

DIABETES A CURSE TO PERIODONTIUM. A QUESTIONNAIRE STUDY

^{*1}Shikha Dhir, ²Shailendra Chauhan, ³Dr. Bharat Kumar Gupta, ⁴Aditya Sinha, ⁵Satendra Sharma and ⁶Saumya Jaiswal

¹Postgraduate Student, Dr. Bhimrao Ambedkar University, ²Head of the Department, Dr. Bhimrao Ambedkar University, ³(Mbbs, Md, Jln Medical College) - Professor, Deptt of Medicine, Dr. Bhimrao Ambedkar University, ^{4,5}Reader, Dr. Bhimrao Ambedkar University, ⁶Postgraduate Student, Dr. Bhimrao Ambedkar University, Department(S) and Institution(S) Department of Periodontology and K. D. Dental College and Hospital.

***Corresponding Author: Shikha Dhir**

Postgraduate Student, Dr. Bhimrao Ambedkar University, Department(S) and Institution(S) Department of Periodontology and K. D. Dental College and Hospital.

Article Received on 27/01/2022

Article Revised on 16/02/2022

Article Accepted on 08/03/2022

ABSTRACT

Background: Diabetes poses as a curse to periodontium due to its various negative effects which also includes formation of multiple abscess. Diabetes is a metabolic disorder, which due to increased blood glucose level, seems to complicate the periodontal disease leading to increased bleeding on probing, gingival inflammation, pocket depth, loosening of teeth and bone loss along with formation of multiple abscesses. Periodontitis marks presence of various microbes in the oral cavity, which potentiates the risk of developing various systemic disease. Consequently periodontal disease and diabetes share a two way risk of complicating the respective conditions. Thus following questionnaire study is being conducted to focus on the effects the diabetes on periodontium. **Aim:** The aim of the study is to evaluate the impact of diabetes on periodontium between different age group people. **Materials and Method:** This was an observational study conducted at K.D DENTAL COLLEGE AND HOSPITAL. The samples were collected from KALYAN HEALTH CARE CENTRE, MATHURA, The study comprised of total 14 questions and to assess the impact of diabetes on periodontium. Face to Face interview was conducted with consenting individual participants to ensure transparency and consistency. **Result:** Amongst 78 participants, 63 diabetic patient complained of blurring of vision and 60 diabetic patients complained of burning sensation of mouth and tongue and patients had increased bleeding on probing. Also increased oral manifestations were found among the patients not medication for diabetes. **Conclusion:** Thus diabetes has negative effect on periodontium.

KEYWORDS: probing, gingival inflammation, pocket depth.

INTRODUCTION

Diabetes has become a nightmare for the patients in recent times. Diabetic patients have increased blood glucose levels which mainly occurs due to deficiency of insulin secretion (pancreatic beta-cell dysfunction) or due to resistance to the action of insulin in liver and muscle, or a combination of these (fig 1).^[1] Hyperglycaemia leads to the development of various complications in diabetic patients such neuropathy, nephropathy, retinopathy, cardiovascular complication and periodontitis. Classification of diabetes include type 1, type 2 and gestation diabetes (fig 1).^[2]

Periodontitis is basically the inflammation of periodontium which is associated with loss of periodontal tissues and alveolar bone. According to American Dental Association, periodontal disease is considered to be the sixth complication of diabetes. Increased blood glucose levels in, lead to the production of AGEs which interact with RAGEs and ultimately lead

to the development of periodontal disease (fig 4) as well to the various complications of diabetes.^[3,4] Glucose in bloodstream interact with haemoglobin in RBCs and forms HbA1c (non-enzymatic glycation) and lead to the production of the Advanced glycosylation end products (AGEs) (fig 3).^[3,10]



Fig 3: Formation of glycated hemoglobin.^[10]

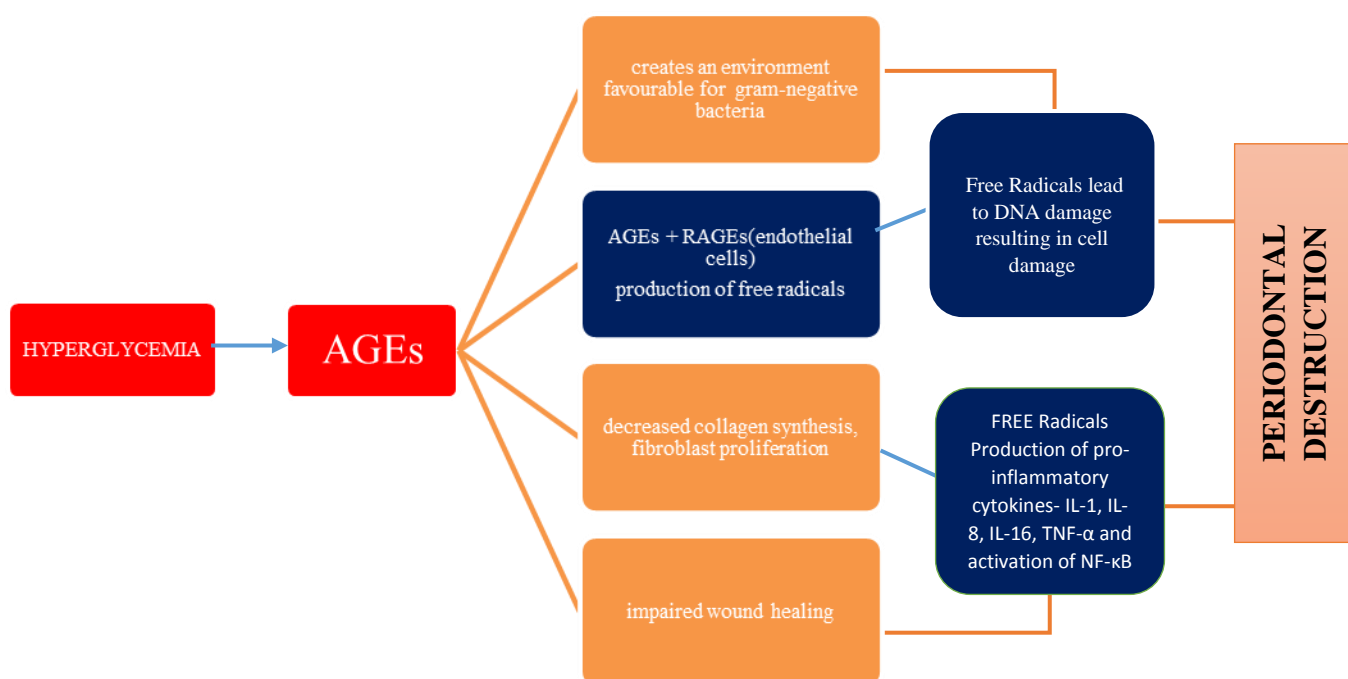


Fig 4: A summary of effect of hyperglycaemia leading periodontal destruction.^[3,4, 5,6,11]

Periodontitis also induces systemic disease. Microorganisms secrete lipopolysaccharides, which results in secretion of pro-inflammatory cytokines mainly TNF- α, is responsible for inhibiting the phosphorylation and translocation of insulin receptor thus, inhibition of intracellular glucose transport and insulin action contributing to insulin resistance.^[2,6]

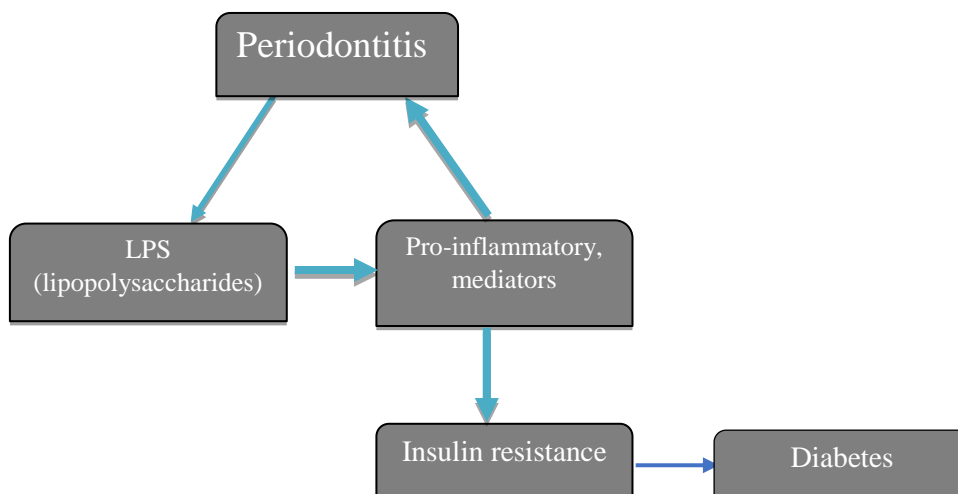


Fig 5: A summary of effect of periodontitis on diabetes.^[3, 6]

MATERIAL AND METHODS

A questionnaire study was conducted amongst the diabetic patients of different age group. Age groups were divided as, Child (0-12 years), Adolescence (13-18), Adult (19-59 years) and Senior Adult (60 years and above), based on the classification of human age based on Neural Network using FG-NET Aging database and Wavelets.^[12] The diabetic patients for the study were selected from the clinic in Mathura. The study was conducted from September 2021 to November 2021. Ethical clearance was obtained from institutional ethical clearance committee of K.D.Dental College and Hospital. Informed consent was filled by each

participants and the study was explained to each participant before the interviews.

SAMPLE SELECTION AND CRITERIA

Inclusion criteria

- Diabetic patients.
- Patients willing to participate in study.

Exclusion criteria.

- Patients having any other systemic disease other than diabetes.
- Patients having any other systemic disease with diabetes.
- Patients who are not willing to participate in study.

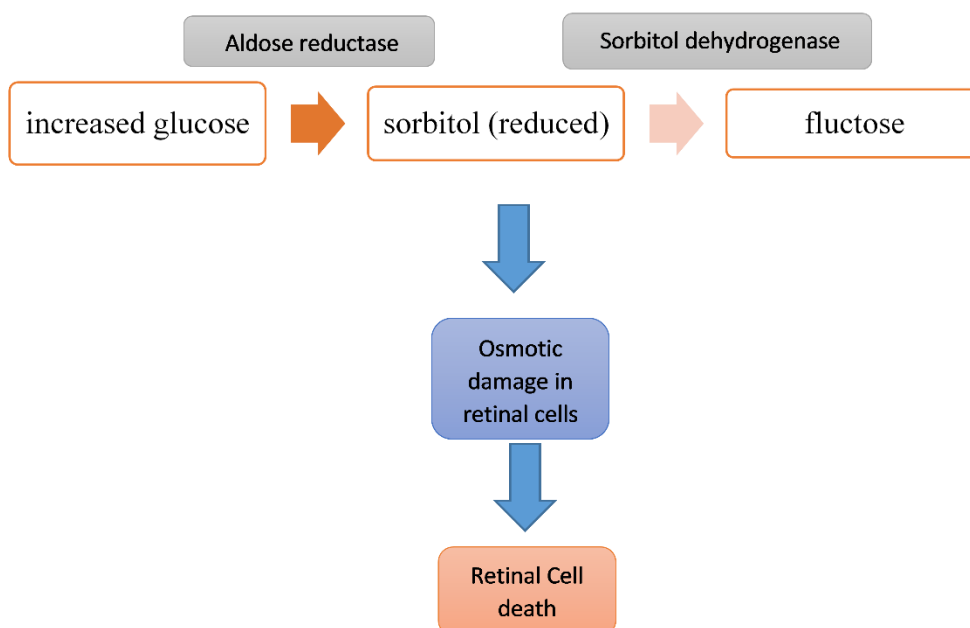


Fig. 6: Effect of diabetes on retinal cells.^[13]

DATA COLLECTION

14 questions were formulated in the questionnaire which included the questions based on family history, signs and symptoms, changes in periodontium and oral manifestations.

RESULT

In the present study, questionnaire was distributed to 78 patients of different age group who were selected randomly. A total 14 questions were included in this study. Out of 78 patients 51 (65.3%) were adult and 27(34.6%) were senior patients. Firstly frequency distribution of effect of diabetes on periodontium among

participants of different age group (table 1). Amongst 78 patients 38 adults and 25 seniors had difficulty in vision which was found to be a total of 63(80.7%) patients, suffering from disturbance in vision (table 1). Increased gums bleeding while tooth brushing or chewing was found amongst 68(87.1%) patients out of 78 patients which included 43 adults and 25 senior patients (table 1). Further, burning sensation on mouth and tongue was also found in 60(76.9%) patients which included 41 adult and 19 senior patients. The results obtained were significant i.e. 0.05, for disturbance in vision, bleeding gums and burning sensation mouth and tongue.

Table1: Frequency distribution of effect of diabetes on periodontium among participants.

Questions	Response	Adult	Senior	Total	P value
Do you have any family history of diabetes mellitus?	YES	24	9	33(42.4%)	0.243
	NO	27	18	45(57.6%)	
Are you on any medication for diabetes mellitus?	YES	39	22	61(78.2%)	0.610
	NO	12	5	17(21.8%)	
Do you have increased thirst?	YES	30	13	43(55.1%)	0.367
	NO	21	14	35(44.9%)	
Do you have increased micturition?	YES	33	19	52(66.6%)	0.610
	NO	18	8	26(33.4%)	
Due to feel blurring of vision or any disturbance in vision?	YES	38	25	63(80.7%)	0.05*
	NO	13	2	15(19.3%)	
Is healing of wounds delayed?	YES	4	1	5(6.41%)	0.478
	NO	47	26	73(93.5%)	
Have you noticed your gums swelling?	YES	13	9	22(28.4%)	0.402
	NO	38	17	55(70.6%)	
Have you noticed your gums bleeding while tooth brushing or chewing?	YES	43	25	68(87.1%)	0.05*
	NO	7	2	9(11.9%)	
Do you have abscesses?	YES	2	5	7(9%)	0.297
	NO	49	22	71(91%)	
Do you have xerostomia odour decreased saliva flow?	YES	20	16	36(46.1%)	0.91
	NO	31	11	42(53.9%)	
Have you noticed loose tooth or mobile tooth?	YES	9	8	17(21.7%)	0.223
	NO	42	19	61(78.3%)	
Have you noticed exposure of root surfaces?	YES	9	8	17(21.7%)	0.223
	NO	42	19	61(78.3%)	
Do you have burning sensation on mouth and tongue?	YES	41	19	60(76.9%)	0.05*
	NO	10	8	18(23.1%)	
Do you have ulcers in mouth?	YES	3	2	5(6.4%)	0.794
	NO	48	25	73(93.6%)	

Secondly calculation was done amongst total no of diabetic Patients under medication having oral

manifestations which included following questions from the questionnaire.

Questions related to oral manifestations

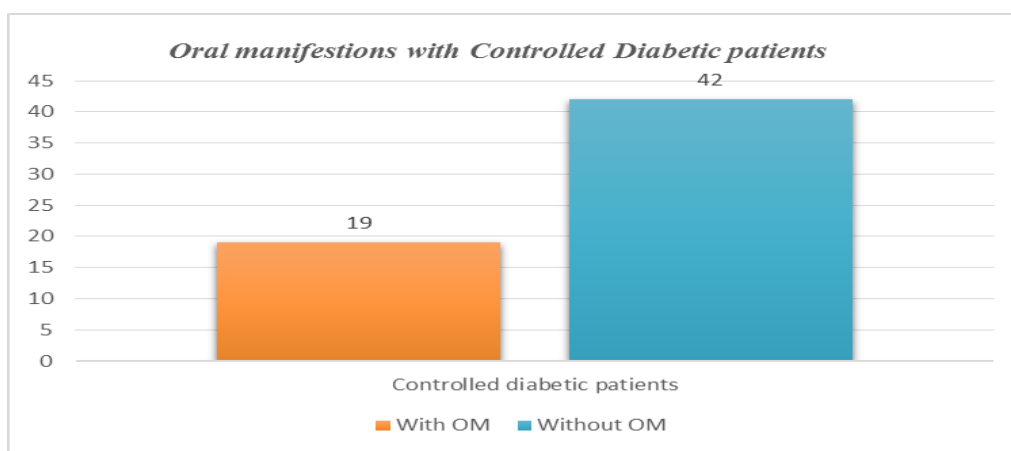
Have you noticed your gums swelling?
Have you noticed your gums bleeding while tooth brushing or chewing?
Do you have abscesses?
Do you have xerostomia odour decreased saliva flow?
Have you noticed loose tooth or mobile tooth?
Have you noticed exposure of root surfaces?
Do you have burning sensation on mouth and tongue?
Do you have ulcers in mouth?

The results obtained was significant (0.05) as patients under medication had less oral manifestations (table 2, graph 1) which included out of 78 patients 61 patients were under medication out of which 19(31.1%) patients had oral manifestations and 42(68.8%) patients didn't have oral manifestations(graph 2). Graph 3 showed that the out of 17 patients who were not under medication 14 (82.3%) showed oral manifestations and 3(17.6%) patient didn't show oral manifestation.

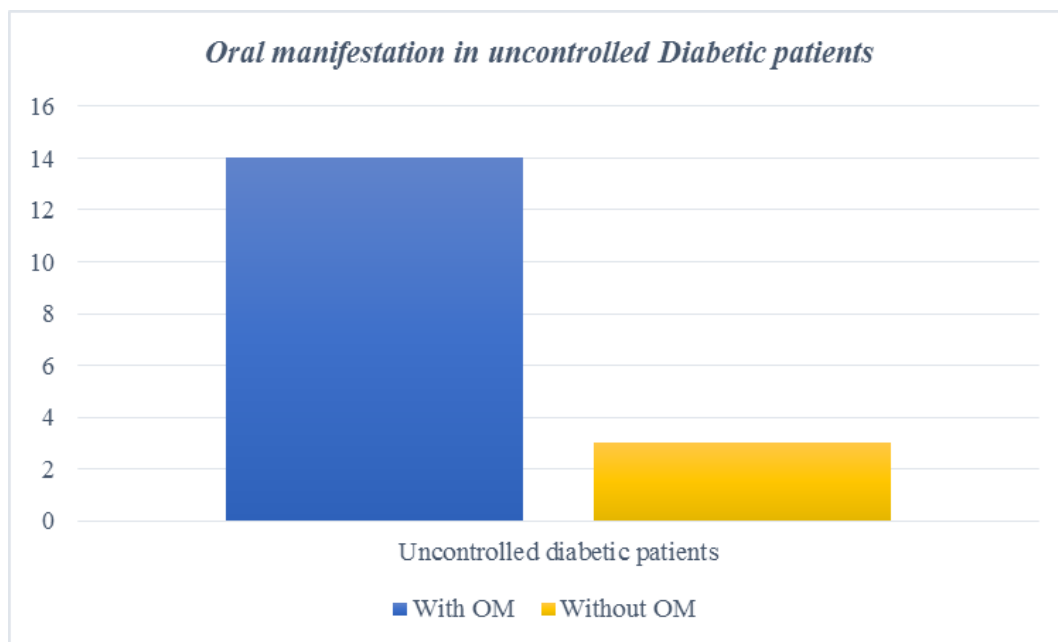
Lastly out of total no of 78 patients, the frequency of diabetes patients was calculated among different age group patient. Result obtained was in favour of adult patients as increased no of adult (19-59)years patients were suffering from diabetes as compared to no of senior patients (60 or above) (table 3 graph 3).

Table 2: Diabetic Patients under medication having Oral Manifestation

Controlled diabetic patients	ORAL MANIFESTATION		Total	Chi-square value	p-value
	Yes	NO			
Yes	19(31.1%)	42(68.8%)	61(100%)	1.926	0.05*
No	14(82.3%)	3(17.6%)	17(100%)		



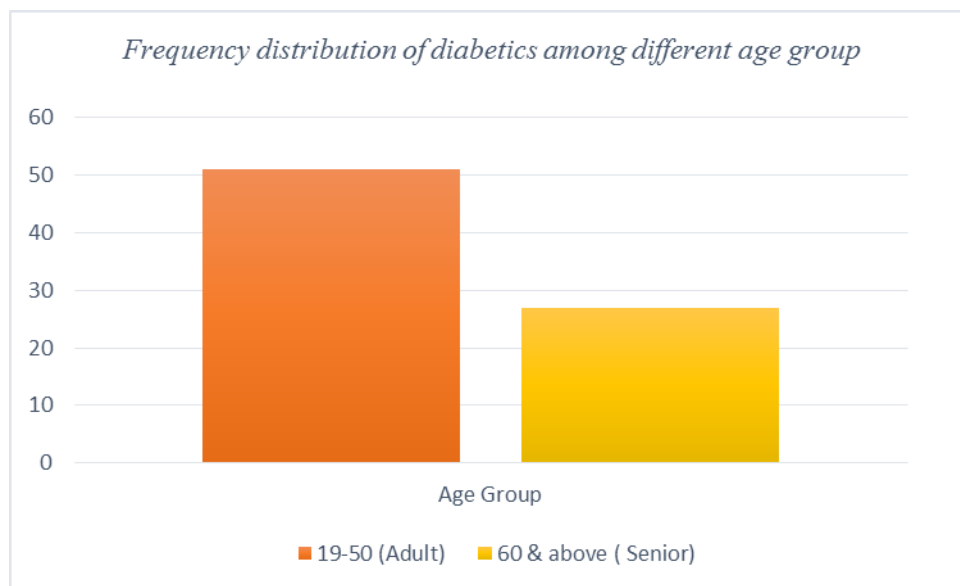
Graph 1: Controlled Diabetic Patients with Oral Manifestation.



Graph 2: Uncontrolled Diabetic Patients with Oral Manifestation.

Table 3: Frequency distribution of diabetics among different age group.

AGE	NO OF DIABETIC	Chi-square value	p-value
19-59 (adult)	51(65.3%)	78.00	0.000
60 & above(senior)	27(34.6%)		
Total	78		



Graph 3: Frequency distribution of diabetics among different age group.

DISCUSSION

The following study was conducted to evaluate the frequency of occurrence of oral manifestations in diabetic patients among the people of different age group. Duration of the study was 3 months, conducted at KALYAN HEALTH CARE CENTER, MATHURA, Uttar Pradesh. A total of 78 diabetic patients took part in the study out of which number of patients having diabetes were more amongst adults, compared to the senior patients. The patients were analysed on the basis of frequency of occurrence of visual disturbances, bleeding gums during brushing (87.1%), xerostomia (46.1%) and also on presence of oral manifestations in medicated 42(68.8%) and non-medicated patients 3(17.6%). Patients were also analysed for the increase frequency of diabetes among different age group people.

Microvascular complication diabetes involves diabetic retinopathy, which is characterised by microangiopathy, increased vascular permeability, ocular haemorrhages, lipid exudate, by vascular closure mediated by the development of new vessels on the retina and the posterior vitreous surface.^[13]

Present study revealed that out of 78 patients, 63(80.7%) patients, had complaint of disturbance in vision. B.Shivananda Nayak et al. did a study to determine the prevalence of deterioration of eyesight among type II diabetes patients of age 50 years and above, the study showed that the out of 180 participants, 59.3% were affected with cataract followed by 19.4% patients who had glaucoma. Thus in the study increased frequency of ocular disturbance can be seen in diabetic patients which supported present study.^[14] Mahfouth A Bamashmus et al did a study to determine the magnitude and risk factors of diabetic retinopathy (DR).The results of the study showed that prevalence of DR to be 54.9%, thus showing the increased frequency of visual disturbances in diabetic

patients which too was in accordance to the present study.^[15] O Revana Reddy et al also did a study to analyse association between dry eye disease and diabetic retinopathy in patients with type 2 diabetes mellitus which concluded that ocular surface damage in long-term type 2 diabetes is more severe than that in patients with shorter disease duration thus showing increased risk of visual disturbances among diabetes patients, which too supported the present study.^[16] Ren-Long Jan et al did a study to investigate the risk of recurrent corneal erosion (RCE) in patients with diabetes mellitus (DM) which concluded, DM increases the risk of RCE (ocular disturbance), thus supporting present study.^[17]

In present study increased frequency of bleeding gums 68(87.1%) was found in diabetic patients. The patients also complaint of bleeding gums while tooth brushing or chewing. Dr. N. Sayeeganesh et al did a study to correlate the percentage of gingival bleeding sites and blood glucose levels in diabetic and non-diabetic patients. Results of the study were significant showing that bleeding tendencies were more in diabetic patients compared to non-diabetic patients which was in accordance to the present study.^[18]

Mahtani et al also performed a questionnaire study which should the increases frequency of bleeding gums while brushing in patients with diabetes which supported the present study.^[19] Salvi GE et al did a study to determine clinical and microbiological changes occurring during a 21-day period of undisturbed plaque accumulation and according to the results of the study the author concluded that type 1 diabetics, however, developed an earlier and significantly higher inflammatory response to a comparable bacterial challenge.^[20] Increased gingival inflammation signifies increased tendency of gingiva to bleed as bleeding on probing is the first clinical sign see in gingivitis.

Amber Kiyani et al did a study to determine the association between Diabetic peripheral neuropathy (DPN) and burning mouth syndrome (BMS)-like symptoms. The following investigation showed that 189 (54%) patients out of total participants presented with BMS-like symptoms in patients with type II diabetes mellitus.^[21] The results of the study were accordance to the present study which showed 60(76.9%) diabetic patients having burning sensation in mouth and tongue which included 41 adult and 19 senior patients out of total no of 78 participants. Paul A. Moorea et al also in their study found the higher prevalence of BMS found among the diabetic patients which too supported present study.^[22]

Maria Rozeli S et al did a study to explore oral manifestations (70 patients) diabetic patients, divided in controlled and uncontrolled patients. The study indicated a prevalence of high blood pressure predominantly in the uncontrolled group (68.6%), which was definitely in accordance to the present study which determined increased frequency of oral manifestations in patients under uncontrolled group i.e. 14 (82.3%) showed oral manifestations and 3(17.6%) patient didn't show oral manifestation.^[23] Lalit Shrimali et al studied the correlation of Oral Manifestations in Controlled and Uncontrolled Diabetes Mellitus in 50 patients. According to the study oral manifestations were more in uncontrolled diabetes mellitus patients, thus the result supported the present study.^[24]

In our 3 months study on diabetic patients, increased prevalence of diabetes was seen in adults (19-59) as compared to senior patients(60 and above), 51(65.3%) adult patients were found to be diabetic as compared to senior patients 27(34.6%).

CONCLUSION

The present study determined that increased prevalence of visual disturbances can be found in diabetic patients. Moreover, increased cases of burning mouth and tongue along with bleeding gums during chewing and after brushing can be seen in patients. However, now diabetes is not an "old age disease" rather increased prevalence of diabetes can be seen in adult age which can affected by various factors including obesity, low nutrition diet, lethargic life style, stress, depression, smoking, excessive drinking etc. people nowadays are more into machines and money, neglecting their life style, there body which is the most important part of their lie without healthy body no money or machine can gove them happiness and joyfulness for which we all crave for.

REFERENCES

1. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. *Periodontol* 2000. 2007; 44:127-53.
2. Chang CP, Lim LP. Interrelationships of periodontitis and diabetes: A review of the current literature. *J.Dent.Sci.*2012; 7:272-282.
3. Wu YY, Xiao E, Graves DT. Diabetes mellitus related bone metabolism and periodontal disease. *Int J Oral Sci.* 2015.26; 7:63-72.
4. Mealey BL, Oates TW. American Academy of Periodontology. Diabetes mellitus and periodontal diseases. *J Periodontol.* 2006; 77:1289-303.
5. Um YJ, Jung UW, Kim CS, Bak EJ, Cha JH, Yoo YJ, Choi SH. The influence of diabetes mellitus on periodontal tissues: a pilot study. *J Periodontal Implant Sci.* 2010 Apr; 40:49-55.
6. Jain A, Manjunath RGS, Saxena P, Mishra N. Diabetes and Its Association with Periodontal Tissues. *Int J Cont Med Res.* 2015;2:79-85
7. Aishwaimi E, Idrees M, Berri Z, El-Sakka H, Kujan O. Association between Diabetes Mellitus and Periodontal Diseases: A Survey of the Opinions of Dental Professionals. *Med Princ Pract* 2019; 28:141-149.
8. Plicka.V. PATHOPHYSIOLOGY OF DIABETES MELLITUS *Electron. J. Int. Fed. Clin. Chem.* 2002; 13: 140-144.
9. Ali O. Genetics of type 2 diabetes .*World J Diabetes* 2013; 4: 114-123.
10. Gupta S, Jain U, Chauhan N .Laboratory Diagnosis of HbA1c: A Review. *J Nanomed Res* 2017; 5: 00120.
11. De Jesus TJ and Ramakrishnan P. Sugar-Coating the Skin. *Austin J Clin Pathol.* 2015; 2(3): 1035.
12. J. Nithyashri and G. Kulanthaivel, "Classification of human age based on Neural Network using FG-NET Aging database and Wavelets," *2012 Fourth International Conference on Advanced Computing (ICoAC)*, 2012;1-5.
13. Sayin N, Kara N, Pekel G. Ocular complications of diabetes mellitus. *World J Diabetes* 2015; 6(1): 92-108.
14. Shivananda Nayaka BS, Ramoutara J , Ramkessona S, Ramkissoona V, Ramlogana T, Ramnarinea J,Ramnarinea S, Ramoutara S, Rampersada K .Eyesight Deterioration With Type II Diabetes *J Endocrinol Metab.* 2019; 9: 29-32.
15. Bamashmus MA, Gunaid AA, Khandekar RB. Diabetic retinopathy, visual impairment and ocular status among patients with diabetes mellitus in Yemen: a hospital-based study. *Indian J Ophthalmol.* 2009 Jul-Aug; 57:293-8.
16. He F, Zhao Z, Liu Y, Lu L, Fu Y. Assessment of Ocular Surface Damage during the Course of Type 2 Diabetes Mellitus. *J Ophthalmol.* 2018:1206808.
17. Jan RL, Tai MC, Ho CH, Chu CC, Wang JJ, Tseng SH, Chang YS. Risk of recurrent corneal erosion in patients with diabetes mellitus in Taiwan: a population-based cohort study. *BMJ Open.* 2020; 10:e035933.
18. Ervasti T, Knuutila M, Pohjamo L, Haukipuro K. Relation between control of diabetes and gingival bleeding. *J Periodontol.* 1985; 56:154-7.
19. Mahtani AA, Jacob C, Lakshmanan R. Prevalence of diabetes among patients and the assessment of the awareness of the bidirectional relation between

- diabetes and periodontal disease. *J Family Med Prim Care* 2020; 9:2774-80.
20. Salvi GE, Kandylaki M, Troendle A, Persson GR, Lang NP. Experimental gingivitis in type 1 diabetics a controlled clinical and microbiological study. *J Clin Periodontol* 2005; 32: 310–316.
 21. Kiyani A, Rana BK, Sohail K, Saeed MHB An investigation to determine the association of burning mouth syndrome-like symptoms with diabetic peripheral neuropathy in patients with type II diabetes. *J Oral Maxillofac Surg Med Pathol* .2021;1: 89-92.
 22. Moore PA, Guggenheimer J, Orchard T. Burning mouth syndrome and peripheral neuropathy in patients with type 1 diabetes mellitus. *J Diabetes Complications*. 2007; 21:397-402.
 23. Quirino MR, Birman EG, Paula CR. Oral manifestations of diabetes mellitus in controlled and uncontrolled patients. *Braz Dent J*. 1995; 6(2):131-6.
 24. L Shrimali, M Astekar, & G Sowmya. Correlation of Oral Manifestations in Controlled and Uncontrolled Diabetes Mellitus. *J. Oral Maxillofac. Pathol*. 2011; 2:24-27.
9. Do you have abscesses?
 - a. Yes
 - b. No
 10. Do you have xerostomia odr decreased saliva flow ?
 - a. Yes
 - b. No
 11. Have you noticed loose tooth or mobile tooth?
 - a. Yes
 - b. No
 12. Have you noticed exposure of root surfaces?
 - a. Yes
 - b. No
 13. Do you have burning sensation on mouth and tongue?
 - a. Yes
 - b. No
 14. Do you have ulcers in mouth?
 - a. Yes
 - b. No

Questionnaire

Effect of Diabetes on Periodontium

1. Do you have any family history of diabetes mellitus?
 - a. Yes
 - b. NO
2. Are you on any medication for diabetes mellitus?
 - a. Yes
 - b. No
3. Do you have increased thirst?
 - a. Yes
 - b. No
4. Do you have increased micturition?
 - a. Yes
 - b. No
5. Due to feel blurring of vision or any disturbance in vision?
 - a. Yes
 - b. No
6. Is healing of wounds delayed?
 - a. Yes
 - b. No
7. Have you noticed your gums swelling?
 - a. Yes
 - b. No
8. Have you noticed your gums bleeding while tooth brushing or chewing??
 - a. Yes
 - b. No