Estimation of serum iron in patients with Oral Submucous Fibrosis in Bareilly population: A comparative study

[1]Dr Kratika Ajai, Reader, Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India.

[2]Dr. Smriti Saxena, Reader, Department of Public Health Dentistry, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India.

[3]Dr Garima Singh, Senior lecturer, Department of Periodontology and Implantology, Chandra Dental College and hospital, Lucknow, India.

[4]Dr Vaibhav Seth, Reader, Department of Oral Medicine and Radiology, Kothiwal Dental College, Moradabad, Uttar Pradesh, India,

[5]Dr Ashish Aggarwal, Professor & Head, Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India.

[6]Dr Sidharth Shankar, Senior Resident, Madhav Prasad Tripathi Medical College, Siddharth Nagar, Uttar Pradesh, India.

Corresponding Author: Dr Kratika Ajai, Reader, Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India.

Abstract

Introduction: Oral submucous fibrosis (OSMF) is the most prevalent precancerous condition in India. This condition is characterized by the juxta-epithelial fibrosis of the oral cavity and in the process of collagen synthesis, iron gets utilized. This happens by the hydroxylation of proline and lysine which further leads to decreased serum iron levels. In the present study, an attempt was made to analyze the serum iron in OSMF and controls.

Materials and methods: The study was conducted in 45 cases of OSMF and 45 age and sex matched controls. The serum iron was analysed using Ferrene method.

Results: The serum iron levels were found to be significantly lower in the OSMF patients in comparison with the controls. On comparison of these values between different stages of the disease, stage 3 OSMF patients showed maximum reduction of iron levels. Thus, the present results showed that the level of serum iron decreases with the progression of the disease.

Conclusion: The present study emphasizes on the serum iron assessment for patients with oral submucous fibrosis. From these findings, it appears that determining iron status may help in early diagnosis and prognosis of oral premalignant condition like OSMF.

Keywords: Oral submucous fibrosis, serum iron, precancerous condition.

Page 104

Introduction

Oral submucous fibrosis (OSMF) is regarded as a precancerous condition and shows a significant tendency to develop cancer. (1) It is a chronic disease of the oral cavity, which is characterized by the juxta epithelial inflammatory reaction followed by fibroelastic change in the lamina propria and associated epithelial atrophy. This results in restricted mouth opening, leading to restriction of food consumption, difficulty in maintaining oral health, as well as impairs the ability to speak. (2) The disease is seen mostly among southeast and south Asian population, particularly in the Indian subcontinent. (3) (4) Etiological factors like areca nut chewing, immunologic processes, nutritional deficiencies (mainly of iron and vitamins), and genetic predisposition are considered as the triggering factors of the disease (5, 6) Iron is considered essential for the overall integrity and health of the epithelium of digestive tract and its contribution to normal enzymatic functions. (7)

Hemoglobin levels, in particular serum iron levels, are considered as biochemical indicators for nutritional assessment. (8) Thus, the present study aimed to estimate the levels of serum iron among patients with OSMF and healthy controls.

Material and Methods

Our study was carried out on 45 cases of OSMF who were clinically and Histopathologically diagnosed. All these patients came to the Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly. Detailed case history of the patient was taken, and clinical diagnosis was made on the presence of characteristic features of the disease like presence of vesicles, mucosal blanching, ulcerations, burning, stiffness of oral mucosa, presence of fibrous bands and progressive inability to open the mouth. OSMF patients were divided into three stages according to the classification given by Haider et al. (9).

Clinical Staging

Stage 1: Faucial bands only

Stage 2: Faucial and buccal bands

Stage 3: Faucial, buccal and labial bands

Functional Staging

Stage 1: Mouth opening >20 mm

Stage 2: Mouth opening 11-19 mm

Stage 3: Mouth opening <10 mm

In the control group, 45 healthy individuals who visited the department for other complaints were included. Age and sex were matched. These patients had no oral lesions or adverse habits or any other major illness in recent past. Informed consent was taken from all the patients. The study was approved by the institutional ethical committee. An exclusion criterion includes patients who were suffering from systemic diseases/ conditions that may be associated with alterations in the serum level of iron. Previously treated cases of OSMF were also excluded from the present study.

The subjects of the study were classified as Group I consisting of 15 patients, clinical and functional stage 1, Group II consisting of 15 patients, clinical and functional stage 2, Group III consisting of 15 patients, clinical and functional stage 3 and Group IV i.e control group, consisting of 45 patients.

Estimation of serum iron

The purpose and procedure were explained to each patient, who then provided informed consent to participate. 3 ml of fasting venous blood was collected and Ferrene method was used for the analysis of serum iron.

Statistical analysis

Statistical Package for the Social Sciences program [SPSS version 13.0] was used to analyse all the variables

of the study. ANOVA test was performed for the assessment of the statistical significance of differences between the control group and different stages of OSMF. Student's t-test was performed for the comparison between serum iron in all the three case groups and in the control group.

Results

In our study 90 subjects were included, out of which 64 were males and 26 were females. Control group i.e group IV included 45 age and sex matched healthy individuals. Group I, II, III included 11, 10, 12 males and 4, 5, 3 females, respectively. The mean age of the patients in the present study in group I was 25.13 years, group II was 27.60 years, group III was 34.53 years and group IV was 29.09 years. It was found that patients were mostly in the second and third decades of life.

The mean serum iron level in oral submucous fibrosis group was 115.09 ± 23.54 mcg/dL. However, in the control group the corresponding value was 132.21 ± 32.10 mcg/dL. (Table 1) A statistically significant reduction [P<0.05] was noted between the OSMF cases and controls.

In different stages of OSMF these values were 130.20 ± 32.8 mcg/dL in stage 1, 114.6 ± 26.0 mcg/dL in stage 2 and 109.1 ± 24.1 mcg/dL in stage 3. It was found that as one moved from control group to that of OSMF cases, these values decrease progressively. It was also found that with the progression of the disease i.e from OSMF stage 1 to stage 3, there is a gradual fall in iron levels. The difference observed was statistically significant. ANOVA showed a statistically significant difference in mean serum iron levels in various clinical stages of OSMF (Table 2).

Table 1. Comparison of mean serum iron among control group and OSMF cases.

Variable	CONTROL (n= 45)	CASES (n=45)	P value
IRON	132.21±32.10 mcg/dL	115.09 ± 23.54 mcg/dL	<0.05

Table 2. ANOVA test for serum iron levels among various groups.

Variable	Groups	n	Mean ± SD	F	P
IRON	Group I (Stage 1)	15	130.20 ± 32.8 mcg/dL	2.64	0.05
	Group II (Stage 2)	15	114.6 ± 26.0 mcg/dL		
	Group III (Stage 3)	15	109.1 ± 24.1 mcg/dL		
	Group IV (Control)	45	132.21±32.10 mcg/dL		

Discussion

OSMF is a chronic, insidious, disabling precancerous condition of the oral cavity (10). Its prevalence is high in India and has always been a challenging disease (11). The hallmark of the disease is fibrosis of submucosa which affects the oral cavity and then further involves the pharynx and the upper esophagus. It is further accompanied by symptoms like burning sensation, blanching, and stiffness of the oral mucosa and oropharynx, resulting in restricted mouth opening which in turn causes limited food consumption, and difficulty in maintaining oral health and impairs the ability to speak (12, 13).

The role of trace metals in the pathogenesis of various potentially malignant disorders is recognized. Trace elements like iron is involved in the maturation steps of

collagen synthesis (14). Moos KS and Madan DK was the first to review the role of iron in OSMF (15). Trace elements are gaining attention these days in the detection of oral cancer and precancer. These are found to be significantly altered in the carcinomas of head-neck, lung, and breast. It was found that only few studies have been conducted to find out the role of iron in OSMF (16). Therefore, in the present study an attempt was made to estimate and compare the serum iron levels in between OSMF patients and normal healthy individuals.

A statistically significant reduction [P<0.05] was noted in serum iron level between the control group and OSMF cases. Similarly, it was noted that these values decrease progressively in different stages as one moved from control group to that of OSMF cases i.e stage 1, stage 2 and stage 3, concluding that serum iron levels also deplete with the progression of the disease. Therefore, it can be said that the serum iron levels can be useful in predicting the progression of the condition. There also appears an association between serum iron content and oral carcinogenesis. The results obtained in our study are in accordance with the studies performed by Ganapathy KS et al., (17), Rupak S et al., (18) and Tadakamadla J et al. (19)

It has been suggested by Anuradha and Devi that utilization of iron in collagen synthesis could be the reason for the low level of iron in oral submucous fibrosis patients. Further, decreased vascularity was noted due to the lack of iron in the tissues which facilitates percolation of arecoline. In vitro studies on human fibroblasts observed that arecoline causes increased fibroblastic proliferation and collagen formation which is a hallmark of OSMF. (20)

Conclusion

The results of the present study show that the serum iron levels were decreased in the study group compared to the control group and this difference was statistically significant. It also showed that there is a progressive decrease in serum iron level from stage 1 to the stage 3 of OSMF. However, more studies are still required with a larger sample size to understand the role of iron in the progression and malignant transformation of the disease. This can, therefore, help in early detection and effective treatment of OSMF.

References

1. Lohe VK, Degwekar SS, Bhowate RR, Kadu RP, Dangore SB. Evaluation of correlation of serum lipid profile and its association with tobacco abuse. J Oral Pathol Med. 2010;39:141-8.

2. Rajalalitha P, Vali S. Molecular pathogenesis of oral submucous fibrosis – A collagen metabolic disorder. J Oral Pathol Med 2005;34:321-8.

3. McGurk M, Craig GT. Oral submucous fibrosis: Two cases of malignant transformation in Asian immigrants to the United Kingdom. Br J Oral Maxillofac Surg 1984;22:56-64.

4. Hazarey VK, Erlewad DM. Oral submucous fibrosis: study of 1000 cases from central India. J Oral Pathol Med 2007;36:12-7.

5. Cox, S. C., & Walker, D. M. Oral submucous fibrosis. A review. Aust Dent J 1996; 41(5): 294- 299.

6. Kiran Kumar K, Saraswathi T R, Ranganathan K, Uma Devi M, Elizabeth J. Oral submucous fibrosis: A clinico-histopathological study in Chennai. Indian J Dent Res 2007;18:106-11.

7. Rajendran R, Vijayakumar T, Vasudevan DM. An alternative pathogenetic pathway for oral submucous fibrosis (OSMF). Med Hypotheses. 1989 Sep;30(1):35-7.

8. Khanna S. Immunological and biochemical markers in oral carcinogenesis: the public health perspective.

Int J Environ Res Public Health. 2008 Dec;5(5):418-22.

9. Haider SM, Merchant AT, Fikree FF, Rahbar MH. Clinical and functional staging of oral submucous fibrosis. Br J Oral MaxillofacSurg. 2000;38:12-5.

10. Aggarwal A, Shetti A, Keluskar V, Bagewadi A. Estimation of serum beta carotene levels in patients with oral submucous fibrosis in India. J Oral Sci. 2011;53:427-31.

11. Mehrotra R, Pandya S, Chaudhary AK, Singh HP, Jaiswal RK, Singh M, et al. Lipid profile in oral submucous fibrosis. Lipids Health Dis. 2009;8:29.

12. Van Wyk CW, Seedat HA, Phillips VM. Collagen in submucous fibrosis: an electron-microscopic study. J Oral Pathol Med. 1990 Apr;19(4):182-7.

13. Paissat DK. Oral submucous fibrosis. Int J Oral Surg. 1981;10(5):307-12.

14. Jassim KA, Sreenivasan BS, Mathew DG, Varghese SS, Radakrishna M, Radhika T. Serum Iron Indices in Patients with Oral Submucous Fibrosis- A Comparative Study. J Orofac Sci 2020;12:107-12.

15. Moos KS, Madan DK. Oral Submucous Fibrosis. Br Dent J. 1968;124:313-317.

16. Bhardwaj D, Dinkar D, Satoskar SK, Desai SR. Serum Iron and Haemoglobin estimation in Oral Submucous Fibrosis: A Diagnostic Approach. J Clin Diagn Res. 2016;10(12): ZC54-ZC58.

17. Ganapathy KS, Gurudath S, Balikai B, Ballal S, Sujatha D. Role of iron deficiency in oral submucous fibrosis: An initiating or accelerating factor. Journal of Indian Academy of Oral Medicine and Radiology. 2011;23(1):25-28.

18. Rupak S, Baby GG, Padiyath S, Kiran Kumar KR. Oral submucous fibrosis and iron deficiency anaemia relationship revisited- Results from an Indian study. E-Journal of Dentistry. 2012;2(2):159-65.

19. Tadakamadla J, Kumar S, Mamatha GP. Evaluation of serum copper and iron levels among oral submucous fibrosis patients. Med Oral Patol Oral Cir Bucal. 2011;16(7):870-73.

20. Anuradha CD, Devi CS. Serum protein, ascorbic acid & iron & tissue collagen in oral submucous fibrosis--a preliminary study. Indian J Med Res. 1993;98:147-51.