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Original Research

Assessment of serum trace element in oral pre-cancer and cancer patients

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ABSTRACT:

Background: Oral cancer is one of the 10 most common forms of cancer among men in developed countries and is ranked as the sixth most common cancer around the world. The present study was conducted to assess serum trace element in precancer and cancer patients. **Materials & Methods:** 80 patients of both genders were divided into 4 groups with 20 subjects each. Group I consisted of histopathologically confirmed cases of oral leukoplakia, group II consisted of casesof oral submucous fibrosis (OSMF), group III consisted ofhistopathologically confirmed cases of oral squamous cell carcinoma (OSSC) and group IV consisted of age and gender matched healthy controls. 5ml venous blood was collected from all subjects and the level of serum Cu, Zn and iron was estimated using Avanta atom absorption spectrophotometer. **Results:** The mean serum copper level in group I was 206.3µg/dL, in group II was 310.6µg/dL, in group III was 212.8µg/dL and in group IV was 194.2µg/dL. The difference was significant (P< 0.05). The mean serum zinc level in group I was 152.4 µg/dL, in group II was 146.5 µg/dL, in group III was 110.3 µg/dL and in group IV was 160.1 µg/dL. The difference was significant (P< 0.05). The mean serum iron level in group I was 210.5 µg/dL, in group II was 204.6 µg/dL, in group III was 194.2 µg/dL and in group IV was 348.2 µg/dL. The difference was significant (P< 0.05).**Conclusion:** There was significant increase in trace elements in all groups as compared to healthy control. Serum copper and zinc could be used as biomarkers for oral precancer and cancer.

Key words: Copper, Oral precancer, Zinc

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INTRODUCTION

Oral cancer is one of the 10 most common forms of cancer among men in developed countries and is ranked as the sixth most common cancer around the world. Oral cancer accounts for approximately 4% of all cancers and 2% of all cancer deaths worldwide.[1] The World Health Organization (WHO) reported oral squamous cell carcinoma (OSCC) as having one of the highest mortality ratios amongst all malignancies. In India OSCC accounts for 50-70% of all cancers. Around 90-95% of oral cancers occur predominantly in alcohol and tobacco users, between the 6th and 7th decades of life.[2]

The development of PMDs and oral cancer is a multistep process with several secondary modifying factors like diet and immunity.Alcohol, viruses, genetic mechanisms, candida and chronic irritation have modifying effects in the etiology of oral cancer. Trace elements are regarded as versatile anti-cancer agents that regulate various biological mechanisms.[3]Micronutrients like copper and iron are integral dietary components and have been the subject of recent studies focused on eliciting their role in pathogenesis and progression of these lesions. Many researchers have observed association between trace elements and cancer mortality.[5] Decrease in contents of Copper (Cu) and Zinc (Zn) in the blood of patients with head and neck cancer. The ratio of copper to zinc is also believed to be a reliable biomarker in development and progression of carcinogenesis.[6]The present study was conducted to assess serum trace element in precancer and cancer patients.

MATERIALS & METHODS

The present study comprised of 80 patients of both genders. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. Patients were divided into 4 groups with 20 subjects each. Group I consisted of histopathologically confirmed cases of oral leukoplakia, group II consisted of cases of oral submucous fibrosis (OSMF), group III consisted ofhistopathologically confirmed cases of oral squamous cell carcinoma (OSSC) and group IV consisted of age and gender matched healthy controls.

5ml venous blood was collected from all subjects and the level of serum Cu, Zn and iron was estimated using Avanta atom absorption spectrophotometer. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III	Group IV
Status	Oral leukoplakia	OSMF	OSCC	Control

Table I shows thatgroup I consisted of cases of oral leukoplakia, group II consisted of casesof oral submucous fibrosis (OSMF), group III consisted ofcases of oral squamous cell carcinoma (OSSC) and group IV consisted of healthy controls.

Table II Estimation of serum copper level

Groups	Mean (µg/dL)	P value
Group I	206.3	0.04
Group II	310.6	
Group III	212.8	
Group IV	194.2	

Table II, graph I shows that mean serum copper level in group I was 206.3µg/dL, in group II was 310.6µg/dL, in group III was 212.8µg/dL and in group IV was 194.2µg/dL. The difference was significant (P< 0.05).

Graph I Estimation of serum copper level

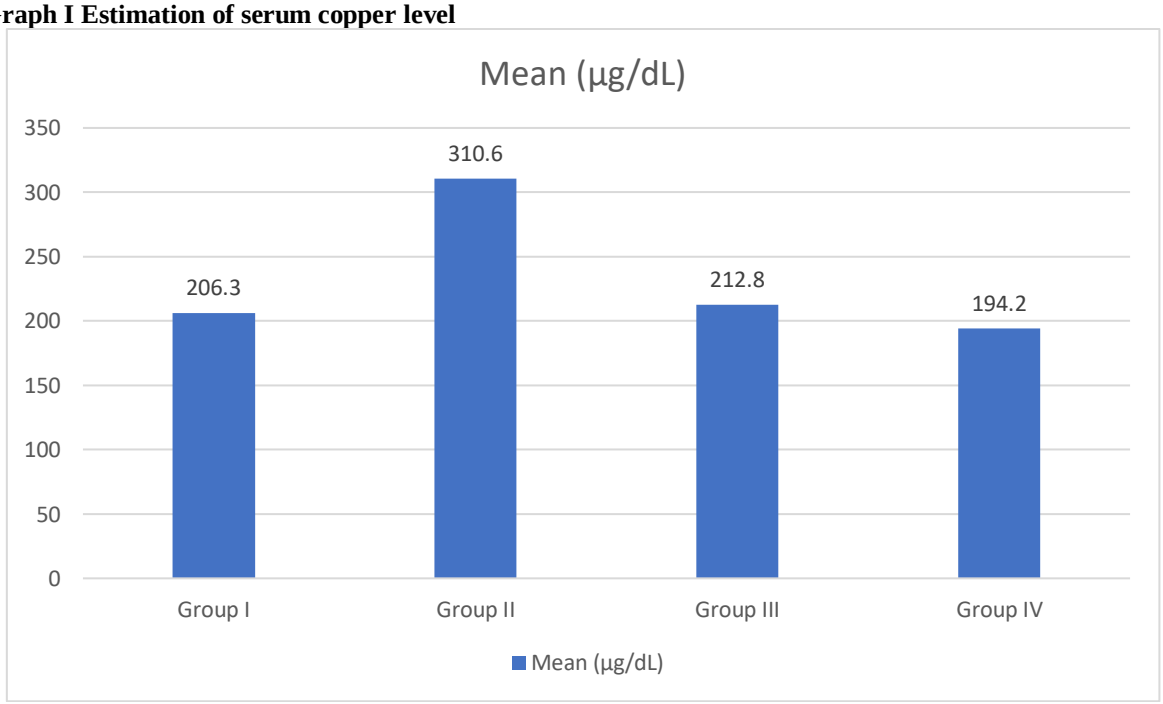

Table III Estimation of serum zinc level

Groups	Mean (µg/dL)	P value
Group I	152.4	0.05
Group II	146.5	
Group III	110.3	
Group IV	160.1	

Table III shows that mean serum zinc level in group I was 152.4 µg/dL, in group II was 146.5 µg/dL, in group III was 110.3 µg/dL and in group IV was 160.1 µg/dL. The difference was significant (P< 0.05).

Table IV Estimation of serum iron level

Groups	Mean (µg/dL)	P value
Group I	210.5	0.01
Group II	204.6	
Group III	194.2	
Group IV	348.2	

Table IV shows that mean serum iron level in group I was 210.5 µg/dL, in group II was 204.6 µg/dL, in group III was 194.2 µg/dL and in group IV was 348.2 µg/dL. The difference was significant (P< 0.05).

DISCUSSION

India has one of the highest incidences of oral cancer in the world. The development of cancer is a multistep process arising from pre-existing potentially malignant lesions.[7]Leukoplakia is the most common precancer representing 85% of such lesions.[8] Alcohol, viruses, genetic mechanisms, candida and chronic irritation have modifying effects in the etiology of oral cancer.The mouth and pharynx which are directly exposed to both inhaled and ingestible carcinogens like tobacco are at a higher risk for showing malignant changes.[9] Due to its association with these habits, oral cancer is more common in males but is increasingly being seen in females as well.[10]The present study was conducted to assess serum trace element in precancer and cancer patients.

We found that group I consisted of cases of oral leukoplakia, group II consisted of casesof oral submucous fibrosis (OSMF), group III consisted ofcases of oral squamous cell carcinoma (OSSC) and group IV consisted of healthy controls. Hosthor et al[11]evaluated the levels of circulating trace elements (copper, iron, magnesium, zinc and calcium) in serum of patients with Oral Submucous Fibrosis (OSF) and Oral Squamous Cell Carcinoma (OSCC), to analyzed the alteration and identify the best predictors amongst these parameters for disease occurrence and progression and their association with areca nut and betel quid chewing habits.Serum levels of trace elements (copper, iron, magnesium, zinc and calcium) were estimated using electronic absorption colorimetric method. The data analysis revealed that serum copper levels increased gradually from precancer to cancer, as the duration of betel quid chewing habit increased. However, serum iron, magnesium, zinc levels were decreased significantly in both the groups. Serum calcium levels were increased in the cancer group owing to bone resorption in the later stages of the disease, whereas it was close to normal in OSF patients. Among all the trace elements, the best predictor for occurrence of both the lesions was copper.

We found that mean serum copper level in group I was 206.3µg/dL, in group II was 310.6µg/dL, in group III was 212.8µg/dL and in group IV was 194.2µg/dL. Tiwari et al[12] compared the serum levels of copper, iron and circulating immune complexes (CICs) in patients diagnosed with PMDs and oral cancer and normal healthy individuals. In this study, 40 histopathologically diagnosed cases of PMDs and oral cancer were included along with 30 healthy controls and 5 ml of venous blood was drawn using venipuncture. Serum estimation of copper, iron and CIC then followed using the colorimetric and spectrophotometric methods. The mean serum copper level was measured as 138.98 ± 10.13µg/100ml in the PMD group and 141.99 ± 21.44 µg/100ml in the oral cancer as compared to 105.5 + 18.81µ/100ml in the controls. The mean serum CIC levels was highest in the oral cancer (9.65 ± 0.16OD_{470}) followed by the PMD group and least in the control group (0.048 ± 0.02OD_{470}). Whereas, the serum levels of iron showed a significant decrease in the PMD group (110.9 ± 10.54 µg/100ml) and the oral cancer group (114.29 ± 25.83 µg/100ml) as compared with the control group (136.85 ± 14.48 µg/100ml). There was no positive correlation obtained between the three groups with respect to the chosen parameters indicating that the variables were independent of each other.

We observed that mean serum zinc level in group I was 152.4 µg/dL, in group II was 146.5 µg/dL, in group III was 110.3 µg/dL and in group IV was 160.1 µg/dL. The mean serum iron level in group I was 210.5 µg/dL, in group II was 204.6 µg/dL, in group III was 194.2 µg/dL and in group IV was 348.2 µg/dL. Shetty et al[13]evaluated the levels of Copper, Zinc and iron in serum of patients with Oral leukoplakia, Oral Submucous Fibrosis and oral Squamous cell carcinoma. There was a highly significant increase in the level of serum copper in Oral submucous fibrosis patients when compared to controls (p=0.001). Serum copper levels were also elevated in oral leukoplakia and oral cancer patients (p=0.01). There was a significant decrease in the serum zinc levels in all three study groups when compared to controls (p=0.001). A highly significant reduction in serum Iron levels was noticed oral submucous fibrosis group. The copper to zinc ratio significantly increased in all the study groups when compared to controls. Results suggest that serum copper and zinc as well as the copper to zinc ratio could be used as biomarkers for oral precancer and cancer.

CONCLUSION

Authors found that there was significant increase in trace elements in all groups as compared to healthy control. Serum copper and zinc could be used as biomarkers for oral precancer and cancer.

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