INTRODUCTION

Diabetes mellitus represents one of the major chronic health problems faced by the society today. The incidence of Diabetes mellitus all over the world, and especially in India, is on a steep rise. The Diabetes atlas published by the International Diabetes Federation, predicted that by 2030, the number of people with Diabetes will have risen to 438 million. Diabetes mellitus is undiagnosed in approximately half of the patients actually suffering from the disease. In addition, the prevalence of diabetes mellitus is more than twice as high in patients with periodontitis when compared to periodontally healthy subjects. Diabetes and periodontitis seem to interact in a bidirectional manner. The increased prevalence and severity of periodontitis seen in patients with diabetes, has led to the designation of periodontal disease as the “Sixth complication of diabetes” and successful periodontal therapy in diabetic patients entails the stabilization of blood glucose to a normal range. Diabetes is often asymptomatic in its early stages and can remain undiagnosed for many years. As a result, by the time of diagnosis in many of these individuals, beta cell function may have declined substantially and significant damage may already have occurred. Thus there is a need to increase opportunities for diabetes screening and early diabetic detection, especially among those who may be at a high risk for diabetes. Due to the close interrelationship between diabetes and periodontitis, the dental practitioner and especially the periodontist is likely to encounter an increasing number of undiagnosed diabetic patients with periodontitis. The introduction of glucose self-monitoring device provided diabetic patients with a simple method for rapid daily monitoring of their disease, by utilizing a blood sample from the finger but requiring a needle puncture of the skin to obtain a drop of blood. Therefore it is possible that oozing blood from the gingival crevice during periodontal probing may be an excellent source for glucometric analysis using portable glucose self monitoring device. The aim of this study is to compare gingival crevicular blood glucose measurement with finger stick blood glucose measurement using a self-monitoring device and also to compare it with the standard laboratory plasma glucose measurement to establish whether gingival crevicular blood can be used as a screening tool for Diabetes.

MATERIALS AND METHODS

20 diabetic (Type II) patients in the age group of 35 to 90 years with untreated moderate to severe periodontitis were selected from the patients attending the outpatient department of Dental Surgery, Community Health centre, Akividu, West Godavari district, Andhra Pradesh, India. Known diabetic cases included were on the basis of history and medical records furnished by the patients. The patients were examined intra orally and the gingiva around the upper anterior teeth was chosen to be the donor site for the gingival crevicular blood (GCB) sample as they offer ideal access. The area was cleaned and isolated with cotton rolls to prevent contamination with saliva. Probing was repeated until sufficient amount of blood (2-3 µl) was present to gather the sample. Blood sample was taken in a micropipette and transferred to the test stick of a glucose self-monitoring device (Accu-check, Roche Diagnostic, Germany). This value was compared with the peripheral finger stick blood glucose value, which was obtained by pricking the finger tip at the same visit and analyzed by the same method. They also underwent routine laboratory measurement of plasma glucose at the same time. Statistical analysis was performed with Karl Pearson’s Coefficient of correlation between gingival crevicular blood glucose and Capillary finger stick blood glucose and between gingival crevicular blood glucose and Venous blood glucose. Results: Highly significant correlation was found between gingival blood glucose and capillary blood glucose and between gingival blood glucose and Venous blood glucose. Conclusion: The results of our study revealed a highly significant co-relation between capillary finger stick blood glucose level and gingival crevicular blood glucose level. Highly significant co-relation was also found between Venous blood glucose level and Gingival blood glucose level. Hence the results suggest that Gingival crevicular blood can be used as a screening tool for Diabetes.

KEYWORDS: Diabetes; Gingival crevicular blood glucose; Screening tool; Venous blood glucose.
Results
The results of our study revealed a highly significant co-relation between capillary finger stick blood glucose level and gingival crevicular blood glucose level ($r=0.9933$). Co-relation is significant at $p<0.0001$. There were no significant differences between capillary and crevicular blood glucose even with increasing blood glucose levels (Graph 1). Highly significant co-relation was also found between Venous blood glucose level and Gingival blood glucose level ($r=0.9913$). Co-relation is significant at $p<0.0001$. There were no significant differenc-
es between Venous and crevicular blood glucose even with increasing blood glucose levels (Graph 2).

Discussion
The American Diabetes Association (2000) recommends that screening for diabetes should start at the age of 45 years, and be repeated every three years in individuals without risk factors for diabetes, and earlier and more often in individuals with risk factors. Testing Crevicular blood glucose level with the Accu-Chek self monitoring device is sensitive, since it can provide results with $2-3 \mu l$ of blood within 10 seconds. Since periodontal inflammation with or without the complicating factor of diabetes mellitus is known to produce ample extravasation of blood during diagnostic periodontal examination, no extra procedure, that is, finger puncture with a sharp lancet, is necessary to obtain blood for glucometric analysis. Even in the case of very low gingival crevicular bleeding, a glucose measurement is possible with the used self-monitoring device, due to the low amount of blood ($3 \mu l$) necessary to perform the analysis.

In this study the gingival crevicular blood glucose value was compared with the capillary finger stick blood glucose value to ascertain whether the former relates to the latter, and thus whether it could serve as an alternative to measure the blood glucose. Estimations of sulcular blood glucose levels were previously conducted and showed co-relation with capillary blood glucose levels, thereby suggesting that testing sulcular blood may be a valuable tool in identifying potential patients with diabetes. Highly significant co-relations ($r=0.9933$, $p<0.0001$) were found between gingival blood glucose levels and capillary blood glucose levels which was similar and consistent to other studies. Highly significant co-relations ($r=0.9913$, $p<0.0001$) were also found between gingival crevicular blood glucose levels and Venous blood glucose levels, the gold standard with which to measure glucose in the laboratory. Subjects can reliably be screened for diabetes by measuring glucose in gingival crevicular blood sample, since probing and gingival crevicular blood collection takes only less than 2 minutes and does not increase patients discomfort. Therefore dental professionals may be motivated to implement diabetes screening. Generally lower values in the gingival crevice blood pointed to considerable contamination with gingival exudates. But that was minimized by using a micro pipette in our study. Hence if the dentist participates in the challenge of undiagnosed diabetes by the routine screening of patients especially those with pronounced gingival inflammation, it would really prove beneficial.

Conclusion
The results of the present study indicate that Gingival Crevicular Blood collected during diagnostic periodontal examination may be an excellent source of blood for glucometric analysis in screening for diabetes since highly significant co-relations were found between Gingival Crevicular Blood glucose levels and Capillary Finger Stick Blood Glucose levels(GCBG Vs CFSG), and also between Gingival Crevicular Blood glucose levels and Venous Blood Glucose levels (GCBG Vs VBG).
Gingival crevicular blood: a screening tool for diabetes

References


How cite this article

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Source of Support: Nil
Conflict of Interest: None Declared