acid fraction and risk of myocardial infarction [17]. There is no evidence that it can show the correlation between serum fatty acid and the coronary atherosclerotic lesions in patients with acute myocardial infarction. Some studies showed that there are increased plasma free fatty acids in patients with acute myocardial infarction [18-20], whereas some other studies have not been shown this relation [21]. There is no data on serum fatty acid in patients with acute myocardial infarction in Gorgan (South East of Caspian Sea), Iran.

Therefore, it is very important to set up a study on serum fatty acid in these patients. The present study aimed to assess serum fatty acid in patients with acute myocardial infarction in this area.

### Material and Methods

The present study was carried out in the Metabolic Disorders Research Center of

Gorgan, Iran in 2011. Thirty and five subjects with acute myocardial infarction who were referred to the intensive Coronary Care Unit in 5th Azar Hospital (the only general teaching hospital in Gorgan), Gorgan Faculty of Medicine, Golestan University of Medical Sciences. There were 12 females and 23 males patients. The mean ages of patients were  $57.22 \pm 11.44$  years old. Acute myocardial infarction patients had no thyroid dysfunction, diabetes, hypertension and liver or kidney disease. Thirty and five healthy subjects included in this study. There were 12 females and 23 males. The mean ages of healthy subjects were  $55.80 \pm 13.15$  years old. Healthy subjects were chosen as control group and matched them for age and gender with acute myocardial infarction patients. Patients with any other acute disease were excluded. Prolonged chest pain was clarified as acute myocardial infarction. Acute myocardial infarction was diagnosed on the basis of clinical examination, electrocardiographic changes and laboratory basis. After 12-hours overnight fast, a venous blood sample was taken from patients and healthy subjects. Centrifugation of the samples were done for 10 minutes at 3000 rpm. Lipid was extracted

from serum by a chloroform/ethanol extraction according to a method described by Folch [22]. Fatty acid composition in methylated sample was analyzed by BUCK Scientific 610 Gas Chromatography. A capillary column (TR-CN 100, P/N: TR-8821662, Spain) was used. An injection temperature of  $260^\circ\text{C}$ , a column temperature of  $210^\circ\text{C}$ , and a column flow of 45 m/min of nitrogen were used. We determined the levels of the 11 fatty acids. Tricosanoic acid was used as the internal standard. The results of this study were shown as mean value. The SPSS- 11.5 version software was used for the statistical analysis. Evaluation of the results were done by using paired and independent student't' statistical tests to determine the significance of fatty acids between patients and healthy subjects.  $P < 0.05$  was considered statistically significant.

### Results

Concentrations of serum fatty acids in acute myocardial infarction patients and control groups have been shown in table 1.

| Parameters                        | Acute myocardial infarction patients (n=35) | Control groups (n=35) | P-value |
|-----------------------------------|---|-----------------------|---------|
| Age (year)                        | $11.44 \pm 57.22$                           | $55.80 \pm 13.15$     | 0.605   |
| Myristic acid (14:0)              | $1.10 \pm 0.55$                             | $1.30 \pm 0.40$       | 0.084   |
| Palmitic acid (16:0)              | $37.83 \pm 3.37$                            | $37.28 \pm 3.59$      | 0.511   |
| Palmitoleic acid (16:1)           | $1.57 \pm 0.67$                             | $1.22 \pm 0.37$       | 0.019   |
| Stearic acid (18:0)               | $6.18 \pm 1.21$                             | $5.48 \pm 0.72$       | 0.007   |
| Trans-Oleic acid (18:1)           | $1.31 \pm 0.48$                             | $1.21 \pm 0.41$       | 0.394   |
| Oleic acid (18:1)                 | $24.57 \pm 2.35$                            | $20.79 \pm 2.37$      | <0.0001 |
| Linoleic acid (18:2)              | $24.82 \pm 4.85$                            | $28.03 \pm 4.27$      | 0.013   |
| $\alpha$ -Linolenic acid (18:3)   | $0.37 \pm 0.18$                             | $0.44 \pm 0.19$       | 0.042   |
| Arachidonic acid (20:4)           | $1.60 \pm 0.56$                             | $2.23 \pm 0.88$       | 0.001   |
| Eicosapentaenoic acid             | $0.41 \pm 0.28$                             | $0.62 \pm 0.40$       | 0.022   |
| Docosahexaenoic acid              | $0.59 \pm 0.31$                             | $0.71 \pm 0.43$       | 0.238   |
| P<0.05 was considered significant |   |                       |         |

### Discussion

This study investigated serum fatty acid among 35 patients after acute myocardial infarction who hospitalized in 5th Azar Heart Center. Fatty acid component in serum fatty acid has been changed

considerably after acute myocardial infarction. We measured the serum levels of the some fatty acid in patients with acute myocardial infarction. We have shown that the fatty acid composition of serum fatty acid is associated with the risk of acute myocardial infarction.

Percentage content of palmitoleic acid (16:1), Stearic acid (18:0) and Oleic acid (18:1) were significantly higher in serum fatty acid of the patients than of the control groups. Linoleic acid (18:2),  $\gamma$ -Linolenic acid (18:3), Arachidonic acid (20:4) and Eicosapentaenoic acid (EPA) were significantly higher in the control groups than the patients. It has been shown that the concentrations of fatty acids, 14:0, 16:0 and 16:1 of the serum phospholipids, were significantly higher in coronary artery disease patients than in the controls, while poly unsaturated fatty acids like linoleic, linolenic and arachidonic acids were at a significantly lower level in the patients when compared to the control groups [23-25].

Study of Yli-Jama et al. [17] have been shown that the mean molar percentage of docosahexanoic, eicosapentenoic, stearic and myristic acid in the serum fatty acid fraction was significantly lower in myocardial infarction patients than in control groups whereas that of oleic and linoleic acid was higher in myocardial infarction patients than in control groups. They have been also shown that elevated percentage of total very long chain unsaturated fatty acids in serum fatty acid were associated with reduced risk of myocardial infarction. Our study showed a significant increase in serum stearic, palmitoleic and oleic acids of acute myocardial infarction patients which is in agreement with the findings of other authors [18-19, 21 and 26]. The mechanism and the importance of the alteration of plasma fatty acid concentration in acute myocardial infarction has been a significant interest.

Several studies suggest that free fatty acids may play an important role in the onset of acute myocardial infarction. The exact mechanisms of the protective effect of serum fatty acids such as poly unsaturated fatty acids on the risk of myocardial infarction are not exactly clear. The major finding in this study was decreasing contents of poly unsaturated fatty acids in serum of acute myocardial infarction. Our findings are in agreement with some studies showing a protective effect of poly unsaturated fatty acids on risk of coronary heart disease (CHD). [27-28]. Nair et al. suggest that fatty acid is released from membrane phospholipids shortly after myocardial

infarction and the type of fatty acid determines dysrhythmic response of the myocardium [29]. Several previous studies have shown an increase in serum fatty acid levels [30, 18 and 31] while other studies did not find any significant increase [17, 32]. It is reported that Trans and saturated fatty acid increase and linolenic and linoleic acid decrease the risk of myocardial infarction [33-35].

Several other studies have been shown that serum fatty acids are elevated in association with myocardial infarction [36]. According to Cowan et al. the total fatty acid concentration increases soon after myocardial infarction, and decrease slowly during the following 7 days [37]. Serum polyunsaturated fatty acids reflect diet intake, whereas serum saturated fatty acid and monounsaturated fatty acid synthesize by lipid metabolic pathway [38-39]. One possible reason for acute myocardial infarction was that most of the patients in the present study had low levels of polyunsaturated fatty acids, which could not to protect against myocardial infarction. Polyunsaturated fatty acid intake may decrease risk of myocardial infarction. Poly unsaturated fatty acids are easily oxidized and may cause development of oxidative change of low density lipoproteins [40]. Low concentration of Poly unsaturated fatty acids in serum of acute myocardial infarction patients may depend on oxidative changes, alteration of fatty acid components and low amount of antioxidants. In conclusion, this study showed that the content of polyunsaturated fatty acids in serum fatty acid component was decreased in acute myocardial infarction patients. These results suggest that there may be some protective effects of poly unsaturated fatty acid against myocardial infarction.

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\*All correspondences to: Dr. Abdoljalal Marjani, Gorgan Faculty of Medicine, Department of Biochemistry and Biophysics, Metabolic Disorders Research Center, Gorgan Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Golestan province, Iran. E-mail:abdoljalal@yahoo.com