Gingival Crevicular Blood as a Potential Screening Tool for diabetes mellitus:
A Cross Sectional Comparative Study

Dr. Jaskirat Sidhu¹, Dr. Veerpal Brar², Dr. Ankita³

¹Reader, Department of Periodontics, Maharaja Ganga Singh Dental College and Research Centre Sriganganagar, Rajasthan, India
²Sr.Lecturer, Department of Periodontics, Maharaja Ganga Singh Dental College and Research Centre Sriganganagar, Rajasthan, India
³Sr.Lecturer, Department of Pedodontics, Maharaja Ganga Singh Dental College and Research Centre Sriganganagar, Rajasthan, India

ABSTRACT:
Background: Because of the association between dental infections and diabetes mellitus, dentists are extremely likely to encounter an increased number of undiagnosed diabetic patients. The present cross-sectional study was conducted to assess Gingival Crevicular Blood as a Potential Screening Tool for diabetes mellitus.

Material and methods: The study involved 25 diabetics and 25 non-diabetics. Both diabetic and non-diabetic patients had moderate to severe gingivitis with at least one tooth in the maxillary anterior region showing bleeding upon probing. The Gingival Index and Oral Hygiene Index-Simplified were recorded. Blood oozing from the gingival sulcus/pocket following periodontal pocket probing was collected using a capillary tube and transferred to the test stick of a glucose self-monitoring device in patients with comparable gingival and oral hygiene status. This value was compared with the peripheral fingerstick blood glucose (PFBG) value, which was obtained by pricking the finger tip at the same visit. Statistical analysis was performed by Student’s independent t-test to test the significance of difference.

Results: In the present study a total of 50 patients, 25 diabetic and 25 non-diabetic aged 20-60 years, were randomly selected for the study. Gingival crevicular blood Glucose in diabetic patients shows mean value of 194.34mg/dL and in non diabetic patients it shows mean value of 96.67mg/dl. Peripheral fingerstick blood glucose in diabetic patients shows mean value of 217.45mg/dL and in non diabetic patients it shows mean value of 102.49mg/dl.

Conclusion: The present study concluded that GCB can be used as a non-invasive diagnostic aid in screening for diabetes mellitus during routine periodontal examination.

Keywords: Peripheral fingerstick blood glucose, Gingival crevicular blood Glucose, diabetic patients

Introduction:
Diabetes is known to be one of the major global epidemic diseases, significantly associated with mortality and morbidity worldwide, conferring a substantial burden to the health care system.¹-³ According to the diabetes atlas published by the International Diabetes Federation,⁴ the estimated diabetes prevalence for 2010 rose to 285 million, representing 6.4% of the world’s adult population, with a prediction that by 2030, the number of people with diabetes will have risen to 438 million. It is estimated that every fifth person with diabetes will be an Indian. The National Urban Diabetes Survey (NUDS) reported that the prevalence of impaired glucose tolerance (IGT) in the Indian subcontinent is ~8.7% in urban and ~7.9% in rural areas.⁵ Diabetes and periodontitis seem to interact in a bidirectional manner.⁶ The increased prevalence and severity
of periodontitis seen in patients with diabetes, especially in those with poor metabolic control, has led to the designation of periodontal disease as the “sixth complication of diabetes.”7-9 Because of the association between dental infections and diabetes mellitus, and because the presence of one promotes the other, dentists are extremely likely to encounter an increased number of undiagnosed diabetic patients.6,10 The present cross-sectional study was conducted to assess Gingival Crevicular Blood as a Potential Screening Tool for diabetes mellitus.

**Material and methods:**
A total of 50 patients, 25 diabetic and 25 non-diabetic aged 20-60 years, were randomly selected for the study. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute. An informed consent was obtained from each subject before the initiation of the study. Known diabetic cases included were on the basis of history and medical records furnished by the patients. Both the study and the control group patients had moderate to severe gingivitis, with at least one tooth in the maxillary anterior region showing bleeding upon probing. Patients undergoing treatment for anemia, polycythemia, gout, dialysis or any other disorder that could cause an abnormal variation in the hematocrit and with any requirement of antibiotic premedication were excluded. In addition, subjects with a history of any systemic diseases, subjects on medication that interfered with coagulation or supplemental Vitamin C that could interfere with the glucose test strip oxidation reaction were also excluded. Standard periodontal examination was carried out in subjects. Gingival index (Loe and Silness, 1963) and Oral Hygiene Index-Simplified (Green and Vermillion, 1964) were recorded. The gingival crevicular blood glucose (GCBG) levels were recorded using an Accu-Chek Active self-monitoring device. The results from this device were compared with the peripheral finger-stick blood glucose (PFBG) values in patients with comparable gingival and oral hygiene status. The gingiva around the upper anterior teeth was chosen to be the donor site for the gingival crevicular blood (GCB) sample as they offer ideal access. Supra- and subgingival scaling was carried out to help facilitate collection of the blood. Contamination with saliva was minimized by using gauze and air-drying. Maxillary anterior teeth were probed with a William’s periodontal probe, with a force of approximately 0.2 N. Bleeding on probing was assessed during 30-60 s after probing. Sites with profuse bleeding were preferred as donor sites while sites with suppurations were avoided. To obtain a clean sample, probing was repeated, when necessary, until a sufficient quantity of blood (2-3 µL) was present to gather a sample. The blood was collected with the help of a small glass capillary tube of 2 mm bore and transferred on to a test strip. The Accu-Chek glucometer reports blood glucose measurements in mg/dL within 15-30 s. Then, the regular capillary finger stick blood was collected from one of the patient’s fingers. The pad of the finger was wiped with alcohol, allowed to dry and then punctured with a sterile lancet. The blood was drawn onto the test strip preloaded in the glucometer. Both samples from each individual were taken at the same visit. Results were recorded and tabulated for each patient of the diabetic and non-diabetic groups. Analyses of the obtained results were carried out by Student’s independent t-test to test the significance of difference.

**Results:**
In the present study a total of 50 patients, 25 diabetic and 25 non-diabetic aged 20-60 years, were randomly selected for the study. Gingival crevicular blood Glucose in diabetic patients shows mean value of 194.34mg/dL and in non diabetic patients it shows mean value of 96.67mg/dL.
Peripheral fingerstick blood glucose in diabetic patients shows mean value of 217.45mg/dL and in non diabetic patients it shows mean value of 102.49mg/dl.

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<tr>
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<th>Diabetic Mean±SD</th>
<th>Non-diabetic Mean±SD</th>
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<tr>
<td>GCBG (mg/dL)</td>
<td>194.34±55.45</td>
<td>96.67±14.23</td>
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<tr>
<td>PFBG (mg/dL)</td>
<td>217.45±59.97</td>
<td>102.49±12.86</td>
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**DISCUSSION:**
The American Diabetes Association (2000) recommends that screening for diabetes should start at the age of 45 years, and be repeated every 3 years in individuals without risk factors for diabetes, and earlier and more often in individuals with risk factors.\(^{11}\)

The diagnosis of diabetes has been through many technological evolutions but a less-invasive diagnostic method still seems to be elusive. The modern glucometer employs pricking the patient’s finger to derive the peripheral blood glucose levels. The use of gingival crevicular blood which is a non-invasive alternative has been on the rounds but it still needs more thrust on the research aspect. Many patients who visit the dental clinic with periodontal complaints are mostly undiagnosed diabetic patients.\(^{12}\) The two-way relationship between diabetes and periodontitis increases the probability and severity of periodontal disease occurrence in individuals with poor blood glucose control.\(^{7,9,13}\)

In the present study a total of 50 patients, 25 diabetic and 25 non-diabetic aged 20-60 years, were randomly selected for the study. Gingival crevicular blood Glucose in diabetic patients shows mean value of 194.34mg/dL and in non diabetic patients it shows mean value of 96.67mg/dL. Peripheral fingerstick blood glucose in diabetic patients shows mean value of 217.45mg/dL and in non diabetic patients it shows mean value of 102.49mg/dl.

Recent evidence of the validity of GCB in detecting diabetes derives from the study conducted by Sibyl et al.\(^{14}\), which performed an analytical study, collecting blood samples by the fingerstick method and periodontal probing in order to correlate the measurements of the two methods. These results, showing a high correlation (r = 0.97) of these two tests for patients presenting adequate bleeding on probing. The authors concluded that gingival crevicular blood testing might be contemplated to increase the screening yield of diabetes in routine dental clinical practice.

Kandwal and Batra registered a very low positive correlation with r = + 0.045 for GCB and FPB for the diabetic group and r = + 0.0324 for the non-diabetic group.\(^{15}\)

A previous study by Strauss et al.\(^{16}\) reported that gingival crevicular blood (GCB) samples were suitable to screen for diabetes in persons with sufficient bleeding on probing to obtain a sample without touching the tooth or the gingival margin.\(^{17}\)

**CONCLUSION:**
The present study concluded that GCB can be used as a non-invasive diagnostic aid in screening for diabetes mellitus during routine periodontal examination.

**REFERENCES:**