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Occurrence of oral mucosal lesions in type 2 diabetes mellitus patients: A hospital based study

Dr. Anvita Sinha
Senior Resident, Department of Dentistry, M.G.M. Medical College & Hospital, Jamshedpur, India.
Email: anvita.mds@gmail.com

Dr. Nitesh Kumar Sharma
Assistant Professor, Department of Dentistry, M.G.M. Medical College & Hospital, Jamshedpur, India.
Email: drniteshsharma@yahoo.com

Dr. Santosh Kumar Verma
Assistant Professor, Department of Periodontology and Oral Implantology, Dental Institute, Rajendra Institute of Medical Sciences, Ranchi, India.
Email: santoshvermakr@gmail.com

Dr. Prithvish Sarkar
Professor & Head, Department of Medicine, M.G.M. Medical College & Hospital, Jamshedpur, India.

***Abstract*---**Introduction: Diabetes Mellitus is a syndrome characterized by chronic hyperglycemia which leads to many complications including those in the oral cavity. Oral mucosal lesions are one of them. The study was conducted to investigate the various oral mucosal alterations in Type 2 diabetes mellitus patients and to compare them with control subjects. Material and methods: An observational case–control study was carried out at Dental outpatient department of MGM Medical College & Hospital, Jamshedpur. It involved 74 diabetic mellitus type 2 patients and 74 non- diabetic control subjects. Complete case history was recorded with thorough clinical examination using specially designed case history format. Extraoral and intraoral examinations were performed using a mouth mirror, probe, tweezers and gauze. Result: With respect to specific oral mucosal lesions, Coated tongue and Xerostomia were the most prevalent among the Diabetes mellitus type 2 patients. A highly significant differences found for Coated tongue (p = 0.000) and Xerostomia (p = 0.001) among the cases and controls. Fissured

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***Corresponding author**: Verma, S.K.; Email: santoshvermakr@gmail.com*
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tongue, lingual varicosity, melanin pigmentation and frictional keratosis found to be more in Diabetes mellitus type 2 patients than control subjects but the differences were not significant. Conclusion: The results of this study show a higher percentages of oral mucosal lesions in diabetic patients than in control subjects.

***Keywords*---**Diabetes mellitus type 2, oral mucosal lesions, oral.

Introduction

Type 2 Diabetes Mellitus is a syndrome characterized by elevated blood glucose levels due to insufficient insulin production, insufficient insulin uptake, or both.[1] India is the country with the second highest number after China with 65.1 million diabetes cases that estimated in 2013. This is expected to increase up to 109.0 million in 2035.[2] Chronic hyperglycemia leads to different complications in various regions of the body including the oral cavity. Possible mechanisms that may be related to oral complications of diabetes include impaired neutrophil function, increased collagenase activity and a reduction in collagen synthesis, microangiopathy, and neuropathy.[3]

Patients with diabetes mellitus have been associated with a number of changes in the oral cavity such as gingivitis, periodontitis, oral mucosal diseases, salivary dysfunction, altered taste, and burning mouth syndrome.[4] Numerous studies have been conducted on dental caries and periodontal diseases but epidemiological studies on oral mucosal lesions are rare globally. High prevalence of oral mucosal lesions in diabetic patients have been reported in few studies. However, it has not been proven whether oral mucosal lesions in diabetic patients occur more frequently than in non - diabetics.[5,6] The relationship between diabetes and oral mucosal lesions is still unclear.[3] Hence, this study was undertaken to study the various oral mucosal lesions in Diabetes Mellitus type 2 patients and to compare each one of them with non-diabetic control subjects .

Aims and Objectives

1. To investigate the various oral mucosal alterations in Type II diabetes mellitus patients and to compare each one of them with control subjects.
2. To explore an association between oral mucosal alterations and Type II Diabetes Mellitus

Materials and Methods

This is an observational case–control study. Convenience sampling was used to select the patients and the study was carried out from 1/12/2019 to 15/03/2020. All subjects included in the study were informed of the aims and methods of this study and written consent was obtained from them. A total of 74 cases (diabetic patients) and 74 controls (non-diabetics) were selected. The subjects included in the study were the patients visiting the Dental out patient department at MGM Medical college & Hospital, Jamshedpur. All the subjects included in the study reported to Hematology laboratory for blood sugar

investigations at MGM Medical College & Hospital, Jamshedpur. Blood samples were taken from the patients and Random blood sugar (RBS) was calculated by the enzymatic God- Pod method.

The patients with RBS level ≤140 mg/dl were considered as normal or non diabetics, whereas patients with ≥140 mg/dl were considered as diabetics. The subjects included in the study aged 35 years or more from both the sexes diagnosed with Type 2 diabetes was the case group and the subjects from both sexes and same age group diagnosed as non-diabetics was the control group. A questionnaire was applied to collect data on the clinical history. Complete case history was recorded with thorough clinical examination using specially designed case history format. Extraoral and intraoral examinations were performed using a mouth mirror, probe, tweezers and gauze. Incisional biopsy and histopathological examination were performed when necessary.

Inclusion criteria:

1. Those who gave their consent to participate in the study.
2. Age group : 35 years and above
3. Both the sexes were included in the study

Exclusion criteria:

1. Those who did not give their consent for participation.
2. Patients with type 1 Diabetes

Statistical methodology

The statistical analysis has been conducted using Minitab, a statistical software. Number, percentages of the oral mucosal lesions and *P values* have been computed. The descriptive statistics have been used for the age of cases and controls.

Results

Oral mucosal changes

Table 1 presents the number and percentage of cases and controls for oral mucosal lesions that includes coated tongue (CT), fissured tongue (FT), lingual varicosity (LV), melanin pigmentation (MP), Oral lichen planus (OLP), tobacco pouch keratosis (TPK), leukoplakia (L), Smoker's palate (SP), traumatic ulcer (TU), frictional keratosis (FK), aphthous ulcer (AU), Oral submucous fibrosis (OSMF) and xerostomia (XS). Lesions were mainly located in buccal mucosa, floor of the mouth, tongue and alveolar ridges. The percentages are computed separately for each lesion so that the cases and the controls could be compared easily for each one of them. These values are obtained using Tables 2 and 3, which, in turn, reveal a smaller number of missing of lesions in cases than in controls. This also includes the individual *P* – values, which are fairly comparable. Further, analysis shows that the differences of percentages between cases and controls for coated tongue (CT) and xerostomia (XS) are highly significant based on *P* - values, while in case of others the differences are not significant but the percentages for most of the lesions are larger under cases than controls.

Age and gender

Table 4 and 5 show some important descriptive statistics of age under controls and cases for female (F), male (M) and the total participants of the survey. These display mean (arithmetic mean), standard deviation (StDev), coefficient of variation (CV), minimum, median and maximum values of the collected data for both situations. Boxplots are drawn to show the outliers (unusual values) as well as to show median with other two quartiles. Figures 1 and 2 portray separate boxplots for female and male in both situations. The outliers appear in Figure 1 for the female at age 67, Figure 2 displays the outliers for the age 79and 80.

Table 1
Numbers and percentages of cases and controls under oral mucosal lesions

Oral Mucosal Lesions	No. of Cases (Percentages)	No.of Controls (Percentages)	*P* - values
Coated Tongue (CT)	43 (58.10%)	19 (25.67%)	0.000
Fissured Tongue (FT)	22 (29.72%)	14 (18.91%)	0.125
Lingual Varicosity (LV)	23 (31.08%)	15 (20.27%)	0.132
Melanin Pigmentation (MP)	31 (41.89%)	21 (28.37%)	0.085
Oral Lichen Planus (OLP)	0 (0.00%)	2 (2.70%)	-
Tobacco Pouch Keratosis (TPK)	3 (4.05%)	4 (5.40%)	-
Leukoplakia (L)	1 (1.35%)	1 (1.35%)	-
Smoker's Palate (SP)	1 (1.35%)	2 (2.70%)	-
Traumatic Ulcer (TU)	2 (2.70%)	3 (4.05%)	-
Frictional Keratosis (FK)	12 (16.21%)	11 (14.86%)	0.821
Aphthous Ulcer (AU)	0 (0.00%)	1 (1.35%)	-
Oral Submucous Fibrosis (OSMF)	1 (1.35%)	4 (5.40%)	-
Xerostomia (XS)	30 (40.54%)	12 (16.21%)	0.001

Table 2
Oral mucosal lesions for control and their frequencies

Oral mucosal lesions for Control	Frequency
CT, FT, TU	1
CT,FK	1
CT,FT	1
CT,FT,LV	1
CT,FT,LV,SP,MP,XS	1
CT,FT,LV,XS	2
CT,FT,MP	1
CT,FT,MP,XS	1
CT,FT,XS	1
CT,LEUKOPLAKIA	1
CT,LV	1

CT,LV,MP,SP,XS	1
CT,LV,XS	1
CT,MP	1
CT,MP,FK	1
CT,MP,TPK	2
CT,MP,TU	1
FT,LV,MP,FK	1
FT,LV,XS	2
FT,MP,FK	2
LV	1
LV,AU,FK	1
LV,MP,XS	1
LV,XS	2
MP	1
MP, TPK, FK	1
MP,FK	3
MP,OSMF	2
MP,TU	1
OLP	2
OSMF	2
TPK,FK	1
Total Nonmissing	42
Missing	32

Table 3
Oral mucosal lesions for cases and their frequencies

Oral mucosal lesions for cases	Frequency
CT	6
CT,FK	1
CT,FT, FK	1
CT,FT,LV	1
CT,FT,LV,TU,XS	2
CT,FT,LV,XS	5
CT,FT,MP	3
CT,FT,MP,XS	1
CT,FT,MP,XS,FK	1
CT,FT,XS	2
CT,LV	1
CT,LV,MP,XS	2
CT,LV,XS	2
CT,MP	3
CT,MP,FK	3
CT,MP,LEUKOPLAKIA	1
CT,MP,OSMF	1
CT,MP,SP,XS	1
CT,MP,TPK,XS	1

CT,MP,XS	3
CT,MP,XS,FK	1
CT,XS,FK	1
FT	1
FT,LV	1
FT,LV,XS	3
FT,MP,FK	1
LV	1
LV,MP,XS	2
LV,MP,XS,FK	1
LV,XS	2
MP	2
MP,FK	2
MP,TPK	2
Total Nonmissing	61
Missing	13

Table 4
Descriptive Statistics of age under control situation for female (F), male (M) and total, StDev and CV denote standard deviation and coefficient of variation respectively of age

Variable	Sex	N	Mean	StDev	CV	Minimum	Median	Maximum
Age	F	32	45.56	8.03	17.62	35.00	45.00	67.00
	M	42	52.45	12.53	23.89	35.00	49.50	80.00
Total		74	49.47	11.29	22.82	35.00	48.00	80.00

Table 5
Descriptive Statistics of age under cases (Age_Cases) for female (F), male (M) and total, StDev and CV denote standard deviation and coefficient of variation respectively of age

Variable	Sex	N	Mean	StDev	CV	Minimum	Median	Maximum
Age	F	33	51.79	8.59	16.59	35.00	51.00	71.00
	M	41	55.32	10.88	19.68	38.00	54.00	81.00
	Total	74	53.74	10.02	18.65	35.00	52.00	81.00

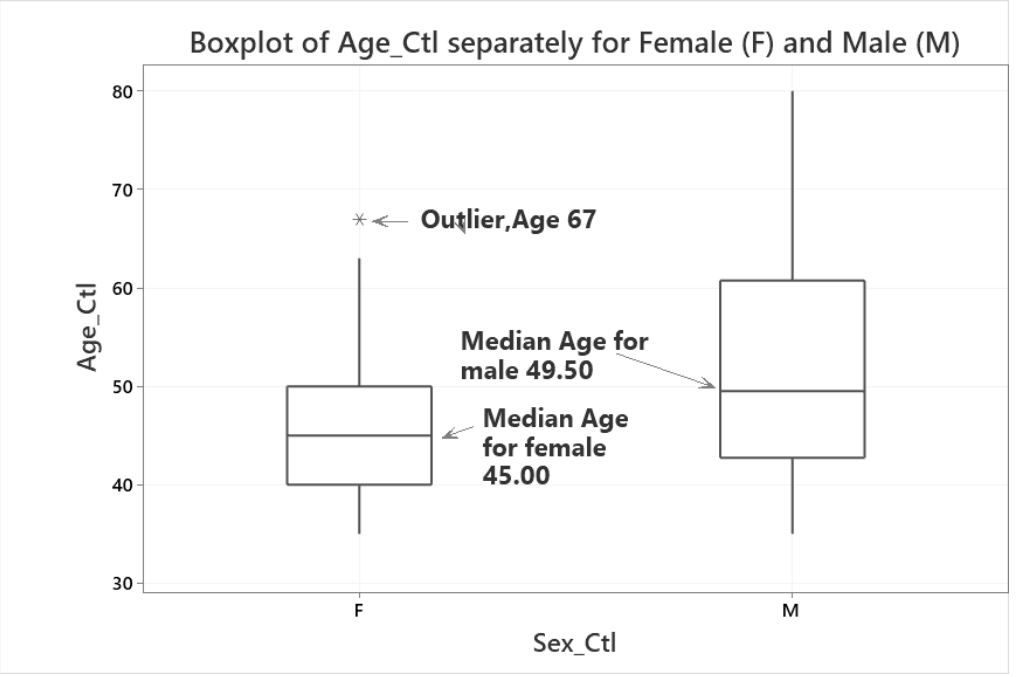

Figure 1. Boxplot of age under control situations (Age_Ctl) separately for female (F) and male (M)

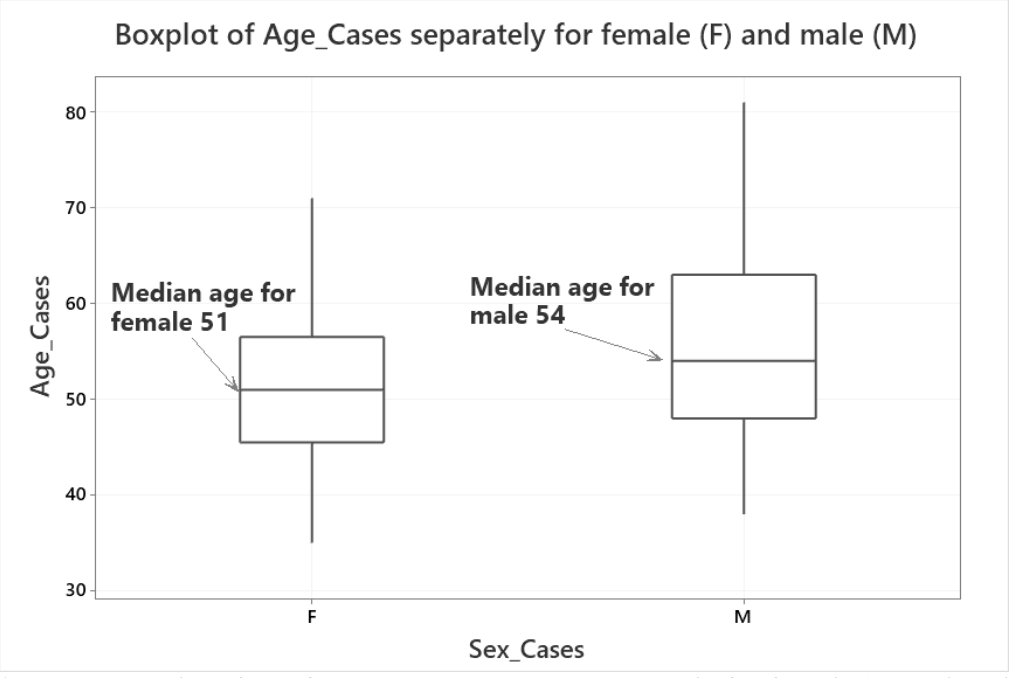

Figure 2. Boxplot of age for cases (Age Cases) separately for female (F) and male (M)

Discussion

The present study identified a high prevalence of oral mucosal lesions among patients with diabetes mellitus. The most common lesions observed in the oral mucosa among the cases was coated tongue and it was highly significant (*P* value = 0.000). In literature, a highly significant association was too observed between coated tongue and type 2 diabetes[7,8]. This finding can be related to decrease in salivary flow and a higher viscosity of saliva that result in reduced action of salivary antimicrobial factors and cleaning capacity of the tongue.[9] The second most frequent oral mucosal alteration observed was Melanin pigmentation which was seen in 41.9% diabetic patients and 28.4% healthy subjects. Few studies showed an association between melanin pigmentation and diabetes .[9,8] However, in another study done on North Kerala population, melanin pigmentation was less and also, not much difference was found between cases (10.25%) and controls (9%).[10] In our study, lingual varicosity was diagnosed in 23 patients (31.08%). Similar finding was seen in a study done by Vasconcelos et al.[11] A prevalence of 20.5% was found in a study by de Souza Bastos et al [8] and 9% was observed in another study done by Madathil et al [10] . Supposedly, this abnormality is related to the fact that it is a frequent semiological finding in the elderly patients. This abnormality may also be related to the circulatory abnormalities typical of diabetes. These assumptions need further studies to be confirmed or to be ruled out.[11] Fissured tongue was the most common oral mucosal lesion found in DM2 patients (26.9%) in a study done by Al-Maweri SAA and Ismail NM.[12] In our study fissured tongue was observed in 29.7% of diabetic patients.

In the present study, oral lichen planus was not found in any diabetic patients but was present in control group (2.7%). Similarly, oral lichen planus was not seen in the study done by Vasconcelos BCdE.[11] A number of research studies showed OLP is more prevalent in DM patients although different prevalence percentages were observed in different studies 0.5 to 9.3% in DM patients and 0 to 1.8% in control subjects.[13] According to Dikshit et al., patients with diabetes were 2 times more likely to develop leukoplakia.[14] Ujpal et al.[15] and Albrecht et al.[16] observed this alteration in 6% and 6.2% of diabetes mellitus patients, respectively. In a previous study done by de Souza Bastos et al, leukoplakia was diagnosed in 2.7% of patients with type 2 diabetes, with no significant difference from the control group.[8] Similar finding was seen in this study. According to Ujpal et al., diabetes patients who smoke are high-risk group to develop oral mucosal alterations such as leukoplakia.[15] The high prevalence of leukoplakia in the aforementioned study could be attributed to a high number of smokers among the diabetics. In our study , smokers were less as compared to other studies. Another potentially malignant disorder, Oral submucous fibrosis was present in 1.4% of cases in our study. Similar finding was seen in diabetic patients (2.0%) in study done by Mohsin et al.[9] However, in our study OSMF was present in more controls (5.4%) than cases. A study by Saini et al also showed no association between DM and oral precancerous lesions.[17]

Traumatic ulcer was seen in 2.7% cases, which was similar to other studies.[10,11] It was more in control group(4.1%) in the present study. The literature studied does not have a factor that links this abnormality to diabetes. Xerostomia or subjective

dryness of mouth is one of the common complaints among patients with diabetes, which might be associated with the poor salivary flow. Like many other studies, xerostomia was one of the most prevalent conditions ($P = 0.001$) among diabetics in this study also.[12,18-20] Here, the maximum patients were just symptomatic with no effect on speech and food intake.

Conclusion

As we know that majority of systemic diseases manifests in the oral cavity and diabetes is no exception to this. Therefore, oral health should be promoted in diabetic patients as an integral component of their overall diabetes management. Also, with the increase in the incidence and prevalence of this disease over the past few decades, a closer collaboration between medical team and dentists is necessary for the overall management of this disease.

The present study will help us to know the various types of oral mucosal lesions in diabetes mellitus and and its prevalence. Also, it will serve as a baselinefor further studies in this regard.

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