

Original Article

Evaluation of Mucosal Copper Levels among patients with Oral Submucous Fibrosis: A Clinical Study

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ABSTRACT:

Background: Oral submucous fibrosis (OSMF) is a well-recognized potentially malignant condition of oral cavity. Trace elements have been extensively studied in recent years to assess whether they have any modifying effects in the aetiology of oral malignant conditions. Hence; we planned the present study to assess the mucosal copper levels in OSMF patients. **Materials & methods:** The present study included assessment of mucosal copper levels in OSMF patients. A total of 40 OSMF patients and 40 normal controls were included in the present study. For the copper estimation a dilution in the ratio of 1:1 of the solution was used. Estimation of the copper content was achieved by the colourimetric method. All the results were analyzed by SPSS software. **Results:** Mean mucosal copper levels of OSMF patients was found to be 4.68 while of normal control was found to be 2.95 respectively. Significant results were obtained while comparing the mean mucosal copper levels in between the study group and control group. **Conclusion:** Copper does play a significant role in the pathogenesis of OSMF.

Key words: Copper, Mucosal, Oral submucous fibrosis.

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INTRODUCTION

Oral submucous fibrosis (OSMF) is a well-recognized potentially malignant condition of oral cavity.¹ It can lead to oral cancer, a disfiguring and potentially fatal disease continuing to rise in incidence among younger and older people alike necessitates astute surveillance.² The role of trace elements in various diseases has been a matter of controversy with various authors reporting on conflicting data.³⁻⁵ Trace elements have been extensively studied in recent years to assess whether they have any modifying effects in the aetiology of oral malignant conditions. Relatively less scientific work has been performed in the area of oral premalignant conditions.⁶⁻⁸ Hence; we planned the present study to assess the mucosal copper levels in OSMF patients.

MATERIALS & METHODS

The present study was planned in the department of oral medicine and radiology of the medical institute and included assessment of mucosal copper levels in OSMF patients. Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 40 OSMF patients and 40 normal controls were included

in the present study. Exclusion Criteria for the present study included:

- Patients who have received treatment for OSF previously were excluded from the study.
- Patients with history of any systemic diseases such as diabetes, hypertension, anemia, jaundice, liver or kidney disorders or any other were excluded from the study.

An incisional biopsy was taken of representative part of oral mucosa of patients. For the copper estimation a dilution in the ratio of 1:1 of the solution was used. Estimation of the copper content was achieved by the colourimetric method. The absorbance of these samples was compared to that of the standard solution provided in the kits at 578 nm in a digital photometer.

STATISTICAL ANALYSIS

All data analysis was carried out using Statistical Package for Social Science 17 (SPSS, Version 17) for the descriptive analysis & statistical tests of significance. The independent unpaired t- test was used to compare the mean scores among the study groups. P- value of less than 0.05 was taken as significant.

RESULTS

A total of 40 OSMF and 40 Normal controls were included in the present study. Mean mucosal copper levels of OSMF patients was found to be 4.68 while of normal control was found to be 2.95 respectively. Significant results were obtained while comparing the mean mucosal copper levels in between the study group and control group.

Table 1: Showing the Mean values & Standard Deviation of the mucosal copper concentration ($\mu\text{g/gm}$) observed in 40 Normal Control (NC) and 40 patients of OSMF.

Groups	No. of Specimens	Mucosal Copper Levels		P- value
		Mean	S.D	
NC	40	2.95	0.74	0.02*
OSMF	40	4.68	0.64	

NC: Normal control

*: Significant

DISCUSSION

In the present study, we observed a significant difference in the mean mucosal copper levels in OSMF patients and normal control. Joshi et al 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 OL, OSMF, and 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 thatcopper 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.⁹ Mathew et al estimated and compared the copper content in areca nuts from plantations with and without copper-based fungicide usage. Four areca nut plantations from Dakshina Kannada district, Karnataka (group A) and four plantations from Ernakulam district, Kerala (group B) were selected for the study. The plantations from Karnataka used copper-based fungicide regularly, whereas the latter were devoid of it. Areca nut samples of three different maturities (unripe, ripe, and exfoliated) obtained from all plantations were dehusked, ground, and subjected to atomic absorption spectrometry (AAS) for copper analysis. There was statistically significant difference in the copper content of areca nuts from both groups. The areca nuts from plantations treated with copper-based fungicide showed significantly higher copper levels in all maturity levels compared to their counterparts in the other group ($P < 0.05$). The high

copper content in areca nut may be related to the copper-based fungicide treatment on the palms. These areca nuts with high copper content used in quid or commercial products may be responsible for the increasing prevalence of OSMF.¹⁰ Srilekha et al evaluated the level of copper, zinc and copper zinc ratio in serum of patients containing OSMF and to evaluate whether copper and zinc could be used as prognostic indicators in the development of OSMF. 60 age and sex matched individuals of OSMF and healthy controls were taken for this study. Under aseptic precautions 5 ml of venous blood was collected and serum copper and zinc level were estimated by spectrophotometric method. From the results, they concluded that that copper and zinc deficiency develop in OSMF. Copper and zinc level have important causative role in OSMF. Serum copper and zinc level are sensitive, but not specific, whereas serum copper zinc ratio is the most reliable indicator in assessing progression of malignancy. Though the trace elements are required in minimum quantity, their amount is necessary for the functioning of the body. This study indicated that the Copper / zinc ratio can be used as a reliable bio marker for the detection of Oral Cancer.¹¹ Singh et al estimated tissue copper level in OSMF patients with habit of areca nut chewing and to correlate any change in tissue copper level with histopathological grading of OSMF. A hospital based case-control study was done on 30 subjects visiting out-patient department (OPD) of Kothiwal Dental College Moradabad, of which 15 were clinically diagnosed OSMF cases with habit of areca nut chewing and 15 were taken as controls with no habit of areca nut chewing. Tissue copper levels were measured by Atomic Absorption Spectrophotometer (AAS). The study showed highly significant difference in mean tissue copper level ($P < 0.001$) in patients with OSMF and controls, with patients exhibiting higher tissue copper level (6.43 ± 1.11) in contrast to control who presented low tissue copper level (4.35 ± 0.91), also a highly significant correlation ($P < 0.001$) was seen between increase in tissue copper level and histopathological staging of OSMF. The present study confirms the hypothesis that copper level in increased in areca nut chewers presenting OSMF. Moreover, copper level increased with increased in histopathological grade of OSMF.¹²

CONCLUSION

From the above results, the authors concluded that copper plays a definite role in the pathogenesis of OSMF. However; future studies are recommended.

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