

## SCREENING FOR DIABETES MELLITUS USING GINGIVAL CREVICULAR BLOOD AND FINGER PRICK METHOD: A CLINICAL STUDY

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### ABSTRACT:

**Introduction:** Diabetes mellitus is one of the most important risk factors for destructive periodontitis. A high number of patients with periodontitis may have undiagnosed diabetes. It is possible that gingival crevicular blood from routine periodontal probing may be source of blood for glucose measurements.

**Aim:** To compare the blood glucose level from gingival crevicular blood and capillary finger prick method using a self-monitor blood glucose device among patients with gingivitis or periodontitis.

**Materials & methods:** Thirty patients with gingivitis or periodontitis. Participants were randomly allocated in to two different groups on the basis of clinical examination. The following clinical periodontal parameters were noted: probing depth, bleeding on probing, Gingival index (1963) and Russell's periodontal index. Blood samples were collected from gingival crevicular blood (GCB) and capillary finger prick blood (CFB). These samples were analyzed using a glucose self – monitoring device. Statistical analysis was performed using Pearson's correlation coefficient.

**Results:** The Karl Pearson's product – moment correlation coefficient for capillary finger prick blood (CFB) and gingival crevicular blood (GCB) samples was found to be  $r$  value = 0.89. The result showed a significant positive correlation between capillary finger prick blood glucose versus gingival crevicular blood glucose.

**Conclusion:** It can be concluded that the gingival crevicular blood glucose may serve as a potential source for screening of blood glucose during routine periodontal examination in populations with an unknown history of diabetes mellitus.

**Key words:** Gingival crevicular blood, Capillary finger prick blood, Diabetes mellitus.



### INTRODUCTION:

Diabetes mellitus is one of the most common chronic diseases that affects mankind and is associated with considerable morbidity and mortality.<sup>[1]</sup> Diabetes Mellitus is a complex disease with both metabolic and vascular components characterized by hyperglycemia due to defects in insulin secretion, insulin action or both as well as dysregulation of protein and lipid metabolism.<sup>[2]</sup> 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.<sup>[3]</sup> The prevalence of diabetes mellitus for all age groups worldwide was estimated to be 2.8% in 2000 and will be 4.4% in 2030.<sup>[4]</sup>

It is possible that gingival crevicular blood from probing may be an excellent

source of blood glucometric analysis using the technology of portable glucose monitors.<sup>[5]</sup> Screening of diabetes at time of periodontal examination provides an additional venue to diagnose and reduce the diabetic burden of the society.<sup>[6]</sup>

**Aim:**To compare the blood glucose level from gingival crevicular blood and capillary finger prick method using a self-monitor blood glucose device among patients with gingivitis or periodontitis.

**Objectives:**To evaluate the efficiency of gingival crevicular blood for determining blood glucose level during routine periodontal examination using glucometer.

- To compare the gingival crevicular and capillary blood glucose measurements in gingivitis and periodontitis patients.

## **MATERIALS AND METHODS:**

This randomized controlled clinical trial was conducted by the Department of Public Health Dentistry of KD Dental College and Hospital in Mathura city. A total of 30 patients (age range, 25 – 42 years) with gingivitis or periodontitis and at least one site with positive bleeding on probing (BOP) were randomly selected from the department of Public Health Dentistry, K.D. Dental College and Hospital, Mathura (U.P.) for the study. The study was approved by the ethical committee of the K.D. Dental College and Hospital, Mathura and an informed consent was taken from all the subjects prior to start of the study.

## **Inclusion criteria**

- Subjects who were willing to participate.
- Patients diagnosed with gingivitis and moderate to severe periodontitis.

## **Exclusion criteria**

- Subjects who were undergoing orthodontic treatment or using intraoral artificial prosthesis.
- Subjects who had taken antibiotics in the past three to four weeks.
- Subjects who were suffering from any systemic illness.
- Patients with intake of substances that interfere with the coagulation system for example, non-steroidal anti-inflammatory drugs or heparin.

## **Collection of data**

Participants were allocated into two different groups on the basis of clinical examination:- 1. Gingivitis group (n = 15)  
2. Periodontitis group (n = 15)

## **Clinical examination**

Data was recorded by using the probing depth, BOP, gingival Index (Loe and Silness, 1963) and Russell's periodontal index (1956) all measured by the same examiner.

All the sites were probed by Williams probe that was inserted into the gingival sulcus, as is commonly done during a periodontal examination. When the

probe was removed, the gingival crevice was observed for bleeding. One site with profuse bleeding on probing was chosen for testing gingival crevicular blood (GCB). The sites most commonly selected were the interproximal areas of the maxillary premolar and molar regions. These areas were isolated with cotton rolls to prevent salivary contamination and dried with compressed air, and the remaining fluid in the site was wiped out using a piece of gauze.

### **Collection of GCB and CFB**

For the collection of the GCB sample, we selected a readily available SMD (Blood Glucose Monitoring System, ACCU-CHEK Active, Roche Diagnostics, USA). The self monitoring device was introduced intraorally with the test strip and blood was allowed to flow onto its reactive area according to the manufacturer's instructions. The test strip was prevented from contacting the tooth, and its entry into the sulcus was also avoided. Immediately after measuring the gingival crevicular blood (GCB), the capillary finger prick blood (CFB) was assessed using the same glucose device. The soft tissue surface of the fingertip of fourth finger on the left hand was wiped with the surgical spirit and the finger was punctured with a sterile lancet and a drop of blood was allowed to form on the finger. The drop of blood was touched to the test end of the strip and held until the instrument gave a beep displaying the blood glucose measurements on the screen in mg/dL. These CFB readings were viewed as

“casual” readings because they were taken without regard to the time of meals. Study participants with elevated casual readings were referred to primary care providers for a more detailed medical evaluation.

### **DATA ANALYSIS**

The data obtained were tabulated and analyzed using statistical package for social sciences, version 16.0 (SPSS). Means and standard deviations were calculated for gingival blood glucose levels and capillary blood glucose levels in study and control groups.

### **RESULTS:**

Out of 30 study participants, the gingivitis was found among 8 (53.3%) males and 7 (46.6%) females while 10 (66.6%) males and 5 (33.3%) females had periodontitis. [Table no. 1].

In this study, out of 30 study participants, the capillary finger prick blood (CFB) readings of the study participants ranged between 80 - 118 mg/dL and their gingival crevicular blood (GCB) readings ranged between 65 - 108 mg/dL [Table no. 2].

In this study, the Karl Pearson's product – moment correlation coefficient for capillary finger prick blood (CFB) and gingival crevicular blood (GCB) samples was found to be  $r$  value = 0.89. The result shows a significant positive correlation between capillary finger prick blood glucose versus gingival crevicular blood glucose. [Table 3].

In the present study, for Group A participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value = 0.93. For Group B participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value = 0.85. The results were found to be highly statistically significant ( $p = 0.000$ ) in both groups. [Table no. 4].

## 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.<sup>[3]</sup> The technique of using gingival crevicular blood (GCB) is less traumatic and less time consuming and does not cause any discomfort to the patient motivating the dental professionals to implement diabetes screening using a gingival crevicular blood (GCB) sample and feel comfortable and confident in doing so.<sup>[7]</sup> Gingival crevicular blood (GCB) can provide an acceptable technique for evaluating the blood glucose level. However, the technique to obtain the blood sample from gingival crevices is technique sensitive, which would limit its application as a clinical practice.<sup>[4]</sup> Gingival crevicular blood (GCB) glucose level collected during periodontal examination is an excellent source of blood, safe, easy to perform and comfortable to the patient.<sup>[8]</sup> Though capillary/venous blood samples used for

diabetes mellitus screening is gold standard, but the gingival crevicular blood may prove to be promising approach for routine dental office screening for diabetes mellitus in periodontal patients.<sup>[9]</sup> 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.<sup>[10]</sup> No earlier study regarding comparison of the blood glucose level from gingival crevicular blood and capillary finger prick method using a self-monitor blood glucose device among patients with gingivitis or periodontitis has been carried out in Mathura city. Therefore, this study was considered to explore whether gingival crevicular fluid (GCF) can provide an acceptable technique for relatively blood glucose level.

Out of 30 participants, the gingivitis was found among 8 (53.3%) males and 7 (46.6%) females while 10 (66.6%) males and 5 (33.3%) females had periodontitis. In a previous study conducted by M.V. Ramoji Rao et al.,<sup>[4]</sup> among 30 study participants who were willing to participate in the study, the gingivitis was found among 5 (12%) study participants and 25 (88%) study participants had periodontitis.

In the present study, the capillary finger prick blood (CFB) readings of the study participants ranged between 80 - 118 mg/dL and their gingival crevicular blood (GCB) readings ranged between 65 - 108 mg/dL. In a previous studies done by

Alka S. Waghmare et al.,<sup>[2]</sup> and Spitti Datta et al.,<sup>[11]</sup> found that the glucose measurement from the capillary finger prick blood (CFB) ranged from 60 to 166 mg/dL and their gingival crevicular blood (GCB) readings ranged from 60 to 160 mg/dL.

M.V. Ramoji Rao et al.,<sup>[4]</sup> concluded that the glucose measurement from the capillary finger prick blood (CFB) ranged from 70 to 344 mg/dL and their gingival crevicular blood (GCB) readings ranged from 43 to 243 mg/dL.

In the present study, the Karl Pearson's product – moment correlation coefficient for capillary finger prick blood (CFB) and gingival crevicular blood (GCB) samples was found to be  $r$  value = 0.89. The result showed a significant positive correlation between capillary finger prick blood glucose versus gingival crevicular blood glucose. Previous studies done by Subodh Gaikwad et al.,<sup>[8]</sup> and M.V. Ramoji Rao et al.,<sup>[4]</sup> concluded that the Karl Pearson's product – moment correlation coefficient for capillary finger prick blood (CFB) and gingival crevicular blood (GCB) samples was found to be  $r$  value = 0.97.

In the present study, for Group A participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value = 0.93. For Group B participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value =

0.85. The results were found to be highly statistically significant ( $p = 0.000$ ) in both groups. Results were in contrast to the study done by Alka S. Waghmare et al.,<sup>2</sup> in which for Group A participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value = 0.98. For Group B participants, the Pearson's correlation for gingival crevicular blood (GCB) and capillary finger prick blood (CFB) samples was found to be  $r$  value = 0.90. The results were found to be highly statistically significant ( $p = 0.000$ ) in both groups.

**Limitations:** Due to small sample size, results could not be extrapolated to larger population.

**Suggestion And Recommendations:** The results of the present study revealed a higher correlation between GCB and CFB with a smaller sample size. Future studies should be planned with a larger sample size, so that the study outcomes can be assessed for positivity and negativity on a larger scale.

## CONCLUSION:

It can be concluded that the gingival crevicular blood glucose may serve as a potential source for screening of blood glucose during routine periodontal examination in populations with an unknown history of diabetes mellitus. The technique is safe, easy to perform, and comfortable for the patient. Furthermore, the costs associated with the purchase of a readily available

glucometer and individual test strips are extremely modest. Thus, with minimal cost and a limited investment of time for

patients and clinicians, dental professionals can play a critical role in supporting their patients' overall health.

## REFERENCES:

1. Shetty N, Shankarapillai R, Mathur LK, Manohar B, Mathur A, Jain M. Gingival crevicular blood: As a non-invasive screening tool for diabetes mellitus in dental clinics. *J Indian Soc Periodontol* 2013;17:472-7.
2. Waghmare AS, Chawla RL, Savitha B, Vhanmane PB. Screening of gingival crevicular blood glucose and capillary finger blood glucose in the diagnosis of diabetes. *J Int Clin Dent Res Organ* 2011;3:53-7.
3. Debnath P, Govila V, Sharma M, Saini A, Pandey S. Glucometric assessment of gingival crevicular blood in diabetic and non-diabetic patients: A randomized clinical trial. *J Oral Biol Craniofac Res.* 2015;5(1): 2 – 6.
4. Rao MV, M. Reddy VC, Sunder SS, Kolasani B, Kiranmai G, Kumar KR. In dental office screening for diabetes mellitus using gingival crevicular blood. *J Int Soc Prev Community Dent.* 2014 Dec; 4(3): S161–S165.
5. Narula HK, Narula JS, Bharti V, Gupta H. In office gingival crevicular blood glucose monitoring in diabetic patients. *J Periodontal Med Clin Pract*, 2014; 1(1): 29 – 37.
6. Shrivastava S, Vishwakarma A, Nayak P, Gupta R, Shende V, Beera A. Gingival crevicular blood: Can it be used as a better diagnostic aid for screening of blood glucose. *International Journal of Women Dentists.* 2014; 1(1): 23 – 27.
7. Feroz M, Hegde S, Kashyap R. Utility of gingival crevicular blood for assessment of blood glucose in individuals with diabetes mellitus and evidence of Periodontitis. *Journal of Dental and Medical Sciences*, 2014; 13(1): 24 – 27.
8. 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 Feb; 43(1): 37–40.
9. P Kumar, BJ Panseriya, A Balani. Gingival crevicular blood: A fast, safe, noninvasive and chairside method of diabetic screening. *Int J Sci Study.* 2013; 1(2): 26 – 31.
10. Kaur H, Singh B, Sharma A. Assessment of blood glucose using gingival crevicular blood in diabetic and non-diabetic patients: A chair side method. *J Clin Diagn Res* 2013;7(12):3066-9.
11. Datta S, Devaraj CG. Detection of blood glucose level through gingival crevicular blood- A pilot study. *J Res Med Den Sci* 2015; 3(1):69-72.

**TABLES:**

Table 1: Distribution of study subjects according to gender in group A (Gingivitis group) and group B (Periodontitis group)

Groups	Gender	
	Male N (%)	Female N (%)
Group A	8 (53.3)	7 (46.6)
Group B	10 (66.6)	5 (33.3)

Table 2: Distribution of study subjects according to variables of capillary finger prick blood (CFB) and gingival crevicular blood (GCB) glucose levels

Variables	Range
CFB Glucose (mg / dL)	80.00 – 118.00
GCB Glucose (mg / dL)	65.00 – 108.00

CFB = Capillary finger – prick blood, GCB = Gingival crevicular blood

Table 3: Distribution of study subjects according to Karl Pearson’s product–moment correlation (r) for capillary finger prick (CFB) blood glucose values versus gingival crevicular blood (GCB) glucose values

Glucose (mg /dL)	Pearson’s correlation (r)
CFB Vs GCB	0.89

CFB = Capillary finger – prick blood, GCB = Gingival crevicular blood, r = Indicates high statistical significance

Table 4: Distribution of study subjects according to comparison of Karl Pearson’s product–moment correlation (r) for glucose readings group A (Gingivitis group) and group B (Periodontitis group)

Groups	Mean $\pm$ SD		Correlation (r value)	P value
	CFB	GCB		
Group A	94.06 $\pm$ 9.90	82.66 $\pm$ 11.08	0.93	0.000*
Group B	96.73 $\pm$ 9.28	84.93 $\pm$ 9.01	0.85	0.000*

\*Statistically significant