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Serum copper levels in subjects with type 2 diabetes mellitus with and without coronary artery disease

It is well known that copper is involved in the production of reactive oxygen species that play an important role in the development of diabetic complications.¹ In addition, documentation supports a role for elevated serum levels of copper as a risk factor for cardiovascular disease.¹ No evidence has yet been presented of a possible association between copper levels and coronary artery disease (CAD) in type 2 diabetes mellitus (T2D). The aim of the present study was to investigate serum levels of copper in subjects with T2D with and without CAD.

A total of 200 subjects with T2D, 100 with CAD and 100 without CAD, consecutively selected from the hospital diabetes outpatient clinic were enrolled into the study. A detailed medical history was elicited from all participants and a physical examination was performed. Blood samples were drawn for measurement of serum glucose, HbA_{1c}, creatinine, lipid profile and copper. Copper levels were determined by use of atomic mass spectrometry.

The two study groups did not differ in terms of age (65.60±8.16 vs 66.68±9.52 years, p=0.38), HbA_{1c} (7.74±1.74 vs 7.58±1.72%, p=0.51) or duration of T2D (13.23±8.27 vs 11.83±8.28 years, p=0.57).

The mean serum level of copper did not differ between subjects with T2D with and those without CAD (113.97±33.48 vs 117.59±33.97 µg/L, p=0.41). In subjects with T2D who had CAD multivariate linear regression analysis demonstrated significant independent association between serum copper

level and gender (males vs females) (beta=-0.22, p=0.05), body mass index (BMI) (beta=0.25, p=0.007), and presence of nephropathy (beta=0.21, p=0.01). In subjects with T2D without CAD multivariate linear regression analysis demonstrated a significant independent association only between serum level of copper and hematocrit (beta=-0.19, p=0.05).

In this study it was shown that the copper levels were the same in subjects with T2D with and without CAD. Copper levels were associated with gender, BMI and the presence of nephropathy in patients with T2D who had CAD, and with hematocrit in those without CAD.

To date, published data refer only to the comparison of copper levels between patients with T2D and healthy subjects. Many studies have demonstrated that subjects with T2D have higher levels of copper than healthy individuals.²⁻⁵ Copper level has been found associated with glycemic control, in terms of HbA_{1c}, and thus linked to diabetic complications.² Patients with T2D with retinopathy, hypertension, or microvascular disease have been found to have higher serum levels of copper than either those without complications or control subjects.³ Another study found the only association of serum copper level to be with the serum levels of creatinine and glucose.⁴ Finally, one study failed to show any significant difference in copper levels between patients with T2D and healthy subjects.⁵

In conclusion, in this study serum copper levels did not differ between subjects with T2D with and without CAD. Further epidemiological and experimental data are needed in order to evaluate the potential role of increased copper levels in the development of T2D and its complications.

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ΠΕΡΙΛΗΨΗ

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Επίπεδα χαλκού πλάσματος σε ασθενείς με σακχαρώδη διαβήτη τύπου 2 με και χωρίς στεφανιαία νόσο

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