

Original Research

Salivary copper levels in oral leukoplakia patients

¹Farheen Farooq, ²Rahil Ahmad Bhatt

¹MDS Oral Medicine and Radiology, Jammu and Kashmir, India;

²MDS Oral and Maxillofacial Surgery, Jammu and Kashmir, India

ABSTRACT:

Background: This research was carried out to evaluate salivary copper levels in oral leukoplakia patients. **Material and methods:** Overall 100 subjects were recruited in this research. The subjects had been divided into 2 groups- group 1(control group) as well as group 2 (leukoplakia group). The levels of copper were estimated in the saliva of 50 patients with oral leukoplakia 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 leukoplakia when compared to the normal controls. Copper levels were increased in subjects having leukoplakia. **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, leukoplakia, saliva.

Received: 14 March, 2022

Accepted: 16 April, 2022

Corresponding author: Rahil Ahmad Bhatt, MDS Oral and Maxillofacial Surgery, Jammu and Kashmir, India

This article may be cited as: Farooq F, Bhatt RA. Salivary copper levels in oral leukoplakia patients. J Adv Med Dent Scie Res 2022;10(5):192-194.

INTRODUCTION

Cancer of the oral cavity is the most common neoplasm in the developing countries. A very high incidence of oral cancer has been reported from Kerala, South India, compared to other parts of the world. Similarly, the incidence of precancerous lesions of the oral cavity such as oral leukoplakia is also very high.¹

The etiology of this high incidence is not fully known. 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 copper in the pathology of various diseases has been the subject of a number of comprehensive reviews.^{2,3}

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.⁴ 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.⁵ So, the present study was undertaken to evaluate the levels of copper in saliva of premalignant lesions of oral cavity.

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 1, while 50 people with oral leukoplakia made up Group 2. 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 leukoplakia group and control group.

Groups	Range	Mean age	P value
Group 1 (control)	38-52	48.53	p>0.05
Group 2	23-62	45.97	Not significant

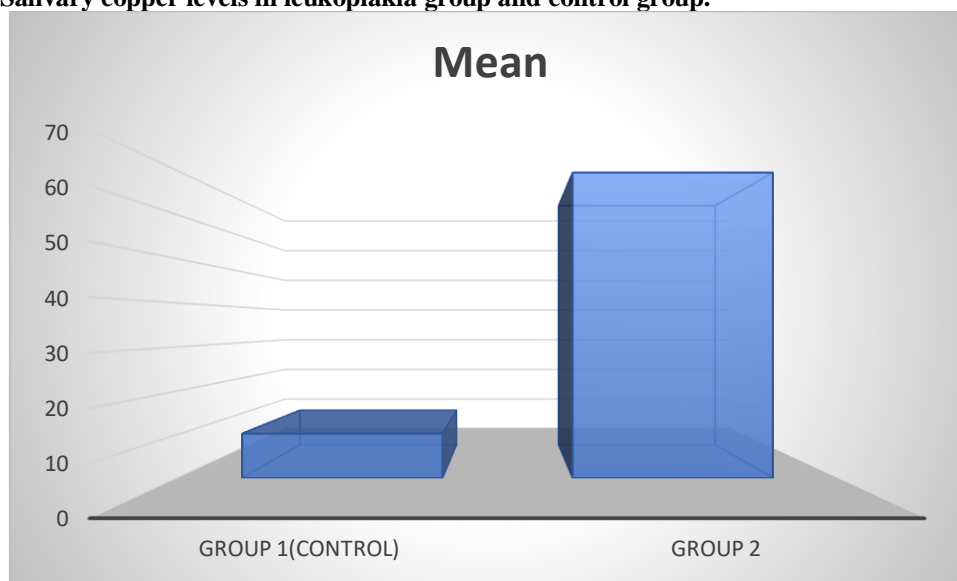
Table 2: Sex distribution of subjects in leukoplakia group and control group.

Groups	Number of subjects	No. of males	No. of females
Group 1(control)	50	25(50%)	25(50%)
Group 2	50	40(80%)	10(20%)

Table 3: Salivary copper levels in leukoplakia group and control group.

Groups	Range	Mean	P value
Group 1(control)	5.83-12.79	10.23	P<0.01 (significant)
Group 2	40.38-213.50	69.54	

Graph 1: Salivary copper levels in leukoplakia group and control group.



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

DISCUSSION

Hence, the present study was undertaken to evaluate the copper levels in the unstimulated whole saliva of normal and premalignant lesions of the oral cavity.

Trace elements play, directly or indirectly, an important role in various physiological metabolic processes in humans. More than 25% of the enzymes in the body need to be activated by metal ions to carry out their metabolic functions.⁶ Bioelementse.g. Copper and zinc are involved in vital biochemical activities like different redox and free radical formation and in maintaining cellular proton homeostasis.⁷ Copper is present in many enzymes involved in oxidation (Tyrosinase, ceruloplasmin, amine oxidase,

cytochrome oxidase). Zinc is involved in carbonic acid (carbonic anhydrase), in proteolysis (carboxy peptidase, leucine amino peptidase, etc.).⁴

In the present study, a significant increase in the salivary copper levels was seen in the leukoplakia group when compared to normal control group.

Henkin et al, proposed that the saliva represents a useful tool in the diagnosis of some physiological and pathological changes in the body function and in understanding the important aspects of trace metal metabolism.⁸ The unstimulated whole saliva is used in the present study because, the anatomical proximity of saliva to both premalignant and malignant oral neoplasm's, saliva could be ideal for screening of

these lesions and highly specific and sensitive analytical methods are currently available allowing measurement of micro concentrations of various salivary components.

Nasulewicz et al.⁹ proposed that copper metabolism is profoundly altered in neoplastic disease and serum copper correlates with tumor incidence and burden, malignant progression, and recurrence in variety of human cancers. Copper plays an important role in tumor angiogenesis, especially in early stages. Copper is necessary for endothelial cell activation as it stimulates their proliferation and activation. Copper activates several angiogenic factors (VEGF, TNF- α , IL -1, b-FGF) which bind to endothelial cells switch from G0 into G1 phase and force proliferation. The level of ceruloplasmin, the principal copper transporting protein, increases four to eight folds during malignant progression, often tumors become palpable.

CONCLUSION

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

REFERENCES

1. Jayadeep A, Pillai KR, Kannan S, Nalinakumari KR, Mathew B, Nair MK, et al. Serum levels of copper, zinc and ceruloplasmin in oral leukoplakia and squamous cell carcinoma. *J Exp Clin Cancer Res.* 1997;16:295–300.
2. Varghese I, Sugathan CK, Balasubramoniyam G, Vijayakumar T. Serum copper and zinc levels in premalignant and malignant lesions of the oral cavity. *Oncology.* 1987;44:224–7.
3. Capel ID, Pinnock MH, Williams D C, Hanham IW. The serum levels of some trace and bulk elements in cancer patients. *Oncology.* 1982;39:38–41.
4. Schwartz MK. Role of trace elements in cancer. *Cancer Res.* 1975;35:3481–7.
5. Streckfus CF, Bigler LR. Saliva as a diagnostic fluid. *Oral Dis.* 2002;8:69–76.
6. Chin-Thin W, Wei-Tun C, Tzu-Ming P, Ren-Tse W. Blood concentrations of selenium, zinc, iron, copper and calcium in patients with hepatocellular carcinoma. *Clin Chem Lab Med.* 2002;40:1118–22.
7. Paul RR, Chatterjee J, Das AK, Cervera ML, de la Guardia M, Chaudhuri K. Altered elemental profile as indicator of homeostatic imbalance in pathogenesis of oral submucous fibrosis. *Biological Trace Element Research.* 2002;87:45–56.
8. Olmez I, Gulovali MC, Gordan GE, Henkin RI. Trace elements in human parotid saliva. *Biol Trace Elem Res.* 1988;17:259–70.
9. Nasulewicz A, Wietrzyk J, Opolski A. The role of Copper in Tumour angiogenesis. *Cell Mol Biol Lett.* 2002;7(Suppl):308.