



RELIABILITY OF USING GINGIVAL CREVICULAR BLOOD IN THE DIAGNOSIS OF DIABETES- A CROSSECTIONAL STUDY

Dr. Musarrat Parveen^{1*}, Dr Sudhakar Singh², Dr. Ashanka Bhardwaj³, Dr. Md. Zeyaur Rahman⁴

^{1*}Tutor, Departement of Biochemistry, Patna Medical College and Hospital, Patna.

²Professor and Head, Departement of Radiotherapy and Clinical Oncology, Darbhanga Medical College and Hospital, Darbhanga.

³Oral and Maxillofacial Pathologist, Jammu City, Jammu and Kashmir.

⁴Registrar, Bihar State Dental Council, Patna, Bihar.

Article Received on
02 Sept. 2018,

Revised on 23 Sept. 2018,
Accepted on 14 Oct. 2018

DOI: 10.20959/wjpps201811-12605

*Corresponding Author

Dr. Musarrat Parveen

Tutor, Departement of
Biochemistry, Patna Medical
College and Hospital, Patna.

ABSTRACT

Aim: The Aim of this study was to evaluate a quick, safe, and noninvasive method to screen for diabetes during regular periodontal examination using self-monitoring glucometer (Accu-check).

Materials and method: 40 diabetic and non-diabetic patients (20 male and 20 female) with moderate to severe periodontitis were enrolled and subjected to routine clinical periodontal examination. Periodontal pocket probing was performed using a William's periodontal probe. Blood oozing from gingival sulcus/pocket following periodontal pocket probing were collected using a capillary tube and transferred to the test stick of a glucose self-monitoring device (Accu-check). As

control, fingerstick capillary blood was analyzed by the same method. Statistical analysis was performed by Pearson's correlation Coefficient. **Results:** The gingival blood glucose (GBGL) levels and Capillary blood glucose (CBGL) derived from all samples were 130.85 mg/dl and 142.2 mg/dl respectively. Highly significant correlation between CBGL and GBGL in total samples was found and the values of blood samples taken from gingiva or finger tip showed a high intra patient correlation and was statistically significant ($r=0.98$; $p<0.01$). **Conclusion:** The results suggested that blood oozing during routine periodontal examination may be used for diabetes mellitus screening in a dental office setting.

KEYWORDS: Diabetes Mellitus, Screening, Gingival Blood, Bleeding on Probing.

INTRODUCTION

The Diabetes mellitus (DM) is a complex metabolic disorder characterized by chronic hyperglycemia. Uncontrolled diabetes (chronic hyperglycemia) is associated with several long term complications, such as retinopathy, nephropathy, neuropathy, micro- and macro vascular disease, altered wound healing, and periodontitis.^[1] The Diabetes mellitus (DM) is undiagnosed in approximately half of the patients actually suffering from the disease. In addition, the prevalence of DM is more than twice as high in patients with periodontitis when compared to periodontally healthy subjects.^[2]

Periodontitis is the sixth most common complication of diabetes making it a major risk factor influencing the incidence and severity of periodontal related problems.^[3] The prevalence of diabetes mellitus in patients with periodontitis is greater than in periodontally healthy patients. Therefore a high number of patients with periodontitis may have undiagnosed diabetes mellitus.^[4]

By this close interrelationship between diabetes and periodontitis, it can be assumed that the dental practitioner and especially the Periodontist 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 diabetes patients.^[5]

The introduction of glucose self-monitoring device provided diabetic patients with a simple method for rapid daily monitoring of their disease. Self- monitoring uses one drop of finger puncture whole blood placed on a test strip impregnated with glucose oxidoreductase. Periodontal inflammation with or without the complicating factor of diabetes mellitus is known to produce ample extravasated blood during diagnostic procedure. Routine probing during periodontal inflammation is more familiar to a dental practitioner and less traumatic than a finger puncture with a sharp lancet. It is possible that gingival blood from probing may be excellent source for glucometric analysis using portable glucose self monitoring device.^[6] In healthy situations glucose levels in gingival crevicular fluid are considerably lower than blood glucose levels. Thus the question arises whether glucose levels measured in blood samples obtained during periodontal examination are sufficiently related to glucose levels measured in capillary fingerstick blood (CFB).^[7] The Aim of this study was to evaluate a

quick, safe, and non-invasive method to screen for diabetes during regular periodontal examination using Accu-chek, self-monitoring glucometer.

MATERIAL AND METHODS

20 non-diabetic and 20 diabetic (type II) patients (20 male and 20 female; age range 16 to 55 years) with untreated moderate to severe periodontitis, were recruited from the patient attending the out patient department. Known diabetic cases included were on the basis of history and medical records furnished by the patients.

The patients were examined intraorally and detailed periodontal status was recorded with graduated Williams periodontal probe and classified according to AAP (American Academy of Periodontology) as moderate (Periodontal depth 3- 5mm) and severe (Periodontal depth >6mm). Bleeding on probing was assessed during 30-60 seconds after probing. A site with more profuse bleeding was chosen for collecting the gingival crevicular blood (GCB) . The area was isolated with cotton rolls to prevent contamination with saliva and dried with compressed air. Probing was repeated until sufficient amount of blood appeared in the gingival crevice. A plastic capillary tube of 2mm bore marked up to 3 μ l was used to collection of blood from the gingival sulcus after probing force of approximately 0.2N was used to elicit bleeding from the site.

The Accu-chek Active Glucometer monitoring device was loaded with the active test strip (impregnated per cm² with glucose dye oxidoreductase 0.7 μ) 2 μ l of blood was transferred on to the test strip. The testing time is about 10 seconds. Then the regular capillary finger stick blood was collected. Both samples were analyzed and readings were recorded.

Patients were excluded from the study if they required antibiotic premedication, any disorder that was accompanied by an abnormally low or high hematocrit, e.g., polycythemia Vera, anemia, dialysis, intake of substances that would interfere with the coagulation system, e.g., coumarin derivatives, non-steroidal antiinflammatory drugs, heparin and actual severe cardiovascular or other organ disorders.

Statistical analysis

Statistical analysis was performed by SPSS 15.0. Statistical test used was Pearson Product Moment Correlation.

RESULTS

40 patients (20 males and 20 females) took part in the study with a mean age of 41.35 years (male 42 years and female 40.3 years). The gingival blood glucose (GBGL) levels and Capillary blood glucose (CBGL) derived from all samples were 130.85 mg/dl and 142.2 mg/dl respectively.

No significant difference between GBGL and CBGL when compared to age and sex group were found. Correlation between GBGL and CBGL in the total sample, in diabetic and in non-diabetic were analyzed with "Pearson correlation coefficient" using the SPSS version 11 (statistical and data analysis). Highly significant correlation between CBGL and GBGL ($r=0.98$) in total samples was found. Correlation is significant at $p<0.01$. There were no significant differences between capillary and crevicular blood glucose even with increasing blood glucose levels.

DISCUSSION

Screening for diabetes should start at a younger age and be repeated every 3 years in persons without risk factors, and earlier and more often in those with risk factors for diabetes. Moreover, testing at younger age or more frequently should be carried out in individuals who are (a) obese, (b) have a 1st-degree relative with diabetes, (c) are members of a high-risk ethnic population, (d) have delivered a baby weighing >4.05 kg or have been diagnosed with gestational diabetes mellitus, (e) are hypertensive ($>140/90$), (f) have an HDL cholesterol level <35 mg/dl and/or a triglyceride level >250 mg/dl, (g) had on previous testing an impaired glucose tolerance or an impaired fasting glucose.^[1]

Testing crevicular blood glucose level with the Accu-Chek self monitoring device is sensitive, since it can provide results with just 2- 3ul of blood within 10 seconds.

With regard to the development of painless and noninvasive methods to measure blood glucose, considerable effort has been made in the past few years. Since periodontal inflammation with or without the complication factor of diabetes mellitus is known to produce ample extravasate 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. Even in the case of very low gingival crevicular bleeding, a glucose measurement is possible with the used self-monitoring device, due to the low amount of blood (3 2 ml) necessary to perform the analysis . Gingival blood glucose levels collected

during routine periodontal examination may be an excellent source of blood, safe, easy to perform and comfortable to the patient. Highly significant correlations ($r=0.98$, $p<0.01$) were found between gingival blood glucose levels and capillary blood glucose levels which was similar and consistent to other studies⁸⁻¹³. Subjects can reliably be screened for diabetes by measuring glucose in gingival crevicular blood sample, since probing and gingival crevicular blood collection takes only not less than 2 min⁸ and does not increase patient's discomfort .

In the present study a fine capillary tube (2mm) diameter was used to collect gingival crevicular blood that may minimize the contamination of GBGL with calculus, debris, or inflammatory exudates. Similarly a bent pipette was used by one study.^[7] The incidence rate of DM in India is increasing at an alarming rate. Hence if the dentist along with the general physician participate in the challenge of undiagnosed diabetes by the routine screening of patient especially those with pronounced gingival inflammation^[14-15], it would really prove beneficial for mankind. Generally lower values in the gingival crevice blood pointed to considerable contamination with gingival exudates^[9,13], but that was minimized by using a thin capillary tube in our study. The difference between glucose level in GBGL and CBGL samples was said to be unacceptable for clinical purposes according to one study^[8], but still though capillary/venous blood samples used for diabetes mellitus screening is gold standard, the gingival crevicular blood may prove to be promising approach for routine dental office screening for diabetes mellitus in periodontal patients.

CONCLUSION

The results of the present study indicate that gingival crevicular blood collected during diagnostic periodontal examination may be an excellent source of blood for glucometric analysis. In addition, the technique described is safe, easy to perform, and comfortable for the patient and might therefore help to increase the frequency of diabetes screening.

REFERENCES

1. Expert committee on the diagnosis and classification of diabetes mellitus (report), Diabetes care, 1997; 20: 1183-1197.
2. Beikler T, Kuczeka, petersilka G, flemming TF. In dental office screening for diabetes mellitus using gingival crevicular blood. J Clin Periodontol, 2002; 29: 216-218.
3. Molecular biology of host-microbe interaction in periodontal diseases: Neuman M, Takei, kelokuld N, Carranza F, Clinical periodontology 10th edition: WB Saunders Co, 2006; 313-315.

4. Tellervo Ervasti, Matti knuttila, Leena pohjamo and Kyosti Haukipauro. Relation between control of diabetes and gingival bleeding. *J Periodontol*, 1985; 56(3): 154-157.
5. Harris M I and Eastman RC early detection of undiagnosed diabetes mellitus, a US perspective. *Diabetes metab res Rev.*, 2000; 16: 230-236.
6. Robert C Parker, John W Raply, William Isley. Gingival crevicular blood for assessment of blood glucose in diabetic patients. *J Periodontol*, 1993; 64: 666-672.
7. Ciantar M, Spratt DA, Neuman HN, Wilson M. Development of an in vitro micro assay for glucose quantification in submicrolite volumes of biological fluid. *J Periodontol Res.*, 2002; 37: 79-85.
8. HP Muller and E Behbehani. Screening of Elevated Glucose Levels in Gingival Crevicular Blood Using a Novel, Sensitive Self- Monitoring Device. *Med Princ Pract*, 2004; 13: 361-365.
9. Hans- Peter Muller, Ebrahim Behbehani. Methods of measuring agreement: Glucose levels in gingival crevice blood. *Clin Oral Invest*, 2005; 9: 65-69.
10. T Beikler, A Kuczek, G Petersilka, and TF Flemmig. In- dental- office screening for diabetes mellitus using gingival crevicular blood. *J Clin Periodontol*, 2002; 29: 216-218.
11. Shiela M Strauss, J Wheeler, Stefanie L Russel. The Potential Use of Gingival Crevicular Blood For Measuring Glucose to Screen for Diabetes. An Examination Based on Characteristics of the Blood Collection Site. *J Periodontol*, 2009; 80: 907-914.
12. GM Stein, AA Nebbia, Greenberg and Jeanek NJ. A chairside method of diabetic screening with gingival blood. *Oral Surg Oral Med Oral Pathol*, 1969; 27(5): 607- 612.
13. YS Khader, BN Al- Zu'bi, A Judeh, M Rayyan. Screening for type 2 diabetes mellitus using gingival crevicular blood. *Int J Dent Hygiene*, 2006; 4: 179-182.
14. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A simplified Indian Diabetes Score for screening for undiagnosed diabetic subjects. *J Asso Physicians India*, 2005; 53: 759-63.
15. Sicree R, Shaw J, Zimmet P. Diabetes and impaired glucose tolerance in India. *Diabetes Atlas*. Gan D Ed. International Diabetes Federation, 2006; 15-103.