

Evaluation of Salivary Copper and Zinc Levels in OSMF Patients

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ABSTRACT

Background: Oral Submucous fibrosis (OSMF) is known and established to be precancerous. Altered trace element status has been reported in both the potentially malignant and malignant stages. Hence; the present study was conducted for evaluating the salivary copper and zinc levels in OSMF patients.

Materials & methods: A total of 30 patients with confirmed clinical and histopathologic diagnosis of OSMF were included in the present study. Another set of 30 subjects with absence of any tobacco or area-nut habit, which came for routine dental check-up were included as healthy controls. Complete demographic and clinical details were recorded. After confirming the diagnosis, all the subjects were recalled in the morning and were made to sit on the dental chair. Salivary samples were obtained in a sterile test tube and were sent to the laboratory for assessment. Auto-analyser was used for analysing the salivary copper and zinc levels.

Results: Mean salivary copper levels among the patients of the OSMF group and control group was 0.039 µg/ml and 0.019 µg/ml, respectively. Mean salivary zinc levels among the patients of the OSMF group and control group was 0.468 µg/mL and 0.239 µg/mL, respectively. While comparing statistically, it was seen that mean salivary copper and zinc levels were significantly increased in OSMF patients.

Conclusion: Copper and zinc are significantly altered in OSMF patients highlighting their role in the pathogenesis of the disease. However; further studies are recommended.

Keywords: Copper, Zinc, Oral submucous fibrosis.

INTRODUCTION

Oral Submucous fibrosis (OSMF) is known and established to be precancerous. In 2002, the statistics for OSMF from the Indian continent alone was about 5 million (0.5% of the population of India). This rise in OSMF in India has been attributed to the increased consumption of Gutkha, of which areca nut is the main ingredient, along with detectable levels of trace elements like copper, zinc, iron and magnesium. OSMF is a fibrotic condition of the oral cavity and is always associated with chronic epithelial inflammation and progressive deposition of collagenous extracellular

matrix (ECM) proteins in the subepithelial layer of the buccal mucosa.¹⁻³

Altered trace element status has been reported in both the potentially malignant and malignant stages. Microminerals are well established to be essential in metabolism as components of enzymes and hormones in the body. This study will focus on two trace minerals—Zinc (Zn) and Copper (Cu), that are altered in OSMF. Zinc is crucial for the normal functioning of the immune cells, antioxidant defence, wound healing, and stability of biological membranes.^{4, 5} Hence; the present study was

Received: May. 12, 2020; Accepted: July. 2, 2020

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conducted for evaluating the salivary copper and zinc levels in OSMF patients.

MATERIALS & METHODS

The present study was conducted in the department of oral pathology at R.K.D.F. Dental College and Research Centre, Bhopal" in place of the department of oral pathology. It included assessment of salivary copper and zinc levels in OSMF patients.

A total of 30 patients with confirmed clinical and histopathologic diagnosis of OSMF were included in the present study. Another set of 30 subjects with absence of any tobacco or area-nut habit, which came for routine dental check-up were included as healthy controls. Complete demographic and clinical details were recorded. Thorough oral examination of all the subjects was carried out. Habit history was recorded separately in OSMF patients. After confirming the diagnosis, all the subjects were recalled in the morning and were made to sit on the dental chair. Salivary samples were obtained in a sterile test tube and were sent to the laboratory for assessment. Auto-analyser was used for analyzing the salivary copper and zinc levels. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Student t test was used for evaluation of level of significance.

RESULTS

In the present study, a total of 30 OSMF patients and 30 controls were enrolled. Mean age of the patients of the OSMF group and the control group was 49.5 years and 50.7 years, respectively. There were 19 males and 11 females in the OSMF group and 20 males and 10 females in the control group.

In the present study, mean salivary copper levels among the patients of the OSMF group and control group was 0.039 µg/mL and 0.019 µg/mL, respectively. Mean salivary zinc levels among the patients of the OSMF group and control group was 0.468 µg/mL and 0.239 µg/mL, respectively. While comparing statistically, it was seen that mean salivary copper and zinc levels were significantly increased in OSMF patients.

Graph 1: Demographic details

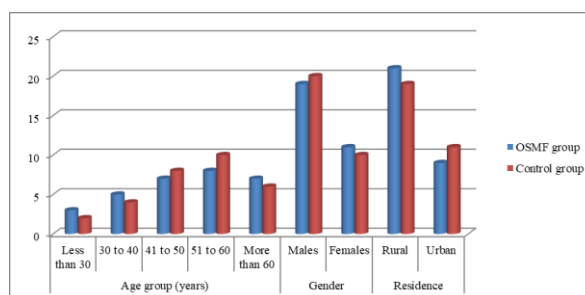


Table 1: Comparison of salivary copper and zinc levels.

Parameter		OSMF group	Control group	p- value
Salivary copper levels (µg/mL)	Mean	0.039	0.019	0.001*
	SD	0.019	0.011	
Salivary Zinc levels (µg/mL)	Mean	0.468	0.293	0.000*
	SD	0.236	0.196	

*: Significant

DISCUSSION

OSMF is a potentially malignant disorder that causes fibrosis and inflammation of the oral mucosa. This condition is more prevalent in South and Southeast Asia, particularly India, with fewer cases reported in Europe and North America. The prevalence of OSMF cases has increased from 0.03% to 6.42% in the last four decades, making it a significant public health problem in India. This disease contributes significantly to mortality because of its high malignant transformation rate of 7.6%.^{5,6}

The high incidence was attributed to several factors such as chewing, smoking and viral infections. Whatever may be the causative factors, very little information is available on the biochemical and immunological derangements. The role of certain trace metals, especially zinc in the pathology of various diseases has been the subject of a number of comprehensive reviews. Zinc and copper have been the most extensively studied of the trace elements in patients with malignant disease and these elements in serum has been found to be reliable parameter as a diagnostic and prognostic index in case of craniofacial tumors.⁷⁻⁹ Hence; the present study was undertake for evaluating salivary copper and zinc levels in OSMF patients.

In the present study, a total of 30 OSMF patients and 30 controls were enrolled. Mean age of the patients of the OSMF group and the control group was 49.5 years and 50.7 years, respectively. There were 19 males and 11 females in the OSMF group and 20 males and 10 females in the control group. Ayinampudi BK et al. evaluated the levels of copper and zinc and copper/zinc ratio in the saliva of premalignant and malignant lesions of the oral cavity. There was a significant difference between the mean salivary copper and zinc levels of oral submucous fibrosis patients and malignant lesions when compared to the normal controls. Copper zinc ratio decreased in a premalignant and malignant group when compared to the normal group. Saliva may be used as a potential diagnostic tool, which can be efficiently employed to evaluate the copper and zinc levels in premalignant and malignant lesions of oral cavity.⁹

In the present study, mean salivary copper levels among the patients of the OSMF group and control group was 0.039 µg/mL and 0.019 µg/mL, respectively. Mean salivary zinc levels among the patients of the OSMF group and control group was 0.468 µg/mL and 0.239 µg/mL, respectively. While comparing statistically, it was seen that mean salivary copper and zinc levels were significantly increased in OSMF patients. Since abnormal levels of Cu and Zn have been encountered in various malignancies, Cu/Zn ratio has been suggested as a better prognostic marker than the individual levels of either of the two Trace elements. Homeostasis of Zn is not as well regulated as that of Cu therefore the Cu / Zn ratio can be considered as a more consistent key for determining the status of these elements. In various studies done by Varghese et al., Toke et al., and Ray et al., they observed that serum Cu/Zn ratio was elevated in oral cancer and OSF. The suggestion given for this increment in the ratio was because of the Cu which is discharged from the commercially available gutkha; the Cu levels are generally increased, and as Zn is consumed in counteracting the oxidant levels, the levels are usually decreased.¹⁰⁻¹³ Khulbe G et al. estimated the salivary concentrations of copper, zinc, and iron in OSMF patients. Out of the 120 patients enrolled, 60 OSMF cases and 60 healthy individuals were studied. Unstimulated whole saliva from each subject was centrifuged and the supernatant stored at -80°C. The mean values of salivary copper, zinc,

and iron were lower in OSMF cases than the controls, and the mean copper to zinc ratio was higher in the cases, the differences being statistically insignificant.¹⁴

In another study, Shetty SR et al. estimated the levels of iron and ascorbic acid in serum and saliva in patients with OSMF and to correlate the change in levels of iron and ascorbic acid with the histopathological grading of OSMF. The study group comprised of 65 clinically diagnosed and histopathologically confirmed cases of OSMF; 21 age- and sex-matched controls were also enrolled in the study. Serum and salivary ascorbic acid were analyzed by the dinitrophenyl hydrazine method, whereas serum and salivary iron were analyzed by the dipyriddy method. The serum and salivary ascorbic acid levels consistently decreased with the progression of histopathological grading of OSMF. Serum and salivary iron levels were also decreased in OSMF patients, but this was not significant. Ascorbic acid and iron may have been used for the excessive collagen synthesis occurring during the progression of OSMF.¹⁵

CONCLUSION

From the above results, the authors concluded that copper and zinc are significantly altered in OSMF patients highlighting their role in the pathogenesis of the disease. However; further studies are recommended.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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