GINGIVAL CREVICULAR BLOOD AS A SCREENING TOOL FOR DIABETIC PATIENT:A RANDOMIZED CLINICAL TRIAL

Abhishek Kandwal, [1] *Manu Batra,* [2]

1. Assistant Professor, Periodontics, Oral Implantology & Oncodontics Division, Himalayan Institute of Medical Sciences, Dehradun
2. Senior Lecturer, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College & Research Centre, Moradabad

ABSTRACT

Background: Diabetes has a high prevalence rate in Indian population due to the genetic profile (thrifty genotype), lifestyle and economy. It is the need of the time to identify diabetic individuals early and prevent the complication associated with diabetes (i.e. neuropathy, retinopathy and nephropathy) from occurring. This requires simple screening tools to identify diabetic individuals. Present study was designed to access whether gingival crevicular blood (GCB) can be used in screening of Type II diabetes mellitus as compared to Finger prick blood (FPB)

Method: 50 patients with chronic Periodontitis; 25 known diabetic and 25 systemically healthy were enrolled in the present study design. Blood oozing from the gingival crevices of anterior teeth following periodontal probing and finger-prick blood was taken and was analysed by glucometer.

Results: Mean ± S.D was 195.84 ± 27.19 and 138.78 ± 29.95 for GCB and FPB respectively in diabetic group. For non-diabetic group Mean ± S.D was 103.84 ± 12.56 and 84.36 ± 10.36 respectively for GCB and FPB. A Pearson correlation coefficient value of r = + 0.045 for diabetic and r = + 0.0324 for non-diabetic group comparing GCB and FPB.

Conclusion: The present study failed to validates use of GCB for testing blood glucose during routine periodontal examination

Key words: Diabetes mellitus, Gingival crevicular blood, Chronic periodontitis, Finger prick blood.

Introduction

Diabetes mellitus is associated with a wide range of complications, such as retinopathy, nephropathy, neuropathy, micro and macro-vascular diseases, altered wound healing and periodontitis.[1] Moreover, diabetes and periodontitis seem to interact in a bidirectional manner.[2] At present, there is strong evidence to suggest that the incidence and severity of periodontitis is influenced in part by diabetes mellitus and the level of blood glucose control.[3] Moreover, periodontal therapy might exert beneficial effects on diabetes control.[4]

Diabetes mellitus is one of the most frequent metabolic disorders with an estimated prevalence of 7% in industrialized countries, of which nearly half the cases are undiagnosed.[5] Patients with undiagnosed diabetes mellitus are at significantly increased risk for coronary heart disease, stroke and peripheral vascular disease.[1] In addition, recent data indicates that the incidence of the most common type of diabetes mellitus i.e. Type II, maybe increasing by up to 6% per year.[6]

Screening of diabetes at time of periodontal examination provides an additional venue to diagnose and reduce the diabetic burden of the society. Glucometer is routinely used by diabetics for accessing blood sugar levels, recently they have been employed to access the same from gingival crevicular blood.

Periodontal examination as a rule comprises of careful probing of periodontal pockets which result in some amount of bleeding from the gingival sulcus. Instead of swabbing and disposing the gingival crevicular blood this can be employed to assess blood glucose by glucometer.

Thus the aim of present trial was to evaluate the authenticity of using gingival crevicular blood as a potential site for blood glucose estimation in screening of diabetic individuals. The objective of the study was to find out whether the blood collected during routine periodontal examination is as authentic as a sample from finger prick for estimation of blood glucose level.

Materials and Method

A sample size of 50 subjects with chronic Periodontitis was decided in order to use student t test to compare gingival crevicular blood and finger prick blood for their use as screening tool for diabetes. Out of these 50 subjects, 25 individuals were known diabetic and 25 individual were systemically healthy.

Inclusion criteria

1. Diabetic patients with generalized chronic periodontitis diagnosed clinically with presence of periodontal pockets and radiographically with bone loss.
2. Non-diabetic patients with generalized chronic periodontitis diagnosed clinically with presence of periodontal pockets and radiographically with bone loss.

Exclusion criteria

1. Patients with requirement for antibiotic premedication.
2. Patients with disorder that was accompanied by an abnormally low or high haematocrit. For example, Polycythaemia vera, Anaemia, and Dialysis.
3. Patients with intake of substances that interfere with the coagulation system for example, Coumarin derivatives, Non-steroidal anti-inflammatory drugs or Heparin.
4. Patients with severe cardio-vascular, hepatic, immunologic, renal, hematological, or other organ disorders.

Present study was a double blinded randomized controlled trial. First examiner did the periodontal examination and assessed the diabetic history. Second examiner collected gingival crevicular blood glucose readings by collecting

blood oozing from the gingival crevices of anterior teeth following periodontal probing with the stick of glucose self-monitoring device. Then performed finger prick to access blood glucose level. Glucometer was standardized by known sugar solution after every 10th reading.

Descriptive data are presented as Mean ± S.D and range values. The difference between the measurements (Gingival Crevicular blood and finger-prick blood) was taken and compared between the two groups. Pearson's product moment correlation coefficient was found to assess the relationship between difference of measurements (GCB and FPB). A P-value of 0.05 or less was considered for statistical significance.

All Patients were informed about the study and a written consent was also taken. Ethical clearance was taken from the ethical committee, according to the Helsinki Declaration of the 1975, as revised in 1983

Results

50 subjects were divided in two groups of 25 each, Group 1 (diabetic group) and Group 2, (non- diabetic group). Range of 178-212 mg/dl for GCB and 123 -190 mg/dl for FPB in diabetic group and a range of 95 -138 mg/dl and 78- 97 mg/dl respectively for GBB and FPB was found in non-diabetic group. (Table 1)

Groups	No.	Particulars	GCB (mg/dl)	FPB (mg/dl)	P value
Group I Diabetic	25	Mean	195.84	138.78	< 0.001
		SD	27.19	29.95	
		Range	178-232	142-190	
Group II Non-Diabetic	25	Mean	103.86	84.36	<0.001
		SD	12.56	10.36	
		Range	95-138	78-97	

Table 1: - Mean, Standard deviation and Range values of Glucose Levels measured at different sites in two groups.

Mean ± S.D was 195.84 ± 27.19 and 138.78 ± 29.95 for GCB and FPB respectively in diabetic group. For non-diabetic group Mean ± S.D was 103.84 ± 12.56 and 84.36 ± 10.36 respectively for GCB and FPB. (Table 1)

On comparison it was found to be significant indicating that the GCB is not similar to FPB. A highly statistically significant difference was found between the two values for both groups of diabetic and non- diabetic. ($P < 0.001$) (Table 1)

GCB Vs FPB	Pearson Correlation Coefficient (r)	P Value
Group I Diabetic	+0.045	< 0.001
Group II Non Diabetic	-0.0324	< 0.001

Table 2: - Karl Pearson Correlation Coefficient for GCB Vs FPB in both Group I and Group II

A Pearson correlation coefficient value of r = + 0.045 for GCB and FPB for diabetic and r= + 0.0324 for non-diabetic group indicating a very low positive correlation. (Table 2)

Discussion

Diabetes has emerged as a major health problem in India. According to International Diabetes Federation every fifth diabetic in world would be an Indian by year 2025.[7] Further the Asian Indian phenotype commonly known as thrifty genotype predisposes Indian population to risk of developing diabetes. It is important to appreciate that these disorders do not initiate periodontitis but they may predispose accelerate or otherwise fasten its progression. It has been estimated that about one third of type 2 cases are undiagnosed and screening for undiagnosed type 2 DM is highly recommended.

In addition, recent data indicates that the incidence of type 2 DM may be increasing by upto 6% per year (Rees 2000). By this and the close interrelationship between diabetes and periodontitis, it can be assumed that the dental practitioner and especially the periodontists are extremely likely to encounter an increasing number of undiagnosed diabetes patients with periodontitis. The early diagnosis of diabetes however might help to prevent its long-term complications that are responsible for the high morbidity and mortality of diabetic patients.

With regard to the development of painless and non-invasive methods to measure blood glucose, considerable effort has been made in past few years.[6] However, until now, none are in routine clinical practice.[8] Since periodontal inflammation with and without complication factor of diabetes is known to produce ample extravagate of blood during diagnostic periodontal examination no extra procedure, e.g., finger puncture with a sharp lancet is necessary to obtain blood for glucometric analysis.[9] Even in the case of very low gingival crevicular bleeding, a glucose measurement is possible with the use of self-monitoring device, due to the low amount of blood (µl) necessary to perform the analysis.

In present study difficulty was reported in collection of blood from gingival crevices, multiple probing was required to collect sufficient amount of blood, also most of the subject preferred finger prick and were comfortable with the same as compared to less gingival crevice blood collection.

In present study there was a significant difference between GCB and F.P.C values indicating both cannot be considered as same. The value of GCB was reported to be higher in every individual as compared to FPB. A simple stimulation such as mastication, trauma and inflammation is sufficient to produce GCF (gingival crevicular fluid). Gingivitis and periodontitis is known to have higher level of GCF. It cannot be ruled out that gingival crevicular fluid is not mixed with the GCB. GCF is known to have glucose as its constituent; hence the blood sugar content cannot be accessed correctly. Similar finding was reported in study by Muller *et al* who concluded that there is no usefulness of

gingival crevicular blood as bleeding on probing was not sufficient in every third case.[10]

On the contrary Parker *et al* examined diabetic patients with unknown periodontal status and wherein a very strong correlation was observed between gingival crevicular, finger prick capillary and the corrected intravenous blood glucose measurements.[11] In another work by Beikler T *et al* 2002 wherein, a strong correlation was observed between GCB and finger stick capillary measured blood glucose when diabetic and non-diabetic patients with moderate to advanced periodontitis were examined. [5] In study by Kaur H *et al* a strong positive correlation was reported, similar findings was reported by Gaikwad S.[12,13]

In the present study, the F.P.B showed consistently lower measurements compared to G.C.B blood glucose. Recently it has been shown that higher glucose level may be detected in gingival crevicular fluid of periodontally diseased site as compared to healthy which could explain the aforementioned difference obtained.[14] A very weak positive correlation was seen between the gingival crevicular blood reading and finger prik blood for both groups indicating that the two screening tools do not correlate.

Present study failed to prove the authenticity of gingival crevicular blood as a screening tool in diabetes mellitus. The two values had significant difference implying that both cannot be considered as equivalent. Hence care should be exercised while interpretation results of blood sugar obtained from gingival crevices. Further study on a larger population is desirable to establish the much hyped relation.

References

1. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (Report). Diabetes Care 1997;20:1183-1197.
2. Grossi SG, Genco RJ. Periodontal disease and diabetes mellitus: A two-way relationship. Ann Periodontol 1998;3:51-61.
3. Nishimura F, Takahashi K, Kurihara M, Takashiba S, Murayama Y. Periodontal disease as a complication of diabetes mellitus. Ann Periodontol 1998;3:20-29.
4. American Academy of Periodontology. Parameter on Systemic Conditions affected by periodontal diseases. J Periodontol 2000;71(5 Suppl):880-883.
5. Beikler T, Kuczek A, Petersilka G, Flemming TF. In-dental-office screening for diabetes mellitus using gingival crevicular blood. J Clin Periodontol 2002; 29:216-218.
6. Rees TD. Periodontal management of the patient with diabetes mellitus. Periodontology 2000 2000; 23: 63-72.
7. Sicree R, Shaw J, Zimmet P. Diabetes and impaired glucose tolerance. In: Gan D, editor. Diabetes Atlas. International Diabetes Federation. 3rd ed. Belgium: International Diabetes Federation; 2006 p. 15-103.
8. Klonoff DC. Noninvasive blood glucose monitoring. Diabetes Care 1997;20:433-437.
9. Ervasti T, Knuuttila M, Pohjamo L, Haukipuro K. Relation between control of diabetes and gingival bleeding. J Periodontol 1985;56:154-57.
10. Muller HP, Behbehani E. Screening of elevated glucose levels in gingival crevice blood using a novel, sensitive self-monitoring device. Med Princ Pract 2004;13:361-365.
11. Parker RC, Rapley JW, Isley W, Spencer P, Killoy WJ. Gingival crevicular blood for assessment of blood glucose in diabetic patients. J Periodontal 1993;64:666-672.
12. Kaur H, Jain S, Bansal S. Minimal invasive chair side procedure for the estimation of glucose level using gingival crevicular blood. Indian Journal of Dental Sciences. 2012;1:4 43-46.
13. Gaikwad S, Jadhav V, Gurav A, Shete AR, Dearda HM. Screening for diabetes mellitus using gingival crevicular blood with the help of a self-monitoring device. J Periodontal Implant Sci. 2013;43:37-40
14. Position Paper. Diabetes and Periodontal Diseases. J Periodontol 1999;70: 935-949.

Corresponding Authors

Dr. Abhishek Kandwal
Assistant Professor
Periodontics, Oral Implantology & Oncodontics Division
Department of Dental Surgery,
Himalayan Institute of Medical Sciences,
Dehradun, Uttarakhand,
Email Id: - way2abhi@gmail.com