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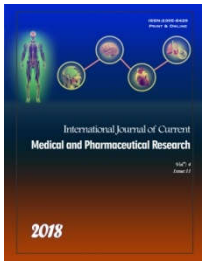

ASSESSMENT OF XEROSTOMIA AMONGST SMOKER AND NON-SMOKER IN DIABETIC POPULATION-A QUESTIONNAIRE BASED STUDY

Sushmini Hegde and Arpita Maitra*

Department of Oral Medicine and Radiology, The Oxford Dental College Hosur Road, Bengaluru-560068. Karnataka. India

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ABSTRACT

Context: Dry mouth is one of the most common and most unpleasant symptoms for which patients often seek help from a dentist or physician. Studies showed higher prevalence ofxerostomia in DM patients than non-DM population, 12.5%-53.5% versus 0-30%. Smoking is one of the risk factors which reduces salivation and causes xerostomia. Saliva is the first biological fluid that is exposed to cigarette smoke, which contains numerous toxic compositions responsible for structural and functional changes in saliva.
Aim: To compare the incidence ofxerostomia among smokers and non-smoker in diabetic patients.
Materials and methods: The study participants were divided into Group A and Group B. Group A consisted of 125 diabetic smokers and Group B consisted of 125 diabetic non-smokers. A validated closed ended standardized questionnaire was given to assess the degree of xerostomia. The questionnaire scores collected from various groups has been tabulated and data has been statistically analyzed.
Statistical Analysis: Chi Square test and SPSS version 22.0
Results: The xerostomic symptoms were statistically significant in diabetic smokers than diabetic non-smokers. Symptoms were even more statistically significant in bidi smoker than cigarette smokers ($p<0.5$).
Conclusion: Diabetic smokers are more prone for xerostomia than diabetic non-smokers and has to be made aware of the consequences.

INTRODUCTION

Saliva is a complex biological fluidmostly composed of water (99%) with a variety of non-organic and organic substances which maintains homeostasis of the oral cavity and keeps oral mucosa healthy. Saliva is essential for maintaining the integrity of oral cavity, the deficiency or absence of saliva causes significant morbidity leading to compromise in patient's QoL.[1]

The term xerostomia comes from the Greek word *xeros* (dry) and *stoma* (mouth), which means dry mouth. Dry mouthis one of the most common and most unpleasant symptoms for which patients often seek help from a dentist or physician.[2] It is mainly caused due to hypo functioning of all the salivary glands that may increase the risk of dental diseases like dental caries, periodontitis, oral infections like candidiasis. It may also induce symptoms like halitosis, burning and oral soreness, difficulty in mastication and speech, dysgeusia, dysphagia. Studies showed higher prevalence ofxerostomia in DM patients than non-DM population, 12.5%-53.5% versus 0-30%.[3]Xerostomia has been reported in 53% of adolescents with type 1 diabetes mellitus and 14% to 62% in type 2 diabetes mellitus patients.[4]

Smoking is one of the risk factors which reduces salivation and causes xerostomia. Saliva is the first biological fluid that is exposed to cigarette smoke, which contains numerous toxic compositions responsible for structural and functional changes in saliva.[5] However, Bouquotand Schroeder have reported that nicotine present in tobacco leads to altered secretion of saliva by acting on specific cholinergic receptors in the brain and other organs and causing neural activation. The mechanical, chemical and thermal stimulation of salivary glands during smoking can stimulate a short-term increase in the amount of saliva. In long term use, the harmful effect of nicotine impacts on parotid gland whose roleis secretion of thin saliva, submandibular and sublingual glands compensate it by secreting mucous saliva explaining the incidence of thicker saliva in smokers.[6]

The aim of the study is to compare the incidence of xerostomia among smokers and non-smoker in diabetic patients.

Corresponding author:* **Sushmini Hegde*
Department of Oral Medicine and Radiology, The Oxford Dental College Hosur road, Bengaluru-560068. Karnataka. India

MATERIALS AND METHODS

Source of data

Prior to starting the research, informed written consent was obtained from the patients. 250smokers and non-smoker associated with diabetes visiting the outpatient department were selected for study group.

The study participants were divided into Group A and Group B. Group A consisted of 125 diabetic smokers and Group B consisted of 125 diabetic non-smokers.

Patients with nutritional disorder, autoimmune disorders, undergoing chemotherapy, with long term drug history for any other systemic diseases and with any other tobacco related habits other than smoking were excluded.

A validated closed ended standardized questionnaire was given to assess the degree of xerostomia. The questionnaire scores collected from various groups has been tabulated and data has been statistically analyzed.

Chi Square test was used to compare the questionnaire responses for assessing severity of Xerostomia between Non-smokers and Smoker ($p<0.05$)

RESULTS

The mean duration of smoking was found to be 10±9 years and the duration of smoking among smokers ranged from 4 months to 40 years. The mean frequency of smoking was found to be 5.7±5.0 whereas it ranged from one to 40 cigarettes per day. Most common lesion in smokers was found to be homogenous leukoplakia (3.2%) followed by smoker's melanosis (0.8%).

Tables

1.Distribution of demographic and diabetic characteristics among Smokers & Non-smokers

Variables	Categories	Non-Smokers		Smokers	
		n	%	n	%
Age (in Yrs)	< 20 yrs	0	0.0%	2	1.6%
	21 – 40 yrs	33	26.4%	56	44.4%
	41 – 60 yrs	69	55.2%	55	43.7%
	61 – 80 yrs	23	18.4%	13	10.3%
	Mean & SD	48.9	11.3	44.1	11.8
	Range	24 – 77		18 – 73	
Sex	Males	60	48.0%	122	96.8%
	Females	65	52.0%	4	3.2%
Duration of Diabetes (in Yrs)	< 1 yr	6	4.8%	9	7.1%
	1 - 10 yrs	100	80.0%	98	77.8%
	11 - 20 yrs	17	13.6%	13	10.3%
	21 - 30 yrs	2	1.6%	6	4.8%
	Mean & SD	6.6	5.5	6.7	6.9
	Range	< 1 yr - 25 Yrs		< 1 yr - 30 yrs	
Medication	No	27	21.6%	23	18.3%
	Yes	98	78.4%	103	81.7%

The total number of cigarette smoker was 114 and bidi smoker was 12. The mean age group among bidi smokers was found to be 57.3±9.6 years and among cigarette smokers 42.7±11.2 years. The age range among bidi smokers was found to be 43-73 years and cigarette smokers 18-72 years. Males were found to be among cigarette smokers than females.

The mean duration of smoking among bidi smokers was found to be 19±6.9 years with a range of 10-30 years. The mean duration of smoking among cigarette smokers was found to be 9±8.7 years with a range of 1-40 years. The frequency of cigarette smoking per day ranged from 1-40 with a mean of 5.1±4.7 cigarettes per day and the frequency of bidi ranged from 5-20 per day with a mean of 12±10.8 bidis per day.

2.Comparison of questionnaire responses for assessing severity of Xerostomia between Non-smokers and Smokers using Chi Square test

Questions	Categories	Non-Smokers		Smokers		χ^2 Value	P-Value
		n	%	n	%		
Sip liquid while having Food	No	78	62.4%	30	23.8%	38.120	<0.001*
	Yes	47	37.6%	96	76.2%		
Dry Mouth at Night	No	79	63.2%	37	29.4%	28.900	<0.001*
	Yes	46	36.8%	89	70.6%		
Dry Mouth at other times	No	72	57.6%	38	30.2%	19.193	<0.001*
	Yes	53	42.4%	88	69.8%		
Amount of Saliva	Not noticed	95	76.0%	78	61.9%	5.824	0.05#
	Too Tittle	27	21.6%	43	34.1%		
	Too Much	3	2.4%	5	4.0%		
Dry Eye	No	103	82.4%	68	54.0%	23.360	<0.001*
	Yes	22	17.6%	58	46.0%		
Dry Lips	No	70	56.0%	31	24.6%	25.722	<0.001*
	Yes	55	44.0%	95	75.4%		
Dry Throat	No	73	58.4%	35	27.8%	24.043	<0.001*
	Yes	52	41.6%	91	72.2%		
Dry Tongue	No	77	61.6%	42	33.3%	20.109	<0.001*
	Yes	48	38.4%	84	66.7%		
Often Thirsty	No	49	39.2%	30	23.8%	6.891	0.009*
	Yes	76	60.8%	96	76.2%		

* - Statistically Significant
\# - Borderline Significance

3.Comparison of questionnaire responses for assessing severity of Xerostomia between Bidi and Cigarette Smokers using Chi Square test

Questions	Questions	Bidi Smoker		Cigarette Smoker		χ^2 Value	P-Value
		n	%	n	%		
Sip liquid while having Food	No	8	66.7%	88	77.2%	0.663	0.42
	Yes	4	33.3%	26	22.8%		
Dry Mouth at Night	No	6	50.0%	83	72.8%	2.723	0.10
	Yes	6	50.0%	31	27.2%		
Dry Mouth at other times	No	9	75.0%	79	69.3%	0.168	0.68
	Yes	3	25.0%	35	30.7%		
Chewing gums to relieve oral dryness	No	1	8.3%	48	42.1%	5.211	0.02*
	Yes	11	91.7%	66	57.9%		
Hard Candies to relieve oral dryness	No	1	8.3%	42	36.8%	3.925	0.05#
	Yes	11	91.7%	72	63.2%		
Amount of Saliva	Not noticed	6	50.0%	72	63.2%	1.809	0.41
	Too Tittle	6	50.0%	37	32.5%		
	Too Much	0	0.0%	5	4.4%		
Dry Eye	No	3	25.0%	55	48.2%	2.362	0.12
	Yes	9	75.0%	59	51.8%		
Dry Lips	No	10	83.3%	85	74.6%	0.450	0.50
	Yes	2	16.7%	29	25.4%		
Dry Throat	No	10	83.3%	81	71.1%	0.816	0.37
	Yes	2	16.7%	33	28.9%		
Dry Tongue	No	10	83.3%	74	64.9%	1.658	0.20
	Yes	2	16.7%	40	35.1%		
Often Thirsty	No	9	75.0%	87	76.3%	0.010	0.92
	Yes	3	25.0%	27	23.7%		

* - Statistically Significant
\# - Borderline Significance

DISCUSSION

Saliva is the principle defense factor of the oral cavity. General state of hydration depicts salivary secretion, but in clinical practice, saliva flow is mainly affected by systemic diseases, drugs and associated habits. Diabetes mellitus might interfere with glandular secretion, causing a sizeable decrease in salivary flow rates (Mata *et al*, 2004; Bernardi *et al*, 2007).[7] Cigarette smoke contains 4000 bioactive chemical compounds, 300 carcinogens which cause structural and functional changes in saliva leading to xerostomia. It acts as an additive effect to enhance the symptoms of xerostomia along with DM.

Smoking is one of the commonest deleterious habit associated with oral cavity, as tobacco smoke spreads to all parts of the

oral cavity. It has been presumed that long term tobacco smoking decreases sensitivity of taste receptors, leading to a depressed salivary reflex. [8]

A questionnaire is a good screening tool for assessing xerostomia. In the present study, the assessment of xerostomia was done by using multiple questionnaires on dry mouth symptoms. Torres *et al*., assessed that 71.2% had the symptoms of xerostomia, using questionnaire.[9] According to Petrusic N *et al*. 51.5% smokers had symptoms of xerostomia with reduced salivary rate.[10]According to Rad *et al* 39% of smokers and 12% of non-smokers reported experiencing at least one xerostomia symptom included in the questionnaire.[5]

In the present study, questionnaires were distributed among 250 smokers and 250 non-smokers associated with diabetes to assess xerostomia. This study showed that 11.8% smokers and 11.3% non-smokers reported with xerostomic symptoms which was in accordance to the study done by Rad *et al*, where smokers had xerostomic symptoms (96.8%) more prevelant than non-smokers. Thus, there is a significant difference in the secretion rate of saliva and dry mouth between smokers and non-smokers.[5]

In the present study, the mean duration of smoking was found to be 10 years with mean age being 19 years; the most common lesion found was homogeneous leukoplakia (3.2%) which was in accordance to the study done by Rad *et al* and Chakraborty S *et al* where youth was found to have more addiction to smoking than any age group.[5,11]

The mean frequency of cigarette smoking was found to be 10.8% and bidi smoking as 4.7% which was in accordance to the study done by Singh *et al* and Gajalakhsmi *et al* as cigarette is commercially available at ease and it psychologically acts as a style statement for smokers especially the youth.[12-14]

Xerostomia was found to be more prevalent in bidi smoker than cigarette smoker. It was found that dryness of mouth at night was more prevalent (50%), along with less amount of saliva (50%), dryness in eye (75%) and frequent thirst (25%) compared to cigarette smokers. Thus, it was seen that unfiltered tobacco (bidi) had a greater impact on symptoms of xerostomia than filtered tobacco (cigarette) which was in accordance to the study by S Chakraborty *et al* where unfiltered tobacco had a decreased rate of saliva as compared to the other forms of tobacco. It is found that the chemicals and the heat produced from unfiltered tobacco leading to the exaggeration of the symptoms more than the filtered form.

A number of studies have shown that salivary flow is reduced in smokers as compared to that in non-smokers. The results of the present study are comparable to the studies by Rad *et al* Chakroborty S *et al* and Petrusic N *et al*, that have shown that smoking was one of the risk factors for xerostomia. However, few studies have shown no significant changes in salivary flow in smokers (Hegde *et al*).[9,11,12]

All the questions had statistically significant result in smokers compared to non-smokers; while the question related to the amount of saliva had borderline significant result.

A number of studies have shown that while cigarette smoking would typically cause a noticeable short-term increase in salivary flow rates, the long-term influence of tobacco use is still unclear. It has also been observed that some individuals develop tolerance to the salivary effects of smoking in the long-term use. However, our results are comparable to studies that have shown smoking is one of the risk factors for reducing saliva and xerostomia. Incase of initial smokers, the activity of salivary glands increases, but in long-term use, it reduces salivary flow rate.[12]The mechanical, chemical and thermal stimulation of salivary glands by cigarettes during smoking can stimulate a short-term increase of the amount of saliva. Iida *et al*. explained chemical stimulation on an animal model and demonstrated that nicotine and cytisine acted on nicotinic receptors as agonists and stimulated the secretion of saliva. Authors Field and Duka have shown that there is a psychological stimulation of saliva in smokers displaying smoking requisites. [11]

The present study conducted demonstrated the considerable variation in prevalence of xerostomia among DM population in relation to non-DM patients. The results of our study also concluded that diabetic smokers have significantly increased dry mouth symptoms due to the physiological and functional alteration of saliva.

CONCLUSION

Xerostomia is found to be more prevalent among diabetic smokers. Diabetes and smoking may act as a catalyst to aggravate the symptoms of xerostomia in patients. The majority of smokers today prevail from low and middle-class families, where the smoking has increased over the last two decades. This could be as a result to stress situations pertaining to financial and family matters that may ultimately result in smoking and prevalence of diabetes altogether. Thus, the population of diabetic smokers should be made aware of the condition and have to be counselled for cessation of the habit to prevent and improve their quality of life eventually.

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