Serum status of selenium and chromium in patients with cardiovascular diseases and controls in Iraq.

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Summary:

Background: The importance of essential trace elements plays a major role in medicine mainly cardiovascular diseases.

Methods: The study involved 305 patients with either myocardial infarction (MI) , angina pectoris (AP) or hypertension (HT) for evaluation of these trace elements level (Se & Cr) as compared with 100 control subjects in Ibin Al Bitar hospital for cardiac surgery between July 2003 and May 2005 by using Atomic Absorption Spectrophotometer (AAS) done in the laboratories of ministry of Sciences and Technology in Baghdad.

Result: The total numbers of patients enrolled in this study were 305 patients, Ml contributes to 70 patients, 55 male and 25 female with mean age of 60 ± 20 and 58 ± 19 years respectively. Unstable angina contribute to 105 patient in which 70 of them were male with mean age of 63 ± 20 years and 35 female with mean age of 60 ± 19 years and 120 hypertensive patient in which male contribute to 90 with mean age of 64 ± 19 years and the other 30 were female with mean age of 48 ± 13 years, those 305 patients were compared with 100 normotensive control subject in which 65 of them were male with mean age of 56 ± 20 years and the remaining 35 were female with mean age of 46 ± 13 years. The analysis of results show that the level of Se and Cr were significantly lower in both sexes in patient with MI, AP and HT as compared with control, and the concentrations of Se were even much lower in acute MI as compared with AP.

Conclusion: The concentrations of trace elements Se and Cr were significantly lower in patients having MI, AP and HT as compared with controlled normotensive persons, besides the concentration of Se was much lower in MI as compared with cases of AP.

Key words: Trace elements, Cardiovascular diseases.

Introduction:

The importance of essential trace elements in nutrition began in the late of 19th century and the demonstration that certain elements were essential in different biological function related to various diseases e.g. cardiovascular, cancer, diabetes mellitus , growth retardation and other various diseases(1).

A potent antioxidant, Selenium is an important co-factor for the body's natural antioxidant glutathione peroxidase system (2).

There is a great demand to monitor trace elements in blood serum of patients with HT, AN and MI. In Iraqi hospitals, no such data is available for Iraqi patients; therefore, the present investigation is a basic study to elevate the significance of selected trace elements in patients with cardiovascular disease.

Chromium was discovered in 1957 (3), it has great effect on the production of insulin and controlling of diabetes. So chromium supplements appear to improve blood sugar control in diabetics. Several epidemiological studies linking chromium deficiency with risk factor of cardiovascular diseases, in individual taking B-blocker, chromium may raise the level of high-density lipoprotein HDL (4).

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Selenium was discovered in 1969(5).It has been found that low selenium levels along with other risk factors play an important role in developing dilated cardiomyopathy.

The aim of this study is to check the levels of trace element selenium, chromium in patients with cardiovascular diseases as compared with control subjects.

Patients and methods
Between April 2004 and May 2005, 305 patients with either MI, AP and HT were enrolled , and compared with 100 control normotensive subjects at Ibin Al Bitar hospital for cardiac surgery, blood samples were taken from all patients together with the control group for estimation of selenium and chromium level by using flame absorption spectrophotometer (Model 760 Shimadzu) as described by Uster (6) .

Myocardial infarction was documented by the presence of pathological Q waves in at least two consecutive leads.

Angina pectoris diagnosed by the classical exertional chest pain, which responds to sublingual nitrate or rest, and/or by positive treadmill test.

Regarding the third group of patients, they were only hypertensive with negative treadmill test and having normal ECG.

Results

Base line characteristic shown in table l, the total numbers of patients enrolled in this study were 305 patients, Ml contributes to 70 patients, 55 male and 25 female with mean age of 60 ± 20 and 58 ± 19 years respectively. Unstable angina contribute to 105 patient in which 70 of them were male with mean age of 63 ± 20 years and 35 female with mean age of 60 ± 19 years and 120 hypertensive patient in which male contribute to 90 with mean age of 64 ± 19 years and the other 30 were female with mean age of 48 ± 13 years, those 305 patients were compared with 100 normotensive control subject in which 65 of them were male with mean age of 56 ± 20 years and the remaining 35 were female with mean age of 46 ± 13 years.

The analysis of results show that the level of Se and Cr were significantly lower in both sexes in patient with MI, AP and HT as compared with control, and the concentrations of Se were even much lower in acute MI as compared with AP as shown in tables 2, 3 & 4

Table (1) baseline characteristics of 305 patients with MI, AP and HT together with 100 control subjects

Variables	MI	AP	HT	Control
Number	80	105	120	100
Male sex	55	70	90	65
Age (year)	60 ± 20	63 ± 20	64 ± 19	65 ± 20
Female sex	25	35	30	35
Age (year)	58 ± 19	60 ± 19	48 ± 13	46 ± 13

Table 2: Comparison of serum concentration in (mic/ml) of Cr & Se between patients with MI and healthy control group

Control group Patients group	Average age (years) ±SD (range)	Chromium mic/ml ±SD	Selenium mic/ml ±SD
Normotensive (Female) (Control group) N= 35	(46 ± 13 y)	0.043 ± 0.014	0.092 ± 0.05
Myocardial infarction (Male) N= 55	(60 ± 20 y)	0.025 ± 0.02	0.044 ± 0.02
Myocardial infarction (Female) N= 25	(58 ± 19 y)	0.023 ± 0.019	0.039 ± 0.02
Normotensive (Male) (Control group) N= 65	(65 ± 20 y)	0.051 ± 0.02	0.099 ± 0.03

Table 3: comparison of serum concentration in (mic/ml) of Cr & Se between patients with AP and healthy control group

Control group Patients group	Average age (years)±SD(range)	Chromium mic/ml± SD	Selenium mic/ml±SD
Normotensive (male) (control group)N=65	(65±20y)	0.051±0.03	0.099±0.03
Normotensive (female) (control group)N=35	(63±20y)	0.035±0.016	0.067±0.02
Angina pectoris (female)N=35	(60±19 y)	0.031±0.018	0.061±0.02

Table 4: Comparison of serum concentration in (mic/ml) of Cr & Se between patients with HT and healthy control group

Control group Patients group	Average age (years) ± SD (range)	Chromium mic/ml ±SD	Selenium mic/ml ±SD
Normotensive (Male) (Control group) N = 65	(65 ± 20 y)	0.051 ± 0.02	0.099 ± 0.03
Normotensive (Female) (Control group) N = 35	(46 ± 13 y)	0.043 ± 0.014	0.092 ± 0.05
Hypertension (Male) N = 90	(64 ± 19 y)	0.042 ± 0.01	0.081 ± 0.02
Hypertension (Female) N = 30	(48 ± 13 y)	0.037 ± 0.01	0.078 ± 0.01

Discussions

It is obvious that serum selenium level in AMI, AP and HT were significantly lower than those in the controls as in table 2 , 3 , 4 .

This result is in agreement with the results obtained by Salonen (7), his results observed low serum selenium level in patients with AMI compared with controls, he suggested a correlation between low Se level and AMI. Finally he considered low Se level is one of the important factors for AMI because Se compounds may protect cell membrane against different oxygen radicals.

In a stress situation with great demand for oxygen to the heart muscle, it could be that insufficient amount of the necessary selenium compound lead to accumulation of dangerous amount of hydroxyl radicals with serious damage to the cell membrane and triggering of platelets aggregation and this is the cause for formation of thrombus. This is one of the important risk factors for AMI. If sufficient Se had been available, the thrombus formation might have been avoided (7). Besides it had been illustrated that the crucial role that Se, the co-factors of one of the major antioxidant enzymes of the myocardium, plays in determining the vulnerability of the heart to ischemia and reperfusion (8).

Previous research has further shown an association between Cr intake and heart disease. So chromium

supplementation has been observed to raise high density lipoprotein (HDL) and lower total cholesterol and triglyceride levels (9).

Conclusions

Since there is a significant decrease in selenium and chromium in patients with myocardial infarction , angina pectoris and hypertension , a supplementation of these trace elements were necessary to prevent a deficiency disease or to get beneficial of trace element rebalance in blood serum.

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