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OriginalArticle

Estimation of Serum Copper and Zinc levels in Oral Submucous Fibrosis Patients: A Biochemical Study

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***ABSTRACT*:**

Background: The pathogenesis of the oral submucous fibrosis (OSMF) is not well established; however, epidemiological evidence strongly suggests an association between areca nut and oral OSMF. Hence; we planned the present study to assess the role of serum copper and zinc levels in OSMF patients. **Materials & methods:** In the present study, we included patients that were diagnosed histopathologically as Oral Submucous Fibrosis (OSMF). A total of 50 subjects were included in the present study, out of which, 25 were of OSMF and 25 were normal control. Patients were called in the morning time, and samples were taken and were sent to laboratory for estimation of serum copper and zinc levels. All the results were evaluated by SPSS software. **Results:** We observed significant results while comparing the mean serum copper levels and zinc levels in OSMF patients and normal controls. **Conclusion:** Copper and zinc do play a significant role in the pathogenesis of OSMF.

Key words: Copper, Oral submucous fibrosis, Zinc

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INTRODUCTION

The pathogenesis of the oral submucous fibrosis (OSMF) is not well established; however, epidemiological evidence strongly suggests an association between areca nut and oral OSMF. It is usually considered to be a result of persistent chemical irritation from the betel quid constituents and the mechanical irritation of the oral mucosa from the coarse fibers of areca nut.[1-3]

Data from the past studies show a crucial role of copper and zinc as a mediator of fibrosis in OSMF. OSMF is considered as Asian version of sideropenic dysphasia, where chronic copper and zinc deficiency leads to mucosal susceptibility to irritants such as chilies and Areca nut products. Trace elements or micro nutrients are chemical elements required in minute amounts.[4-6]The enzymes of trace elements are an important part of certain biological and chemical reactions. The ratio of copper to zinc is also believed to be a reliable biomarker in the development and progression towards OSMF. Copper is an abundant mineral in the body and is involved in the release process of energy inside the cell formation of red blood cells, collagen production and iron absorption. Zinc is needed for a healthy immune system, cell division, hair, skin and muscle growth.[7-9]Hence; we planned the present study to assess the role of serum copper and zinc levels in OSMF patients.

MATERIALS & METHODS

In the present study, we included patients that were diagnosed histopathologically as Oral Submucous Fibrosis (OSMF) in Jammu region.

Ethical approval

Ethical clearance was taken from the Ethical Committee of the Dental College and Hospital and written informed consent was obtained from all the subjects.

Exclusion criteria:

- Subjects suffering from chronic disease,
- Patients with any known drug allergy,
- Patients with history of any other metabolic disorder

A total of 50 subjects were included in the present study, out of which, 25 were of OSMF and 25 were normal control. Patients were called in the morning time, and samples were taken and were sent to laboratory for estimation of serum copper and zinc levels. All the results were evaluated by SPSS software. Chi- square test was used for assessment of level of significance.

Table 1: Showing the Mean values & Standard Deviation of the serum copper concentration (µg/dL) observed in Normal Control (NC) and patients of OSMF.

GROUPS	NO. OF SPECIMENS	SERUM COPPER LEVELS	
		MEAN	S.D
NC	25	126.41	16.74
OSMF	25	220.15	13.84

Table 2: Showing the Mean values & Standard Deviation of the serum Zinc concentration (µg/dL) observed in Normal Control (NC) and patients of OSMF.

GROUPS	NO. OF SPECIMENS	SERUM ZINC LEVELS	
		MEAN	S.D
NC	25	94.85	12.11
OSMF	25	52.64	8.97

Table 3: Showing the t-value and p-value of the mean serum copper levels comparing between specimens of OSMF and specimens of normal control.

GROUPS	No. OF SPECIMENS	MEAN SERUM COPPER LEVELS	
		t - value	p – value
OSMF vs NC	50	7.41	< 0.05 (s)

S = Significant

Table 4: Showing the t-value and p-value of the mean serum zinc levels comparing between specimens of OSMF and 40 specimens of normal control.

GROUPS	No. OF SPECIMENS	MEAN SERUM ZINC LEVELS	
		t - value	p – value
OSMF vs NC	50	8.41	< 0.05 (s)

S = Significant

RESULTS

In the present study, we observed significant results while comparing the mean serum copper levels and zinc levels in OSMF patients and normal controls.

DISCUSSION

We observed significant results while comparing the mean serum copper levels and zinc levels in OSMF patients and normal controls. Mathew et al estimated and compared the copper content of raw areca nuts in three different stages of maturity, and commercial areca nut products. Raw areca nut samples of three different maturities were obtained from four plantations in Sullia, Karnataka, India and commercial areca nut products were obtained from local shops in Chidambaram, Tamil Nadu, India. The samples were grounded and subjected to Atomic Absorption Spectrometry (AAS) for copper analysis. There was statistically significant difference in copper content in raw areca nuts of all three maturities ($p<0.05$) and was highest in the exfoliated mature nuts. Importantly copper level was significantly higher in the commercial products compared to raw areca nuts of different degrees of maturity ($p<0.05$). The copper levels in commercial products are significantly higher than that of raw areca nuts in all three stages of maturity. The increase in copper content on processing and post commercialization can be related to the increasing prevalence of OSMF.[10]

Hosthor et al 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 analyze the alteration and identified 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. These levels were compared with controls and statistically evaluated using ANOVA and POST-HOC TUKEY tests. 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. The present study showed that the above trace elements may be associated with the pathogenesis and progression of OSF and OSCC. Betel quid and areca nut chewing habits are frequently associated with both disease states and may play a role in altering the serum levels of these trace elements. Concerted efforts would, therefore, help in early detection, management and monitoring the

efficacy of treatment.[11] Desai et al attempted to search, at molecular level, the reasons for alterations in trace metals occurring and their role, if any, in the etiopathogenesis of OSMF and carcinogenesis, with an aim to improve prognosis. Also to evaluate the role of copper (Cu) and zinc (Zn) along with cadmium (Cd), chromium (Cr), and nickel (Ni) which may have a role in carcinogenesis. It was an observational cross‑sectional study. Subjects and Methods: The study comprised 50 patients each in group‑A with oral submucous fibrosis, group B (chewing habit without oral submucous fibrosis), and group C (healthy individuals without chewing habit). The serum levels of Cu, Zn, Cd, Cr, and Ni were analyzed from venous blood using atomic absorption spectrometry. Statistical Analysis: The data were analyzed by Student's unpaired ''t'‑test and one‑way analysis of variance Bonferroni post‑hoc test using SPSS software. Results: Groups A and B showed a highly significant statistical difference in serum values of Cu, Zn, and Cd ($P < 0.001$). The values of Cu and Cd were significant when compared among groups A and C. Statistically significant difference in values of Cu, Zn, and Cr were found when compared between groups B and C. The altered values of serum observed may be a reflection of the tissue levels. Copper's role in pathogenesis of OSMF is reestablished with proposed role of Zn, Cd, Cr, and Ni in carcinogenesis.[12]

CONCLUSION

From the above results, the authors concluded that copper and zinc do play a significant role in the pathogenesis of OSMF.

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