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Evaluation of the Haematological Profile and Its Correlation with The Severity of Oral Submucous Fibrosis in Western Rajasthan Population

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Conflict of interest: Nil

Abstract

Background: Nutritional deficiencies, particularly of iron and essential vitamins, have long been implicated in the etiology and progression of Oral Submucous Fibrosis (OSMF). Recent evidence also suggests that alterations in complete blood count (CBC) parameters may reflect underlying inflammatory activity and systemic changes associated with chronic oral conditions.

Aim: To evaluate the haematological profile and correlate it with the severity of OSMF in the Western Rajasthan population.

Objective: To assess the relationship between various haematological parameters and different clinical stages of OSMF.

Materials and Methods: Outpatients reporting to the Department of Oral Medicine and Radiology were screened, and 80 clinically diagnosed OSMF subjects were selected following the WHO (2005) criteria. Informed consent was obtained from all participants. Detailed oral examination, habit history, and clinical staging were recorded using a structured case history proforma. The 80 OSMF patients were categorized into

four groups according to Chandramani More et al. (2011) staging system. All subjects underwent haematological investigations the following morning to evaluate their blood profile.

Results: Haematological parameters such as hemoglobin (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), serum iron, and vitamin B12 levels were significantly higher in normal subjects compared to OSMF patients. Among OSMF patients, these values showed a progressive decline from stage I to stage III, demonstrating a significant correlation between advancing disease severity and deteriorating haematological status.

Conclusion: The study highlights a significant association between OSMF severity and altered haematological parameters. These findings suggest that haematological profiling may serve as a useful adjunctive diagnostic and prognostic marker in the management of OSMF.

Keywords: Oral Submucous Fibrosis, Haematological parameters.

Introduction

Oral Submucous Fibrosis (OSMF) is a chronic, progressive, potentially malignant disorder first described by Schwartz in 1952 as "Atrophica idiopathica mucosae oris" and later defined by Pindborg in 1966 as a condition marked by juxtaepithelial inflammation, fibroelastic changes in the lamina propria, and epithelial atrophy leading to mucosal stiffness and trismus[1-3]. Clinically, OSMF presents with burning sensation, reduced tongue mobility, blanching, leathery mucosa, depapillation, and progressive limitation of mouth opening[4,5]. The disorder predominantly affects populations across India, Pakistan, Sri Lanka, Bangladesh, Taiwan, and among South Asian diaspora, with prevalence influenced by geographic and cultural habits[6-9]. Areca nut chewing is recognized as the primary etiological factor, though additional contributors such as chili intake, malnutrition, vitamin deficiencies, and genetic susceptibility have been suggested[10-12]. Nutritional deficiencies, particularly of iron and vitamin B12, may compromise epithelial integrity and have been reported in OSMF patients[13]. Recent evidence also highlights the potential role of hematological parameters—including complete blood count (CBC)—as markers of inflammation and disease progression[14-15].

Considering the multifactorial nature of OSMF, the present study aims to evaluate the hematological profile and correlate it with disease severity in the Western Rajasthan population. The objectives of this study are to analyze the correlation between hematological parameters and different stages of OSMF, and to assess whether hematological profile can serve as a diagnostic marker in OSMF.

Material and methods

The present cross-sectional study titled "Evaluation of the haematological profile and its correlation with the severity of Oral Submucous Fibrosis in the Western Rajasthan population" was conducted in the Department of Oral Medicine and Radiology, Darshan Dental College and Hospital, Udaipur. A total of 80 patients clinically diagnosed with OSMF based on WHO (2005)[4] criteria were included after obtaining informed consent. Individuals above 18 years of age and free from systemic diseases were recruited and divided into four groups (n = 20 each) according to the clinical staging proposed by Chandramani B. More et al. (2011)[8].

Inclusion criteria- Patients clinically diagnosed with OSMF (WHO, 2005)[4]. Individuals without systemic

diseases. Willing participants providing informed consent.

Exclusion criteria - Systemic illness and presence of mucosal lesions other than OSMF.

Clinical examination was performed using standard diagnostic armamentarium including mouth mirror, explorer, probe, gloves, gauze, and illumination. Diagnosis was based on typical features such as burning sensation, mucosal blanching, fibrous bands, restricted mouth opening, and tongue rigidity. Staging included clinical (S1–S4) and functional (M1–M4) classifications.

All participants underwent hematological assessment the following morning. After aseptic precautions, 5 mL of fasting venous blood was collected from the median cubital vein. Hemoglobin, PCV, MCV, MCH, and MCHC were estimated using an automated cell counter, while serum iron levels were measured using Ferrene's method. Samples were processed using deionized glassware and analyzed on a semi-autoanalyzer (Microlab-200) following manufacturer guidelines.

Normal reference ranges for males and females were used for comparison. (Table 1).

Table 1: List of tests that were studied under haematological profile[6,7]

S.No	Blood Test	Normal reference range values	
		Male	Female
1	Hb (g/dL)	14 to 18 g/dl	12 to 16 g/dl
2	PCV(%)	38.3% to 48.6%	35.5% to 44.9%
3	MCV(fl)	90–100	80–98
4	MCH (picograms per cell)	28 to 31	27 to 29
5	MCHC (g/dL)	32–36	30-34
6	Iron (mcg/dL)	64 to 170	60-168

Statistical Analysis

Data were compiled and analyzed using Chi-square test for categorical variables. Independent t-test was employed to compare mean hematological values among different OSMF stages. A p-value < 0.05 was considered statistically significant.

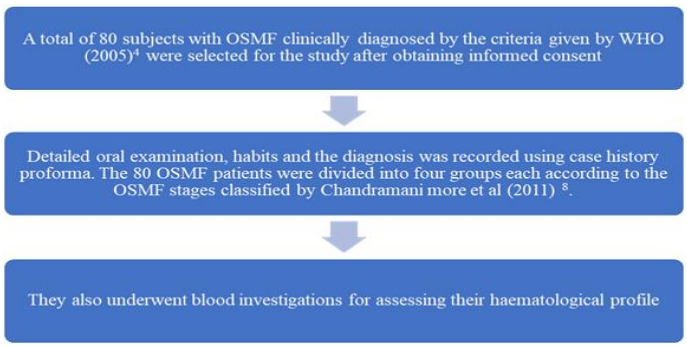


Figure 1: Schematic diagram of methodology

Results

A total of 80 clinically diagnosed OSMF patients were included in the study. The highest prevalence was seen in the 31–40-year age group (36.25%), followed by 20–30 years (23.75%). Overall, 80% of the study population were males. Both age and gender distributions were statistically significant (p=0.031 and p=0.012, respectively). (Table (2,3) & Graph (1,2))

Table 2 & Graph 1: Distribution of study participants according to age.

Age groups (years)	Number	Percentage	t value	p value
20-30	19	23.75		
31-40	29	36.25		
41-50	15	18.75	0.962	0.031*
51-60	10	12.50		
61-70	07	8.75		
Mean ±SD (years)	35.81±2.36			

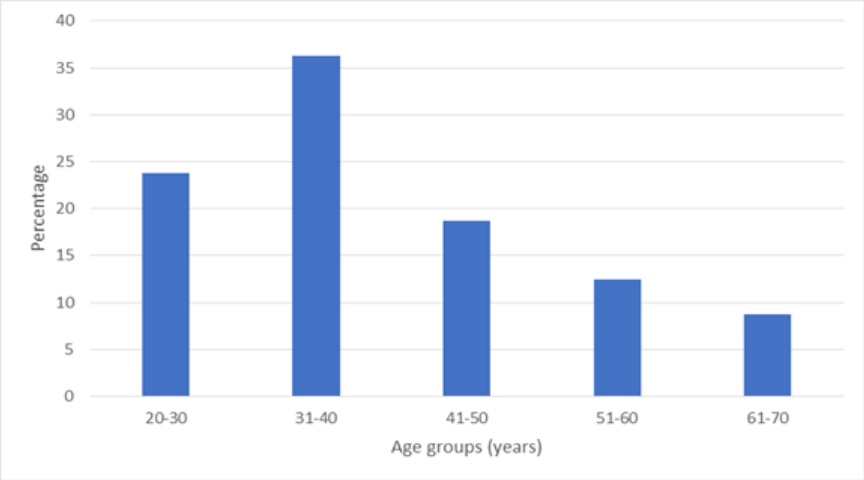
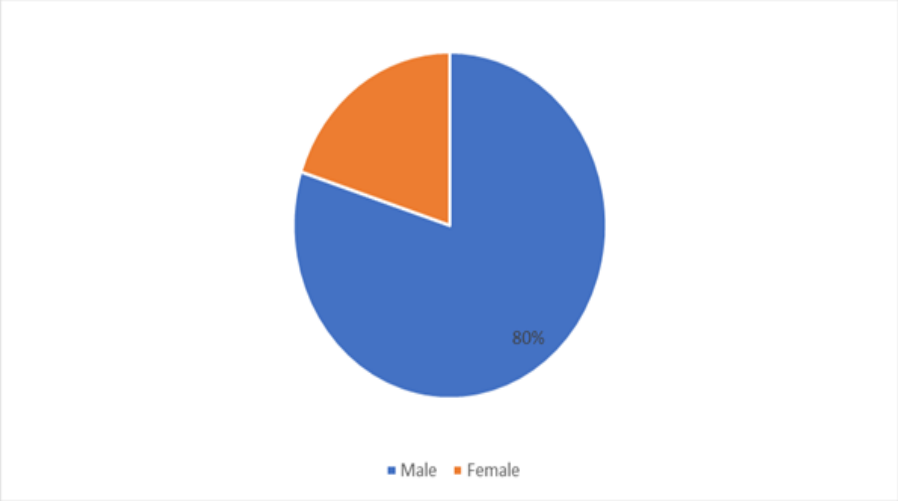


Table 3 & Graph 2: Distribution of study participants according to gender

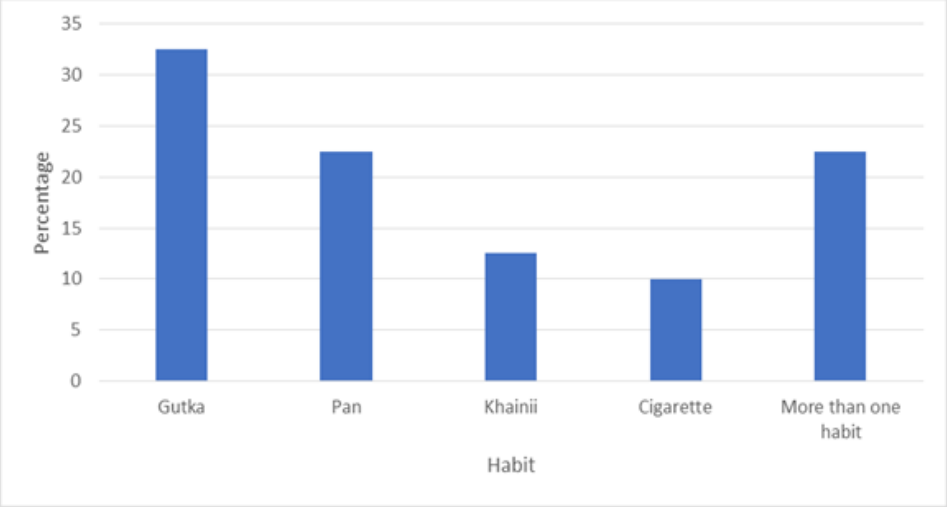
Gender	Number	Percentage		
Male	64	80.00	0.863	0.012*
Female	16	20.00		



Regarding habit history, gutka was the most common habit (32.50%), followed by pan (22.50%), khaini (12.50%), and cigarette smoking (10%), while 22.50% reported multiple habits. Habit frequency was highest in the 3–4 times/day group (45%), and the most common habit duration was 6–10 years (35%), followed by 2–5 years (25%). All habit variables were statistically significant. (Table 4 & Graph 3)

Table 4 & Graph 3: Habit history among patients

Habit	Number	Percentage		
Gutka	26	32.50		
Pan	18	22.50	0.974	0.011*
Khainii	10	12.50		
Cigarette	08	10.00		
More than one habit	18	22.50		



Clinical staging showed that most patients were in Stage S2 (36.25%) and S3 (37.50%), while 17.50% presented with Stage S4. Functional staging revealed most patients in M2 (35%) and M3 (33.75%). Both staging distributions were statistically significant. (Table (5,6), & Graph (4,5)), (Figure 2,3,4,5).

Table 5 & Graph 4: Distribution of patients according to Clinical staging.

	Number	Percentage		
S1	07	08.75		
S2	29	36.25	0.942	0.041*
S3	30	37.50		
S4	14	17.50		

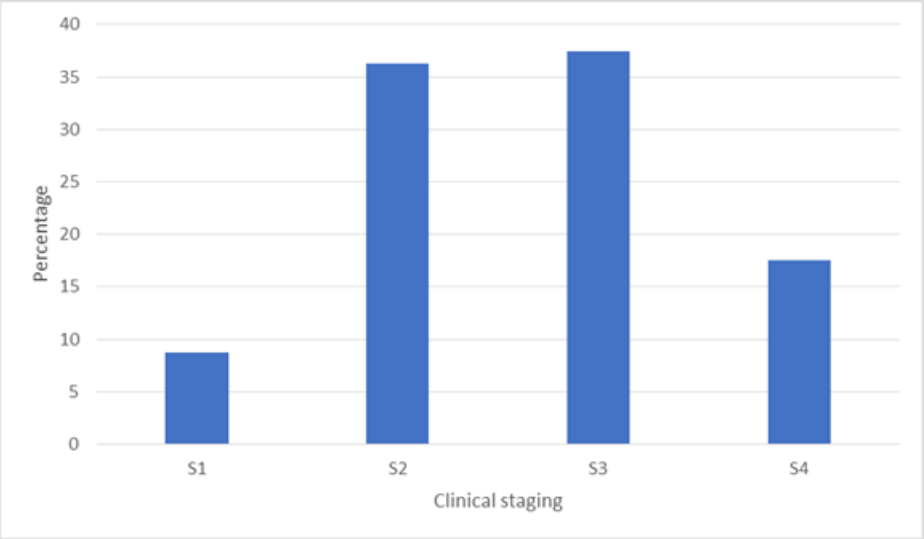
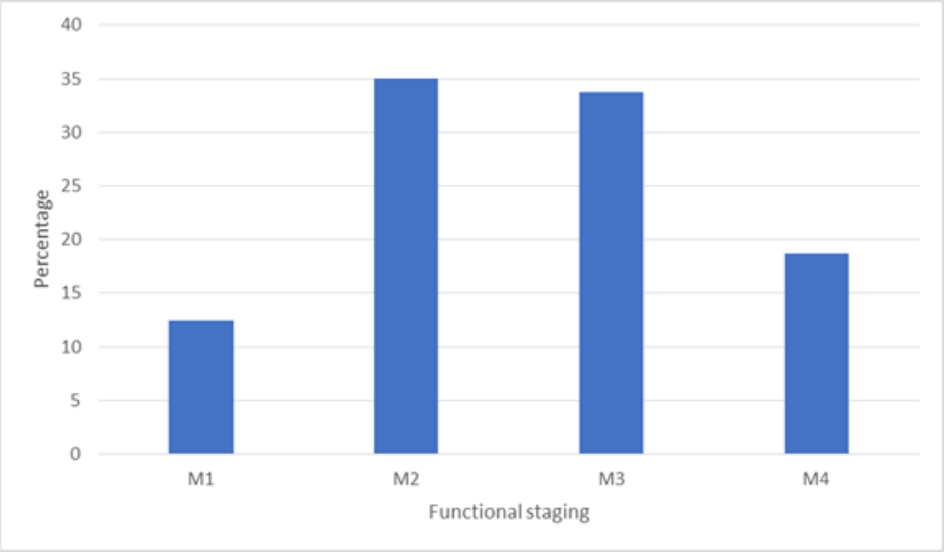


Table 6 & Graph 5: Distribution of patients according to Functional staging.

Functional Staging	Number	Percentage		
M1	10	12.50		
M2	28	35.00	0.873	0.032*
M3	27	33.75		
M4	15	18.75		



Hematological assessment showed decreased values in all parameters across the OSMF population. Mean Hb, PCV, MCV, MCH, MCHC, and serum Iron levels were lower in females than males, and all were significantly reduced compared to normal reference ranges (p=0.002). (Table 7).

Table 7: Haematological parameters (Mean ± SD), t-values and p-values in male, female and all OSMF patients

Parameter	All Patients (Mean ± SD)	Male (Mean ± SD)	Female (Mean ± SD)	t-value	p-value
Hb (g/dL)	10.69 ± 1.24	11.24 ± 2.03	9.27 ± 0.96	0.817	0.002
PCV (%)	33.70 ± 2.35	34.57 ± 3.14	31.18 ± 1.07	0.928	0.013
MCV (fL)	81.59 ± 2.35	83.23 ± 3.14	78.18 ± 1.07	0.702	0.021
MCH (pg/cell)	24.07 ± 1.12	25.23 ± 1.04	23.18 ± 1.17	0.813	0.011
MCHC (g/dL)	29.34 ± 1.03	31.27 ± 1.11	28.23 ± 1.04	0.924	0.015
Iron (mcg/dL)	56.93 ± 2.14	58.34 ± 2.02	54.17 ± 2.16	0.815	0.012

A progressive decline in hematological parameters was observed with increasing clinical and functional severity of OSMF. As staging advanced from S1 to S4 and from M1 to M4, mean values of Hb, PCV, MCV, MCH, MCHC, and Iron consistently decreased. All correlations between disease severity and hematological profile were statistically significant ($p<0.05$).

Overall, the results demonstrate a strong negative correlation between OSMF severity and hematological parameters, indicating that worsening fibrosis is associated with increasing hematological deficiencies. (Table 8).

Table 8: Correlation of Haematological Parameters with Clinical and Functional Staging in OSMF Patients

Parameter	Stage Type	Stage	Male (Mean)	Female (Mean)	t-value	p-value
Hb (g/dL)	Clinical	S1	15.20	12.20	0.963	0.023
		S2	13.50	11.50	0.963	0.023
		S3	12.02	10.81	0.963	0.023
		S4	11.70	09.93	0.963	0.023
	Functional	M1	15.31	13.31	1.063	0.003
		M2	13.61	11.61	1.063	0.003
		M3	12.13	10.92	1.063	0.003
		M4	11.81	09.04	1.063	0.003
PCV (%)	Clinical	S1	33.87	31.76	1.053	0.002
		S2	32.56	30.49	1.053	0.002
		S3	31.34	29.28	1.053	0.002
		S4	30.21	28.14	1.053	0.002
	Functional	M1	33.76	31.65	0.821	0.012
		M2	32.45	30.38	0.821	0.012
		M3	31.23	29.17	0.821	0.012
		M4	30.10	28.03	0.821	0.012
MCV (fl)	Clinical	S1	87.22	85.11	0.113	0.01

		S2	86.16	84.07	0.113	0.01
		S3	85.34	83.15	0.113	0.01
		S4	84.19	84.07	0.113	0.01
	Functional	M1	87.33	85.22	0.779	0.042
		M2	86.27	84.18	0.779	0.042
		M3	85.45	83.26	0.779	0.042
		M4	84.21	84.18	0.779	0.042
MCH (pg/cell)	Clinical	S1	25.12	24.03	0.983	0.01
		S2	24.27	23.16	0.983	0.01
		S3	23.12	22.03	0.983	0.01
		S4	22.19	21.08	0.983	0.01
	Functional	M1	25.23	24.14	0.981	0.001
		M2	24.38	23.27	0.981	0.001
		M3	23.23	22.14	0.981	0.001
		M4	22.20	21.19	0.981	0.001
MCHC (g/dL)	Clinical	S1	33.31	31.20	0.883	0.01
		S2	32.44	32.33	0.883	0.01
		S3	31.09	31.12	0.883	0.01
		S4	30.14	30.25	0.883	0.01
	Functional	M1	33.42	31.11	0.994	0.012
		M2	32.55	32.44	0.994	0.012
		M3	31.11	31.23	0.994	0.012
		M4	30.25	30.36	0.994	0.012
Iron (mcg/dL)	Clinical	S1	60.34	56.28	0.883	0.01
		S2	58.12	54.17	0.883	0.01
		S3	56.21	52.09	0.883	0.01
		S4	54.26	50.22	0.883	0.01
	Functional	M1	60.45	56.39	0.994	0.012
		M2	58.23	54.17	0.994	0.012
		M3	56.33	52.10	0.994	0.012
		M4	54.26	50.23	0.994	0.012

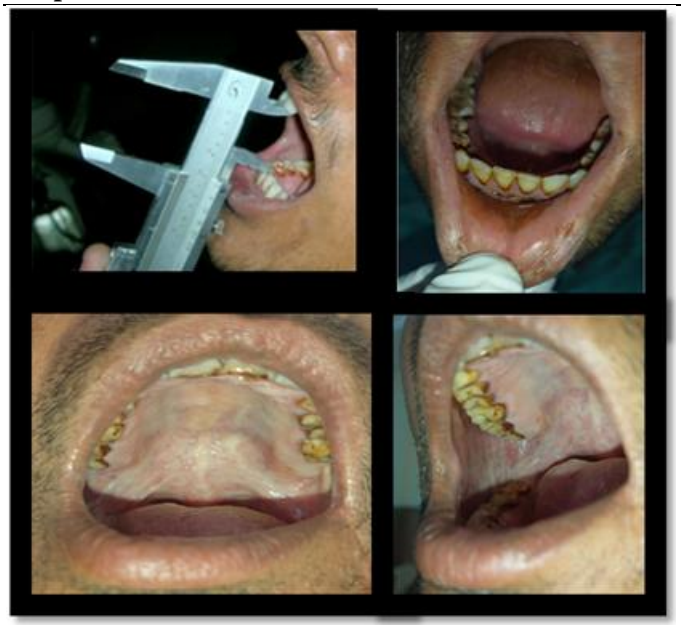


Figure 2: Stage 1 Oral submucous fibrosis patients based on clinical exam according to Chandramani More classification.

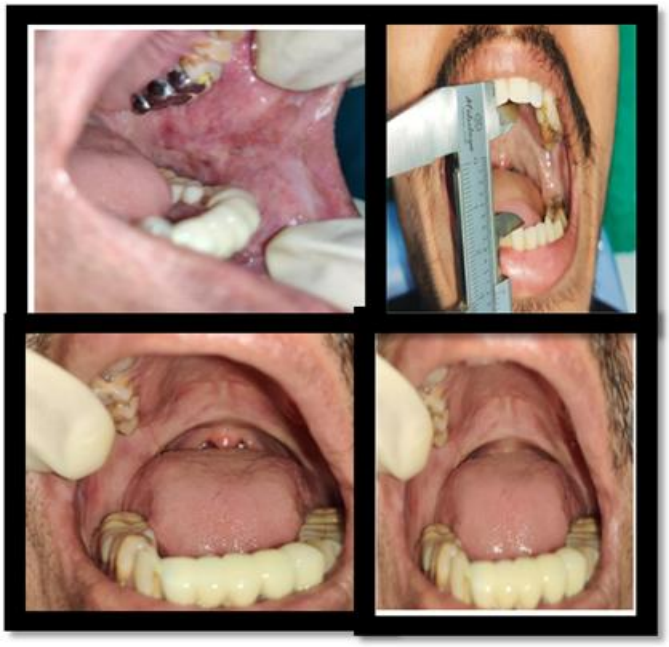


Figure 3: Stage 2 Oral submucous fibrosis patients based on clinical exam according to Chandramani More classification.

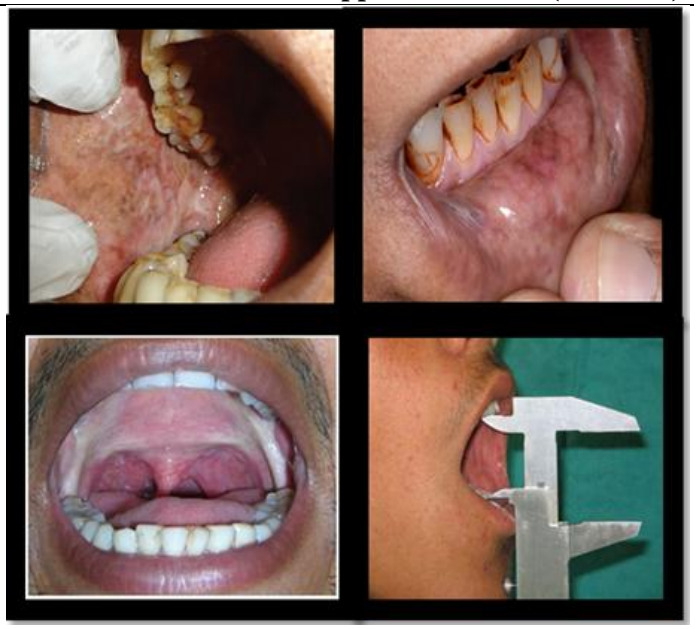


Figure 4: Stage 3 of Oral submucous fibrosis patients according to Chandramani More classification.

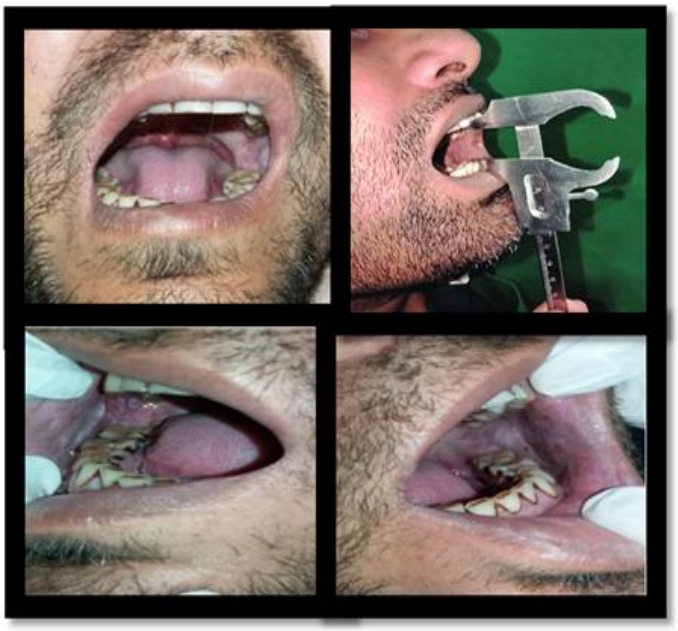


Figure 5: Stage 4 Oral Submucous fibrosis patient according to Chandramani More classification.

Discussion

Oral submucous fibrosis (OSMF) is a potentially malignant disorder characterized by progressive fibrosis of the oral mucosa, leading to restricted mouth opening and functional impairment. It is particularly prevalent in South Asian populations, with areca nut chewing

identified as the primary etiological factor. Nutritional deficiencies, genetic predisposition, and immunologic factors further contribute to its pathogenesis.[16-20]

Hematological parameters, particularly hemoglobin (Hb) and serum iron levels, serve as biochemical markers reflecting nutritional status and mucosal integrity. Iron, vitamin B12, and folate are critical for maintaining oral epithelial health. Deficiency of these elements can impair epithelial maturation, enhance collagen cross-linking, and promote submucosal fibrosis.[21-25]

In this study, OSMF patients demonstrated significantly lower Hb, PCV, MCV, MCH, MCHC, and serum iron levels compared to healthy individuals. These values progressively decreased with increasing clinical and functional severity of OSMF, highlighting a clear correlation between hematological deficiencies and disease progression.[26-30]

Our findings are consistent with previous studies reporting a high prevalence of iron deficiency anemia in OSMF patients. Reduced serum iron and hemoglobin levels compromise oral mucosal resilience, exacerbate epithelial atrophy, and increase susceptibility to irritants.17-20 Additionally, insufficient iron impairs hydroxylation of proline and lysine, essential for collagen maturation, thereby contributing to excessive deposition of cross-linked collagen—a hallmark of OSMF. Vitamin B12 deficiency, although less pronounced, may act synergistically with iron deficiency to exacerbate mucosal damage.[23,31-35]

The clinical implications are significant: early assessment and correction of hematological deficiencies may prevent or slow disease progression. Iron and antioxidant supplementation, along with lifestyle modifications, have been shown to improve mucosal health and potentially reduce malignant transformation risk.[6,24,26]

While biopsy remains the gold standard for diagnosis, hematological evaluation offers a minimally invasive, cost-effective approach for monitoring disease severity and prognosis. OSMF is strongly associated with hematological alterations, particularly iron deficiency and reduced hemoglobin levels. These deficiencies not only reflect poor nutritional status but also contribute to the pathogenesis and progression of the disorder.[24,28,36-38]

Routine hematological profiling can serve as a useful adjunct in early diagnosis, staging, and management of OSMF, emphasizing the need for integrated nutritional and therapeutic interventions to improve patient outcomes. Further research is warranted to explore the mechanistic links between trace element deficiencies and malignant transformation in OSMF.[39-40]

Conclusion

This study evaluated the haematological profile and correlate it with the severity of Oral Submucous Fibrosis in Western Rajasthan population. It was observed that the values of haematological tests like (Hb (g/dL), PCV, MCV (fl), MCH, MCHC, Iron (mg/dL) and Vitamin B12 (pg/ml) was greater in normal subjects as compared to OSMF patients. In OSMF patients values were found to decrease further as the severity (staging) of OSMF increased. The findings were statistically significant showing decrease in the values of different haematological parameters as the stage of OSMF progressed from stage I to stage III. Haematological profile can be used as a diagnostic marker in Oral Submucosa Fibrosis.

References

1. Bhardwaj D, Dinkar AD, Satoskar SK, Desai SR. Serum Iron and Haemoglobin Estimation in Oral Submucous Fibrosis and Iron Deficiency Anaemia: A

Diagnostic Approach. J Clin Diagn Res. 2016;10(12):54-58.

2. Thakur M, Guttikonda VR. Estimation of hemoglobin, serum iron, total iron-binding capacity and serum ferritin levels in oral submucous fibrosis: A clinicopathological study. J Oral Maxillofac Pathol. 2017;21(1):30-35.
3. Jani YV, Chaudhary AR, Dudhia BB, et al. Evaluation of role of trace elements in oral submucous fibrosis patients: a study on Gujarati population. J Oral Maxillofac Pathol. 2017;21(3):455-460.
4. Sachdev PK, Freeland-Graves J, Beretvas SN, et al. Zinc, Copper, and Iron in Oral Submucous Fibrosis: A Meta-Analysis. Int J Dent. 2018;2018:347-349.
5. Nagaraj T, Santosh HN. Estimation of serum hepcidin in oral submucous fibrosis before and after supplementation with oral iron: A randomized control clinical trial. J Oral Maxillofac Pathol. 2018;22(3):303-306.
6. Khulbe G, Tantradi P, Ammanagi R, Byahatti S. Estimation of salivary copper, zinc, iron and copper to zinc ratio in oral submucous fibrosis patients and its comparison with healthy individuals. J Indian Acad Oral Med Radiol. 2019;31(4):333-338.
7. Wu YH, Lee YP, Chang JY, et al. Higher frequencies of anemia, hematinic deficiencies, and gastric parietal cell antibody positivity in vitamin B12-deficient Taiwanese male oral submucous fibrosis patients. J Dent Sci. 2023;18(1):367-373.
8. Patil DJ, Joshi M. Evaluation of Hematological profile in Oral Submucous Fibrosis: A Cross-sectional Study. J Oral Maxillofac Pathol. 2020;24(3):575-580.
9. Raut T, Keshwar S, Rimal J, et al. Biochemical status of serum iron in histopathological grades of oral submucous fibrosis. J Oral Biol Craniofac Res. 2020;10(4):753-757.
10. Jassim KA, Sreenivasan BS, Mathew DG, et al. Serum iron indices in patients with oral submucous fibrosis-A comparative study. J Orofac Sci. 2020;12(2):107-112.
11. Wu YH, Lee YP, Chang JY, Wang YP, Chiang CP, Sun A. High frequencies of vitamin B12 and folic acid deficiencies and hyperhomocysteinemia in Taiwanese male patients with oral submucous fibrosis. J Dent Sci. 2023;18(1):407-413.
12. Wu YH, Lee YP, Yu-Fong Chang J, et al. Higher frequencies of anemia, vitamin B12 deficiency, and gastric parietal cell antibody positivity in folic acid-deficient Taiwanese male OSMF patients. J Dent Sci. 2023;18(2):801-807.
13. Ekka RK, Gandhi R, Sharma P, et al. Comparative analysis of salivary trace elements and copper-to-zinc ratio in oral submucous fibrosis patients and normal individuals. Age (years). 2023;45(8):45-46.
14. Gopalakrishna MM, Rao RS. Diet and Micronutrients. In: Oral Submucous Fibrosis: A Guide to Diagnosis and Management. 2023:24(6):123-129.
15. Sourabh A, Shreedhar B, Khare A, et al. Correlation of serum trace elements (Fe, Cu, and Zn) in Indian patients with leukoplakia, oral squamous cell carcinoma, and OSMF. J Oral Maxillofac Pathol. 2023;27(1):76-79.
16. Wu YH, Lee YP, Chang JY, et al. Higher frequencies of anemia, hematinic deficiencies, and gastric parietal cell antibody positivity in vitamin B12-deficient

Taiwanese male OSMF patients. J Dent Sci. 2023;18(1):367-373.

17. Torabinia N, Aghakouchakzadeh A, Kargahi N, Motamedi A. Evaluation of copper salivary level in oral squamous cell carcinoma, occupationally copper exposed, and normal population. Dent Res J (Isfahan). 2023;20(8):245-255.
18. Sargaiyan V, Singh S, Shukla R, et al. Hematological profile of OSMF patients with increasing severity. Bioinformation. 2024;20(4):353-357.
19. Sachdev R, Garg K, Mehrotra V, et al. Significance of ascorbic acid and iron levels in serum and saliva in premalignant disorder patients. Natl J Maxillofac Surg. 2024;15(1):131-135.
20. Shah R, Khidri FF, Waryah YM, et al. Serum and salivary Cu/Zn ratio as a diagnostic biomarker for oral submucous fibrosis. Biometals. 2024;37(2):447-459.
21. Kumar V, Kumari N, Ealla KKR, et al. Comparative analysis of trace elements in saliva and serum of OSMF and oral squamous cell carcinoma patients. Mol Clin Oncol. 2024;20(3):18-25.
22. Saoji K Jr, Reche A. The Role and Significance of Trace Elements in Oral Submucous Fibrosis. Cureus. 2024;16(6):62-68.
23. Kavle P, Dubey R, Sasank Tejaswee AS, et al. Serum iron, zinc, and copper among Indian patients with leukoplakia, OSMF, and oral squamous cell carcinoma. Bioinformation. 2024;20(6):660-664.
24. Samadi FM, Sivakumar N, Sonam M, et al. Quantitative correlation of serum and salivary trace elements in oral squamous cell carcinoma and oral potentially malignant disorders. J Oral Maxillofac Pathol. 2024;28(3):434-442.
25. Senevirathna K, Mahakapuge TAN, Ileperuma P, et al. Correlation between serum heavy metals and the risk of oral squamous cell carcinoma and oral potentially malignant disorders. Sci Rep. 2024;14(1):19-29.
26. Mekala MS, Koothati RK, Mummidi K, et al. Evaluation of the role of trace elements in malignant transformation of OSMF. Cureus. 2024;16(7):65-70.
27. Ravi D, Balaji NK, Sinha S. Clinical and hematological profile of patients with OSMF – A cross-sectional study in a tertiary care hospital. IOSR JDMS. 2023;15(2):133-137.
28. Sundar S, Pandiar D, Yuwanati M. Biological copper levels in oral squamous cell carcinoma: A meta-analysis. J Oral Biol Craniofac Res. 2025;15(5):1010-1020.
29. Paul S, Pachipulusu B, Poornima C, et al. Estimation of Vitamin B12 level and serum iron in OSMF patients: A case-controlled study. J Oral Maxillofac Pathol. 2025;29:269-273.
30. Tadakamadla J, Kumar S, GP M. Evaluation of serum copper and iron levels among OSMF patients. Med Oral Patol Oral Cir Bucal. 2011;16(7):870-873.
31. Ganapathy KS, Gurudath S, Balikai B, et al. Role of iron deficiency in OSMF: An initiating or accelerating factor. Indian Acad Oral Med Radiol. 2011;23(1):25-28.
32. Karthik H, Nair P, Gharote HP, et al. Role of hemoglobin and serum iron in OSMF: A clinical study. ScientificWorldJournal. 2012;25(4):10-13.
33. Hegde K, Gharote H, Nair P, et al. Iron deficiency in OSMF: Accelerator or promoter? Group. 2012;60(11.9):41-43.
34. Shetty SR, Babu S, Kumari S, et al. Evaluation of micronutrient status in serum and saliva of OSMF

patients. Indian J Med Paediatr Oncol. 2012; 33(4):224-226.

35. Rupak S, Baby GG, Padiyath S, Kumar KR. OSMF and iron deficiency anemia relationship revisited. E-Journal of Dentistry. 2012;2(2):42-46.
36. Lamlakar AS, Parashram RM. OSMF and iron deficiency anemia: A clinical study. Group. 2016; 45(14.2):100-105.
37. Wu YC, Wang YP, Chang JY, et al. Oral manifestations and blood profile in patients with iron deficiency anemia. J Formosan Med Assoc. 2014; 113(2):83-87.
38. Patil et al. Iron deficiency and vitamin B12 deficiency in OSMF patients. J Oral Maxillofac Pathol. 2020;24(3):575-580.
39. Shetty SR, Babu S, Kumari S, et al. Status of trace elements in saliva of oral precancer and oral cancer patients. J Cancer Res Ther. 2015;11(1):146-149.
40. Okade A, Hallikeri K, Trivedi D. Salivary estimation of copper, iron, zinc, and manganese in OSMF patients: A case-control study. Clin Cancer Investig J. 2015;4(3):302-306.