



COMPARISON OF BLOOD GLUCOSE LEVELS FROM THE GINGIVAL CREVICULAR BLOOD AND FINGER PRICK BLOOD FOR DIABETICS & NON – DIABETICS

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ABSTRACT

Diabetes mellitus has a high prevalence rate in Indian population due to the genetic profile & lifestyle. There are several patients who go undiagnosed with diabetes mellitus in the early stages. The idea of this study was to see if the gingival crevicular blood can be used as a diagnostic marker for diabetes mellitus. The rationale for choosing gingival crevicular blood is that it is easily obtainable in the oral cavity during routine dental probing. To estimate the blood glucose levels of diabetic and non diabetic individuals using Gingival Crevicular Blood and Finger Prick Blood. To check for any correlation in the blood levels of these two sources. The sample size was Group I 30 diabetic patients and group II 30 Non diabetic patients. The blood drawn was evaluated using Accucheck (Roche Diabetics Care, India). The relevant statistical analysis were performed. The mean blood glucose in the gingival blood for group I (Diabetics) was 58.77 ± 3.49 Standard Deviation(SD) and group II (Non Diabetics) was 29.57 ± 5.22 SD g/dl. The capillary blood glucose level for group I (Diabetics) was 220.53 ± 1.12 (SD) and for Group II was 101.77 ± 3.72 SD. The results when compared were statistically significant for differences in the Gingival Crevicular Blood and Finger Prick blood individually between group I and group II separately ($p < 0.05$). However there was no statistically significant difference in the blood glucose levels between the gingival crevicular blood and finger prick blood within the group ($P > 0.05$). As the intra group comparison was not statistically significant no correlation analysis was performed. This study shows that the blood glucose levels between diabetics and non diabetics had statistically significant differences between group I and group II, however no correlation was observed between the gingival crevicular blood and finger prick blood.

KEYWORDS: *Gingival Crevicular Blood, Blood glucose estimation, diabetes mellitus, periodontitis*



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INTRODUCTION

Diabetes mellitus is one among the most common metabolic diseases that affects mankind and is associated with considerable morbidity and mortality. Diabetes mellitus affects more than 120 million people worldwide.¹ In this group more than half the patients remain undiagnosed in the early stages of the disease. It is purported that for every patient with known diabetes there is one case with undiagnosed diabetes mellitus. These undiagnosed cases increases the patient's risk for Coronary artery disease, cerebral vascular disease and renal problems.² As Dental surgeons we encounter a lot of patients who remain undiagnosed and are being treated for dental procedures. The common dental disease of gingivitis and periodontitis have a birectional interaction between them.³ Periodontitis is considered to be the sixth complication of Diabetes.⁴ Periodontal diseases can have a significant impact on the metabolic state in diabetes. The presence of periodontitis increases the risk of worsening glycemic control over time. Periodontitis is considered to be one of the pathognomic oral warning signs and is designated as the sixth complication of Diabetes mellitus.⁴ It is hypothesised that the blood extravasated during routine diagnostic procedure can be used to estimate the blood glucose level.² Periodontal inflammation is associated with gingival bleeding. The gingival crevicular blood (GCB) from probing may be an excellent source of blood for glucometric analysis. The recent advent of glucometers further makes the task easy as it requires only 0.1 ml of blood to estimate the blood glucose.³ Glucometers are easy, rapid, affordable and commonly used for blood glucose determinations in diabetes screening. Dental office screening during treatments allows minimization of serious complications associated with diabetes mellitus.⁵ Thus we dentists have an opportunity of employing the estimation of blood glucose through GCB as a screening tool in high risk patients like patients with chronic periodontitis, xerostomia and patients with a family history of diabetes mellitus. The aim of this study is to estimate the glucose values in the GCB and capillary blood for patients with known diabetes and compare it with normal patients. The expected objectives where to see if the GCB and capillary blood levels are the same, and to assess if

there is an elevation in the blood glucose values of GCB among diabetics and non-diabetics.

MATERIALS AND METHODS

The study was conducted in a total of 60 patients, 30 diabetic (Group-1) and 30 non-diabetic (Group-II). The patients were classified as Group I and II from their medical records. The patients were selected from the dental outpatients diagnosed with chronic gingivitis and chronic periodontitis visiting Saveetha Dental College. As the subjects were enrolled into the study, their Finger Prick Blood (FPB) was collected. Blood oozing from the gingival crevices during dental examination of pocket probing was taken and analysed by Accu-check glucometer (Roche Diabetes Care, India). All patients were informed about the study and a written consent was obtained. To obtain gingival crevicular blood, each subject was examined intra-orally for any signs of inflammation and bleeding sites. The subjects recruited into the study were positive for gingival inflammation and bleeding on probing. The sites with more profuse bleeding were chosen. Care was taken to prevent contamination with saliva and the gingival crevicular fluid. If the blood quantity was insufficient the probing was repeated to obtain an adequate amount of blood. All possible attempts were made to obtain the blood sample with a fine capillary tube (2 mm) without contact with gingival and periodontal tissues and then transferring the blood to the stick of glucose self-monitoring device. The test strip was held until the instrument beeped giving the blood glucose measurements in mg/dl. The samples for finger-capillary blood were drawn from the index finger of the subject. The finger was wiped with spirit, dried and then punctured with sterile lancet. Sample was drawn onto the test strip preloaded in the glucometer and was held until the instrument gave a beep displaying the blood glucose measurements on the screen in mg/dl.

RESULTS

The mean blood glucose in the gingival blood for group I (Diabetics) was 58.77 g/dl and group II (Non Diabetics) was 29.57 g/dl. (Figure 1)

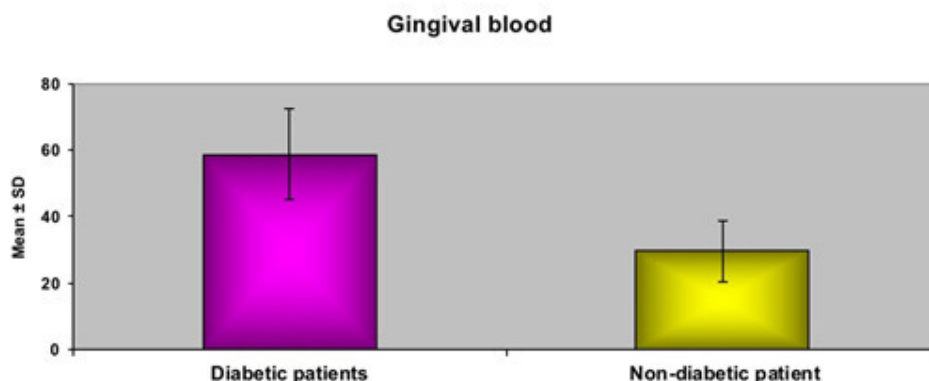
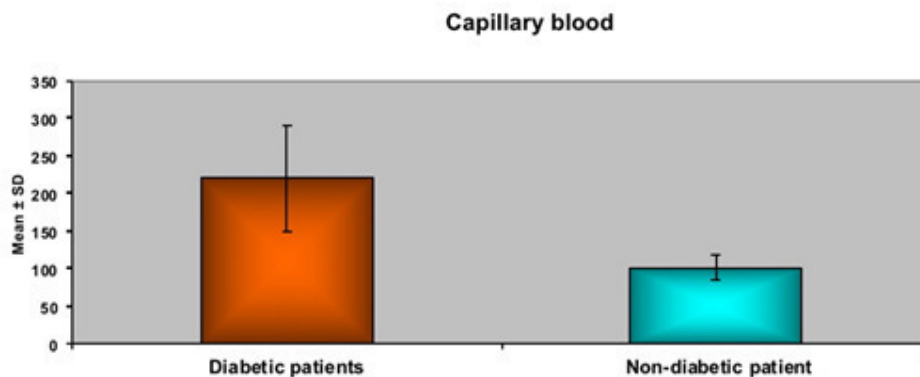


Figure 1
Comparison of Blood Glucose from Gingival Crevicular Blood of Diabetics and Non Diabetics



The capillary blood glucose level for group I (Diabetics) was 220.53 g/dl and for Group II was 101.77 g/dl. (Figure 2)

Figure 2
Comparison of Blood Glucose from Finger prick blood (Capillary Blood) of Diabetics and Non Diabetics

The data was checked for normal distribution using fit of curve for normal histogram and Shapiro Wilke’s test hence was decided to use parametric test for comparison of the results for statistical significance. The first statistical analysis performed was comparing the GCB of group I and II and FPB of group I and II. Since it is comparison of means from two different groups,

independent sample t test was used. The null hypothesis that was set was that there is no difference in the glucose levels of both the groups. The statistical analysis proved that the null hypothesis was wrong for both the groups. The comparison of GCB and FPB individually between group I and II yielded statistically significant results ($p < 0.05$). (Table 1)

Table 1

Comparison of Blood Glucose from Gingival Crevicular Blood and Finger Prick Blood of Diabetics and Non Diabetics. (Intra Group Comparison)

	GINGIVAL BLOOD	CAPILLARY BLOOD
GROUP-I	58.77 ±13.49	220.53±71.12
GROUP-II	29.57±9.22	101.77±17.72
STATISTICAL SIGNIFICANCE	$p < 0.05$	$p < 0.05$

The second statistical analysis performed was comparison of glucose levels of GCB and FPB within the respective groups of diabetics and non diabetics. Since it is two data obtained from the same patient, a student t test was performed. The null hypothesis assumed was the blood glucose values were not same

between GCB and FPB separately in group I and group II. But after the statistical analysis it was found that the null hypothesis was correct as the p values when compared between group I and separately in group II gave statistically non-significant results ($p > 0.05$). (Table 2)

	GINGIVAL BLOOD	CAPILLARY BLOOD	STATISTICAL SIGNIFICANCE
GROUP-I	58.77 ±13.49	220.53±71.12	$p > 0.05$
GROUP-II	29.57±9.22	101.77±17.72	$p > 0.05$

Table 2
Comparison of Blood Glucose from Gingival Crevicular Blood and Finger Prick Blood of Diabetics and Non Diabetics (Inter Group Comparison)

As the intra group comparison didn't yield statistically significant results no correlation analysis was performed between GCB and FPB.

DISCUSSION

Diabetes has emerged as one of the major health issues in India. It is important to appreciate that these disorders do not initiate periodontitis but they may increase the risk of development of periodontitis. This in turn can lead to early loss of tooth structure. Almost one third of type 2 diabetic cases are undiagnosed.² The primary methods used to diagnose diabetes mellitus and monitor blood glucose levels have traditionally been fasting blood glucose, a combination of fasting blood glucose with a 2-hour test after glucose loading (2-hour post-prandial) and oral glucose tolerance test.⁶ These tests require fasting by the patient, tend to be highly dependent on patient compliance, and results usually will only be available at subsequent visit (second appointment) and screening for undiagnosed type 2 DM is highly recommended.⁷ Estimation of Gingival Crevicular blood glucose level can be done as an in-office screening procedure. The advantages of this method are it is safe, reliable, easy to perform, inexpensive, comfortable for patients, non-invasive, painless and convenient for the dentist. In this study, ACCU-CHEK Active, Roche Diabetes Care, India, is the glucometer used in this study to measure the glucose levels in the blood which oozes out during routine probing. Measuring blood glucose with a glucometer is very sensitive since it can provide results with 2-3µl of blood within 10 seconds. It is a less time consuming procedure and does not require any additional tools like sharp lancet for puncture.⁸ None of the subjects under study reported pain / discomfort and no complications have been reported

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after sampling by this method. This method cannot be applied in cases where purulent exudates are found in pockets. This results in dilution of the blood sample and alteration of glucose levels. In a study carried out by Parker et al examined diabetic patients with unknown periodontal status where a very strong correlation was observed between gingival crevicular, finger prick capillary and intravenous blood glucose measurements.⁹ In another study by Beiker et al, a pronounced association was observed between GCB and finger stick capillary measured blood glucose when diabetic and non diabetic patient with moderate to advanced periodontitis were examined.² However, in our study we have found that the GCB values were markedly lower than the values reported from FPB. But we had found that the GCB values were higher in diabetics compared to non-diabetic group. The reason for the not matching values could be a possible contamination of the GCB with Gingival Crevicular Fluid.

CONCLUSION

In conclusion, blood sugar value in GCB is much lower than the FPB. However, the blood sugar of GCB is two fold higher than the FPB in both diabetic and non-diabetic patients. The limitation of our study is the small sample size and hence, a larger sample size would be required to test if the capillary blood and GCB sugar values are matching. We would also recommend that in future longitudinal studies can be done to monitor the crevicular and capillary blood. This could pave the way to establish baseline normal values for GCB.

CONFLICT OF INTEREST

Conflict of interest declared none.

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