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Original Article

Pattern of Occurrence and Severity of Oral Submucous Fibrosis Among Habitual Gutkha, Areca Nut and Pan Chewers

Taimoor Ali Khan[1*], Farah Irshad[2], Faiza Hasan[3], Kashif Ali Channar[1], Bushra Arain[4] and Khurram Anwar[5]

[1]Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
[2]Department of Oral Medicine, Bahria University Medical and Dental College, Karachi, Pakistan
[3]Department of Pharmacology, Fatima Jinnah Dental College, Karachi, Pakistan
[4]Department of Oral Medicine, Isra Dental College, Hyderabad, Pakistan
[5]Department of Periodontology, Isra Dental College, Hyderabad, Pakistan

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***Corresponding Author:**
Taimoor Ali Khan
Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
tamikhan18@gmail.com

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ABSTRACT

Oral submucous fibrosis (OSF) is a complex, insidious and precancerous disease of the oral cavity. The high use of addictive substances in our local setting merits to be worked on finding out the resultant prevalence of OSF. **Objective:** To determine the frequency of occurrence and severity of OSF among habitual gutkha, areca nut and pan chewers. **Methods:** A total of 183 patients with presenting complaints of burning in mouth, difficulty in chewing and cheek biting and who are habitual chewer of areca nut, gutkha or pan for over 6 months with minimum frequency of 1 pack per day were recruited in this study at Oral and Maxillofacial Surgery Department of Liaquat University of Medical and Health Sciences Jamshoro, Pakistan. Severity of OSF was assessed as per clinical staging and findings was reported. **Results:** The average age of the patients was 34.57±9.98 years. Frequency of occurrence of OSF among habitual gutkha, areca nut and pan chewers was 100%. Regarding severity of OSF among habitual gutkha, areca nut and pan chewers was observed and found 31.15% stage 1, 51.91% stage 2 and 16.94% stage 3. Severity of stages were not statistically significant in all type of addiction. **Conclusions:** It was concluded that dose-dependent association between the frequency and length of daily use of commercially accessible areca nut and tobacco products and the increased risk of disease.

INTRODUCTION

Oral submucous fibrosis (OSF) is a complex, debilitating insidious and precancerous disease of the oral cavity [1]. The disease was most prevalent south-east Asia with highest incidence reported from India, Bangladesh, Sri Lanka, Pakistan and Nepal. Recent research suggests that the disease is on further rise in the region with prevalence increasing from 0.03% to 6.42% in just a few decades in the Indian subcontinent [2]. The fact that the condition is capable of undergoing malignant transformation up to 30% of the cases, makes this rise in prevalence even more worrying [3]. The morphology and physiology of the oral cavity are significantly altered by OSF, which is linked to a juxta-epithelial inflammatory reaction, fibro-elastic changes in the lamina propria layer, and epithelial atrophy, which causes the oral mucosa to become inflexible and eventually resulting in trismus and difficulty opening the mouth [4, 5]. Although OSF may appear at any age, it is more often observed in young and adults between the age of 25 and 35 years. The buccal mucosa, labial mucosa, retro-molar pads, soft palate, and floor of the mouth are the primary areas implicated. There have also been isolated reports of fibrotic alterations in the throat, oesophagus, and paratubal muscles of the Eustachian tubes [6, 7]. The first symptoms of OSF include

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inflammation, which is followed by hypovascularity, fibrosis, and blanching of the oral mucosa, which has a marble-like effect. A fibrous band also develops, causing trismus, dysphagia, dysphonia, and abnormalities in hearing and gustatory perception [8-10]. Multiple risk factors have been advocated to bear causative role in etiology of OSF, including chilies consumption, malnutrition, genetic predisposition, altered salivary composition, autoimmunity, collagen defects and areca nut chewing. Use of Areca nut, a habit in our region was believed to be the most significant risk factor contributing to OSF development [11]. Additionally, it is also believed that the amount, frequency and duration of areca nut in betel quid chewing maybe related to the development of OSF [12]. However, relying on a variety of circumstances including individual susceptibility, the kind of areca nut chewed, length of time and other variables. The time between the start of the chewing habit and the emergence of clinical signs of OSF may vary greatly, ranging from a few months to many decades [13]. Betel quid is essentially made up of areca nut, catechu, slaked lime, and betel leaf wrapped in tobacco [14]. Pan translates to "leaf" in a number of South Asian languages. The betel leaf is used to wrap a variety of items like Tobacco, spices, and areca nut wrapped in betel quid are the usual ingredients of pan. Gutkha is a tobacco and areca nut powder that is sold in premade pouches of 5 to 10 grams [15]. The usage of gutkha has suddenly increased lately because of its affordability, ease of availability, eye-catching, colored packaging, and extended shelf life [16]. Research has shown that areca nut reduces appetite, improves digestion, changes focus and relaxation, and sometimes even raises attentiveness. In a recent study patient with habit of chewing areca nut and gutkha were 58.58% [2]. Others report the percent frequencies of chewing habits of OSF patients to comprise of guthka (30%) chaliya (6.5%), raw tobacco (21.2%), manpuri (20%), pan (12.9%) and naswar (9%) [17]. Research on school going children has revealed that 40.8% children chewed areca nut regularly, 39% occasionally and 20.2% rarely [18].

This study was conducted to determine frequency of occurrence and severity of oral sub mucous fibrosis among habitual gutkha, areca nut and pan chewers, which will be beneficial for our local population in order to change their behaviors regarding personal habits. This study will also help in generating baseline data and planning strategies to control disease burden.

METHODS

A cross sectional study was conducted from February 2021 to January 2022, in Oral Maxillofacial Surgery Department of Dentistry at Liaquat University of Medical Health Sciences Hospital, Jamshoro, Pakistan. The study was based on using non-probability consecutive sampling. Total sample size calculated was 183 with margin of error set as 2.5%. Sample was calculated using Open-Epi sample size calculator. Frequency of OSF was expected as 3.06% [19]. Patients with either gender having age range of 18 to 50 years presenting with presenting complaints of burning in mouth, difficulty in chewing and cheek biting and who were habitual chewer of areca nut, gutkha and pan for over 6 months with minimum frequency of 1 pack / 1 unit per day were included in the research. Patients with limited mouth opening due to causes other than OSF, history of tobacco smoking, mentally retarded and those who were having collagen defects and autoimmune disorders were excluded from study. This study was approved by Research Ethics Committee LUMHS (LUMHS/REC/22 Dated 25.1.2021). Every research individual had their OSF status checked. A medical history was taken from OSF patients, including the kind, frequency, and length of their chewing habit. A self-assessment descriptive rating scale (Absent, Mild, Moderate, and Severe) was used to evaluate the degree of burning sensation. Salivary change that was subjective was noted. The patient was questioned about if they need repeated sips of water to moisten their mouths, swallow meals, or deal with any accumulation of saliva in their mouths. According to the patient's reaction, a rise or fall in salivation was noted on the research proforma. Using a sweet and salt solution, changes in taste sensations were evaluated. Following mouth washing, the patient was given 2 ml of either a salty solution (1% sodium chloride), sucrose solution (0.25% saccharine solution), or water, which they were to swill for one minute before spitting it out. If both answers were accurately detected, the patient's gustation was deemed normal. If the participant could not identify any of them, then the gustatory experience was deemed to be reduced. The conductive hearing loss was evaluated using the tuning fork test. The soft palate, buccal mucosa, retromolar regions, and labial mucosa were palpated for the presence of fibrous bands during a clinical examination. To termed a fibrous band, a felt structure that was thick, vertical, and continuous was regarded to be a band. Using a Vernier calliper, the interincisal distance between the maxillary and mandibular right and left central incisors was determined. According to clinical staging (Stage 1: Faucial Bands Only, Stage 2: Faucial and Buccal Bands, Stage 3: Faucial and Labial Bands), the severity of OSF was evaluated. By coding the data, the privacy and confidentiality of each patient were protected. Data were analyzed using Microsoft Excel 2016 and SPSS version 21.0. Qualitative data (gender, presenting complaint, socioeconomic status, pattern of OSF, location of fibrous band, chewing habit and stage of OSF) was expressed as number and percentage. Frequency and severity of OSF was compared with the type of habit and duration of habit

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by applying Chi-Square test. Quantitative data (age, duration and frequency of chewing areca nut, gutkha or pan) was expressed as mean & standard deviation (X ± SD). Independent T Test was used to find the significance of association among quantitative variables.

RESULTS

A total of 183 patients with presenting complaints of burning in mouth, difficulty in chewing and cheek biting. who are habitual chewer of areca nut, gutkha or pan for over 6 months with minimum frequency of 1 pack / 1 unit per day were recruited in this study. The average age of the patients was 34.57±9.98 years. Median frequency of chewing and duration of addition was 1 (IQR=1) and 9 (IQR=6) as shown in (table 1)

Table 1: Descriptive Statistics of Characteristic of Patients

Variables	Mean ± SD	Median	Interquartile Range
Age (Years)	34.57 ± 9.98	35	19
Frequency of Chewing	1.52 ± 0.572	1.00	1
Duration of Habit	10.23 ± 3.21	9	6

There were 133 (72.68%) male and 50 (27.32%) female patients encountered with OSF in this study (figure 1).

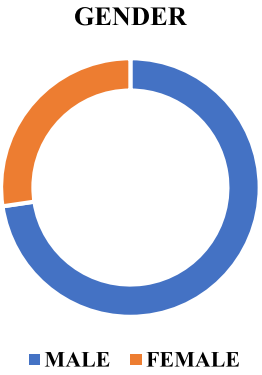

Figure 1: Gender Distribution of the Patients (n=183)

Burning sensation was observed in all patients, salvation, taste perception and hearing were also observed in 40% to 50% cases (table 2)

Table 2: Clinical Examination of the Patients

Clinical Examination		Count %
Burning Sensation	Absent	0 (0%)
	Mild	73 (39.9%)
	Moderate	102 (55.7%)
	Severe	8 (4.4%)
Salivation	Normal	76 (41.5%)
	Increased	101 (55.2%)
	Decreased	6 (3.3%)
Taste Perception	Normal	104 (56.8%)
	Altered	79 (43.2%)
Hearing	Normal	99 (54.1%)
	Altered	84 (45.9%)

Regarding type of habit 81 (44.3%) were observed with habit of chewing areca nut 85 (46.4%) were chewing pan and 47 (25.7%) were habitual of gutkha. Some of the patients were also taking pan and areca and also gutkha. Type of habit, frequency of chewing habit per pack/unit per day Clinical examination, location of fibrous bands, functional and clinical staging are recorded. Regarding severity of OSF among habitual gutkha, areca nut and pan chewers was observed and found 31.15% stage 1, 51.91% stage 2 and 16.94% stage 3 (table 3)

Table 3: Frequency Distribution of Different Variables

Frequency Variables		Count %
Type of Habit	Areca nut	81 (44.3%)
	Pan	85 (46.4%)
	Gutkha	47 (25.7%)
Frequency of Chewing	1 Pack per day	95 (51.91%)
	2-3 Pack per day	81 (44.26%)
	3-5 Pack per day	07 (3.83%)
Fibrous Band Location	Buccal Mucosa	123 (67.21%)
	Labial Mucosa	24 (13.11%)
	Retromolar Area	20 (10.93%)
	Fauces Area	14 (7.65%)
	Soft Plate	02 (1.09%)
Functional Staging	Stage A	76 (41.53%)
	Stage B	83 (45.36%)
	Stage C	24 (13.11%)
Clinical Staging	Stage 1	57 (31.15%)
	Stage 2	95 (51.91%)
	Stage 3	31 (16.94%)

Stratification analysis was performed and observed that severity of OSF was associated with age groups, gender but not statistically significant with occupation, socioeconomic status, frequency of chewing and duration of addition as shown in table 4.

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Table 4: Frequency of Severity of OSF Among Habitual Guthka, Areca Nut and Pan Chewers Stratified by Effect Modifiers

Effect Modifiers		Severity of OSF			Total	p-Value
		Stage 1 (n=57)	Stage 2 (n=95)	Stage 3 (n=31)		
		Count %	Count %	Count %		
Age (Years)	<30	34 (45.3%)	34 (45.3%)	7 (9.3%)	75	0.007
	31 to 40	10 (20.0%)	30 (60.0%)	10 (20.0%)	50	
	>40	13 (22.4%)	31 (53.4%)	14 (24.1%)	58	
Gender	Male	34 (25.6%)	79 (59.4%)	20 (15.0%)	133	0.004
	Female	23 (46.0%)	16 (32.0%)	11 (22.0%)	50	
Occupations	Worker	34 (27.2%)	73 (58.4%)	18 (14.4%)	125	0.036
	Not Working	23 (39.7%)	22 (37.9%)	13 (22.4%)	58	
Socioeconomic Status	Low	35 (29.4%)	66 (55.5%)	18 (15.1%)	119	0.280
	Medium	15 (30.0%)	23 (46.0%)	12 (24.0%)	50	
	High	7 (50.0%)	6 (42.9%)	1 (7.1%)	14	
Frequency of Chewing	1 Pack/Unit per Day	33 (34.7%)	42 (44.2%)	20 (21.1%)	95	0.084
	2-3 Packs per Day	24 (29.6%)	48 (59.3%)	9 (11.1%)	81	
	3-5 Pack/Unit per Day	0 (0%)	5 (71.4%)	2 (28.6%)	7	
	5-10 Pack/Unit per Day	0 (0%)	0 (0%)	0 (0%)	0	
Duration of Habit	<12 Months	44 (32.1%)	71 (51.8%)	22 (16.1%)	137	0.813
	>12 Months	13 (28.3%)	24 (52.2%)	9 (19.6%)	46	

DISCUSSION

Oral submucous fibrosis (OSF) is a chronic oral cavity disorder that has the potential to progress to malignancy and often results in mouth cancer [19, 20]. According to our analysis, the majority of OSMF patients, with an average age ranging from 34.57±9.98 years. This is consistent with research done in Taiwan which found that the participants ages ranged from 20 to 39 years; however, research done on 1000 patients in Central India found that the participants' ages ranged from 30 to 39 years. Similarly, the age group most often afflicted was found to be between 20 and 39 years old in research conducted in Pakistan [21-23]. The primary cause of the OSF conditions is the overindulgence in tobacco substances and areca nut based goods like gutkha, pan masala, khaini, mava, etc. These very addictive items, which have been around for a few decades, come in little, inexpensive, colorful sachets that serve as betel quid replacements. Intense marketing and advertising, which often portray them as safe items, cause high consumption across all age categories, especially in India and among the migrant populations who migrate there from other countries [24]. The frequency of OSMF was much greater in males than in women [25]. In India, Sinor *et al.* discovered a male preponderance in cases of OSF [26]. The male preponderance in this research may be explained by the fact that men have easier access to areca nut and its products, which they employ more often than women. Patients who were male had a higher prevalence of OSF (73%), comparing to 2.33% in female patients. Males (69%) had a higher percentage of OSF patients than females (31%) according to another research done in Karachi [27]. In comparison, 12.8% of men and 7.5% of women were found in Indian research [28]. In Allahabad, North India, Mehrotra *et al.* studied the incidence rates of oral mucosal lesions in this hospital between 1990 to 2001. Data on age, sex, the site of involvement, and the histopathology results were gathered annually. It demonstrated the prevalence of both malignant and possibly malignant oral lesions among the patients coming to the hospital from this area [29]. Likewise, patients who used pan masala were shown to be at increased risk of acquiring OSF in a population-based case control study conducted in rural and urban Lucknow [30]. In our research on addiction types, we found that 44.3% of participants chewed areca nut habitually, 46.4% chewed pan habitually, and 25.7% habitually chewed gutkha. According to the research conducted by Srivastava et al [31]. Out of the total participants, 55.81% were habitual gutkha consumers, 6.98% were betel quid and gutkha drinkers, 26.74% were tobacco and gutkha consumers, and 10.46%) were smokers and gutkha consumers. When areca nut and pan chewers were monitored, the severity of OSF was determined to be 31.15% stage 1, 51.91% stage 2, and 16.94% stage 3. In his analysis of 1,006 OSF patients, Kumar discovered that 422 (41.94%) of the cases were stage 2 [32]. In contrast to the current research, 226 individuals (22.29%) were in stage 4, 184 individuals (18.29%) were in stage 3, and 174 individuals (17.29%) were in stage 1. This may be due to the fact that in the early stages, notable changes specifically, restricted mouth opening are not observed. Additionally, patients may not seek medical attention unless there is a severe impairment of their bodily functions. Lack of knowledge about the illness may also play a role in this. Babu *et al.*,

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research among OSF patients in Hyderabad revealed that gutkha was the most addictive substance compared to other tobacco and areca nut related goods including pan, pan masala, and raw areca nut. They discovered a clear link between chewing gutkha and OSF and concluded that eating gutkha caused OSF [33]. The incidence and severity of OSF among Moradabad, India's habitual gutkha, areca nut, and pan chewers were ascertained by Nigam et al [34]. The research found that among OSF patients, gutkha chewing was the most frequent abusive practice, with a 6.3% incidence of OSF. According to research conducted in India by Ara *et al.*, the frequency of gutkha intake was 35.3% for stage 1 OSF patients and 53.3% for stage 2 patients [24]. In another research carried out in India, Ahmad *et al.*, discovered that gutkha was primarily utilized by almost 55% of OSF patients [35]. According to Babu *et al.*, gutkha was ingested by OSF patients in greater quantities than any other similar areca nut substance. In contrast to raw areca nut, they found a robust correlation between chewing gutkha and OSF and highlighted the significant role gutkha plays in the early stages of OSF illness [33]. Shah and Sharma conducted similar research in Delhi and found that chewing gutkha generated OSF early than raw areca nut and other items [36].

CONCLUSIONS

One significant risk factor for the development of oral carcinogenesis is oral submucous fibrosis. The current investigation found a dose-dependent association between the frequency and duration of daily use of commercially available areca nut and tobacco products and the relative risk of illness. To prevent cancer, we must take action to outlaw all of these harmful items from our marketplace and establish addiction treatment centers that provide recommendations on how to use these harmless-seeming drugs. By eliminating oral pre-malignant conditions like OSF, these actions may significantly lower the risk of oral cancer.

Authors Contribution

Conceptualization: TAK, FI
Methodology: TAK, KAC
Formal analysis: BA
Writing-review and editing: FH, KA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Shaikh AH, Ahmed S, Siddique S, Iqbal N, Hasan SM, Zaidi SJ *et al.* Oral Submucous Fibrosis; Study of cases reported at Dow International Medical College Hospital, Karachi, Pakistan. The Professional Medical Journal.2019 Feb; 26(02): 275-81. doi: 10.29309/TPMJ/2019.26.02.3100.

[2] Shivam AK, Azam F, Sadiq H. Prevalence of oral submucous fibrosis among habitual gutkha and areca nut chewers in Dhanbad district. International Journal of Preventive and Clinical Dental Research. 2018 Oct; 5(4): 60-2. doi: 10.4103/INPC.INPC_5_19.

[3] Hosein M, Mohiuddin S, Fatima N. Association between grading of oral submucous fibrosis with frequency and consumption of areca nut and its derivatives in a wide age group: a multi-centric cross sectional study from Karachi, Pakistan. Journal of Cancer Prevention. 2015 Sep; 20(3): 216. doi: 10.15430/JCP.2015.20.3.216.

[4] Siriwardena BS, Jayawardena KL, Senarath NH, Tilakaratne WM. An evaluation of clinical and histopathological aspects of patients with oral submucous fibrosis in the background of oral squamous cell carcinoma. Biomed Research International. 2018 Oct; 2018. doi: 10.1155/2018/4154165.

[5] Passi D, Bhanot P, Kacker D, Chahal D, Atri M, Panwar Y. Oral submucous fibrosis: Newer proposed classification with critical updates in pathogenesis and management strategies. National Journal of Maxillofacial Surgery. 2017 Jul; 8(2): 89-94. doi: 10.4103/njms.NJMS_32_17.

[6] Angadi PV and Rekha KP. Oral submucous fibrosis: a clinicopathologic review of 205 cases in Indians. Oral and Maxillofacial Surgery. 2011 Mar; 15: 15-9. doi: 10.1007/s10006-010-0225-x.

[7] James L, Shetty A, Rishi D, Abraham M. Management of oral submucous fibrosis with injection of hyaluronidase and dexamethasone in grade III oral submucous fibrosis: A retrospective study. Journal of International Oral Health. 2015 Aug; 7(8): 82.

[8] Eipe N. The chewing of betel quid and oral submucous fibrosis and anesthesia. Anesthesia and Analgesia. 2005 Apr; 100(4): 1210-3. doi: 10.1213/01.ANE.0000146434.36989.34.

[9] Wollina U, Verma SB, Ali FM, Patil K. Oral submucous fibrosis: an update. Clinical, Cosmetic and Investigational Dermatology. 2015 Apr: 193-204. doi: 10.2147/CCID.S80576.

[10] Gupta SC, Singh M, Khanna S, Jain S. Oral submucous fibrosis with its possible effect on eustachian tube functions: A tympanometric study. Indian Journal of

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DOI: https://doi.org/10.54393/pjhs.v5i04.1422

Otolaryngology and Head and Neck Surgery. 2004 Jul; 56: 183-5. doi: 10.1007/BF02974346.

[11] Salam H, Shaheen A, Wahid M, Irshad M. Pattern of presentation for oral submucous fibrosis. Pakistan Oral and Dental Journal. 2016 Jun; 36(2). doi:

[12] Rajalalitha P and Vali S. Molecular pathogenesis of oral submucous fibrosis-a collagen metabolic disorder. Journal of Oral Pathology & Medicine. 2005 Jul; 34(6): 321-8. doi: 10.1111/j.1600-0714.2005.00325.x.

[13] Rajendran R. Familial occurrence of oral submucous fibrosis: report of eight families from northern Kerala, south India. Indian Journal of Dental Research: Official Publication of Indian Society for Dental Research. 2004 Oct; 15(4): 139-44.

[14] Niaz K, Maqbool F, Khan F, Bahadar H, Hassan FI, Abdollahi M. Smokeless tobacco (paan and gutkha) consumption, prevalence, and contribution to oral cancer. Epidemiology and Health. 2017; 39. doi: 10.4178/epih.e2017009.

[15] Htin K, Isao I, Koichi K. Effect of belief and knowledge on betel quid chewing behavior in Myanmar: variation across socio-economic status. Kōkūbyō Gakkai Zassh. 2019; 86: 53-70. doi:

[16] Aziz SR. Coming to America: betel nut and oral submucous fibrosis. The Journal of the American Dental Association. 2010 Apr; 141(4): 423-8. doi: 10.14219/jada.archive.2010.0194.

[17] Khan MA, Saleem S, Shahid SM, Hameed A, Qureshi NR, Abbasi Z *et al*. Prevalence of oral squamous cell carcinoma (OSCC) in relation to different chewing habits in Karachi, Pakistan. Pakistan Journal of Biochemistry And Molecular Biology. 2012; 45(2): 59-63.

[18] Sarfaraz M, Ali A, Mirza T. Prevalence and characteristics of areca nut chewing habit among school going children in Karachi. Journal of the Dow University of Health Sciences. 2014 Dec; 8(3): 111-6.

[19] Tariq H, Ahmed S, Naz M, Naureen A. Frequency of oral sub mucous fibrosis and its correlation with the level of education in patients coming to a tertiary care hospital of Karachi from January 2018 to December 2018. Asian Pacific Journal of Cancer Care. 2020 Aug; 5(3): 157-60. doi: 10.31557/apjcc.2020.5.3.157-160.

[20] Li N, Jian X, Hu Y, Xu C, Yao Z, Zhong X. Discovery of novel biomarkers in oral submucous fibrosis by microarray analysis. Cancer Epidemiology Biomarkers and Prevention. 2008 Sep; 17(9): 2249-59. doi: 10.1158/1055-9965.EPI-07-2908.

[21] Yang YH, Lee HY, Tung S, Shieh TY. Epidemiological survey of oral submucous fibrosis and leukoplakia in aborigines of Taiwan. Journal of Oral Pathology and Medicine. 2001 Apr; 30(4): 213-9. doi: 10.1034/j.1600-0714.2001.300404.x.

[22] Hazarey VK, Erlewad DM, Mundhe KA, Ughade SN. Oral submucous fibrosis: Study of 1000 cases from central India. Journal of Oral Pathology & Medicine. 2007 Jan; 36(1): 12-7. doi: 10.1111/j.1600-0714.2006.00485.x.

[23] Merchant AT, Haider SM, Fikree FF. Increased severity of oral submucous fibrosis in young Pakistani men. British Journal of Oral and Maxillofacial Surgery. 1997 Aug; 35(4): 284-7. doi: 10.1016/S0266-4356(97)90049-8.

[24] Ara SA, Arora V, Zakaullah S, Raheel SA, Rampure P, Ashraf S. Correlation of habits and clinical findings with histopathological diagnosis in oral submucosal fibrosis patients. Asian Pacific Journal of Cancer Prevention. 2013; 14(12): 7075-80. doi: 10.7314/APJCP.2013.14.12.7075.

[25] Yang SF, Wang YH, Su NY, Yu HC, Wei CY, Yu CH *et al*. Changes in prevalence of precancerous oral submucous fibrosis from 1996 to 2013 in Taiwan: A nationwide population-based retrospective study. Journal of the Formosan Medical Association. 2018 Feb; 117(2): 147-52. doi: 10.1016/j.jfma.2017.01.012.

[26] Sinor PN, Gupta PC, Murti PR, Bhonsle RB, Daftary DK, Mehta FS *et al*. A case-control study of oral submucous fibrosis with special reference to the etiologic role of areca nut. Journal of Oral Pathology and Medicine. 1990 Feb; 19(2): 94-8. doi: 10.1111/j.1600-0714.1990.tb00804.x.

[27] Mohammad H, Hadi NI, Ahmed F, Younus S. Comparison of frequency of habits among different stages of oral submucous fibrosis. Pakistan Journal of Rehabilitation. 2013; 2(1).

[28] Parkin DM, Bray F, Ferlay J, Pisani P. Estimating the world cancer burden: Globocan 2000. International Journal of Cancer. 2001; 94(2): 153-156. doi: 10.1002/ijc.1440.

[29] Mehrotra R, Pandya S, Chaudhary AK, Kumar M, Singh M. Prevalence of oral pre-malignant and malignant lesions at a tertiary level hospital in Allahabad, India. Pacific Journal of Cancer Prevention. 2008 Jan; 9(2): 263-5.

[30] Mehrotra D, Kumar S, Agarwal GG, Asthana A. Odds ratio of risk factors for oral submucous fibrosis in a case control model. British Journal of Oral and Maxillofacial Surgery. 2013 Oct; 51(7): e169-73. doi: 10.1016/j.bjoms.2012.08.001.

[31] Srivastava R, Jyoti B, Pradhan D, Siddiqui Z. Prevalence of oral submucous fibrosis in patients visiting dental OPD of a dental college in Kanpur: A demographic study. Journal of Family Medicine and Primary Care. 2019 Aug; 8(8): 2612-7. doi: 10.4103/jfmp

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DOI: https://doi.org/10.54393/pjhs.v5i04.1422

c.jfmpc_465_19.

[32] Kumar S. Oral submucous fibrosis: A demographic study. Journal of Indian Academy of Oral Medicine and Radiology. 2016 Apr; 28(2): 124-8. doi: 10.4103/0972-1363.195085.

[33] Babu S, Bhat RV, Kumar PU, Sesikaran B, Rao KV, Aruna P *et al.* A comparative clinico pathological study of oral submucous fibrosis in habitual chewers of pan masala and betelquid. Journal of Toxicology: Clinical Toxicology. 1996; 34: 317-22. doi: 10.3109/15563659609013796.

[34] Nigam NK, Aravinda K, Dhillon M, Gupta S, Reddy S, Raju MS. Prevalence of oral submucous fibrosis among habitual gutkha and areca nut chewers in Moradabad district. Journal of Oral Biology and Craniofacial Research. 2014 Jan; 4(1): 8-13. doi: 10.1016/j.jobcr.2013.10.005.

[35] Ahmad MS, Ali SA, Ali AS, Chaubey KK. Epidemiological and etiological study of oral submucous fibrosis among gutkha chewers of Patna, Bihar, India. Journal of Indian Society of Pedodontics and Preventive Dentistry. 2006 Apr; 24(2): 84-9. doi: 10.4103/0970-4388.26022.

[36] Shah N and Sharma PP. Role of chewing and smoking habits in the etiology of oral submucous fibrosis (OSF): a case-control study. Journal of Oral Pathology & Medicine. 1998 Nov; 27(10): 475-9. doi: 10.1111/j.1600-0714.1998.tb01915.x.

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