

Evaluation of role of trace elements in oral submucous fibrosis patients

Dr. Priyanka Raghav¹, Dr. Anjali Khare²

¹Associate Professor, Department of Oral Pathology, Subharti Dental College, Swami Vivekanand Subharti University, Meerut.

²Professor and Head, Department of Pathology, Subharti Medical College, Swami Vivekanand Subharti University, Meerut.

¹pradeep29raghav@gmail.com

Abstract— Background: This study was conducted to assess the role of trace elements in oral submucous fibrosis patients.

Material and methods: The study sample comprised 150 participants, with 100 individuals diagnosed with OSMF being the cases group and 50 persons as the control group. Histopathological investigation revealed the presence of OSMF in all of the cases. The blood samples were collected from a total of 150 individuals and were then analyzed using a digital autoanalyzer photometer. The purpose of this analysis was to determine the serum levels of copper using the colorimetric method. Statistical analysis was used to compare the results obtained for both cases and controls.

Results: It was observed that the concentrations of copper were reduced in the control group and raised in study group.

Conclusion: The gold standard for diagnosing Oral Submucous Fibrosis (OSMF) is biopsy; however, this approach is invasive and time-consuming. Currently, numerous contemporary advancements are employed to facilitate the early detection of OSMF and mitigate its development towards advanced and reversible phases. Trace elements have the potential to function as prognostic and diagnostic markers for patients with oral submucous fibrosis (OSMF).

Keywords— OSMF, trace elements

Introduction

Oral submucous fibrosis (OSMF) is a chronic, precancerous condition, found to affect the South and South East Asian population, especially those of the Indian subcontinent.¹ It has now

become an Indian epidemic with an estimated 2.5 million people being affected with this disease.^{2,3} It has been suggested that areca nut chewing, consumption of chillies, genetic susceptibility, nutritional deficiency, autoimmunity and collagen disorders may be involved in the pathogenesis of this condition.⁴ The most common a etiology considered for causation of OSMF is “arecoline” which is a constituent of areca nut. In the later advanced stage of OSF, a fibrous band that restricts mouth opening (trismus) is characteristic. It causes further problems in oral hygiene, speech, mastication, and possibly swallowing. Development of fibrous bands in the lip leads to thickening and rubbery appearance. It becomes difficult to retract or evert the lips, which transform into an elliptical shape.⁵

Hence, this study was conducted to assess the role of trace elements in oral submucous fibrosis patients.

Material and methods

The study sample comprised 150 participants, with 100 individuals diagnosed with OSMF being the cases group and 50 persons as the control group. Histopathological investigation revealed the presence of OSMF in all of the cases. The blood samples were collected from a total of 150 individuals and were then analysed using a digital autoanalyzer photometer. The purpose of this analysis was to determine the serum levels of copper using the colorimetric method. The data analysis was conducted utilizing SPSS version 12.0 for Windows, developed by SPSS, Inc., based in Chicago, IL, USA. The statistical confirmation of the association between clinical staging and histological grading was achieved by the application of Pearson's correlation coefficient. The statistical analysis employed an independent t-test to examine the disparities in mean serum copper levels between the study and control groups.

Results

TableI: Comparison of mean serum copper concentrations ($\mu\text{g/ml}$) in individuals of study group and control group.

GROUP	MEAN COPPERCONCENTRATION ($\mu\text{g/ml}$)
Study group	192.53

Control group	106.89
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It was observed that the concentrations of copper were reduced in the control group and raised in study group.

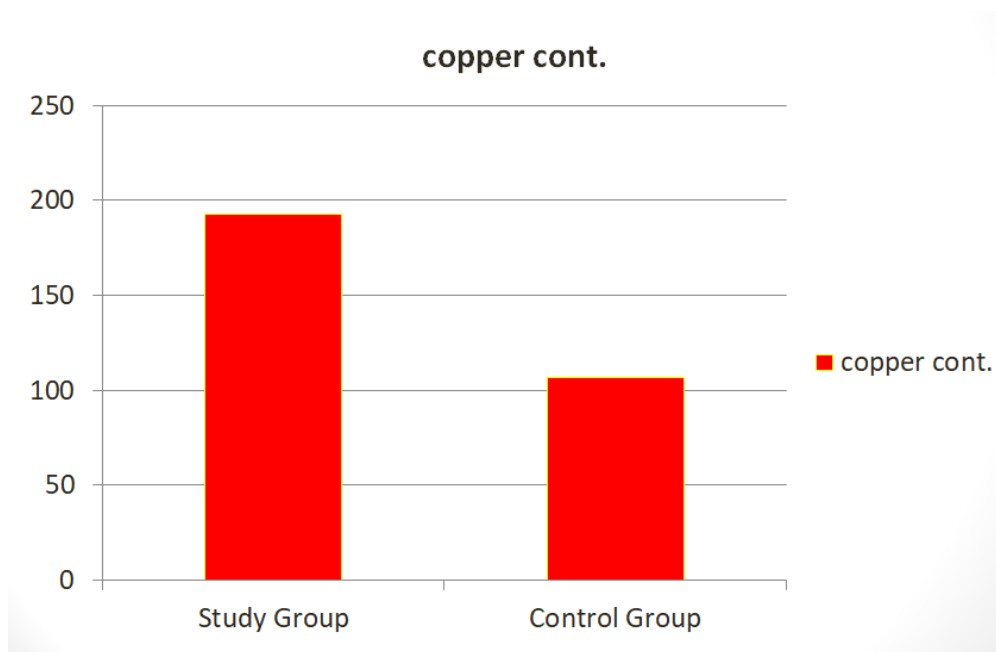


Figure I: Copper Concentration in study and control group

The study comprised of 150 participants, with 100 individuals diagnosed with OSMF being the cases group and 50 persons as the control group. Histopathological investigation revealed the presence of OSMF in all of the cases. Purpose of the analysis was to determine the serum levels of copper using the colorimetric method.

The comparison between the study group and control group is done. It was observed that the concentrations of mean copper were reduced in the control group and raised in study group. The difference between mean serum copper in OSMF among study group is found statistically significant ($p < 0.01$).

Therefore, In present study serum copper was significantly increased in OSMF patients of study group as compared to control group.

Discussion

One of the leading causes of death in India is Cancer. There is a high rate of malignant transformation of premalignant states like oral leukoplakia and oral submucous fibrosis. Among various premalignant conditions, OSMF is of important concern due to its mutilating condition that it produces in the patient¹².

Oral mucosal diseases like oral submucous fibrosis (OSMF), the topic of interest, are increasing in an alarming frequency irrespective of metro cities in India. Meanwhile, the prevalence of the Betel Nut products in India is 0.2 – 1.2%².

Trace elements like copper and zinc have a role in the anticarcinogens defence system of the human body. Copper is involved in the cell metabolism, as a part of various enzymes tyrosinase, uricase and cytochrome oxidase, which are mainly concerned with oxidation reactions. It was observed that mean serum copper levels were significantly higher in the patients with oral premalignant and malignant lesions¹³.

Chennai is one of the metro cities located in the southern part of India. Warnakulasuriya et al⁶ reported OSMF as one of the potentially malignant disorders (PMD) of oral mucosa, which can lead to OSCC. Areca nut- associated oral squamous cell carcinoma is the third most common malignancy in the developing world and oral submucous fibrosis (OSMF) has been reported as the PMD of the oral cavity that has high prevalence rate in India.⁷ According to Rajalalitha et al,⁸ the incidence rate of OSCC in patients with OSMF has been estimated to be 2.3-7.6%. The morbidity and mortality rate of the disease are still high in most of the countries with a survival rate of 50-63%.^{9,10}

OSMF is a pathological lesion of the oral mucosa, which is characterized by chronic inflammation and epithelial atrophy along with loss of rete ridges leading to hyalinization and fibrosis of submucosal tissue. As the disease progresses, patients experience difficulty in opening their mouth due to excessive fibrosis of buccal mucosa. Areca nut chewing is the main factor that contributes to the pathogenesis of the disease. An experiment conducted in mice showed that, a long-term topical application of aqueous extract of areca nut lead to the epithelial atrophy followed by the infiltration of immune cells into the subepithelial layer and the gradual deposition of collagenous matrix components.¹¹

Hence, this study was conducted to assess the role of trace elements in oral submucous fibrosis patients. Furthermore, much attention has been given towards detection of trace elements in oral cancer and precancerous¹².

In this study, the serum copper level was significantly ($P < 0.0001$) higher among the cases than controls. It was similar to the study by Balpande *et al.*¹² where it has been concluded that the serum copper was increased significantly in OL, OSMF, and OSCC. Thus, the assessment of Cu, Zn, Fe and Cu/Zn ratio can be used as auxiliary test to the diagnosis and of oral pre cancer and cancer lesions¹². Further in study conducted by Shetty *et al.* copper to zinc ratio significantly increased in all the study groups when compared to controls, suggesting that the serum copper and zinc as well as the copper to zinc ratio could be used as biomarkers for oral precancer and cancer¹³. Increased serum copper in OSMF can be correlated to copper present in areca nut increases the collagen production in oral fibroblasts by upregulating lysyl oxidase leading to crosslinking of collagen and elastin. Trivedy *et al.* has also reported on the copper-induced mutagenesis through the p53 aberrations in OSMF, which may be critical in the progression of the potentially malignant lesions to squamous cell carcinoma.¹⁴

Conclusion

It was observed that the concentrations of copper were reduced in the control group and raised in study group. Future studies investigating the levels of Cu and Zn in precancerous and cancerous tissue and correlating them with serum changes would be useful in determining the role of these micronutrients in oral carcinogenesis¹³.

Trace elements have the potential to function as prognostic and diagnostic markers for patients with oral submucous fibrosis (OSMF). However the results of the present study reveal that Copper can be used as biological markers in oral carcinogenesis.

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