

## Gingival Crevicular Blood – A New Chairside Tool for Determining Blood Glucose Level



### Dental Science

**KEYWORDS :** Diabetes mellitus, gingival crevicular blood

**DR ASHA PRABHU**

Head of the department, professor & guide, Department of Periodontology, Dr G.D. Pol Foundation Y. M.T Dental college, Kharghar, Navi Mumbai

**DR KANCHAN JADHAV**

Post graduate student, Department of Periodontology, Dr G.D. Pol Foundation Y. M.T Dental college, Kharghar, Navi Mumbai

**DR SACHIN GAIKWAD**

Post graduate student, Department of Periodontology, Dr G.D. Pol Foundation Y. M.T, Dental college, Kharghar, Navi Mumbai, m Mobile no-9766784461

### ABSTRACT

*For many individuals with periodontal diseases not screened elsewhere, the dental visit may be an important setting for diabetes screening, with considerable benefits to patient as well as clinicians. **Aim:** To evaluate blood glucose levels with glucometer using gingival crevicular blood during routine periodontal examination. **Materials & method:** 40 subjects divided into 2 groups, group A (20 diabetic) and group B (20 non-diabetic) were included in study. Blood was collected following probing of the sulcus (using a capillary tube) and transferred to the test stick of a glucose self-monitoring device. Finger-prick blood was also taken for glucometric analysis for all subjects. **Result:** The comparison between gingival crevicular blood and capillary finger-prick blood showed a positive Pearson correlation( $r=0.995$ ) **Conclusion:** Gingival crevicular blood collected during routine periodontal examination is an excellent source of blood for glucometric analysis.*

### INTRODUCTION

Diabetes mellitus is emerging as a global epidemic<sup>1,2</sup>. 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. Because of the observation that ~35% of those with IGT will develop full-blown diabetes in ≤5 years, the sheer numbers of those with diabetes seems overwhelming<sup>2</sup>. The countries with the largest number of people with diabetes will be India, China, and the United States by 2030.<sup>2,3</sup> It is estimated that every fifth person with diabetes will be an Indian<sup>3</sup>.

In the previous analysis of National Health and Nutrition Examination Survey (NHANES) data collected from adults, who had moderate or severe periodontitis but did not report a past diabetes diagnosis, researchers found that 93% would have been recommended for diabetes testing, according to American Diabetes Association guidelines. Many of these adults had recent contact with a dentist (50% in the past year) and could have potentially been screened for diabetes in the dental office<sup>4</sup>. Diabetes and periodontitis seem to interact in a bidirectional manner (Grossi & Genco 1998)<sup>5</sup>. 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 (Nishimura et al. 1998)<sup>6</sup>. Screening for diabetes mellitus would allow earlier recognition of cases, with the potential to intervene earlier in the disease course benefitting both the patient and the clinician.

Thus the present study was conducted to check if screening for blood glucose level during routine dental checkup can be utilised to augment the present screening methods for diabetes mellitus.

### MATERIALS & METHOD

The present study was conducted in department of Periodontology, Dr G.D. Pol Foundation Y.M.T dental college. Prior to the start of the study, the study proposal was sent to the institutional ethical committee (IEC), in a prescribed format. Once reviewed and approved by IEC the main study was conducted. All the subjects were explained about the nature of the study. A signed written and informed consent was obtained from all the subjects.

40 subjects divided into 2 groups, group A (20 diabetic) and group B (20 non-diabetic) were included in study. All the participants meeting inclusion criteria of sufficient bleeding on probing in the maxillary anterior region were recruited from out-patient department. Patients on antibiotic therapy, with any bleeding disorder, severe systemic diseases, haematological disorders & on medications interfering with the coagulation system were excluded from the study.

The upper anterior segment was isolated to avoid contamination by saliva or debris. The true pressure sensitive probe was introduced into the gingival sulcus with the standardized force of 0.75N. Following bleeding on probing, blood sample was collected using glass capillary tube of 1 mm bore. (Figure1) The blood was then transferred, in order to analyse blood glucose, onto the reagent strip already mounted on a glucometer (SD Codefree™) (Figure2). Capillary fingerprick blood was also analysed for blood glucose levels in all the subjects using the glucometer. Results were obtained within 5 seconds.



Figure 1: Gingival crevicular blood collection using a glass capillary tube



Figure 2: Transfer of blood sample onto reagent strip mounted on glucometer.

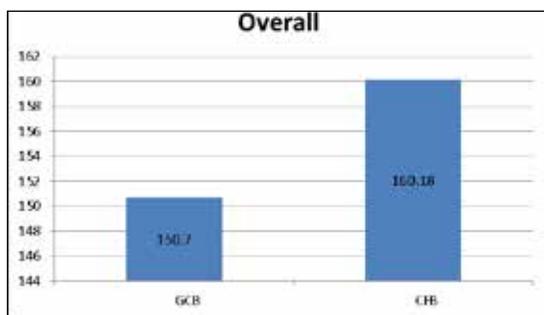
## COLLECTION OF DATA & STATISTICAL ANALYSIS

The glucometer readings obtained for gingival crevicular blood (GCB) and capillary fingerprick blood (CFB) for all the subjects were recorded. The data so obtained was subjected to statistical analysis using statistical package for social science (SPSS v 22.0, IBM). Comparison of mean GCB and CFB in diabetic (20) and non diabetic (20) subjects was done using independent t test. Additionally comparison of mean GCB and CFB for overall 40 subjects was also done using independent t test.

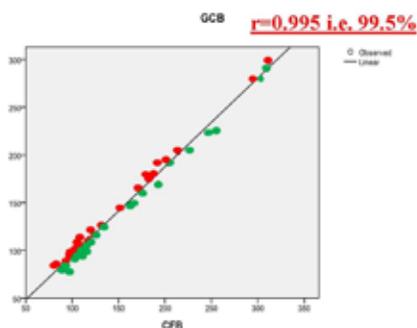
Correlation was calculated using Pearson's correlation coefficient( $r$ ).For all the statistical tests,  $p \leq 0.05$  was considered to be statistically significant.

## RESULT

In group A (diabetics) correlation between GCB and CFB was found to be 0.990 i.e. 99%.In group B (non-diabetics) it was found to be 0.90 i.e. 90 %. Overall correlation of GCB and CFB in all 40 subjects was found to be 0.995 i.e. 99.5% (graph 1 shows: mean blood glucose level of GCB and CFB graph 2 shows: Karl Pearson correlation coefficient  $r = 0.995$ )



**Graph 1: Shows mean blood sugar levels of i) GCB in group A (20 diabetics) + group B (20 non-diabetics). ii) CFB in group A (20 diabetics) + group B (20 non-diabetics); total 40 subjects.**



**Graph 2: Shows Pearson's correlation coefficient  $r=0.995$  i.e. 95% correlation between GCB and CFB of group A (20 diabetics) + group B (20 non-diabetics); total 40 subjects.**

## DISCUSSION

Diabetes mellitus and periodontitis seem to interact in a bi-directional manner. Patients with diabetes mellitus are at higher risk for periodontal disease and vice versa.<sup>5</sup> Use of gingival crevicular blood for detection of blood sugar level has been documented in literature as far back as 1969.<sup>7</sup>

In the present study, a high correlation and a marked relationship was found between GCB and CFB which is in accordance with the earlier studies done by Shetty N<sup>8</sup>, Shetty S<sup>9</sup>, Parker<sup>11</sup> and Strauss<sup>12</sup>.

Khadar et al.<sup>13</sup> suggested that GCB can provide an acceptable source of measuring blood glucose level, but the technique to obtain an acceptable blood sample from gingival crevices is not always feasible, which would limit its application as a clinical practice. Muller and Behbehani<sup>10</sup> also failed to provide any evidence for the usefulness of GCB for testing blood glucose during a routine periodontal examination.

Failure in showing correlation between GCB and CFB may be attributed to two errors mainly manual timing of the test strip reaction and the wiping of the test strip onto gingival crevicular blood when using glucose selfmonitors. In the present study a capillary tube was used for collection of GCB which reduced the chances of the sample getting contaminated by saliva as opposed to taking sample directly over the reagent strip

The clinical application of these findings involves the inter-relationship of diabetes mellitus and periodontal disease. Consulting with the diabetic patient's physician routinely yields the result of a single blood glucose test. Because periodontal disease requires long-term treatment that often continues for years, a single blood glucose test would definitely be insufficient for periodontal management. Using the method described in this study, the practitioner can rapidly measure blood glucose many times using the GCB.<sup>8</sup>

The limiting factor for this study is that GCB and CFB samples were not compared to venous blood glucose level.

## CONCLUSION

Within the confines of this study it can be rightly said that gingival crevicular blood can be used as a non-invasive, less time consuming and an effective alternative for diabetes screening in dental office.

## REFERENCES

- International Diabetes Federation. IDF diabetes atlas. Available at [www.diabetesatlas.org/content/foreword](http://www.diabetesatlas.org/content/foreword). Accessed October 14, 2010
- Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, et al. Diabetes Epidemiology Study Group in India (DESI). High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. *Diabetologia* 2001;44:1094-101.
- Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004;27:1047-53.
- Strauss SM, Russell S, Wheeler AJ, Norman R, Borrell LN, Rindskopf D. The dental office visit as a potential opportunity for diabetes screening: An analysis using NHANES 2003- 2004 data. *J Public Health Dent* 2010; 70:156-162
- Grossi, S. G. & Genco, R. J. (1998) Periodontal disease and diabetes mellitus: a two-way relationship. *Ann Periodontol* 3, 51-61.
- Nishimura, F., Takahashi, K., Kurihara, M., Takashiba, S. & Murayama, Y. (1998) Periodontal disease as a complication of diabetes mellitus. *Ann Periodontol* 3, 20- 29.
- Stein GM, Nebbia AA. Chairside method of diabetic screening with gingival blood. *Oral Surg Oral Med Oral Pathol* 1969;27:607-12.
- Shetty N, Shankarapillai R, Mathur LK, Manohar B, Mathur A, Jain M. Gingival crevicular blood: As a noninvasive screening tool for diabetes mellitus in dental clinics. *J Indian Soc Periodontol* 2013;17:472-7.
- Shetty S, Kohad R, Ramreddy Y, Shetty K. Gingival blood glucose estimation with reagent test strips: A method to detect diabetes in a periodontal population. *J Periodontol* 2011;82:1548-55.
- Müller HP, Behbehani E. Screening of elevated glucose levels in gingival crevice blood using a novel, sensitive self-monitoring device. *Med Princ Pract* 2004;13:361-5.
- Parker RC, Rapley JW, Ishley W, Spencer P, Killoy WJ. Gingival crevicular blood for assessment of blood glucose in diabetic patient. *J Periodontol* 1993;64:666-72

- 12 Strauss SM, Wheeler AJ, Russell SL, Brodsky A, Davidson RM, Gluzman R, et al. 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;80:907-14.
- 13 Khader YS, Al-Zu'bi BN, Judeh A, Rayyan M. Screening for type 2 diabetes mellitus using gingival crevicular blood. *Int J Dent Hyg* 2006;4:179-182