

## INTRODUCTION

Oral cavity is recurrently subjected to a series of alterations with increase in age, life style related changes, local and systemic, environmental variations. Changes in the mucosa of oral cavity can be seen secondary to traumatic, inflammatory, infectious, genetic, hormonal, mechanical, chemical and other numerous factors. Consumption of tobacco in any form can lead to a numerous health problems affecting various body systems. These may result in pulmonary diseases, cardiovascular diseases, gastroenteral diseases, various malignancies along with multitude of oral mucosal changes [1]. Consumption of tobacco is reported to be the second leading reason of mortality globally and causing around 5 million deaths yearly [2]. The number is expected to increase and reach the value of 8.4 million approximately by the year 2020 [3,4]. The clinical appearance, location and frequency of the oral changes are related to the various ways and forms in which tobacco is consumed. It has been reported that over 300 products can be found in tobacco smoke or in saliva as the water-soluble components [5]. Long term use of tobacco and consumption of alcoholic beverages along with poor dietary and nutritional status are known to be the prime factors leading to 90 percent head and neck malignancy cases. In industrialized countries, smoking is proved to be the leading cause of 40-45 percent of all cancer deaths among males, around 90-95 percent deaths secondary to pulmonary cancers, approximately 85 percent of deaths due to oral malignancy, and around 35 percent of deaths due to underlying cardiovascular diseases [6]. Long term use of smoked and smokeless tobacco found to produce severe effects on oral soft tissues and hard tissues. These changes may be seen secondary to the carcinogen itself or as a result of protective mechanism of the oral cavity [7]. The strong correlation between malignancies of the oral cavity with usage of tobacco is well established and reported in literature. Consumption of tobacco, the nature, frequency and duration is determined by various factors, such as, attitude of the individual, social and economic factors, availability, local medias, education status, etc [8]. Similar to other part of the world, in Saudi Arabia a prevalence of 21.1% of smoking in males and 0.09% was observed in females in 1999 and in 2009

a prevalence of 11.6%-52.3% was noted all over the country from various studies, which shows a significant increase in the use of tobacco [9]. In the 1<sup>st</sup> International Islamic Conference of Ulemas on Drugs, Narcotics and Liquors held in (Saudi Arabia 1982, a resolution prohibiting the use of tobacco in any of its forms, its cultivation, manufacturing, trading, selling or promoting it in any way has been

## STATISTICAL ANALYSIS

Descriptive statistical analysis was carried out in the present study. Significance was set at 5% level of significance ( $p < 0.05$ ). Chi-square test was used to find the significance association between two attributes on categorical scale and the Z-proportionality tests was used to find the significance difference between two parameters with proportion rates. Data were analysed using SPSS, version 21.0 (SPSS Inc., Chicago, Illinois, USA).

## RESULTS

The study included total number of 536 male patients reported with tobacco habits in the age group of 18–65 years. Out of the 536 subjects with history of tobacco smoking and chewing habits, 386 (72%) showed changes in oral mucosa at the time of the study. 69% of patients were found to be using tobacco in the form of smoking and 31% of patients were using smokeless tobacco [Table/Fig-1].

### Prevalence of oral mucosal lesions [Table/Fig-2]

[Table/Fig-2] represents the Prevalence of oral lesions, smokers melanosis was seen with a maximum prevalence (43.28%) as compared to a minimum of leukoplakia (3.17%) followed by, leukoedema (27.05%), smoker's palate (22.76%), lichenoid lesion (15.30%) and lichenplanus (6.00%).

### Distribution of the oral lesions according to site [Table/Fig-3]

In the present study, a maximum 29.27% of patients had lesion at buccal mucosa and a minimum 1.03% of patients had lesion at floor of mouth, followed by commissures (20.98%), labial mucosa (12.95%), palatal mucosa (10.88%), buccal vestibule (9.84%), gingiva and alveolar mucosa (6.99%), retromolar areas (5.95%) and at the tongue (2.07%).

Habits	N	%
Smoking	370	69
Smokeless	166	31
Total	536	100

[Table/Fig-1]: Distribution of patients according to habits

Lesions	N	%
Smoker's melanosis	232	43.28
Leukoedema	245	27.05
Smoker's palate	122	22.76
Tobacco induced keratosis	90	16.8
Lichenoid lesion	82	15.3
Lichenplanus	32	6.0
Leukoplakia	17	3.17

[Table/Fig-2]: Prevalence of oral lesions

Site	N	%
Buccal mucosa	113	29.27
Commissures	81	20.98
Labial mucosa	50	12.95
Palatal mucoas	42	10.88
Buccal vestibule	38	9.84
Gingiva and alveolar mucosa	27	6.99
Retromolar areas	23	5.95
Tongue	8	2.07
Floor of mouth	4	1.03

[Table/Fig-3]: Site wise distribution of the oral lesions

Lesions	Types of tobacco usage		Z-value	p-value
	Smoking	Smokeless		
Smoker's melanosis	232 (43.28 %)	0	10.2054	0.00001*
Leukoedema	86 (16.44 %)	59 (11.00%)	1.6420	0.1006
Smoker's palate	122 (22.76 %)	0 (00)	6.6951	0.00001*
Tobacco induced keratosis	19 (3.54%)	71(13.24 %)	-4.1987	0.00001*
Lichenoid lesion	34 (6.34 %)	48 (8.95)	-1.0845	0.2782
Lichenplanus	15 (2.79 %)	17 (3.17 %)	-0.2421	0.8087
Leukoplakia	6 (1.11 %)	11 (2.05 %)	-0.8561	0.3919

[Table/Fig-4]: Prevalence of lesion in relation to type of tobacco usage  
Chi-square= 319.8292 p = 0.00001\*

Lesions	Frequency		
	<5 times/day	5-10 times/day	>15 times/day
Smoker's melanosis	103 (19.21 %)	78 (14.55 %)	51 (9.70 %)
Leukoedema	59 (11.00 %)	46 (8.58 %)	40 (7.46 %)
Smoker's palate	37 (6.90 %)	39 (7.27 %)	46 (8.58 %)
Tobacco induced keratosis	20 (3.73 %)	32 (5.97 %)	38 (7.08 %)
Lichenoid lesion	35 (6.52 %)	18 (3.35 %)	29 (5.41 %)
Lichenplanus	14 (2.61 %)	8 (1.49)	10 (1.84 %)
Leukoplakia	4 (0.74 %)	5 ( 0.93 %)	8 ( 1.49 %)

[Table/Fig-5]: Association between frequency of tobacco usage and oral lesions  
Chi-square= 30.0121, p = 0.0003

Lesions	Duration			
	1-5 year	5 to 10 years	10 to 15 years	>1 5 years
Smoker's melanosis	22 (4.10 %)	43 (8.02 %)	65 (12.12 %)	102 (19.02 %)
Leukoedema	14 (2.61 %)	25 (4.66%)	42 (7.83%)	64 (11.94%)
Smoker's palate	12 (2.23 %)	19 (3.54%)	38 (7.08%)	53 (9.88%)
Tobacco induced keratosis	14 (2.61%)	13 (2.42%)	28 (5.22%)	35 (6.52%)
Lichenoid lesion	31 (5.78%)	26 (4.85%)	19 (3.54%)	6 (1.11%)
Lichenplanus	11 (2.05%)	7 (1.30)	10 (1.86%)	4 (0.74%)
Leukoplakia	0 (0.00 %)	3 (0.55%)	6 (1.11 %)	8 ( 1.49%)

[Table/Fig-6]: Association between duration of tobacco usage and oral lesions  
Chi-square= 79.3470, p = 0.00001

### Prevalence of lesion in relation to type of tobacco usage [Table/Fig-4]

A significant association was observed between lesions and type of tobacco usage among the present study (chi-square=319.8292,  $p=0.00001$ ). A significant difference was observed between smoking tobacco usage and smokeless tobacco usage in relation to smoker's melanosis ( $Z=10.2054$ ,  $p=0.00001$ ) smoker's palate ( $Z=6.6951$ ,  $p=0.00001$ ) and tobacco induced keratosis ( $Z=-4.1987$ ,  $p=0.00001$ ) at 5% level.

### Association between frequency of tobacco usage and oral lesions [Table/Fig-5]

Out of total samples, 19.21% who were consuming tobacco at least <5 times had smokers's melanosis as compared to 14.55 % who were consuming tobacco 5-10 times and 9.70 % of those who consumed tobacco >15 times per day. Similarly, 11.00% of leukoedema was seen in those who consumed tobacco <5 times as compared to 8.58 %, seen in subjects who consumed tobacco 5-10 times and 7.46 % those using tobacco >15 times per day. Incidence of leukoedema decreased in subjects with an

increased frequency of tobacco usage. Smokers palate was seen in 6.90%, who consumed tobacco <5 times as compared to 7.27% who were consuming tobacco 5-10 times and 8.58 % of subjects using tobacco >15 times per day. Association between frequency of tobacco usage and oral lesions was found to be statistically significant (chi-square=30.0121,  $p = 0.0003$ ).

### Association between duration of tobacco usage and oral lesions [Table/Fig-6]

The duration of tobacco usage and oral lesions was found to be statistically significant (Chi-square= 79.3470,  $p = 0.00001$ ). All the lesions except lichenoid reaction and lichenplanus were found to be more prevalent in subjects who used tobacco for more than 15 years.

## DISCUSSION

This is the first research carried out in Aljof province of Saudi Arabia, regarding the tobacco usage and its associated oral mucosal changes. In the present study 69% of patients were found to be using tobacco in the form of smoking and 31% of patients were using smokeless tobacco, which was in contrast to the study by Sujata et al., where 39.2% used smoked tobacco and 28.1% used smokeless tobacco [15]. Use of smokeless tobacco was found among 22.8% and 21.2% of population in the different region of Saudi Arabia [9,16]. The prevalence of oral mucosal changes seen in the study population was 72 %, which was less in comparison with another similar study conducted in other part of Saudi Arabia by Safia Ali Al-Attas et al., but the changes were very much high in comparison with studies from different part of world [9,15-17]. In this study smoker's melanosis was the most common lesion (43.28%), whereas Safia Ali Al-Attas et al., noticed smokers melanosis as second most common lesion (36.1%) followed by hairy tongue as the most common lesion (49.9%) [9]. Sujata et al., observed smoker's melanosis in 13.4% of male subjects which was very low when compared to the results of present study [15]. Sadeq A Al-Maweri et al., observed fissured tongue (41.9%) as the most common lesion found in males in their study [18]. The second most common lesion in our subjects was leukoedema with a prevalence of 27.05% which was very high in comparison to the results of Sadeq A Al-Maweri et al (4.8 %) [18], Sujata et al., (8.1%) [13], Patil et al., (0.84 %) [17]. Smoker's palate was seen in 22.76% subjects of present study, which was less in comparison with Safia Ali Al-Attas et al., who detected smokers palate in 28.9% of subjects [9], whereas Sujata et al., noticed smokers palate in 6.0% and Patil et al noticed in 1.9% which was very less when compared to present study [15,17]. It has been stated that premalignant lesions and conditions like leukoplakia, erythroplakia, lichenpanus, oral submucous fibrosis etc., may progress in oral malignancy if they are not prevented and treated at earlier stages. To achieve this objective, awareness regarding the prevalence of these lesions and conditions is necessary. Leukoplakia (3.17%) was the least common lesion which was noticed in this study whereas Sujata et al., and Patil et al., noticed that leukoplakia was the most common lesion in the tobacco users in their respective studies [15,17]. Safia Ali Al-Attas et al., observed leukoplakia in 2.3 % of subjects [9] and Sadeq A Al-Maweri et al., seen in 0.7% of male patients [18]. None of the subjects in the present study had hairy tongue, oral submucous fibrosis, erythroplakia and malignant changes which were found in other studies [9,15-17]. Rarity of oral submucous fibrosis may be due to no or minimal usage of areca nuts by this population. As stated in the previous studies, duration and frequency of habits had a positive influence in the development of oral changes. Subjects who used tobacco for more than 15 times per day for more than 10 years were seen with maximum number of oral changes, which was in accordance with other studies by Yen AM et al., [19] Aruna et al., [20] and Sujata et al., [15]. In the present study, buccal mucosa was the most frequent site for the occurrence of oral changes followed

by commissures and floor of the mouth being least involved, Patil et al., found that even though buccal mucosa was the common site for oral lesions but the labial mucosa was second common and alveolar mucosa was least common [17]. Studies in literature suggest that the use of smokeless tobacco leads to a spectrum of oral cavity lesions, including leukoplakia, speckled leukoplakia, erythroplasia, tobacco-associated keratosis, carcinoma in situ and squamous cell carcinoma (SCC), whereas the results of this study show that majority of the mucosal changes were seen in the subjects who were smoking tobacco except for premalignancies, which were more prevalent in subjects who chewed the tobacco [14,15,21,22].

Local irritation effect from tobacco and its products is thought to be prime reason for development of oral changes in the tobacco users. Reports in the literature established that lichenoid lesions may be seen due to combination of dryness of oral mucosa and exposure to chemical and mechanical irritation [23].

## LIMITATIONS

The major limitation of this study was the inclusion of only male patients in the sample and selection of sample only from localised province of Saudi Arabia. The details regarding the frequency and duration of the tobacco habits may be biased as it is totally dependent on the self report of patients.

## CONCLUSION

The results of the present study conclude that use of tobacco can be positively correlated to the occurrence of various benign, premalignant and malignant oral changes. Studies covering a larger geographic region correlating the demographic details, socio-economic factors, influence of cessation of habits and involvement of both sexes as sample subjects may prove more beneficial. The results of this study also signify the importance of examining the oral mucosa of the patients with the habits of tobacco usage. This study aids in creating awareness among the public regarding the deleterious effects of tobacco and may motivate them for cessation of tobacco use.

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