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Investigating the Clinical Presentation of Oral Submucous Fibrosis: Patterns and Progression

Jie-Ru You[1], Ya-Ting Chen[1], Chia-Yu Hsieh[1], Sin-Yu Chen[1], Tzu-Yao Lin[1], Jing-Syuan Shih[1], Guan-Ting Chen[1], Sheng-Wei Feng[1], Tzu-Yu Peng[1], Chia-Yu Wu[2,3*], I-Ta Lee[1]

[1]School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei 110301, Taiwan.
[2]Division of Oral and Maxillofacial Surgery, Department of Dentistry, Taipei Medical University Hospital, Taipei 11031, Taiwan.
[3]School of Dental Technology, College of Oral Medicine, Taipei Medical University, Taipei 11031, Taiwan.

*E-mail ✉ m204097001@tmu.edu.tw

ABSTRACT

Oral submucous fibrosis (OSMF) is a complex, collagen-related metabolic disorder that is mainly caused by chronic areca nut consumption. This lesion is classified as a 'potentially premalignant oral epithelial lesion (PPOEL)', which has the potential to regress if detected in its early stages. This study aimed to analyze the prevalence of clinical symptoms among OSMF patients visiting a dental institution and to explore the relationship between specific symptoms and the severity of disease progression. Retrospective data from 155 OSMF patients were collected and analyzed over one year. The prevalence of OSMF in different age groups and genders was examined using SPSS software. A Chi-square test was used to determine the association between gender and primary symptoms, as well as between the distribution of symptoms and disease grading. The results showed that 91.89% of the affected individuals were male, while 8.11% were female. The most frequently reported symptoms were a burning sensation (35.1%) and restricted mouth opening (35.1%), followed by cheek pain (18.9%) and oral ulcers (10.8%). Notably, symptomatic cases were only observed in stages 2, 3, and 4, according to the classification of Kerr *et al*. While there was no statistically significant association between gender and specific symptoms (P = 0.63, P > 0.05), a significant association was found between symptom distribution and disease grading (P = 0.0001, P < 0.05). These findings suggest that OSMF patients experience significant symptoms only in advanced stages, thereby increasing the complexity of treatment and patient care.

Keywords: OSMF, OSF, Oral submucous fibrosis, Oral potentially malignant disorders, Clinical symptoms, OPMD

Introduction

Oral submucous fibrosis (OSMF) is a chronic, progressive disorder affecting collagen metabolism, characterized by fibrosis and scarring within the oral cavity. It is predominantly observed in India and Southeast Asian countries, where it is recognized as a precancerous condition [1]. Over the past 40 years, the prevalence of OSMF in India has surged from 0.03% to 6.42% [2]. The primary causative factor is the habitual chewing of areca nut products, often consumed in quid form, either with or without betel leaves. The active compound arecoline and its metabolites stimulate Transforming Growth Factor-Beta (TGF-β) and fibroblast proliferation, leading to excessive collagen buildup. The pathogenesis of

OSMF is linked to an imbalance between collagen production and degradation within the extracellular matrix [3].

The growing consumption of areca nut among younger individuals can be attributed to multiple factors, including limited awareness of its harmful effects, peer influence, low socioeconomic status [4], easy accessibility near educational institutions [5], and aggressive marketing strategies that specifically target young consumers, fostering early addiction [6]. Additionally, academic stress in private school students has been identified as a contributing factor to habit formation [7].

OSMF is now recognized as one of the most extensively documented Oral Potentially Malignant Disorders (OPMDs). In India, the incidence of oral squamous cell carcinoma (OSCC) stands at 12.6 cases per 100,000 individuals [8], with an estimated 13.7% of OSMF cases progressing to OSCC [9]. The global rate of malignant transformation for OSMF ranges from 2.3% to 7.6% [10], whereas in India, it is significantly higher, varying between 7% and 30% [11].

Clinically, OSMF manifests through a combination of symptoms, including a burning sensation in the oral mucosa, cheek pain, ulcerations, tongue depapillation, mucosal blanching with a leathery texture and marbled appearance, loss of pigmentation, restricted jaw mobility, reduced mouth opening, limited tongue protrusion, palpable fibrotic bands, and a shrunken uvula [12]. The most frequently affected site is the buccal mucosa; however, OSMF can extend to other parts of the oral cavity, including the pharynx [13]. The fibrotic tissue tends to be bilaterally symmetrical and progressively becomes firm and pale over time.

This research aimed to retrospectively analyze the prevalence of clinical symptoms in OSMF patients who sought treatment at a dental institution. Additionally, it sought to determine the correlation between the severity of clinical symptoms and the grading of OSMF.

Materials and Methods

This retrospective study was done in the Department of Oral Medicine and Radiology at our dental hospital in India over one year, from March 2021 to March 2022. Before data collection, institutional ethical clearance was obtained from the research department (IHEC/SDC/OMED-2002/22/457). The study adhered to the ethical guidelines outlined in the Declaration of Helsinki. Patient clinical records were retrieved from the dental information archiving software (DIAS), where data had been securely stored following both verbal and written informed consent. To ensure study reliability, internal validity was maintained by sourcing information from a standardized database, while external validity was confirmed, as the study design can be replicated in other clinical environments under appropriate standardization.

The study utilized convenience sampling, and a total of 155 clinically diagnosed OSMF cases were carefully screened. Patient-reported chief complaints were analyzed to identify symptoms specific to OSMF, with non-specific complaints excluded from the study. The primary OSMF-associated symptoms were categorized into functional impairments, including burning sensation, cheek pain, reduced mouth opening, and oral ulcers. Additional demographic variables such as age and gender were also recorded.

To classify disease severity, the Kerr and Warnakulasuriya grading system [14] was employed, as it is widely recognized for integrating clinical presentation, functional mouth opening, and histopathological characteristics—making it one of the most comprehensive classifications available in existing literature **(Table 1)**. Cases diagnosed as grade 5 OSMF were excluded from the study, as these patients were immediately referred for oncology evaluation and biopsy due to the confirmed presence of oral squamous cell carcinoma (OSCC), ensuring no delay in necessary treatment and care.

Table 1. Modified Kerr and Warnakulasuriya classification of oral submucous fibrosis

Grade	Description
Grade 1	Mild stage, presenting with any characteristic features of Oral Submucous Fibrosis (OSMF), with an interincisal opening exceeding 35mm.
Grade 2	Moderate stage, displaying OSMF-associated features, with mouth opening restricted between 20-35mm.
Grade 3	Severe stage, exhibiting distinct OSMF clinical signs, with interincisal opening reduced to less than 20mm.
Grade 4A	OSMF is accompanied by additional indicators of oral potentially malignant disorders (OPMDs).
Grade 4B	OSMF with histopathological confirmation of epithelial dysplasia, irrespective of severity.
Grade 5	OSMF coexists with oral squamous cell carcinoma (OSCC).

The collected data was systematically recorded in Microsoft Office Professional Plus 2019 Excel and formatted for analysis. Statistical evaluation was conducted using IBM SPSS Statistics 23.0 (SPSS Inc.,

Chicago, IL, USA). To determine the statistical significance of the association between chief complaints and disease grading in OSMF patients, the Chi-square test was applied. A P-value < 0.05 was considered statistically significant.

Results and Discussion

Out of the total study population (n = 155), the majority were male participants (93.55%; n = 145), while female participants accounted for 6.45% (n = 10). The mean age of male participants was 42.5 years, whereas females had a higher mean age of 52.4 years, with standard deviations of 11.8 and 9.4, respectively (**Figure 1**).

When analyzing the grading distribution of OSMF cases, the highest prevalence was observed in grade 1 (76%), followed by grade 3 (12.9%), grade 2 (7.74%), and the least number of cases were found in grade 4 (3.2%) (**Figure 2; Table 2**).
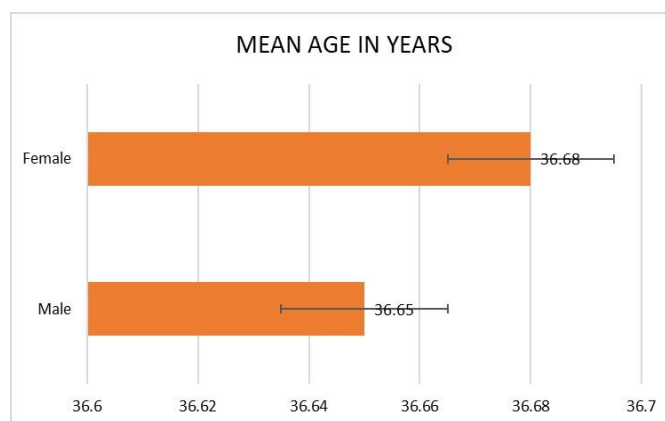

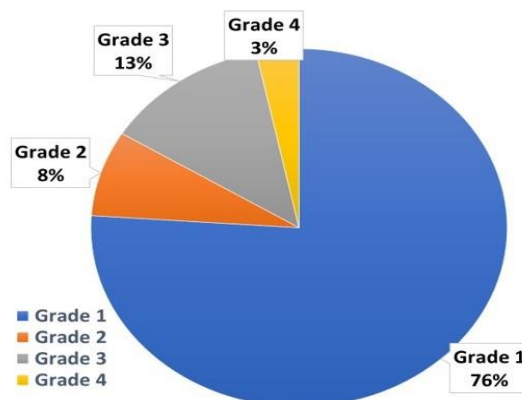**Figure 1.** Graphical representation of age distribution according to gender

Figure 2. Distribution of grading of OSMF lesions in the study

Table 2. The chi-square test shows that there was a significant difference in the distribution of complaints and grading among OSMF patients

Variable	Response	Not specific to OSMF		Specific to OSMF		P-value
		Frequency	Percent	Frequency	Percent	
Gender	Male	111	94.1	34	91.9	0.63
	Female	7	5.9	3	8.1	
	Total	118	100.0	37	100.0	
Complaints	Missing teeth	13	11.0	0	0	0.0001
	Mobility of teeth	2	1.7	0	0	
	Stains on teeth	29	24.6	0	0	
	Toothache	74	62.7	0	0	

	Burning sensation	0	0	13	35.1
	Pain in cheeks	0	0	7	18.9
	Reduced mouth opening	0	0	13	35.1
	Ulcers in mouth	0	0	4	10.8
	Total	118	100.0	37	100.0
Grading of OSMF	Grade I	118	100.0	0	0
	Grade II	0	0	12	32.4
	Grade III	0	0	20	54.1	0.0001
	Grade IV	0	0	5	13.5
	Total	118	100.0	37	100.0

Patients presenting with OSMF-specific symptoms accounted for 23.87%, while the majority (76.13%) reported non-specific, tooth-related complaints **(Figure 3)**. In terms of gender distribution, 91.89% of males and 8.11% of females exhibited distinct symptomatic complaints linked to OSMF **(Figure 4)**.

Regarding the prevalence of symptoms **(Table 2)**, burning sensation and restricted mouth opening were the most commonly reported symptoms, each contributing to 35.1% of cases. This was followed by cheek pain (18.9%), while oral ulcers were the least frequently reported symptom, appearing in 10.8% of cases.
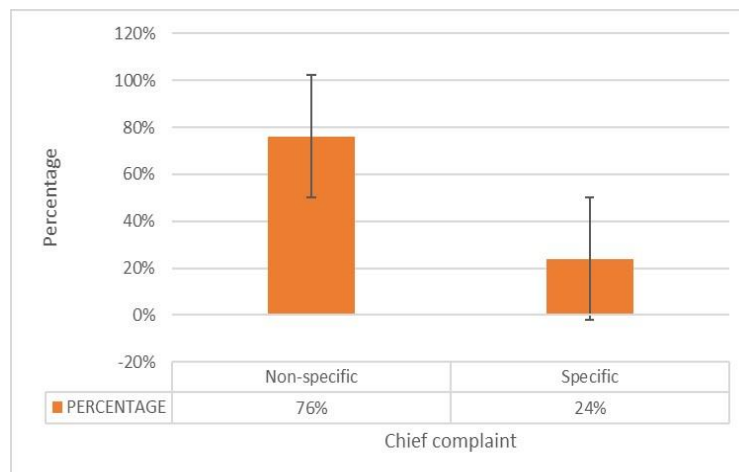

Figure 3. Graphical representation of specificity of complaints among OSMF patients. 23.87% of the patients had complaints specific to the clinical presentation of OSMF
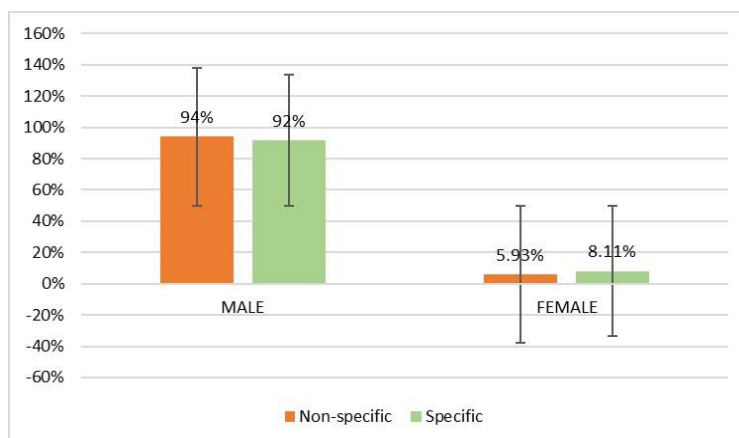

Figure 4. Gender distribution in the study specific to the specificity of the lesions to OSMF

The Chi-Square (X^2) test was conducted to assess correlations between different study variables **(Table 2)**. The comparison between gender and the specificity of chief complaints did not yield statistical significance

(P-Value = 0.63, P > 0.05). However, a significant relationship was found between the distribution of chief complaints and the grading of OSMF, with a P-value = 0.0001 (P < 0.05). Notably, symptomatic cases were exclusively observed in grades 2, 3, and 4, where restricted mouth opening and burning sensation emerged as the most frequently reported concerns.

The development of OSMF is influenced by multiple factors, with areca nut and its metabolic by-products in betel quid playing a critical role [15]. The increasing prevalence of OSMF in India has been linked to a rise in areca nut consumption among younger demographics. The documented prevalence across different regions varies, with 0.6% in the southern region, 0.03–0.2% in the west, 2.7% in the east, 6.3–14.2% in the north-central, and significantly higher rates of 30–42% in the northern region [16].

Historically, chewing areca nut was ingrained in social and cultural traditions in Southeast Asia, often incorporated into ceremonies and community gatherings. During colonial times, areca nut use extended to Western nations due to its perceived medicinal benefits. Although awareness campaigns have reduced traditional consumption, the substance remains popular among younger individuals, primarily because of its addictive and psychoactive effects. Users report elevated mood, increased focus, a sense of well-being, warmth, and enhanced productivity [17], contributing to long-term dependency.

In clinical settings, OSMF cases are commonly diagnosed among habitual betel quid chewers, with further assessment relying on histopathological analysis to determine the extent of dysplasia. Managing OSMF requires an integrated treatment approach, involving counseling for habit cessation, pharmacological interventions (either supportive or intralesional therapy), physiotherapy for jaw mobility, and in severe instances, surgical procedures. Surgical options include the removal of fibrotic bands, buccal flap repositioning, or LASER-assisted fibrotomy. The treatment plan is tailored based on histopathological findings, the patient's medical status, willingness to undergo procedures, and long-term follow-up considerations.

In many cases, OSMF is identified incidentally during screening programs or when individuals seek dental care for unrelated tooth-related issues [18]. However, understanding the clinical presentation of patients who actively report symptoms is crucial for evaluating OSMF progression from the patient's perspective. With this objective, the present study was conducted to assess the prevalence of clinical symptoms in OSMF patients visiting a dental institution. The data collection followed a retrospective approach spanning one year, and the findings were statistically analyzed.

Among the 155 OSMF cases, the condition was more prevalent in males (93.55%) compared to females (6.452%), with an average age of 42.5 ± 11.8 years in males and 52.4 ± 9.4 years in females. These findings align with earlier research, which also reported a higher incidence of OSMF in men [19, 20]. This disparity may be attributed to higher rates of chronic tobacco chewing among males compared to females [21].

When categorizing OSMF cases using Kerr *et al.*'s classification [14], the majority of patients were classified as grade 1 (76%), followed by grade 2 (7.74%), grade 3 (12.9%), and grade 4 (3.2%). Notably, only 23.87% of the patients reported OSMF-specific symptoms, with the distribution among males (91.89%) and females (8.11%). The most frequently experienced symptoms were a burning sensation (35.1%) and reduced mouth opening (35.1%), highlighting the fact that individuals tend to recognize the impact of their detrimental oral habits only when noticeable discomfort arises.

Statistical analysis revealed that the association between gender and the presence of specific OSMF complaints was not significant (P-Value = 0.63), indicating that gender does not influence whether a patient experiences or reports symptoms. However, a significant correlation was observed between OSMF grading and the specificity of complaints (P-Value = 0.0001). This finding emphasizes that symptoms become evident predominantly in later stages, as reduced mouth opening and burning sensation are among the key indicators prompting patients to seek professional evaluation, regardless of gender.

Patients in grade 1 OSMF, often asymptomatic, remain unaware of their condition, leading to its detection primarily through routine oral screenings. This delayed recognition is concerning, as treatment complexity increases with disease progression. Because of the lack of a standardized pharmacological therapy for OSMF, the responsibility of healthcare management falls heavily on both patients and communities, particularly those from lower socioeconomic backgrounds. Moreover, a delayed diagnosis in advanced stages significantly affects quality of life, contributing to issues such as low self-esteem, weight loss, sleep disturbances, malnutrition, and social withdrawal [22]. Since this is the first study conducted in India to evaluate the prevalence of symptomatic chief complaints in OSMF patients, direct comparisons with previous research could not be made. The primary motivation behind this research was to gain insights into the disease progression from the patient's

perspective, as the presence of symptoms plays a crucial role in prompting individuals to seek treatment from oral medicine specialists. In this study, the most frequently reported concerns were burning sensation (35.1%) and restricted mouth opening (35.1%), which were the driving factors for patients to visit the dental institution. These findings offer valuable insights into the prevalence of OSMF in the South Indian population, detailing the age and gender distribution of affected individuals. Additionally, a strong association between specific symptoms and OSMF grading was established.

This study, however, comes with certain limitations. Since it was conducted retrospectively, the data was restricted to patients who visited the institution, thereby reflecting only the demographic patterns within the hospital's vicinity or regions with access to this facility. To gain a more comprehensive understanding of the condition, large-scale multicentric studies encompassing both urban and rural populations across diverse geographic locations are necessary. Expanding the scope would help capture variations in OSMF presentation, influenced by differences in betel quid chewing habits.

Another key observation from this study was the higher prevalence of OSMF among males. However, this result should be interpreted cautiously, as it does not necessarily indicate that females are less affected. Instead, likely, many women with OSMF do not seek treatment due to factors such as lack of awareness, societal stigma, or limited access to healthcare facilities. These barriers may prevent timely intervention and highlight the need for increased awareness campaigns and improved healthcare accessibility for women affected by OSMF.

Conclusion

This study establishes that symptomatic cases of OSMF typically emerge only after the disease advances to grade 2, as patients in grade 1 remain asymptomatic. The most frequently observed symptoms were a burning sensation in the oral cavity and restricted mouth opening, both of which play a crucial role in guiding the clinical diagnosis of OSMF among the general population during routine examinations conducted by oral healthcare professionals. These findings underscore the lack of knowledge regarding the early clinical manifestations of OSMF, particularly among chronic areca nut product users.

Additionally, there remains a significant gap in research concerning the relationship between clinical symptoms and dysplasia grading, the specific anatomical position of fibrotic bands, and the type of areca nut quid consumed—whether commercial tobacco products or self-prepared formulations. This study further reinforces the urgent need for preventive measures aimed at reducing tobacco product consumption, along with early screening initiatives for individuals with habitual areca nut chewing practices. Strengthening these preventive efforts is essential for promoting a healthier, disease-free society.

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