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Original Article

Gingival Crevicular Blood: Assessment of Blood Glucose Levels among Diabetic Patients

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ABSTRACT

Background: Diabetes mellitus is a massive, growing, and silent epidemic that has the potential to cripple health services in all parts of the world. Screening of diabetes at time of periodontal examination provides an additional venue to diagnose and reduce the diabetic burden of the society.

Aim: The aim of this study was to assess the blood glucose levels among diabetic patients using different techniques.

Materials and Methods: A total of 60 diabetics patients were divided into two groups of 30 each, Group A-Capillary finger prick blood glucose, Group B-gingival crevicular blood (GCB) glucose. The gingiva around the upper anterior teeth was chosen for the GCB sample as they offer ideal access. Immediately after measuring GCB glucose levels, capillary finger stick blood glucose was assessed using the same glucose self-monitoring device. Then, the individuals were instructed to take 75 g of glucose and after 2 h blood samples from 2 sites were collected similarly.

Results: About 38.46 ± 14.22 was the mean age of males and 40.10 ± 6.87 was the mean age of females. Moreover, there was no statistically significant difference between the genders. There was no statistically significant difference between fasting and postprandial capillary finger prick blood glucose and GCB glucose levels. However, there was a highly significant correlation.

Conclusion: This study concluded that blood obtained during routine periodontal probing can be used for estimation of blood glucose levels.

Key words: Blood glucose level, Diabetes mellitus, Finger prick blood, Gingival crevicular blood

INTRODUCTION

Diabetes mellitus is one of the most common chronic diseases that affects mankind and is associated with considerable morbidity and mortality. Diabetes mellitus affects >120 million people worldwide, and it is estimated that it will affect 220 million by the year 2020.[1]

Diabetes mellitus is a massive, growing, and silent epidemic that has the potential to cripple health services in all parts of the world. Diabetes mellitus is a group of chronic diseases characterized by insulin deficiency, cellular resistance to insulin action, or both, resulting in hyperglycemia and other related metabolic disturbances. The disease is associated with serious complications of the eyes, kidneys, heart and blood vessels, and other organ systems, which may markedly impair quality of life and shorten the patient's lifespan. Many people are affected by diabetes worldwide and the number is climbing steeply.[2]

In 1998, the World Health Organization[3] adopted the diagnostic parameters for diabetes established by the American Diabetes Association. Measuring the fasting blood glucose is considered to be the gold standard. These conventional laboratory methods employed to detect blood glucose are time-consuming, invasive and require elaborative equipment. The advent of blood glucose monitors allows the clinician to assess blood glucose at the chair side. In contrast to laboratory method, results are obtained instantaneously, which helps the clinician to decide if further confirmatory tests are required to diagnose diabetes. Recently, there has been an increasing

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evidence of research carried out to use gingival crevicular blood (GCB) in monitoring blood glucose levels.[4]

Screening of diabetes at time of periodontal examination provides an additional venue to diagnose and reduce the diabetic burden of the society. Periodontal examination, as a rule, comprises careful probing of periodontal pockets which result in some amount of bleeding from the gingival sulcus.[5] Hence, this study was conducted to assess the blood glucose levels among diabetic patients using different techniques.

MATERIALS AND METHODS

This study consists of 60 individuals from the department of periodontics, S.B. Patil Dental College. 60 diabetic patients were divided into two groups of 30 each, Group A-capillary finger prick blood glucose, Group B-GCB glucose. Consent was obtained from each individual taking part in the study and detail was collected as person's name, age, sex, and relevant medical history. Individuals were recruited with inclusion criteria: Patients 20-70 years of age, patients diagnosed with moderate to severe periodontitis, and individuals with any indication for antibiotic prophylaxis, any bleeding disorder, severe systemic diseases such as cardiovascular, renal, hematological disorders were excluded from the study.

The gingiva around the upper anterior teeth was chosen for the 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 using gauze and air-drying. Maxillary anterior teeth were probed with William's periodontal probe, the selected areas were analyzed using the glucometer (ACCU-CHEK active, Roche diagnostics, Germany), according to the manufacturer's instructions. The top edge of the reagent strip of glucometer is placed against the bleeding site. The blood is automatically drawn into reaction cell of the strip by capillary action until the conformation window is full. Immediately after measuring GCB glucose levels, capillary finger stick blood glucose was assessed using the same glucose self-monitoring device. The fingertip of 4th finger on the left hand was wiped with surgical spirit and was allowed to evaporate. The sample was drawn on the lateral surface of the fourth digit since it will have thinner epithelium and also it is a finger of lesser use. The hand is held down and the fingertip is gently massaged (but not squeezed) to obtain a round drop of blood. The first drop of blood was wiped away and the second drop was used. Then, the individuals were instructed to take 75 g of glucose and after 2 h blood samples from 2 sites were collected similarly. Results were analyzed using Student's *t*-test to test the significant difference between the 2 readings and correlation was evaluated using Karl Pearson's correlation test.

RESULTS

Table 1 shows distribution of study subjects according to gender and mean age. 38.46 ± 14.22 was the mean age of males and 40.10 ± 6.87 was the mean age of females. Moreover, there was no statistically significant difference between the genders.

Table 2 reveals the fasting capillary finger prick blood glucose and fasting GCB glucose levels. Moreover, there was no statistically significant difference (0.910) found between the groups. Table 3 reveals the postprandial capillary finger prick blood glucose and postprandial GCB glucose levels. Moreover, there was no statistically significant difference (0.152) found between the groups.

Table 4 shows Pearson's correlation for fasting, postprandial capillary finger stick blood glucose, and GCB glucose. There was a highly significant correlation was found (r = 0.854 and 0.840).

DISCUSSION

Diabetes mellitus and periodontitis seem to interact in a bidirectional manner. Various studies prove that periodontal therapy exerts beneficial effects on diabetes mellitus control. Diabetes is undiagnosed in approximately one-half of the patients with the disease. 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.[6]

The present method of blood glucose estimation needs the venipuncture, which is highly traumatic to the patients at times, especially to the children. Apart from physical trauma, process also renders mental trauma and anxiety about the procedure to discourage the patients further. It is high time that the gravity of this problem be assessed so as to make the blood glucose analysis more acceptable to the patients which will not hamper their regular visit to diabetic clinic.[7]

In this study, there was no statistically significant difference was found between the fasting and postprandial capillary

Table 1: The distribution of study subjects according to gender and mean age

Gender	Number	Mean age±SD	*t*	*P*
Males	30	38.46±14.22	0.854	0.910
Females	30	40.10±6.87		

SD: Standard deviation

Table 2: Fasting capillary finger prick blood glucose and fasting GCB glucose levels among study subjects

Groups	Mean±SD	*t*	*P*
Group A	92.86±16.25	0.438	0.729
Group B	94.93±14.25		

GCB: Gingival crevicular blood, SD: Standard deviation

Table 3: Postprandial capillary finger prick blood glucose and postprandial GCB glucose levels among study subjects

Groups	Mean	*t*	*P*
Group A	128.40±18.17	0.233	0.152
Group B	134.10±15.55		

GCB: Gingival crevicular blood

Table 4: Correlation of capillary finger prick blood glucose and GCB glucose levels

Pearson's correlation	*r*	*P* value and Significance
Fasting - Group A versus Group B	0.854	0.0001***
Postprandial - Group A versus Group B	0.840	0.0001***

GCB: Gingival crevicular blood. ***$P<0.05$, highly significant

finger prick blood glucose and GCB glucose levels. Strauss *et al*.[8] reported that 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 (i.e., in patients having the basic clinical signs of gingivitis or periodontal disease). Furthermore, the method of collection of sulcular blood is critical because the resultant glucose values may be altered if there is any contamination of the collected sample by the oral tissues or tissue products.

Tsutsui *et al*.[9] reported the rubbing of blood onto the test strip from a blood-laden dental curette. Rubbing or direct wiping of intraoral blood onto the test strip will not produce a uniformly timed reaction and may damage the strip's chemical indicator surface.

Müller and Behbehani[10] in 2005 reported no correlation between capillary finger prick blood and GCB. The results of this study revealed a higher correlation between capillary finger prick blood and GCB with a smaller sample size. Estimations of fasting and postprandial blood glucose levels were less frequently conducted. In this study, both fasting and postprandial blood glucose levels showed correlations with capillary blood glucose levels, thereby suggesting that testing crevicular blood may be a valuable tool in identifying potential patients with diabetes. There are some limitations to our study caused by the limited knowledge about patient hematocrit, oxygen saturation, hydration and viscosity status, and the existing interfering substances that are affecting the measurement of these glucometers.

CONCLUSION

Within the limitation, this study concluded that blood obtained during routine periodontal probing can be used for estimation of blood glucose levels. Hence, GCB is an efficient diagnostic tool for estimation of blood glucose levels. The technique of using 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 GCB sample.

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