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PERIODONTAL HEALTH ASSESSMENT AS A STRATEGIC METHOD FOR SCREENING OF DIABETES.

Dental Science

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ABSTRACT

OBJECTIVE: Diabetes mellitus is a systemic condition associated with periodontitis. The study was conducted to evaluate the effectiveness of gingival crevicular blood (GCB) for diabetic screening as a chair-side method.
METHOD: The subjects were divided into two groups: subjects with moderate to severe chronic periodontitis and healthy or gingivitis subjects. Estimation of GCB and Capillary finger blood (CFB) glucose levels was carried out using a self-monitoring glucometer and analyzed to find correlation within the groups.
RESULTS: The correlation between the GCB and CFB glucose readings for group I were strong (0.74). However, correlation between the readings for group II was weak (-0.295).
CONCLUSION: GCB can be used for diabetic screening as chair-side method and can be encouraged in patients with chronic generalized periodontitis to facilitate early diagnosis and treatment.

KEYWORDS

Bleeding on Probing, diabetes mellitus, periodontitis, gingival bleeding.

INTRODUCTION

Diabetes mellitus is a metabolic disorder which is characterized by increased blood glucose levels. The International Diabetes Federation (IDF) survey revealed that in 2017 there were 451 million people with diabetes worldwide and the figure is expected to rise to 693 million by 2045. The FDI also reported 84 million people with diabetes in the South-east Asia region with India being the major contributor.[1] Diabetes mellitus is associated with numerous complications and periodontal disease has been called the sixth complication of diabetes.[2] Moreover, diabetes and periodontitis seem to interact in a bidirectional manner.[3] Periodontal complications of uncontrolled diabetes includes pocket formation, multiple abscess formation, increased tooth mobility and tooth loss. These complications occurred with greater frequency in patients with a decreased glucose tolerance. In developing countries, only less than half of people with diabetes are diagnosed. Without timely diagnoses and adequate treatment, complications and morbidity from diabetes rise exponentially. Early diagnosis of diabetes can prevent long-term complications responsible for the high morbidity and mortality of patients with diabetes.[4] Glavind et al. studied the periodontal status of the diabetic men aged 20 to 40 years and found that diabetes of longer than 10 years showed a greater loss of periodontal structures than those with a history of less than 10 years.[5]

Dental office and hospitals were initially considered as strategic venues for assessing the glucose levels in patients visiting for dental treatment and Gingival Crevicular Fluid (GCF) was considered for diabetes screening in individuals those were at risk of developing diabetes.[6] However, due to involvement of extremely technique sensitive procedures and expensive equipments in addition to the extended time required to collect and analyze the samples lead to change in this approach. As gingival crevicular blood (GCB) was easy to collect for glucose measurement using readily available glucometers that measures glucose in a few seconds, GCB offered a more practical approach to screen subjects at risk of diabetes.[7] Also, laboratory methods of glucose estimation results in an additional site of injury to collect the blood sample and the reports were obtained at an interval rather than chair-side.[8]

The purpose of the present study was to screen undiagnosed diabetes in patients during routine dental visits using gingival crevicular blood (GCB) as an alternative to capillary finger blood (CFB) and use GCB as the site to procure the sample for blood glucose level estimation.

MATERIALS AND METHODS

A. Study subjects

The study protocol was reviewed and approved by the Institutional Review Board. Study participants were recruited from the Outpatient department of Department of Periodontology. A total number of 50 subjects (30 males and 20 females aged between 20 – 75 years) participated in the study. Subjects were divided into two groups. Group I included 25 subjects with moderate to severe chronic periodontitis and probing pocket depth ≥5mm and bleeding on probing. Group II included 25 healthy subjects or with gingivitis and sulcus depth ≤ 3mm and minimal or no bleeding on probing. Subjects were excluded from the study if they required antibiotic prophylaxis prior to invasive dental care, if there was a history of bleeding disorder, if patients took medications interfering with blood coagulation, or there was history of cardiovascular, hepatic or renal disorder, and a known history of diabetes. Subjects were briefed about the procedure and the risks and benefits associated with participation in the study following which they gave their written informed consent for participation.

B. Collection of GCB and CFB samples

The periodontal examination for both the groups included evaluation of the probing pocket depth (PPD) and assessing the bleeding on probing (BOP) using a periodontal probe. Gingival sulcus in the maxillary anterior was chosen for sample collection as it was easy to collect after adequate isolation and avoid contamination. Contamination with saliva was prevented by using cotton rolls and the area was dried with compressed air. To obtain a clean sample, probing was repeated, when necessary, until a sufficient quantity of blood was present to gather a sample. It was relatively easier to collect samples from group I as sufficient quantity of blood was obtained with routine assessment for BoP. However, in group II with PPD≤3mm, it was essential to probe more than once to obtain a sufficient sample. The samples were collected using a glucometer(OneTouch Horizon blood glucose monitoring system, LifeScan, Milpitas, CA) that attaches the test strips and gives out the reading. It had a compact design that facilitated intraoral collection and needed small quantity of blood for an accurate reading (1.5µl). The glucometer with test strip in position was introduced intra-orally. Care was taken to avoid any contact with the gingiva and the tooth. The CFB sample was collected from the index finger of either of the hands preferred by the patient. The finger was wiped with surgical spirit and a small puncture was made with the sterile lancet. The drop of blood was then collected on the strips provided by the manufacturer with the glucometer. Both the GCB and CFB readings were recorded within 5 secs as suggested by manufacturer.

STATISTICAL ANALYSIS

The statistical analysis for the current study was performed using the SPSS software. Mean, Standard Deviation, Median values for both the groups were calculated. The relationships between GCB and CFB glucose readings within each of the two groups were examined. The Pearson's correlation has been used to find the correlation between the variables, and the significance of correlation has been obtained using the Student's *t-test.*

RESULTS

A total of 50 subjects participated in the present study, aged between 20-75 years with the mean age of 45 years. As shown in Table 1, GCB glucose readings for the subjects in Group I ranged from 57 to 224 mg/dl with a mean ± SD of 121.80 ± 37.73.

Table 1. Mean, Standard Deviation, Median values for Group I

Method	Mean	SD	Median	Min	Max
GCB (mg/dl)	121.80	37.73	120	57	224
CFB (mg/dl)	125.08	31.37	119	79	211

SD = Standard deviation

CFB glucose readings for the subjects in Group I ranged from 79 to 221 mg/dl with a mean ± SD of 125.08 ± 31.37. As shown in Table 2, GCB glucose readings for the subjects in Group II ranged from 59 to 141 mg/dl with a mean ± SD of 100.00 ± 20.71.

Table 2. Mean, Standard Deviation, Median values for Group II

Method	Mean	SD	Median	Min	Max
GCB (mg/dl)	100.00	20.71	98	59	141
CFB (mg/dl)	101.64	18.21	98	71	135

SD = Standard deviation

CFB glucose readings for the subjects in Group II ranged from 71 to 135 mg/dl with a mean ± SD of 101.64 ± 18.21. Higher mean glucose level (mg/dl) were recorded in group I with GCB compared to CFB whereas slightly lower mean glucose level (mg/dl) is recorded in group II in GCB compared to CFB. In Group I, it was observed that the correlation between GCB & CFB was positive & strong (r=0.740) as shown in Table 3.

Table 3. Pearson's Correlation for CFB and GCF in both groups

Group	r	P-value
Group I	0.740	<0.001*
Group II	-0.295	0.152

* denotes significant correlation

Also, the correlation was found to be significant with P<0.001. In Group II, GCB samples were obtained from intraoral sites with PD ≥ 5mm. The Pearson correlation was -0.295 between the GCB and CFB samples for group II study participants (p>0.001).

DISCUSSION

Diabetes a metabolic disorder and has a close association with periodontal disease. With the increasing number of individuals developing the disorder and many being undiagnosed with diabetes, it becomes important to screen patients for diabetes and avoid the associated periodontal complications. This study aims at finding a simple and quick method to screen individuals with periodontal problems and find an association of these complications with diabetes. This would enable us to detect the presence of diabetes at an early stage and possibly prevent the associated periodontal and systemic complications. Since dental appointments are scheduled after every 6 months for a routine check-up as well dental examination prior to treatment offers a point of collection of blood sample that can estimate the levels of glucose. This can prevent the addition need to visit the laboratory and prevent second site of puncture for blood sample collection.[9] In the present study, glucometer was used to evaluate the blood glucose levels for GCB and CFB samples. The sample collection was easy without the use of any additional tools and was quick in response in contrast to the equipment used in the study conducted by Parker et al which involved the use of plastic pipette.[10]

The present study demonstrated a strong correlation between gingival crevicular and fingerstick capillary blood in group I subjects with chronic peridoontitis and adequate bleeding on probing which is in agreement with the study carried out by Parker et al[10] and Beikler et al.[11] Also, the method by which the samples were obtained and assessment was done was easy and less time consuming which is similar in the study conducted by Gaikwad et al.[12] There is possibility that GCB collected from site with inadequate bleeding may give a higher glucose reading due the contamination of the sample with tooth or gingiva. As a result, this study does not indicate the use of GCB in cases where there is minimal or no bleeding on probing as the correlation between GCB and CFB glucose levels was weak. This is similar to the results in the study conducted by Strauss et al.[13] Results of study by Strauss et al., showed high correlation between CFB and GCB glucose readings in group with adequate bleeding on probing, and lower correlation in group with little or no bleeding on probing, as is in agreement with the present study. This is in agreement with the present study where bleeding on probing was more in chronic periodontitis group and the correlation between GCB and CFB glucose level was high compared to group II with minimal or no bleeding on probing. As the diabetic status would not influence the correction between GCB and CFB readings, subjects were not segregated based on whether they were diabetic or not.

Periodontitis is a multifactorial disease but primarily bacteria associated which can lead to insulin resistance. It is of prime importance that individuals with periodontitis are screened for diabetes. This can help prevent and manage periodontitis as well as successful management of diabetes mellitus. GCB is readily available, easy to carry out procedure and causes minimum discomfort to the patient. The present study suggests that GCB can be a good alternative to capillary blood in screening and early detection of diabetes in individuals with periodontitis.

CONCLUSION

The GCB values have a strong correlation with the CFB values in individuals with chronic periodontitis. Dental professionals can collect GCB to measure glucose as patients anticipate oral intervention in dental office. GCB sample can occur simultaneously while probing for diagnosis of periodontal disease. Since it is quick & simple intraoral procedure with minimal cost, it can motivate dental professionals to implement diabetes screening using a GCB sample. Thus, diabetes screening can be encouraged in patients with chronic generalized periodontitis using GCB samples.

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