



Salivary copper levels in oral submucous fibrosis patients

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Abstract

Background: This research was carried out to evaluate salivary copper levels in oral submucous fibrosis patients (OSMF).

Material and methods: overall 100 subjects were recruited in this research. The subjects had been divided into 2 groups- group A(control group) as well as group B (OSMF group). The levels of copper were estimated in the saliva of 50 patients with OSMF using inductively coupled mass spectrometry (ICP- MS). The values were compared with 50 normal age and sex matched control subjects.

Results: There was a significant difference of the mean salivary copper levels in subjects having OSMF when compared to the normal controls. Copper levels were increased in subjects having OSMF.

Conclusions: Saliva may be used as a potential diagnostic tool, which can be efficiently employed to evaluate the copper levels in pre malignant lesions of oral cavity.

Keywords: Copper, OSMF, saliva.

Introduction

Oral submucous fibrosis (OSF) is a chronic disease that produces scars, tissue fibrosis, and precancerous lesions. It frequently occurs in the buccal mucosa.^{1,2} Pathological characteristics include chronic inflammation, excessive collagen deposition in the connective tissues below the oral mucosal epithelium, local inflammation in the lamina propria or deep connective tissues, and degenerative changes in the muscles. OSF patients experience a severe burning sensation in the mouth after ingesting spicy foods. Other symptoms of OSF include dry mouth, pain, taste disorders, restricted tongue mobility, trismus, dysphagia, and altered tone. This disease contributes significantly to mortality because of its high malignant transformation rate (1.5–15%).³ The incidence of OSF differs with ethnicity and region and is closely associated with diet, habits, and culture.⁴⁻⁶ India has the greatest number of OSF patients worldwide but the disease also occurs in Taiwan and other Asian countries.^{7,8} There are also numerous OSF patients in South Africa as this country has many Indian immigrants. According to World Health Organization (WHO) statistics, there are >5 million OSF patients

globally.^{9,10} In India, OSF occurs more often in women than men but the opposite is true for other regions.

Copper has been the most extensively studied of the trace elements in patients with premalignant and 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.¹¹ Recent technological advances have made saliva as a tool for the diagnosis of many things; among them are hormone imbalances, liver function, immunodeficiency and even cancer.¹² So, the present study was undertaken to evaluate the levels of copper in saliva of subjects having OSMF.

Material and methods

The study population was made up of 100 patients in total, who were divided into two groups. 50 healthy volunteers made up Group A, while 50 people with OSMF made up Group B. This study only included cases that had been histopathologically confirmed and those who had been clinically assessed as having no systemic disorders. The subjects selected for the control group had no oral illnesses. Through the use of questionnaires, the nutritional status of each subject was assessed.

One hour prior to the sample collection, the subjects were asked to refrain from eating, drinking, or rinsing, and to immediately rinse with deionized water before saliva was collected. Each person was instructed to collect saliva in their mouths for two minutes before spitting into sterile plastic vials. The entire unstimulated saliva was collected using this method for six minutes. The samples were centrifuged for five minutes at 3,000 rpm and 4 °C. This method yields a saliva sample devoid of significant debris and with reduced viscosity, enabling a considerably more precise and repeatable examination. In 10 ml/L nitric acid, each specimen was multiplied by five, and the trace elements were determined using inductively coupled mass spectrometry (ICP- MS).

The results were given as parts per billion (ppb) or g/L. The student's independent t-test and one-way analysis of variance (ANOVA) were used in the statistical analysis to compare the means in the two study groups and the two independent groups, respectively.

Results

The age and sex distribution of all the subjects in the present study is presented below:

Table 1: age distribution of subjects in OSMF group and control group.

Groups	Range (years)	Mean age	P value
Group A (control)	38-52	40.63	p>0.05
Group B	17-55	28.64	Not significant

Table 2: sex distribution of subjects in OSMF group and control group.

Groups	Number of subjects	No. of males	No. of females
Group A(control)	50	25(50%)	25(50%)
Group B	50	42(84%)	08(16%)

Table 3: salivary copper levels in OSMF group and control group.

Groups	Mean concentrations	P value
Group A(control)	100.40 ± 24.52	P<0.01 (significant)
Group B	155.50 ± 40.13	P<0.01 (significant)

There was significant difference of the mean salivary copper levels of OSMF subjects when compared to the normal controls. Elevation in salivary copper levels was discovered in the subjects having OSMF.

Discussion

OSMF is a well-recognized, potentially malignant condition of the oral cavity. Controlling the devastating, widespread consequences of OSMF requires interventions in at-risk persons ideally before the disease becomes invasive. Detection of the premalignancies and preventing them from malignant transformation seem to be the best available tool in the fight against oral cancer. Very few studies have been conducted to find out the role of different trace elements in oral precancer and cancer.¹³ Hence, a comprehensive study was carried out to estimate levels of serum copper in patients with OSMF.

In this study, there was significant difference of the mean salivary copper levels of OSMF subjects when compared to the normal controls. Elevation in salivary copper levels was discovered in the subjects having OSMF.

In this study, 50 subjects with OSMF were in the age range of 17–55 years with a mean age of 28.64 years. This is comparable to mean age of 28 years observed by Kumar et al.¹⁴ 28.8 years by Hazarey et al.¹⁵ Maher et al.¹⁶ and Borle and Borle.¹⁷

Among the fifty OSMF subjects, 42 were male and 8 were female patients, thus showing an extreme male predominance over female with the ratio of 5.25:1. A similar male predominance was reported by Sinor et al.¹⁸ Pindborg et al.¹⁹, Ahmad et al.²⁰, and Hazarey et al.¹⁵

In this study, the serum copper level was significantly ($P < 0.0001$) higher among the cases (155.50 ± 40.13) than controls (100.40 ± 24.52). It was similar to the study by Balpande *et al.*²¹ and Shetty *et al.*²²

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.²³

Conclusion

There was a significant rise in the salivary copper levels among subjects having OSMF as compared to the subjects in the control group. Hence, it was concluded that salivary levels of copper in OSMF may be used as a potential diagnostic tool.

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