

ORIGINAL RESEARCH

Assessment of Serum Copper and Zinc Levels in Oral Cancer Patients

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ABSTRACT:

Background: The aim of the study is to estimate serum copper, and in patients with oral cancer. Higher incidence of oral cancer in Indian population necessitates in depth probing of various etiological and contributing factors for its early diagnosis and prognosis. **Materials & methods:** The present study included evaluation of serum copper and zinc levels in cancer patients. A total of 30 cancer patients and 30 apparently healthy controls were included in this study. Serum samples were obtained in the morning hours for standardization and were assessed for serum copper and zinc levels in both the study group and the control group. The results were analysed by SPSS software. **Results:** The mean of serum copper levels and zinc level of cancer patient group subjects were found to be significantly higher comparison to the mean serum and zinc levels of the control group. **Conclusion:** Serum levels of zinc and copper were higher in patients with oral cancer compared with controls. It can be suggested that assessment of oral precancer and cancer patients may help in earlier diagnosis and/or prognosis.

Keywords: copper, zinc, serum, trace elements.

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INTRODUCTION

Oral cancer is the sixth most common cancer in the world.¹Prevalence of oral cancer in countries such as India, Brazil, and parts of France stands higher than the global standard. India has one of the highest incidences of oral cancer in the world. The development of cancer is a multi step process arising from pre existing potentially malignant lesion. Leukopenia is the most common precancer representing 85% of such lesion. Alcohol consumption, Genetic mechanisms and chronic irritation have modifying effects in the etiology of oral cancer. The occurrence of oral cancer has been rising during the last decade in some countries and it is the sixth fatality cause in the world, as

approximately 50% of diagnosed patients die annually with this disease.^{2,3}

Recently trace elements are receiving much attention in the detection of oral cancer and precancerous as they found to be significantly altered in the neck, lung and breast carcinomas. Trace elements have an important role in carcinogenesis.³Zn is an important element which plays a role in a large number of metalloenzymes.⁴ In addition, it is considered as antioxidant component of metalloproteinases.⁵ It is reported that serum Zn levels decreased or increased in some human cancers, such as lung, colorectal, renal, bladder and oral ones.⁶⁻⁹

Cu is an essential element and its concentration is elevated in cancer tissues, which promotes cancer development via some mechanisms, such as

increasing angiogenesis.¹⁰ Tumor progression and metastasis initiated along with the increasing Cu serum levels in patients with lymphoma and breast cancer.^{11,12} Also, Cu/Zn ratio is stated to be effective in diagnosis of some cancers. In some studies, Zn/Cu ratio has been used to evaluate the prognosis of cancer patients.¹³

Consequently, serum level of micronutrients has been propounded as an effective biochemical marker in the diagnosis of oral cancer whose significance has recently been put forth by researchers and has opened a new way for diagnosis and treatment of many diseases, especially blood dyscrasias, accordingly. In recent years, micronutrients have been examined to a great extent in order to evaluate their probable role in the etiology of various kinds of cancers. Measurement of serum levels of micronutrients is not only useful for diagnosis but also an appropriate guide for prognosis of the disease.¹⁴ Hence; the present study was conducted to measure the quantities of copper, and zinc in blood of patients with oral cancer.

MATERIALS AND METHODS

The present study was conducted for evaluating the serum copper and zinc levels in oral cancer patients. This cross sectional study was conducted on 30 patients diagnosed with oral cancer and 30 controls. Subjects of the control group neither had cancer nor suffered from systemic disease. Controls were matched with cancer group in terms of age and gender. In patients of cancer institute were examined after obtaining required authorization. 5ml of blood sample were collected from the patients intravenously by registered nurses and then transferred to acid-wash tubes. Then the samples were centrifuged, the serum part was separated and kept in a refrigerator at 70 degrees, finally the samples were checked for minimising error. After that Serum copper was estimated by colorimetric method using a procedure mentioned in the kit manufactured by coral clinical systems. Serum zinc was estimated by autoanalyzer. The absorbance of standard and test was measured against the blank using colorimeter method. Complete demographic and clinical details of all the subjects were obtained. Subjects appearing for routine dental check-up were evaluated for inclusion in the control group. Values obtained in both the study group and

the control group were compiled and compared. The results were analysed by SPSS software. Chi-square test was used for assessment of level of significance and p-value <0.05 was taken as significant

RESULTS

In the present study, 30 cancer patients and 30 apparently healthy controls were analysed. The mean serum copper levels of the study group and control group were 213.40µg/dL and 295.00 µg/dL respectively. The mean serum copper levels of the study group subjects were found to be significantly higher in comparison to the mean serum copper levels of the control group (p-value<0.05) as shown in Table 1. The mean serum zinc levels among subjects of the study group and the control group were 105.66 µg/dL and 215.89 µg/dL respectively. The mean serum zinc levels of the study group subjects were found to be significantly lower than the mean serum zinc levels of the control group subjects (p- value < 0.05) (Table 2). So it is evident that serum values of copper and zinc in patients with oral cancer were high when compared with the control group.

DISCUSSION

Maryam baharv and studied that copper chelator compounds may act as tumor restraining factors. According to a research conducted in this regard, tetrathiomolybdate (TTM) has been found as a copper chelator in different kinds of cancer, which is capable of stopping tumor growth and preventing recurrence.¹⁵ Theophanides and noted that copper ion plays a prominent role in producing free oxygen metabolites due to oxidation and regeneration activity.¹⁶ Anastassopoulou and noted that zinc directly prevents DNA damage and eventually gene mutation and in this way, the element decreases the risk of cancer accordingly.¹⁷ Sonali S Khanna and noted that serum iron levels are considered as biochemical indicators for nutritional assessment.¹⁸

In the present study, the mean serum copper levels of cancer patients study group subjects were observed to be significantly higher in comparison to the mean serum copper levels of the control group subjects (p-value < 0.05) (Table 1).

Table 1: Comparison of mean serum copper levels in between subjects of both the study groups

GROUP	NUMBER OF SUBJECTS	MEAN SERUM COPPER LEVELS (µg/dL)	SD	P- VALUE
Normal control	30	213.40	209.345	0.04
Cancer patients	30	295.00	288.608	

Table 2: Comparison of mean serum zinc levels in between subjects of both the study groups.

GROUP	NUMBER OF SUBJECTS	MEAN SERUM Zinc LEVELS (µg/dL)	SD	P- VALUE
Normal control	30	105.66	39.428	0.02
Cancer patients	30	215.89	81.099	

It was also observed that the mean serum zinc levels of cancer patient study group subjects were found to be significantly lower than the mean serum zinc levels of the control group (p-value < 0.05) (Table 2). The results of the present study were observed to be in correlation with the results obtained by previous authors in the past literature.^{19,20} Ayinampudi BK et al evaluated the levels of copper and zinc and copper/zinc ratio in saliva of premalignant and malignant lesions of oral cavity, because of the anatomical proximity of the saliva to both premalignant and malignant oral neoplasms. The levels of copper and zinc were estimated in the saliva of 5 patients with oral submucous fibrosis, 5 patients with oral leukoplakia, 5 patients with oral lichen planus and 10 patients with oral squamous cell carcinoma of oral cavity using inductively coupled mass spectrometry (ICP- MS). The values were compared with 6 normal age and sex matched control subjects. There was significant difference of the mean salivary copper and zinc levels of premalignant and malignant lesions when compared to the normal controls. In oral cancer patients there was significant difference in the copper levels according the histodifferentiation in squamous cell carcinoma. Within the premalignant group the copper levels were more in the oral sub mucous fibrosis when compared to the leukoplakia and lichen planus. Copper zinc ratio decreased in premalignant and malignant group when compared to the normal group. Saliva may be used as a potential diagnostic tool, which can be efficiently employed to evaluate the copper and zinc levels in pre malignant and malignant lesions of oral cavity.

CONCLUSION

Serum levels of zinc and copper were higher in patients with oral cancer compared with controls. It can be suggested that assessment of oral precancer and cancer patients may help in earlier diagnosis and/or prognosis.

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