

## The Association of Blood Biochemical Parameters with Myocardial Infarction

Mohamad Khalid Nusier,<sup>\*,a</sup> Zeyad El-Akawi,<sup>a</sup> and Sameer Abd-Alkareem Otoom<sup>b</sup>

<sup>a</sup>Department of Biochemistry and Molecular Biology and

<sup>b</sup>Department of Pharmacology, Faculty of Medicine, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan

(Received May 11, 2004; Accepted June 9, 2004)

Biochemical changes that occurred in the blood of myocardial infarction patients were investigated. Two hundred and fifty two patient, 180 males and 72 females were involved in this study. The mean age was  $49.3 \pm 9.25$  years. Biochemical parameters including serum total protein, albumin, total bilirubin, and total cholesterol to albumin ratio were analyzed. Biochemical parameters showed that the increased level of triglyceride and total bilirubin were associated with myocardial infarction. Triglyceride and total bilirubin levels in myocardial infarction patients were  $2.3 \pm 1.4$  mmol/l and  $12.3 \pm 3.2$   $\mu$ mol/l respectively, whereas those of healthy controls were  $1.7 \pm 1.2$  mmol/l for triglyceride and  $9.7 \pm 3.7$   $\mu$ mol/l for bilirubin. On the other hand, serum total protein and albumin concentrations were lower in myocardial infarction patients compared with those of controls. Total protein level was  $65.5 \pm 3.1$  g/l in myocardial infarction patients and  $76.2 \pm 5.3$  g/l in healthy controls. Albumin levels in both patients and controls were  $40.2 \pm 3.2$  g/l and  $45.4 \pm 4.5$  g/l correspondingly. Interestingly, serum total cholesterol level was not significantly different in myocardial infarction patients compared with controls. Patients cholesterol level was  $5.8 \pm 1.3$  mmol/l and that of controls was  $5.2 \pm 1.2$  mmol/l. In addition, cholesterol/albumin ratio in infarction patients ( $0.14 \pm 0.04$ ) found to be significantly higher than that in healthy controls ( $0.11 \pm 0.03$ ).

**Key words** — myocardial infarction, hypertriglyceridemia, hypercholesterolemia, bilirubin

## INTRODUCTION

Coronary heart disease (CHD) is commonly caused by atherosclerosis and plaque formation on the inner surface of the arteries. These pathological factors cause narrowing of the major coronary arteries and thus decrease blood flow to the heart muscle.<sup>1)</sup> When this process is severe or prolonged, it results in myocardial infarction and necrosis in the heart muscle.<sup>2,3)</sup> According to the American Heart Association, coronary heart disease causes 12 million deaths in the world each year.<sup>4,5)</sup> CHD is responsible for half of deaths in several developed countries, and one of the main causes of death in adults in many developing countries.<sup>4,5)</sup> Premature death rates from coronary heart disease range from 40.5 per 100000 in France to 248 per 100000 in Latvia, a ratio of 1 to 6 globally.<sup>4,5)</sup> In Africa, Western Asia and Southeast Asia, 15–20% of the estimated 20 million annual deaths are due to coronary heart disease.<sup>5,6)</sup> Cardiovascular diseases are emerging as a major health problem in the Eastern Mediterranean region. The portion of deaths from coronary heart disease ranges from 25 to 45%.<sup>7)</sup> High blood triglycerides and cholesterol levels were reported to be risk factors of coronary heart diseases in many countries.<sup>7,8)</sup>

Many countries have experienced rapid socioeconomic changes over the last two decades. Daily caloric intake has increased, which resulted in obesity. A high prevalence of smoking has reported among patients having acute myocardial infarction.<sup>9,10)</sup> Moreover, diabetes mellitus and hypercholesterolemia were implicated as risk factors, but there is no direct evidence that either of these factors can adequately explain the increased vulnerability to coronary heart disease.<sup>11,12)</sup>

Although, coronary heart disease is the leading cause of death in developed countries, developing countries such as Jordan has noticed an increase in deaths related to coronary heart disease. Risk factors such as obesity, smoking, low physical activities and unhealthy life style have been observed in Jordan.<sup>13)</sup> This increase is probably due to westernization that unmasks a genetic predisposition of Jordanian population for coronary heart disease.

The aim of this study is to investigate the blood biochemical parameters that associated with myocardial infarction in Jordan. These biochemical parameters include serum total protein, albumin, total bilirubin and total cholesterol to albumin ratio.

\*To whom correspondence should be addressed: Department of Biochemistry and Molecular Biology, Faculty of Medicine, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan. Tel.: +962-2-709-5111 (Ext. 23696); Fax: +962-2-709-5010; E-mail: mick@just.edu.jo

**Table 1.** Blood Biochemical Parameters of Jordanian Patients with Myocardial Infarction

	Trigl (mmol/l)	T. chol (mmol/l)	T. prot (g/l)	Albm (g/l)	T. bilirn (mmol/l)	Chol to albm ratio
Patients (mean $\pm$ 2S.D.) <i>n</i> = 252	2.3 $\pm$ 1.4	5.8 $\pm$ 1.3	65.5 $\pm$ 3.1	40.2 $\pm$ 3.2	12.3 $\pm$ 3.2	0.14 $\pm$ 0.04
Healthy (mean $\pm$ 2S.D.) <i>n</i> = 260	1.7 $\pm$ 1.2	5.2 $\pm$ 1.2	76.2 $\pm$ 5.3	45.4 $\pm$ 4.5	9.7 $\pm$ 3.7	0.11 $\pm$ 0.03
<i>p</i> -value	s	ns	s	s	s	s

s = Significant difference between patients and healthy cases; ns = no significant difference between patients and healthy cases.

## MATERIALS AND METHODS

This is a retrospective case-control study of patients with first attack of acute myocardial infarction and age- and sex-matched controls. Biochemical parameters were obtained from the case notes of patients with acute myocardial infarction who were admitted to Al Amirah Basmah Teaching Hospital (referral hospital), Irbid, Jordan, between January 1999 and May 2000. The cases were diagnosed based on clinical symptoms, electrocardiographical and laboratory findings. Laboratory data obtained were performed on the first day of the myocardial infarction using commercially available kits (Randox, U.K.). Only patients with complete biochemical data were included in the study. Healthy, non-obese (BMI < 25) subjects without any previous history of chest pain or myocardial infarction who visited the outpatient clinic for minor ailments or routine medical check-up were chosen as controls.

We applied simple descriptive statistics (mean and standard deviation) to describe our observations in both patients and control cases. Statistical analyses were done using the SPSS (version 6.0). *p*-Values < 0.05 were considered significant.

## RESULTS

Biochemical data were collected from 252 myocardial infarction patients of which 180 (71.43%) were males, and 72 (28.57%) were females. The mean age of the participants in this study was 49.3  $\pm$  9.25 years.

Table 1 demonstrated that blood triglyceride level in patients with myocardial infarction is (2.3  $\pm$  1.4 mmol/l) and in healthy control group is (1.7  $\pm$  1.2 mmol/l). Total cholesterol level in patients with myocardial infarction as shown in Table 1 is (5.8  $\pm$

1.3 mmol/l) and in healthy control group is (5.2  $\pm$  1.2 mmol/l). Albumin and total protein levels in myocardial infarction patients are (40.2  $\pm$  3.2 g/l) and (65.5  $\pm$  3.1 g/l), respectively. As also demonstrated in Table 1, total bilirubin concentration in Jordanian patients with myocardial infarction and healthy control group are (12.3  $\pm$  3.2  $\mu$ mol/l) and (9.7  $\pm$  3.7  $\mu$ mol/l), respectively. Total cholesterol to albumin ratio for Jordanian patients with myocardial infarction is (0.14  $\pm$  0.04) compared with healthy control group (0.11  $\pm$  0.03).

## DISCUSSION

Myocardial infarction is emerging as a major health problem among the Jordanian population with male predominance. The mean age of the participants in this study was 49.3  $\pm$  9.25 years which is not significantly different from what has been previously reported by Olusi, and coworkers for both Kuwaiti and non-Kuwaiti Arabs (56.40  $\pm$  11.50 and 50.05  $\pm$  9.25 years), respectively.<sup>7)</sup> This suggests that myocardial infarction occurs at a similar age among Jordanian patients compared to other reported Arabs.

High triglyceride blood levels that we demonstrated in myocardial infarction patients are in agreement with what have been reported.<sup>7,14-16)</sup> Previous reports suggested that hypertriglyceridemia predisposes to thrombosis by increasing factor VII coagulant activity.<sup>17-19)</sup> Therefore, the relationship between hypertriglyceridemia, factor VII coagulant activity and myocardial infarction should be considered in future studies. On the contrary, there were no significant differences in total cholesterol concentration between patients with myocardial infarction (5.8  $\pm$  1.3 mmol/l) and control group (5.2  $\pm$  1.2 mmol/l). These observations suggest that high triglycerides

but not cholesterol blood levels play a significant role in myocardial infarction in Jordanian population. Albumin and total protein concentrations in myocardial infarction patients were significantly lower than those in control group (Table 1). These results are in agreement with what had been reported by Kuller and coworkers who found that there was a significant inverse relation between serum albumin level and risk of coronary heart disease.<sup>20)</sup>

High serum total bilirubin level in patients with myocardial infarction may suggest that there is a direct correlation between serum total bilirubin and myocardial infarction. Our results are in agreement with those reported by Olusi and coworkers.<sup>7)</sup> Thus, high bilirubin level might be considered as a risk factor for myocardial infarction. On the other hand, Schwertner and coworkers data are not in agreement with our findings, who found that serum total bilirubin was an independent risk factor for myocardial infarction.<sup>21–23)</sup> Recent reports suggest an inverse relationship between bilirubin levels and coronary heart disease; they stated that mild increase in the circulatory bilirubin might have a protective role against CHD by suppressing atherosclerosis.<sup>24,25)</sup> This protective mechanism might be inversed in the case of high plasma bilirubin levels as indicated by our study, where we have a significant increase in these levels in CHD patients compared with controls.

Interestingly, we found that cholesterol albumin ratio is elevated in myocardial infarction patients compared with healthy controls. Our data came to confirm what has been previously reported on this parameter by Olusi and coworkers.<sup>7)</sup> Therefore, cholesterol albumin ratio should be considered in future work.

In conclusion, serum triglyceride levels, total bilirubin and cholesterol albumin ratio were significantly higher in Jordanian patients with myocardial infarction than those of the control group. Conversely, serum total protein and albumin concentrations were lower than those of the control group. No significant difference in cholesterol levels between the two groups.

Therefore, serum triglyceride, bilirubin and cholesterol albumin ratio may be considered biochemical risk factors for myocardial infarction.

**Acknowledgements** The authors thank Dr. Abdel Rahman M. Radaideh from Jordanian Ministry of Health for his help in data collection.

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