AN ASSOCIATION BETWEEN TYPE 2 DIABETES MELLITUS AND A CLINICAL PERIODONTAL PARAMETER: POCKET DEPTH

Sara Mariyum[1], Amjad Iqbal Khan[2], Shamaila Wadud[3], Hina Hakeem[3], Nazma saleem[4], Muhammad Younas[5]

[1]Department of Biochemistry, Swat Medical College, Swat
[2]Department of community dentistry, Saidu College of Dentistry, Swat
[3] Department of Biochemistry, Peshawar Medical College, Peshawar
[4]Department of biochemistry, Rehaman College of Dentistry, Peshawar
[5]Department of Oral Medicine, Peshawar Dental College, Peshawar

ABSTRACT

Objectives: *To find out an association between type 2 diabetes mellitus and a clinical periodontal parameter i.e Pocket depth*

Materials and Methods: *This research(case control) was performed in two hospitals of Peshawar, Prime Teaching hospital and Peshawar Dental hospital. Type 2 Diabetics with Periodontal problem,referred tothe Periodontology departments of both the hospitals from June 2018 to January 2019, were included in our study. Patient having no diabetes and with periodontitis visiting Periodontology department of Peshawar Dental hospitalswere controls of our study. Basic periodontal examination of Diabetics and non-Diabetics patients was done in Periodontology ward of Peshawar dental college.Glycated hemoglobin test (HbA1C) of both Diabetics and Non-Diabetics patient was performed in laboratory of Prime Teaching Hospital.*

Results: *The correlation analysis in two subjects establish a durable linkamong Diabetes and Pocket Depth (rs=0.788).The average Periodontal Pocket Depth observed in our study is 3.70mm ± 1.28. In our study control group have Periodontal Pocket depth of 1.42mm± 0.94.*

Conclusion: *We conclude that diabetic patient compared to non-diabetic patients of similar age, gender, socio-economic status, level of education and oral hygiene measures have higher incidence of Periodontal disease.*

Key words: *Periodontitis, Glycated hemoglobin test (HbA1C)*

INTRODUCTION

Chronic inflammatory conditions like Diabetes mellitus and periodontal disease, effectinghuman health badly. The word “Diabetes” originated from Greek language that means “to pass through “or “a siphon” and “mellitus” is a Latin word, meaning “honeyed or sweet”. Apollonius of Memphis was pioneer to use word ‘diabetes’ in 250 BC 1. Thomas Willis later added the term “mellitus”[1]

Correspondence:
Amjad Iqbal
Head of Department, Community & preventive Dentistry,
Saidu College of Dentistry, Swat
Cell: +923335383959
Email: dramjadkhattakpdc@gmail.com

The diabetes mellitus is a disorder due to either by deficiency in insulin hormone secretion, insulin action, or both[1]. Insufficiency in insulin release or its resistance, leads to lack of transport of glucose into the cells. Retention of glucose in the blood leads to hyperglycemia[2].

Almost ninety-five percent of diabetes is of Type 2. Type 2 diabetics develop insulin resistance and mostly results in “relative” insulin deficiency”. Type 2 diabetics are capable to secrete some insulin as destruction ofβ pancreatic cells doesn’t occur in type 2 diabetes mellitus, though secretion frequently reduces with duration[3].

Diabetes mellitus was considered as an epidemic

but now turned into pandemic[4]. Obesity; intake of junk food, increase in population and unhealthy life style is the basis of the global upturn in diabetes mellitus[5].

Pocket formation is one of the sign of periodontal disease and pocket depth is one of the clinical parameters that can be used to assess the severity level of periodontal disease .The periodontal disorders are a heterogeneous group of disorders that influence the surrounding structures of the teeth. One of the major cause in progression of periodontitis is diabetes mellitus[6]. In diabetes, the inflammatory cells in the gingiva cause loss of structural components like fibroblasts and collagen. Destruction of layers of junctional epithelium causes loss in tooth contact which ultimately leads to periodontal pocket formation[7]. Anaerobic environment in the pocket facilitates the accumulation of the facultative microorganisms. Apical proliferation of infiltrate and the assembly of Interleukin 1β (IL-1β), Tumor Necrosis Factor α (TNFα) and Prostaglandin 2 will augment the reaction to bacterial infection and leads to bone loss. When the disease is not treated, the tissue destruction caused by the inflammatory response overcomes any tissue repair and may result in the depth of the periodontal pocket; attachment loss and bone resorption[8].

Campus and his colleagues found a significant increase in the amount of probing and pocket depths in diabetic patients[9].There was significant increase in periodontal probing depth in diabetics after 6 months of follow up.

Effect of periodontitis varies indifferent culture; socioeconomic status, dietary and oral habits of different groups of populations[10]. No such study has been conducted in the diabetic (Type2) population of the Khyber Pakhtunkhwa exploring a relationship of type 2 diabetics and periodontal Pocket depth.

MATERIALS AND METHODS

This matched case-control study has sample size calculated is 70 having 95% confidence level, two-sided significance level (α) of 0.05 to detect the Odds ratio (OR) of 5.5(on the basis of earlier studies). 105 patient of both gender were taken and study conducted from june 2018 to January 2019 in prime teaching and Peshawar dental hospital. Cases include 56 participantsand controlled group containing 49 .The two groups were similar in relation to sex, age, SES, level of education, methods of dental cleansing and frequency of dental cleansing methods.

Examination was scheduled in the morning. The patient reporting to the Periodontology department was met by the researcher who explained the examinationprocedure. The patients were free to inquire any query, if they realized that they still were unclear. The form was then filled both in English /Urdu and was signed by the participants. Researcher examined the patient wearing gloves, mask and goggles. The participants were also provided with goggles and napkins during examination. Instruments were sterilized in an Enclave Auto MEC 235 autoclave before examination. All the instruments were packed in Medicum Self- Sealing Sterilization Pouches of size 3 ½''x 10''/ 89 mm x254 mm prior to sterilization. Mouth mirror; periodontal probe and WHO probe were used for the examination procedures

At six sites of each tooth i.e mesiobuccal, distobuccal, mesiolingual, distolingual, midlingual and midbuccal, probing depth was recorded ,using a WHO probe. Probing was performed by inserting the probe into the gingival crevice along the long axis of the tooth and stopped when hindrance was felt.

Mean probing depth was taken. Clinicalexaminationwas normally completed within 30mins for each subject .All the data was handled with confidentially and password protected computer was used for the data. Analysis of data was done by SPSS version 20.

RESULT

The present study included a total of 105 subjects, out of which 56 were cases and 49 as controls.

Mean age of participants were51.48±7.92. The patients were grouped into five age groups. Group 1 ranges from 40-45 years, Group 2 from 46-50 years, Group 3 from 51-55 years, Group 4 from 56-60 years, Group 5 from 61-65 years.

Among 56 Diabetics (cases), 20 (35.7 %) were male and 36 (64.3 %)were females.Among 49 controls (non diabetics),13 (26.5%) were males and 36 (73.5 %) were females.

Out of 56 diabetics (cases) 18 (32.1%) belonged to high socio ecnomic status and38 (67.9%) were from low socio ecnomic status .Among 49 non

diabetics (controls) 16(32.7%) belonged to high socio ecnomic status and 33 (67.3%) belonged to low socio ecnomic status.

In cases, frequency of brushing in 24 participants is one time, in 15 participants two times, 11 participant brush and 6 participant did not brush and not useany method of oral hygiene in 49 controls, 20 participant brushed onetime a day, 13 participant brushed two times a day,11 cleaned teeth infrequently and 5 were not using any method of oral hygiene. (figure 3)

Table 1: Sample distribution of subjects

Sample distribution	Numbers(n)	Percentage
Cases	56	53.3
Controls	49	46.6
Total	105	100.0

Table 2: Age distribution of the subjects (n= 105)

Age group	Numbers(n)	Percentage
40-45	30	28.6
46-50	15	14.3
51-55	21	20.0
56-60	32	30.5
61-65	7	6.7
Total	105	100.0

Table 3:Comparison of Socioeconomic status between cases and controls

Socioeconomic status	Cases	Controls	Total
High	18(32.1)	16(32.7)	34
Low	38(67.9)	33(67.9)	71
Total	56	49	105

Table 4:Periodontal Probing Depth

Factor	Cases Mean± SD(n=56)	Controls Mean± SD(n=49)	p-Value
Periodontal Probing Depth	3.70±1.28	1.42±0.94	b0.015*

b= p value measured by t test
*=significant (significance level p<0.05)

Table 5: Diabetes Status

Parameter	r_s	P
Periodontal Probing Depth	0.788	.000*

r_s=spearman's rank correlation coefficient
*=significant

Mean Periodontal Pocket Depth of 3.70mm (± 1.28) in diabetics (cases) and 1.42mm(± 0.94) in non-diabetic (control) was recorded. p - value, measured by the T test was significant.

Spearman correlation test was conducted to explore the association between the type 2 diabetes and the periodontal pocket depth

DISCUSSION

Diabetes mellitus affected the periodontium has always remain an issue of research for the medical and dental professionals. Our research investigated the impact of diabetes mellitus upon the deepening of periodontal pockets that leads to periodontal disease.

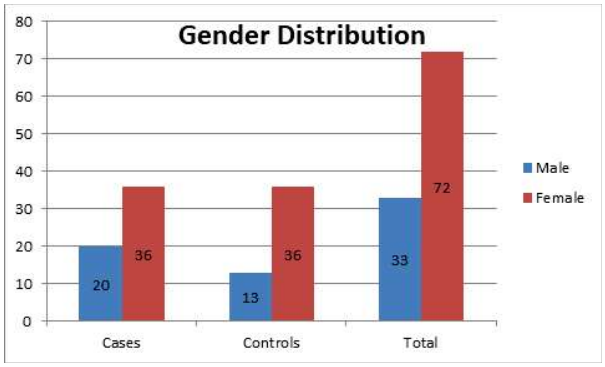

Fig 1: Gender Distribution

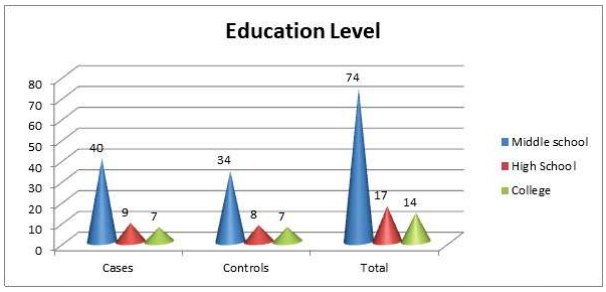

Fig 2: Education Level

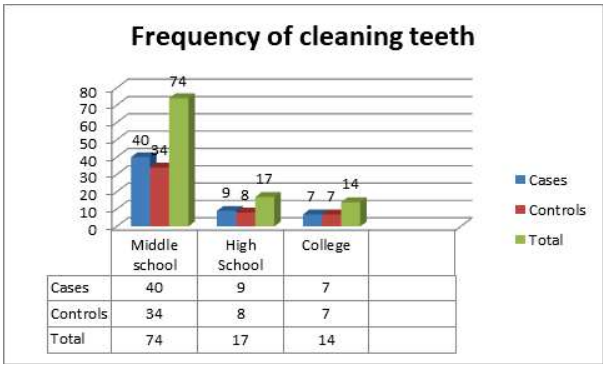

Fig 3: Frequency of cleaning teeth

In our study the association between diabetes and Pocket Depth(rs=0.788) was strong.The mean Periodontal Pocket depth observed in our study is 3.70mm ± 1.28 in diabetics (cases) which was higher than the mean Periodontal Pocket depth of 1.42mm± 0.94 in Control group. Significance ofp value (0.015) was found between the two groups. The results show that diabetic status is related to the Periodontal Pocket depth. These findings are in accordance to that of a study conducted in 2012 at Lahore by Haseeb et al, that have observed the mean Periodontal Pocket depth to be 3.96mm in diabetic group and 2.93mm in non-diabetics group. Significant difference was found between the group[11] .Rohani et al have reported a mean Pocket depth of 2.54mm in diabetic group and 2.35mm in non-diabetic group with a significant difference of p=0.03[12] and the results support the findings of our study. Khader et al, also noted significant difference (P<.001) in the mean depth of periodontal pocket as 3.67mm± 0.11 in diabetics and 2.82mm ± 0.08 in non-diabetics[13]. Tran et al in a systematic review established that all the parameters of periodontal disorder including the periodontal pocket depth are adversely affected by the Diabetes Mellitus[14].Many factors have been mentioned to explain the higher prevalence of periodontitis and increased depth of periodontal Pockets in diabetics that includes: the change in the flora of gingival, host reaction and delayed healing[15]. Apical proliferation of infiltrate and the production of Interleukin 1β (IL-1β), Tumor Necrosis Factor α and Prostaglandin 2 will rapidly raise infection caused by bacteria and leads to loss of bone. If the pathology is left untreated, tissue damage initiated by the inflammatory reaction overcomes any repair and will cause deepening of pocket; loss of attachment, bone and tooth loss[16]. Joshipura et al also reported the relationship between the periodontal pocket depth and the blood glucose levels in diabetics[17].

Contrary to these findings, Serrano et al, have found insignificant difference (p=0.88) between the mean Pocket depth of diabetics (2.53mm ±0.61) and non-diabetic group (2.51mm ±0.46)[18]. Mattout et al, also found almost same values of pocket depth between the two groups[19]. The confounding effect of different factors like duration of diabetes, glycemic control etc. may have caused these similarities as most of the studies reported significant differences between the meanpocket depths of the two groups.

CONCLUSION

A strong association does exist between Type 2 diabetes mellitus and periodontal pocket depth. Periodontal pocket depth is one of the clinical parameter that shows the severity level of periodontitis

REFERENCES

1. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2021. Diabetes Care 2021;44(Suppl. 1):15–3
2. Davies MJ, D'Alessio DA, Fradkin J, et al. Management of Hyperglycemia in Type 2 Diabetes, 2018. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care2018;41(12):2669-01
3. Mealey BL, Ocampo GL. Diabetes mellitus. Periodontol 2000 :3:1-29
4. Zimmet, P.Z. Diabetes and its drivers: the largest epidemic in human history. Clin Diabetes Endocrinol 2017;3:1-19
5. Talukder, A., Hossain, M.Z. Prevalence of Diabetes Mellitus and Its Associated Factors in Bangladesh: Application of Two-level Logistic Regression Model. Sci Rep 2020;10:1-15
6. Emese B, Dorottya G, Szabolcs N, Csaba L, Gabriella E,Zolta´nB,Tama´s V. Periodontal Disease in Diabetes Mellitus: A Case– Control Study in Smokers and Non-Smokers Received:2020
7. Silva N, Abusleme L, Bravo D, et al. Host response mechanisms in periodontal diseases. J Appl Oral Sci 2015;23(3):329-55
8. Yu, N., Van Dyke, T.E. Periodontitis: a Host-Mediated Disruption of Microbial Homeostasis. Curr Oral Health Rep 2020;7:1-13
9. Wernicke, K., Zeissler, S., Mooren, F.C. et al. Probing depth is an independent risk factor for HbA1c levels in diabetic patients under physical training: a cross-sectional pilot-study. BMC Oral Health 2018;18:19-19
10. Barbieri W, Peres SV, Pereira CB, Peres Neto J, Sousa ML, Cortellazzi KL. Sociodemographic factors associated with pregnant women's level of knowledge about oral health. Einstein (São Paulo) 2018;16(1):1-9
11. Haseeb M, Khawaja KI, Ataullah K, Munir MB, Fatima A. Periodontal Disease in Type 2 Diabetes Mellitus. J Coll Physicians Surg Pak 2012;22 (8): 514-18
12. Rohani B. Oral manifestations in patients with diabetes mellitus. World J Diabetes. 2019;10(9):485-89
13. Kesavan R, Chaly PE, Reddy V C, Mary A V. Periodontal status among type II diabetic and nondiabetic individuals in Chennai, India: A comparative study. J Indian Assoc Public Health Dent 2015;13:393-8

14. Tran DT, Gay I, Du XL, Fu Y, Bebermeyer RD, Neumann AS, et al. Assessing periodontitis in populations: A systematic review of the validity of partial-mouth examination protocols. J ClinPeriodontol 2013;40:1064-71

15. Singh M, Bains VK, Jhingran R, Srivastava R, Madan R, Maurya SC, Rizvi I. Prevalence of Periodontal Disease in Type 2 Diabetes Mellitus Patients: A Cross-sectional Study. ContempClin Dent. 2019;10(2):349-357

16. Dhir S, Wangnoo S, Kumar V. Impact of Glycemic Levels in Type 2 Diabetes on Periodontitis. Indian J EndocrinolMetab. 2018;22(5):672-77.

17. Joshipura KJ, Muñoz-Torres FJ, Dye BA, Leroux BG, Ramírez-Vick M, Pérez CM. Longitudinal association between periodontitis and development of diabetes. Diabetes Res ClinPract. 2018 ;141:284-93.

18. Khanuja PK, Narula SC, Rajput R, Sharma RK, Tewari S. Association of periodontal disease with glycemic control in patients with type 2 diabetes in Indian population. Front Med. 2017;11(1):110-9.

19. Liccardo D, Cannavo A, Spagnuolo G, et al. Periodontal Disease: A Risk Factor for Diabetes and Cardiovascular Disease. Int J Mol Sci. 2019;20(6):1414.