INTRODUCTION
Hypertension also known as high blood pressure is one of the most common complex and public health problems which becomes more prevalent in developed and developing countries\(^1\). It is becoming an area of increasing concern all over the world. Hypertension is a condition with a multi-factor pathogenesis. Epidemiological studies have found links between high blood pressure and age, sex, race, geographic location, local industrialisation level, lifestyle, nutrition and work\(^2\). Macro and micro elements are known to play a major role in various enzyme reactions directly related to the regulation of blood pressure and indirectly related to generation of oxidative metabolic energy and alterations in blood lipid levels. Disturbances in these elements composition may therefore play a major role in the development and management of essential hypertension. The changes in plasma copper, zinc level in hypertensive patients should therefore be actively investigated. The findings of this study may help to understand the effects of elements in the regulation of blood pressure. Therefore our goal is to find out the involvement of plasma elements in the pathogenesis of hypertension\(^3\). Copper may be linked with the onset and development of atherosclerosis because of its known catalytic function in lipid peroxidation\(^4\). The abnormal deficiency of copper in hypertensives probably contributes to decreased activities of lysyl oxidase and superoxide dismutase which result in failure of collagen and elastin cross linking and impaired defense against free radicals\(^5\). Zinc concentration in the diet plays an important role in the regulation of systolic blood pressure and can be a critical nutrient for maintenance of anti-oxidative events in spontaneously hypertensive rats. Synergistic and antagonistic interactions between minerals disturbed proportions—

ABSTRACT
BACKGROUND: To measure the levels of trace elements (Serum Copper, Zinc) in patients of Hypertension.
MATERIALS AND METHODS: Serum copper and serum zinc were estimated in fifty (50) hypertensive patients and fifty (50) age-and sex-matched apparently healthy well nourished controls by colorimetric method using Erba XL 640 fully auto analyzer. RESULTS: Mean serum zinc was significantly reduced, while serum copper was significantly higher in hypertensive patients than control group. CONCLUSION: Hypertension is asymptomatic condition whereby the patient’s blood pressure measurement is greater than 140/90mmHg\(^1\). The causes of high blood pressure vary. It may be due to smoking of cigarettes, alcoholism and narrowing of arteries. Diet definitely plays a crucial role in the development of hypertension along with stress. The relationship between trace elements and cardiovascular diseases, including high blood pressure, has been the subject of many investigations over the past 40-50 years. It is believed that mineral imbalance may significantly contribute to the development and course of hypertension. Mean serum zinc was significantly reduced, while serum copper was significantly higher in hypertensive patient than control group.

Key Word: Hypertension, Copper, Zinc

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all these affect concentration levels of other minerals and may, for instance, have considerable impact on the development of arterial hypertension\textsuperscript{6}

**MATERIALS AND METHODS**

The cross sectional case control study was conducted in Civil Hospital, Ahmedabad during August 2014 to December 2014. Altogether 100 participants were involved in this study. Patients with hypertension were diagnosed by clinical examination, ECG and further evaluated by biochemical investigations. Exclusion criteria were having Moderate-severe valvular heart disease, Pericarditis, Recent history of stroke, Current abnormal thyroid function, Hemachromatosis, Alcohol abuse, Hepatitis B, C. Fifty hypertensive patients (n=50), their age range between 18 to 75 years participated in this study. Mean age of participants in case group was 56.16 ± 10.97 (mean±SD). The control group consisted of 50 healthy participants matched sex and age distribution. Fifty normal Controls healthy persons (n=50) aged 18 to 75 years were used as control. The mean age of control was found to be 52.54 ± 6.63. They selected from the individuals who referred for check up.

About 3 ml of blood samples were collected and allow to clot then centrifuged to obtain the serum. Serum Copper and Serum Zinc were determined by Colorimetric method using Erba XL 640 fully auto analyzer with following principle.

Copper, released from ceruloplasmin in an acidic medium, reacts with Di-Br-PAESA( 2-(5 bromo-2-pyridylazo)-5-(N-propyl-N-sulfopropylamino) aniline Na salt) to form a coloured complex. Intensity of the complex formed is directly proportional to the amount of Copper present in the sample.\textsuperscript{7}

Copper + Di-Br-PAESA $\rightarrow$ Coloured Complex

Zinc in an alkaline medium reacts with Nitro-PAPS(2-(5-nitro-2-pyridylazo)-5-(N-propyl-N-sulfopropylamino)phenol disodium salt dehydrate) to form a purple coloured complex. Intensity of the complex formed is directly proportional to the amount of Zinc present in the sample.\textsuperscript{7}

Zinc +Nitro-PAPS $\rightarrow$ Purple Coloured Complex

**RESULTS**

Table (1) showed the results of serum trace elements expressed as mean±standard deviation. Serum zinc level of hypertensive patients are significantly lower (p<0.05) than the level in normal subjects as shown in Table. Serum copper level of hypertensive patients are significantly higher (p<0.05) than the level in normal subjects

<table>
<thead>
<tr>
<th>Level of Trace Element</th>
<th>Normal Subject (mean ±SD)</th>
<th>Hypothyroid Patients (mean ±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>101± 18.2</td>
<td>138± 28</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Zinc</td>
<td>102.12± 13.18</td>
<td>68.92± 8.94</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In our study it was found that there is a significant decrease in serum zinc level in hypertensive patients as compare with normal subject while there is increase in serum copper level between this two group. Our study correlates well with other studies like It is reported that significant
decrease levels of Zn and increase levels of Cu in patients as comparison to the normal subjects in other different researches in Alteration in Copper and Zinc metabolism and significance of blood trace elements.\textsuperscript{8,9}

Copper can act as both an antioxidant and a pro-oxidant. As an antioxidant, it scavenges damaging particles in the body known as free radicals. Free radicals occur naturally in the body and can damage cell walls, interact with genetic material, and possibly contribute to the aging process as well as the development of a number of health conditions. Antioxidants can neutralize free radicals and may reduce or even help to prevent some of the damage caused by free radicals\textsuperscript{10}. Because Copper is a cofactor for Cu-Zn SOD and ceruloplasmin, two important antioxidant enzymes, and the possible antioxidant activity of copper may be accounted for, at least in part, by its role in these enzymes\textsuperscript{11}. Arteries are vulnerable to ongoing oxidative stress due to exposure to oxidizing agents such as drugs and free radicals, including superoxide and lipid peroxyl radicals. Blood contains an elaborate array of antioxidants, including ascorbic acid, uric acid and defensive serum proteins to limit this damage. However, antioxidant defenses are not 100% efficient. Zinc participates in these defenses by serving as a cofactor for the antioxidant enzyme, superoxide Dismutase. Inverse correlations between blood pressures and serum Zn were observed\textsuperscript{12}. So any imbalance of copper and zinc leads to decrease the activity of Cu-Zn SOD which leads to oxidative stress, that causes hypertension\textsuperscript{13}. So, The determination of trace elements is now considered to be very important test in medicine because the levels of some elements can be related to hypertension in human beings. The result obtained, therefore can contribute towards diagnosis and treatment of hypertension.

REFERENCES

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