

Relationship of serum copper and zinc to human hypertension in Nigerians*

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Abstract

Serum copper and zinc levels were determined by atomic absorption spectroscopy in 48 hypertensive Nigerians and in 37 normotensive controls. Serum copper and total cholesterol levels were significantly increased in the hypertensive patients, but their serum zinc levels did not differ from those of the controls.

The relationship between trace elements and cardiovascular disease is under investigation in various parts of the world (1) and the determination of serum copper and zinc levels in patients suffering from essential hypertension has aroused some interest. Harman (2) has postulated that copper may be linked with the onset and development of atherosclerosis because of its known catalytic function in lipid peroxidation. Klevay (3) has also suggested that the ratio of these two minerals in the diet may be associated with cholesterol metabolism and the development of coronary heart disease.

In this communication we report the results of measurements of serum copper, zinc, and cholesterol levels in a group of Nigerians suffering from essential hypertension.

Materials and methods

Selection of patients. Forty-eight patients suffering from essential hypertension were randomly selected from those attending the outpatient clinic at University College Hospital, Ibadan. Twenty-five of the patients were males and 23 were females. Their average age was 51.5 years, with an age range from 30 to 83. The mean duration of hypertension was

4½ years with a range of 2 weeks to 14 years. All the patients were undergoing medical treatment with one or more of the following drugs: methyl dopa, debrisoquine, hydroflumethiazide, and digoxin. Blood pressures were recorded in the recumbent position by a single observer, and the mean of three readings was calculated for each patient.

The control subjects were hospital personnel and other volunteers who were free from hypertension and any disease of the cardiovascular system.

Determination of serum copper, zinc, and cholesterol levels. Venous blood was collected with minimum stasis into Venoject vacuum tubes.^a Special care was taken to avoid contamination of the blood samples during handling, and where glassware was used it was washed in dilute nitric acid (1 part concentrated nitric acid to 3 parts water) and rinsed with double distilled water before use.

Copper and zinc concentrations were determined by atomic absorption spectroscopy in serum deproteinized with 80 g/l trichloroacetic acid, according to the method of Parker *et al.* (4). Total serum cholesterol was determined by the colorimetric method of Sackett described by Varley (5).

Results.

The results of the measurements of serum copper, zinc, and cholesterol in hypertensive patients and in the controls are shown in Table 1. In comparison with the values in the control group, the serum copper and cholesterol values in the hypertensive patients were significantly higher ($P < 0.001$), but the serum zinc levels were identical in both groups of subjects.

Discussion.

The data presented in this paper have shown that in hypertensive patients, serum copper levels are increased but serum zinc concentrations are similar to those in normotensive controls. The biological

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^a Manufactured by the Jintan Terumo Co., Tokyo, Japan.

Table 1. Serum copper, zinc and cholesterol levels in subjects with essential hypertension (48 subjects) and in normal control subjects (37 subjects)

	Weight (kg)	Height (cm)	Systolic BP (mm Hg)	Diastolic BP (mm Hg)	Serum copper (mg/l)	Serum zinc (mg/l)	Serum cholesterol (mmol/l)
Essential hypertension							
Mean	66	166	160	100	1.38 ^a	1.09	6.1 ^a
Standard deviation	13.1	7.2	22.4	15.2	0.280	0.127	1.1
Range	41-110	48-183	110-220	70-130	0.80-2.00	0.86-1.30	3.1-8.0
Controls							
Mean	—	—	—	—	1.01	1.07	4.6
Standard deviation	—	—	—	—	0.182	0.122	1.5
Range	—	—	—	—	0.70-1.50	0.80-1.30	1.8-7.6

^a $P < 0.001$ when this value is compared with that for the controls.

significance of these observations is at present unknown. It remains to be explained whether a causal relationship exists between the hypertension and the increase in serum copper levels, or whether the increase represents a non-specific reaction common to many diseases. Thind & Fischer (6) and Wester (7) have also reported that serum zinc levels were similar in hypertensive patients and normotensive controls.

The increase in serum cholesterol in the hypertensive patients is in agreement with previously published results, although the serum cholesterol values were generally lower than have been found in non-Nigerian patients.

ACKNOWLEDGEMENTS

The technical assistance of Mr F. A. Adeniyi is gratefully acknowledged. This study received financial support from the World Health Organization and the Population Council, New York, USA.

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