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Assessment of Serum Levels of Copper and Zinc in OSMF Patients: A Preliminary Study

Arti Mewara[1*] Hemani Sukhija[2] Tarun Vyas[3] Satish Bhosale[4] Priyanjali Dutta[5] Ramya Ramadoss[6]

[1]Reader, Department of Oral Pathology & Microbiology, R.R. Dental College & Hospital, Umarda, Udaipur, India.
[2]Professor, Department of Oral Pathology & Oral Microbiology, Index Institute of Dental Sciences, Indore, India.
[3]Senior Lecturer, Department of Oral Medicine and Radiology, R.R. Dental College & Hospital, Umarda, Udaipur, India.
[4]Senior Lecturer, Department of Oral Pathology & Microbiology, R.R. Dental College & Hospital, Umarda, Udaipur, India.
[5]Senior Lecturer, Department of Oral Pathology & Microbiology, R.R. Dental College & Hospital, Umarda, Udaipur, India.
[6]Reader, Department of Oral Pathology & Microbiology, SRM Dental College, Ramapuram, Chennai, India.

ABSTRACT

Background: Oral submucous fibrosis (OSMF) is one of the common chronic debilitating diseases of the oral cavity. The role of copper and zinc as mediators in the pathogenesis of fibrosis in OSMF has been postulated. Hence, the present preliminary study was planned to assess serum levels of copper and zinc in OSMF patients.

Materials & methods: The present study included evaluation of serum copper and zinc levels in OSMF patients. A total of 20 OSMF patients and 20 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 serum copper levels of OSMF group subjects were found to be significantly higher in comparison to the mean serum copper levels of the control group. The mean serum zinc levels of OSMF group subjects were found to be significantly lower in comparison to the mean serum zinc levels of the control group.

Conclusion: Both copper and zinc play mediating roles in the pathogenesis of oral submucous fibrosis and may be considered to be of diagnostic value.

Keywords: Copper, Zinc, Oral submucous fibrosis, OSMF, Trace element.

INTRODUCTION

Oral submucous fibrosis (OSMF) is a common chronic debilitating disease of the oral cavity. The potentially malignant nature of OSMF was first described by Paymaster, who observed the onset of slow-growing squamous cell carcinoma in one third of such patients. Copper has diverse roles in biological electron transport and oxygen transportation.[1-3]

Interest in the role of copper as a mediator of fibrosis in OSMF has been postulated. Zinc is an essential trace element, necessary for plants, animals, and microorganisms.[4] Zinc is found in nearly 100 specific enzymes and serves as structural ion source in transcription factors. OSMF is considered as Asian version of sideropenic dysphagia, where chronic copper and zinc deficiency leads to mucosal susceptibility to irritants such as chillies and areca nut products. Trace elements or micronutrients are chemical elements required in minute amounts.[5-7] The present study was planned and conducted to assess serum levels of copper and zinc in OSMF patients.

AIMS AND OBJECTIVES

The aim of the present study was to evaluate whether copper and zinc play a role in the

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*Correspondence Dr. Arti Mewara.
Department of Oral Pathology & Microbiology, R.R. Dental College & Hospital, Umarda, Udaipur, India.
Email: Not Disclosed

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pathogenesis of oral submucous fibrosis and whether these elements may be considered as diagnostic indicators for OSMF. The objectives were to evaluate the change in serum copper and zinc levels in OSMF patients and compare the same with the apparently healthy control group.

MATERIALS & METHODS

The present study was conducted in the department of Oral Pathology and Oral Microbiology of the dental institute and it included evaluation of serum copper and zinc levels in OSMF patients. Ethical clearance was obtained from the concerned committee. Consent from subjects was taken after explaining the research protocol.

A sample of 40 subjects comprising of 20 OSMF patients and 20 apparently healthy controls were included in the present study. Patients included in the OSMF study group were evaluated based on history, clinical correlation, histopathological examination of suspected lesion. The study group was evaluated for areca nut consumption and other habits, and not presenting with any other systemic illness. The control group included apparently healthy subjects with no habits. The subjects included in the study group and control group were within the range of 25-50 years of age.

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.

Blood samples were obtained in the morning hours for standardization and were assessed for serum copper and zinc levels by standardized methods.

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 $\leq$0.05 was taken as significant.

RESULTS

In the present study, 20 OSMF patients and 20 apparently healthy controls were analysed. Mean age of the subjects in the OSMF group and the control group was 44.5 years and 48.2 years respectively.12 subjects in the study group and 14 subjects in the control group were males.

The mean serum copper levels of the study group and control group were 210.84 µg/dL and 120.52 µg/dL respectively as depicted in **Graph 1**. 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 56.42 µg/dL and 90.14 µg/dL respectively as shown in **Graph 1**. 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**).

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

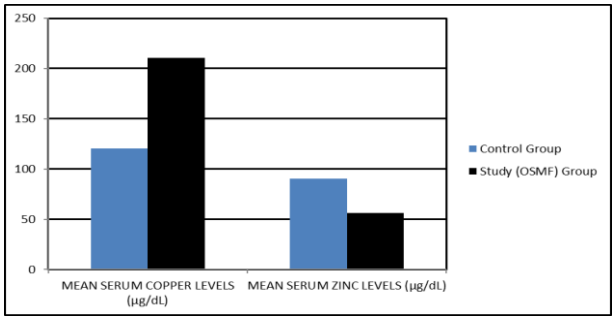
GROUP	NUMBER OF SUBJECTS	MEAN SERUM COPPER LEVELS(µg/dL)	SD	P-VALUE
Normal control	20	120.52	14.52	0.03*
OSMF	20	210.84	18.11	

* Significant

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	20	90.14	14.28	0.01*
OSMF	20	56.42	8.55	

*Significant



Graph 1: Mean serum copper and zinc levels in subjects of both the study groups.

DISCUSSION

Etiological factors which trigger OSMF include areca nut chewing, nutritional deficiencies, immunologic process and genetic predisposition. Most of the trace elements mediate vital biochemical reactions by acting as cofactors or catalysts for many enzymes. They also participate in building stabilizing structures such as enzymes and proteins. The accumulation or deficiency of these elements may stimulate an alternate pathway which contributes in the pathogenesis of disease.[8-10]Hence, considering the aforementioned, the present study was planned to assess serum levels of copper and zinc in oral submucous fibrosis patients.

In the present study, the mean serum copper levels of OSMF 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**). It was also observed that the mean serum zinc levels of OSMF 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.[10-12]

Khanna *et al*, 2013 noted that oral cancer is a major cause of cancer morbidity and mortality worldwide and is prevalent in most areas where tobacco related practices are observed. Essential elements play a role in many biochemical reactions as a micro-source and there is growing evidence that their concentrations are altered on the onset and progress of malignant disease.[13]

Joshi *et al*, 2015 evaluated and compared the copper content and its depth of penetration in tissue sections of diagnosed cases of oral precancer and cancer by using rhodamine staining method. This retrospective analytical study was conducted on histologically diagnosed 10 cases each of oral leukoplakia (OL), OSMF, and oral squamous cell carcinoma (OSCC). Ten cases of normal mucosa served as control. The selected cases were subjected to staining with rhodamine for qualitative analysis of copper content. Paired t-test showed a significant increase in copper content in the study group (P = 0.516) as compared to control group. Krushall–Wallis non-parametric test showed higher mean value of copper content in cases of OSMF (2.00) than the cases of OL (1.20) and OSCC (1.70). From the results, they concluded that copper content by rhodamine staining technique was found to be higher in OSMF than OL and OSCC this staining technique can be used as a prognostic indicator for assessment of disease progression.[14]

Yadav *et al*,2015 conducted a study on fifty subjects with clinically diagnosed OSMF and fifty controls with no apparent lesions of the oral mucosa and without any areca nut related oral habit. The level of serum zinc was significantly lower among cases compared with controls. However, the serum copper level was significantly higher among cases than controls. The level of serum iron was observed to be lower among the cases as compared to controls, and the difference was statistically significant. They concluded that serum zinc, copper, and iron levels could be used as potential prognostic and diagnostic markers in OSMF patients.[15]

Nayak *et* al, 2010 observed that trace elements have been extensively studied to assess whether they have any modifying effects in the etiology of oral malignant conditions but relatively less scientific work has been performed in the area of oral premalignant conditions. In their study, they concluded that OSMF patients have markedly increased concentrations of copper within the oral mucosa and a definite reduction in the tissue zinc concentration which suggests that both an increased copper level and a decreased zinc level operate at the local level in OSMF tissue.[16]

Kamath *et al*, 2013 mentioned in their review that a strong role played by copper in the etiology of OSMF has been postulated and reduced levels of zinc in OSMF were found in most studies.[17]

From the results of the present study, it may be observed that the levels of copper increased significantly and those of zinc decreased significantly in OSMF study group subjects supporting that both these elements may have a role in the pathogenesis of OSMF.

CONCLUSION

It may be inferred by the results yielded that both copper and zinc play a mediating roles in the

pathogenesis of OSMF and may be of diagnostic value. However, further studies are recommended for better exploration of the same.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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