

## Prevalence and the relationship of oral mucosal lesions in tobacco users and denture wearers in the North Indian population

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ABSTRACT

**Aim:** The aim of the present study was to determine the prevalence and the relationship of oral mucosal lesions in tobacco users and denture wearers in a North Indian population. **Materials and Methods:** The study comprised 3,749 patients attending the Department of Oral Medicine and Radiology, Jodhpur Dental College General Hospital between September 2008 and December 2012, for the treatment of dental problems other than oral mucosal lesions. The ages ranged from 28 years to 83 years, with a mean age of 49.7 years. The results were evaluated using the Pearson Chi-square test, with Yate's correction and ANOVA tests. **Results:** A total of 2,318 patients were diagnosed with lesions associated with the use tobacco and the wearing of dentures. The most frequently seen lesion was melanin pigmentation (29.9%) followed by linea alba (22.2%) and frictional keratosis (19.9%). Ulcers (6.1%) were the most common oral lesion seen in patients who wore dentures, followed by hyperplasia (4.8%). A statistically significant relation ( $P < 0.05$ ) was established between tobacco and melanin pigmentation, frictional keratosis, traumatic ulcerations and leukoplakia. In those who wore dentures a statistically significant relation ( $P < 0.05$ ) was found between candidiasis, traumatic ulceration and frictional keratosis. **Conclusion:** The results of the present study indicate that the association of frictional keratosis with tobacco users and wearers of dentures can help in determining the diagnosis and treatment plan for oral cancer. Wearers of dentures should also be recalled for periodic checks at regular intervals and optimum preventive measures implemented.

**Key words:** Denture wearers, oral mucosal pathology, smokers

### INTRODUCTION

Most studies on the prevalence of oral mucosal lesions have been conducted in the developed world such the American,<sup>[1,2]</sup> European<sup>[3,4]</sup> and Asian<sup>[5,6]</sup> continents. Since there are vast cultural, ethnic and geographical differences between the Indian subcontinent and the countries on these continents, it would not be realistic to apply the results of those studies to the Indian

population. As stated previously, tobacco and its related products are notable risk factors for the development of pre-cancerous lesions and conditions, which may eventually lead to oral cancer.<sup>[7,8]</sup> The prevalence of melanin pigmentation, various oral lesions and white lesions is higher among smokers.<sup>[3,9]</sup> However, some studies do not identify smoking as a risk factor for oral lesions.<sup>[10]</sup> The use of dentures in the elderly has also been known to act as a potential risk factor for oral lesions and the development of oral cancer as well as other characteristic lesions such as denture stomatitis and hyperplasia.<sup>[11,12]</sup> Traumatic ulcers are the most frequently seen oral lesion in users of dentures.<sup>[13]</sup>

The present study was carried out to verify the association between the use of tobacco and dentures and the development of oral mucosal lesions and to find the prevalence of oral lesions in a North Indian population.

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## MATERIALS AND METHODS

For the study, 3,749 patients attending the Department of Oral Medicine and Radiology, Jodhpur Dental College General Hospital, between September 2008 and December 2012 for the treatment of dental problems other than oral mucosal lesions, were selected. Ethical clearance was obtained from the Institutional Ethical Committee, Jodhpur Dental College General Hospital and Jodhpur National University. Informed consent was obtained from all patients prior to the examination. The study was designed as per the World Health Organization (WHO) guidelines for the conduct of oral health epidemiological studies and all diseases were diagnosed and recorded according to the WHO classification.<sup>[14-16]</sup> Patients with any lesions resulting from trauma were excluded from the study. The oral examination was conducted with appropriate instruments under suitable lighting. A patient who has smoked >8 cigarettes/bidis a day for the past 10 years was identified as a smoker. A patient who uses either partially removable or complete dentures was included as a wearer of dentures for the study. A provisional diagnosis was established at the time of examination. If there was no improvement in the lesion after 15 days, a biopsy of the lesion for histopathological examination was advised. The observations were analyzed using the computer program, SPSS 12 (SPSS Inc. Chicago, USA). The results were evaluated using the Pearson Chi-square test, with Yate's correction and ANOVA tests.  $P < 0.05$  were considered statistically significant.

## RESULTS

The study sample comprised 2035 (54.3%) male and 1714 (45.7%) female patients. The ages of the patients ranged from 28 years to 83 years with a mean age of 49.7 years. The distribution of the sample by age and gender is shown in Table 1. Most of the patients ( $n = 1049$ ; 58.34%) in the 28-37 years age group were smokers and the number of patients with either partial or complete dentures ( $n = 553$ ) (non-denture wearers,  $n = 318$ ) increased after the fourth decade [Table 2]. A total of 2,318 patients (61.8%) were diagnosed with lesions associated with tobacco use and the wearing of dentures. The most frequently seen lesion was melanin pigmentation ( $n = 1121$ ; 29.9%) followed by linea alba ( $n = 835$ ; 22.2%) and frictional keratosis ( $n = 746$ ; 19.9%) [Table 3]. Melanin pigmentation was more commonly seen in males ( $n = 632$ ; 40.8%) while females showed a higher prevalence of linea alba ( $n = 423$ ; 24.6%) and frictional keratosis ( $n = 418$ ; 24.4%). Ulcers ( $n = 232$ ; 6.1%) were the most commonly seen oral lesion in patients who wore dentures, followed by hyperplasia ( $n = 181$ ; 4.8%). All the

denture-related lesions were more common in females. It was noticed that a large number of the lesions occurred on the buccal mucosa and the lips. Most of the patients examined were of middle and lower socio-economic status (>80%).

The distribution of the oral mucosal lesions according to the habit of smoking and the use of dentures is shown

**Table 1: Distribution of the sample according to age and gender**

Age (in years)	Males (%)	Females (%)	Total (%)
28-37	946 (46.4)	852 (49.7)	1798 (47.9)
38-47	625 (30.7)	455 (26.5)	1080 (28.8)
48-57	175 (8.6)	204 (11.9)	379 (10.1)
58-67	137 (6.7)	106 (6.2)	243 (6.5)
>68	152 (7.5)	97 (5.6)	249 (6.6)
Total	2035 (54.3)	1714 (45.7)	3749 (100)

**Table 2: Distribution of the sample according to age and smoking habits and age and denture wearing status**

Age (in years)	Smokers	Non-smokers	Denture wearers	Non-denture wearers
28-37	1049	749	143	1655
38-47	586	494	202	878
48-57	175	204	146	233
58-67	158	85	192	51
>68	128	121	215	34
Total	2096	1653	969	2771

**Table 3: Distribution of oral pathology lesion according to gender**

Lesion	Males		Females		Total	
	No.	%	No.	%	No.	%
Melanin pigmentation	632	40.8	489	28.5	1121	29.9
Leukoplakia	223	10.9	27	1.6	250	6.6
Lichen planus	49	2.4	8	0.4	57	1.5
Linea alba	312	15.3	423	24.6	835	22.2
Cheek/lip biting	293	14.3	342	19.9	635	16.9
Frictional keratosis	328	16.1	418	24.4	746	19.9
Geographic tongue	102	5.0	23	1.3	125	3.3
Hairy tongue	284	13.9	9	0.5	293	7.8
Traumatic ulcers	109	5.3	324	18.9	433	11.5
Recurrent aphthae	98	4.8	212	12.4	310	8.2
Herpes labialis	205	10.0	263	15.3	468	12.5
Candidiasis	79	3.8	129	7.5	208	5.5
Angular cheilitis	18	0.8	76	4.4	94	2.5
Denture related						
Stomatitis	52	2.5	90	5.2	142	3.8
Ulcers	97	4.7	135	7.8	232	6.1
Hyperplasia	74	3.6	107	6.2	181	4.8
Tumor like lesions	89	4.3	56	3.2	145	3.8
Others	614	30.1	526	30.7	1040	27.7

**Table 4: Distribution of oral mucosal lesions according to smoking habit and denture wearing status**

Lesion	Smokers		Non-smokers		Denture wearers		Non-denture wearers	
	No.	%	No.	%	No.	%	No.	%
Melanin pigmentation	783	37.3	338	20.4	85	8.7	1036	37.3
Leukoplakia	106	5.0	244	14.7	4	0.4	246	8.8
Lichen planus	7	0.3	50	3.0	10	1.0	47	1.6
Linea alba	28	1.3	807	48.8	37	3.8	798	28.8
Cheek/lip biting	82	3.9	553	33.4	44	4.5	591	21.3
Frictional keratosis	503	23.9	243	14.7	69	7.1	647	23.3
Geographic tongue	10	0.4	115	6.9	8	0.8	117	4.2
Hairy tongue	99	4.7	194	11.7	15	1.5	278	10.8
Traumatic ulcers	139	6.6	294	17.7	102	10.5	371	13.4
Recurrent aphthae	15	0.7	295	17.8	7	0.7	303	10.9
Herpes labialis	83	3.9	385	23.3	42	4.4	426	15.5
Candidiasis	79	3.7	129	7.8	177	18.2	31	1.1
Angular cheilitis	14	0.6	80	4.8	19	1.9	75	2.7
Denture related								
Stomatitis	43	2.0	99	5.9	121	12.4	21	0.7
Ulcers	156	7.4	76	4.5	148	15.3	84	3.0
Hyperplasia	59	2.8	122	7.3	119	7.2	62	2.2
Tumor like lesions	33	1.5	112	6.8	27	2.7	118	4.2
Others	487	23.2	653	39.5	182	18.7	858	30.9

in Table 4. The statistical analysis showed a statistically significant relation ( $P < 0.05$ ) between the tobacco habit and melanin pigmentation ( $P = 0.0001$ ), frictional keratosis ( $P = 0.0016$ ), traumatic ulcerations ( $P = 0.0342$ ) and leukoplakia. Similarly, in wearers of dentures a statistically significant relation ( $P < 0.05$ ) was found between Candidiasis ( $P = 0.0004$ ), traumatic ulceration ( $P = 0.0073$ ), stomatitis ( $P = 0.0116$ ) and frictional keratosis ( $P = 0.0000$ ). No significant relation was established between gender and melanin pigmentation ( $P = 0.0012$ ) and melanin pigmentation and the socio-economic status of patients ( $P > 0.05$ ). However, a statistically significant relation was found between frictional keratosis and gender ( $P = 0.0024$ ) as well as in patients of low socio-economic status ( $P < 0.05$ ).

## DISCUSSION

The prevalence of the various oral mucosal lesions in the present study (61.8%) was similar to other studies mentioned in the literature.<sup>[17-19]</sup> However, these results are much higher than the global prevalence, which is reported to be  $<10\%$ .<sup>[6]</sup> The number of patients who have the habit of smoking is much higher (55.0%), than in similar studies with the reported number of smokers as approximately 34-37%.<sup>[3,17]</sup> Some studies had a higher percentage of patients who wore dentures,<sup>[18]</sup> but the present study had 969 patients who wore dentures (25.8%).

In certain countries, the pigmentation of the oral mucosa ranges from 70.5% to 88.4%.<sup>[3,18]</sup> The current study showed melanin pigmentation in 29.9% of the patients, a much

higher finding than those of Salonen *et al.*<sup>[3]</sup> who reported prevalence of 9.9% in 1976 and 6.6% in the 1990 study. Similar to the findings of Axéll *et al.*<sup>[18]</sup> and Hedin and Axéll<sup>[9]</sup> melanin pigmentation was more common in males (40.8%). However, a few other studies have reported a higher prevalence in females taking contraceptives.<sup>[20]</sup> Hedin and Axéll<sup>[9]</sup> reported a statistically significant relationship between melanin pigmentation and the tobacco habit, but no statistically significant relation was established in the present study.

The prevalence of leukoplakia in the current study was 6.6%, similar to the findings of other studies.<sup>[4,21]</sup> This was, however, much higher than the 0.5% prevalence reported by Martínez Díaz-Canel and García-Pola Vallejo.<sup>[17]</sup> The relationship of leukoplakia with the tobacco habit is somewhat controversial. Some studies<sup>[4,22]</sup> link tobacco habits to leukoplakia, as in the study, which showed 13.6% of smokers afflicted with leukoplakia.<sup>[3]</sup> While others have shown no relation between leukoplakia and smoking.<sup>[23]</sup> The present study established a statistically significant relation between the 2 entities.

Lichen planus represents approximately 20% of the diagnoses in routine practice and is the most frequent non-infectious disease of the oral mucosa.<sup>[24]</sup> The present study reported prevalence of 1.5%, a figure which is much higher than that of the previous study done in an Indian population.<sup>[25]</sup> Other similar studies done in Thailand and in Sweden showed a higher prevalence of 3.8% and 2.4% respectively.<sup>[3,18]</sup> Lichen planus was more commonly seen in males in the current study, similar to the findings of

Bouquot and Gorlin<sup>[1]</sup> and Salem.<sup>[26]</sup> On the other hand, a few studies have shown it to be more common in females.<sup>[17]</sup>

According to the symposium on white lesions held in Uppsala in 1994,<sup>[27]</sup> the origin of a white lesion of the oral mucosa is unlikely to be trauma. The theory of cheek biting in anxiety and stress is shown by the difference in prevalence depending on where the study is conducted. In a study in Denmark,<sup>[28]</sup> 0.5% of the patients presented with cheek or lip biting while in another study carried out in South Africa the prevalence was 4.6%.<sup>[29]</sup> The prevalence in the present study was estimated as 16.9%, a much higher figure than the studies done in American and Spanish populations showed.<sup>[1,17]</sup> The prevalence of frictional keratosis observed in the current study was 19.9%, which was much higher than was reported by Salonen *et al.* (4.6%).<sup>[3]</sup> The greater frequency of keratosis seen in patients younger than 50 years, was thought to have originated from caries and fractured teeth rather than from dentures. A statistically significant relationship between frictional keratosis and tobacco was established.

The prevalence of pathologies of the tongue in the present study (11.1%) was similar to that observed Axéll *et al.* (12.6%).<sup>[18]</sup> Some studies have however, suggested the prevalence as high as 18%.<sup>[30]</sup> The prevalence of geographical tongue or benign migratory tongue in patients of the present study was 3.3%, which is closer to what was seen in the Swedish population.<sup>[3]</sup> However, a much lower prevalence was seen in the United States (0.3%)<sup>[31]</sup> and in the Spanish population (0.8%).<sup>[17]</sup> The prevalence of hairy tongue, was 7.8%, a much higher figure than has been reported in similar studies.<sup>[18,30]</sup> This phenomenon is more frequent in males, its prevalence increasing with age. No statistically significant relation was established between this lesion and the habit of smoking or the wearing of dentures as proposed by Beaven and Brooks.<sup>[32]</sup>

Some studies have shown the highest prevalence of oral lesions to be traumatic ulcerations.<sup>[20]</sup> However, this was not so in the present study. The prevalence of traumatic ulcerations found in the present study (11.5%) was higher than was estimated by Salonen *et al.*<sup>[3]</sup> who reported it as 8%. The prevalence of recurrent aphthous stomatitis also shows great variations in different populations owing to the differences in the methodology used for the study, socio-economic status and the professional level.<sup>[17,33]</sup> The result of the present study (8.2%) is higher than the 2% found in the Swedish study.<sup>[3]</sup> However, there was no indication in the present study that this entity is related to a determined socioeconomic-professional level. The prevalence is higher in females, which is in accord with other similar studies.<sup>[33,34]</sup> Ship<sup>[35]</sup> stated that in edentulous patients, underlying denture aphthous

lesions are uncommon. Indeed some similar studies have reported a relationship between non-denture wearers and non-smokers and the presence of aphthous. Some authors consider local trauma as one of the predisposing factors for recurrent aphthous.<sup>[17]</sup>

Embil *et al.*<sup>[36]</sup> indicated that there are geographical variations in the prevalence of herpes labialis. These variations may be seen as possibly due to social and ethnic differences, as seen in other Asian countries.<sup>[18]</sup> The differences in the results of the present study and the study of Salonen *et al.*<sup>[3]</sup> may be because in these studies, the lesion was verified when it was present and not from recurrence in the clinical history. It has been suggested, that recurrent herpes is more frequent in low social classes than in higher social classes.<sup>[37]</sup> The values for the prevalence of candidiasis in previous studies (<0.5%)<sup>[1,18]</sup> were much lower than the present study (5.5%). These differences may be due to the high percentage of wearers of dentures in the present study sample. This was statistically significant, as in other similar studies.<sup>[17,38]</sup>

In the present study, the percentage of hyperplasia caused by the suction effect or negative pressure<sup>[39]</sup> diagnosed in those who do not wear dentures is very similar to the findings of Salonen *et al.*<sup>[3]</sup> and Axéll *et al.*<sup>[18]</sup> As indicated in similar studies,<sup>[1,3]</sup> our study shows that wearers of dentures more frequently suffer from traumatic ulceration. While a few other studies have shown that frictional keratosis, denture stomatitis and hyperplasia<sup>[10]</sup> were more commonly seen in wearers of dentures. Due the presence of fibrous hyperplasia and candidiasis in a high number of denture wearers, it is essential to carry out periodic examination of the oral mucosa in these patients to establish a preventive protocol to eradicate the pathology caused by the use of dentures.

## CONCLUSION

The results of the present study indicate a strong association of frictional keratosis with tobacco users and wearers of dentures with the etiology of oral cancer. This should be of interest to dental clinicians since it would help in quick diagnosis and planning the treatment of oral cancer. Wearers of dentures should also be recalled periodically for a check-up, so that optimum preventive measures could be taken.

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