

Association between Prediabetes and Periodontitis- A Case control Study

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ABSTRACT

To determine association of prediabetes and periodontitis among patients reporting to Khyber College of Dentistry, Peshawar. This case control study was on 60 participants (30 cases and 30 controls) at Khyber College of Dentistry, Peshawar. The participants with age more than 20 years, having at least 14 teeth in oral cavity, and no use of antibiotics or steroids in previous three months were included. Individuals that were smokers, using alcohol, ketoacidosis, acute infection, and history of inflammatory or rheumatic diseases were excluded. Cases were prediabetics and controls were healthy subjects. Periodontitis was labeled positive by clinical attachment loss (CAL) of at least 2mm and probing depth (PD) of at least 3 mm. Independent t test and Chi-square test was applied to compare quantitative and qualitative data between the cases and controls respectively. The age was 42.88 ± 10.5 years with range of 22 to 60 years. The males were 46(76.7%) and females were 14(23.3%). The Pocket depth was higher in prediabetic (3.18 ± 1.02 mm) than healthy (2.3 ± 0.63 mm) participants statistically ($P < 0.001$, 95% CI=0.44, 1.31). Similarly the clinical attachment loss was more in cases (2.65 ± 0.93 mm) than controls (1.63 ± 1.159 mm) statistically ($P < 0.001$, 95% CI= 0.47, 1.56). The frequency of periodontitis was higher in Prediabetic cases (n=24, 80%) than controls (n=8, 20%) and these results were very highly statistically significant ($P < 0.001$). The odds of periodontitis were 11 times more in prediabetics than healthy controls (OR=11, 5% CI=3.292, 36.751). There is positive and significant association between prediabetes and periodontitis.

Keywords: Periodontitis, prediabetes, clinical attachment loss, pocket depth, hyperglycemia

Introduction

Two most common diseases of periodontium are gingivitis and periodontitis.¹ Gingivitis is reversible condition in which no loss of attachment occurs while periodontitis lead to loss of attachment and increased in pocket depth or gingival recession.² In most of instances periodontitis is an irreversible phenomena and only treatment option for inducing reattachment is guided tissue regeneration (GTR).³

Many etiologic factors are associated with periodontitis like plaque accumulation, gingivitis, smoking, tooth brush trauma, ill-fitting margins of prosthesis, and medical conditions.^{4, 5} Other risk factors for periodontal disease are male gender, old age, smoking and low socio-economic level.^{4, 6}

Diabetes mellitus (DM) is a sort of metabolic disorder having the features of hyperglycemia and impaired metabolism of carbohydrate, protein and lipid.⁷ Prediabetes is a condition in which metabolism of glucose is altered and increase the risk of progression to diabetes. WHO define prediabetes is a condition in which glucose level is higher than normal but less than level classified as DM.⁸ A strong association between DM and periodontitis has been established.^{9, 10} One of the most common complications of DM is periodontitis.¹⁰ Hyperglycemia in DM can cause impairment of gingival fibroblast synthesis, loss of periodontal fibers and alveolar bone loss.¹¹

Literature Review

Constant high blood sugar level can cause periodontal diseases in patients with prediabetes by inducing pre-inflammatory factors like cytokines.¹² A previous study conducted in Iran on association of periodontitis and prediabetes and they found that positive association.¹³ Another study reported that plaque index, bleeding index and probing depth mean values were higher in prediabetic cases than controls.^{14, 15}

There is lack of literature on this topic in our province. Prediabetes is relatively common condition so this study will help whether prediabetes is associated with periodontitis in our population or not. This will alert the clinicians about giving due consideration to oral health while attending prediabetic patients.

The objective of this study was to determine association of prediabetes and periodontitis among patients reporting to Khyber College of Dentistry, Peshawar, Pakistan.

Methods

Sample and Participants

This case control study was conducted in Periodontology department of Khyber College of Dentistry, Peshawar on total of 60 (30 cases and 30 controls) participants by non-probability consecutive sampling technique. After detailed explanation about benefits and purpose of the study verbal informed consent were obtained from all participants. The participants were assured that their data will be confidential. The participants with age more than 20 years, having at least 14 teeth in oral cavity, and no use of antibiotics or steroids in previous three months were included. Individuals that were smokers, using alcohol, suffering from ketoacidosis, acute infection, and history of inflammatory or rheumatic diseases were excluded.

Measurements tools

Cases were those having initial fasting blood sugar from 100 to 125 mg/dL while controls were those having normal fasting blood sugar (≤ 80 mg/dl). After detailed history and clinical examination by using sterilized examination kit that include mouth mirror, tweezers and calibrated probe (Michigan O probe with Williams marking). Periodontitis was labeled positive by clinical attachment loss (CAL) of at least 2mm and pocket depth (PD) of at least 3 mm.

Data analysis tools

Statistical analysis was performed in SPSS version 22. Mean and SD were computed for continuous data like age, CAL and PD while percentages and frequencies for qualitative data like gender and periodontitis. Independent t test was applied between two groups to compare CAL and PD. Chi-square test was applied to compare qualitative data between the two groups. $P \leq 0.05$ was significant level.

Results

The age was 42.88 ± 10.5 years with range of 22 to 60 years. The males were 46(76.7%) and females were 14(23.3%). The mean age of cases and controls was not different statistically ($P=0.552$). The Pocket depth was higher in prediabetic (3.18 ± 1.02 mm) than healthy (2.3 ± 0.63 mm) participants statistically ($P < 0.001$, 95% CI=0.44, 1.31). Similarly the clinical attachment loss was more in cases (2.65 ± 0.93 mm) than control (1.63 ± 1.159 mm) statistically ($P < 0.001$, 95% CI= 0.47, 1.56). **(Table 1)**

The frequency of periodontitis was higher in prediabetic cases ($n=24$, 80%) than controls ($n=8$, 20%) statistically significant ($P < 0.001$) and these results were also statistically significant in both males ($P < 0.001$) and females ($P=0.04$). **(Table 2 & 3)**

Comparison of periodontitis between prediabetic and healthy participants stratified by age groups showed that the frequency of periodontitis was higher in cases than controls statistically in age group 31-40 years ($P=0.004$) and 41-50 years ($P=0.013$). **(Table 4)**

The association of prediabetes and periodontitis was positive ($OR=11$) and statistically significant (95% CI=3.292, 36.751). The odds of periodontitis were 11 times more in prediabetics than healthy controls. **(Table 5)**

Table 1: Comparison of age, pocket depth, CAL between Prediabetic and healthy participants

Group		Mean $\pm$ SD	P-Value*	95% CI
Age (year)	Prediabetes	42.07 ± 11.19	.552	-7.09, 3.82

	Control	43.7±9.9		
PD (mm)	Prediabetes	3.18±1.02	<0.001	0.44, 1.31
	Control	2.3±0.63		
CAL (mm)	Prediabetes	2.65±0.93	<0.001	0.47, 1.56
	Control	1.63±1.159		

*independent t test

Table 2: Comparison of periodontitis between prediabetic and healthy participants

Periodontitis	Prediabetes		Control		P-Value
	N	%	n	%	
Yes	24	80.0	8	20.0	<0.001
No	6	20.0	22	80.0	

Table 3: Comparison of periodontitis between prediabetic and healthy participants stratified by gender

		Prediabetes		Control		P-Value
		N	%	n	%	
Male	Yes	20	76.9	4	20.0	<0.001*
	No	6	23.1	16	80.0	
Female	Yes	4	100.0	4	40.0	0.04**
	No	0	0.0	6	60.0	

*Chi-square test, **Fisher exact

Table 4: Comparison of periodontitis between prediabetic and healthy participants stratified by age groups

Age (years)	Periodontitis	Prediabetes		Control		P-Value*
		N	%	N	%	
20-30	Yes	4	100.0	1	50.0	.121
	No	0	0.0	1	50.0	
31-40	Yes	8	72.7	1	10.0	.004
	No	3	27.3	9	90.0	
41-50	Yes	5	83.3	2	20.0	0.013
	No	1	16.7	8	80.0	
Above 50	Yes	7	77.8	4	50.0	.232
	No	2	22.2	4	50.0	

*Fisher exact test

Table 5: Odds ratio for periodontitis among cases and control

Odds Ratio for periodontitis	95% CI for OR
11.0	3.292, 36.751

Discussion

This study was aimed to determine association of prediabetes and periodontitis among patients in a sample of Peshawar, Pakistan populations. Our main findings were that PD, CAL and periodontitis was higher in cases than controls. The odds of periodontitis were 11 times more in cases than controls.

Prediabetes is a condition in which metabolism of glucose is altered and increase the risk of progression to diabetes. WHO define prediabetes is a condition in which glucose level is higher than normal but less than level classified as DM.⁸

Periodontitis is an irreversible condition in which loss of attachment is found. The two most common parameters to assess this condition are pocket depth and clinical attachment loss. CAL is more reliable indicator of periodontitis than PD.¹⁶ In CAL actual degree of loss of attachment can be determined while higher pocket depth may be due to gingival hypertrophy due to systemic conditions or medications like phenytoin.¹⁷ We control these confounders by apply exclusion criteria. We labeled periodontitis positive on basis of CAL.

We used to classified prediabetes on basis of fasting blood sugar (100 to 125 mg/dL). Similar scale was used in previous literature.^{13, 14} Fasting blood sugar is more reliable than random blood sugar in diagnosing diabetes and prediabetes.¹⁸

An Iranian study was carried on 108 participants on association of periodontitis and prediabetes and they reported that association was positive and significant.¹³ Another study reported that plaque index, bleeding index and probing depth mean values were higher in prediabetic cases than control.¹⁴ Another case control study was conducted by Fawad et al.¹⁴ In Saudi Arabia on 39 participants and reported the mean pocket depth was higher in prediabetics than controls statistically. These results support our findings.

The underlying mechanism behind the higher loss of attachment in prediabetics than healthy subjects is due to the fact that hyperglycemia leads to more inflammatory mediators release and disturbed chemotactic activity of phagocytes in gingival tissues.¹⁹

Our result shows the association between prediabetes and periodontitis was significant in higher ages²⁰. Our results were not significant in above 50 years group but it can be due to less number of participants in this age group. Old age by itself is a risk factor for both diabetes and periodontitis.²¹

Conclusion

Within the limits of this study it can be concluded that there is positive and significant association between prediabetes and periodontitis. However further large sample studies are needed to further explore this area.

Conflict of interest: No possible conflicts of interest have been declared by the author(s) with respect to the study, authorship, and/or publication of this paper.

Funding disclosure: For the research, authorship, and/or publication of this article, the author(s) received no financial support.

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