ABSTRACT

Introduction: Diabetes mellitus (DM) is one of the most incessant metabolic afflictions with a high prevalence rate in Indians. Diagnosis of diabetics in the initial stage helps to prevent its long-term complications that are responsible for high morbidity and mortality. The aim of the present study was to assess whether glucometric analysis using gingival crevicular blood (GCB) can be used for screening of diabetic patients in dental chair.

Materials and methods: A total of 60 patients were selected and samples of GCB and intravenous blood (IVB) were collected. Prior to collection of the samples, the probing pocket depth was measured. From each patient, blood sample from the two sites, i.e., GCB and IVB, was analyzed for blood glucose values.

Results: The mean age of the patients was 48.4 ± 12.16 years. The intravenous value (mg/dL) in diabetics was 246.8 ± 97.8 and the GCB value (mg/dL) was 195.3 ± 64.3. There was an extremely significant difference in intravenous values (mg/dL) and GCB value (mg/dL) in diabetic patients with chronic periodontitis (p = 0.0009).

Conclusion: The results of this study concluded that glucometer (ACCU-CHEK) is not an authentic chair-side method of assessment of diabetic patients using GCB.

Keywords: Diabetes mellitus, Gingival crevicular blood, Intravenous blood.


Source of support: Nil

Conflict of interest: None

INTRODUCTION

Periodontitis is a chronic inflammatory disease caused by (multifactorial) microbial plaque with an important role of systemic diseases that weaken the body’s immune system. Diabetes mellitus is a chronic metabolic disorder. It is characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both, with several major complications affecting both the quality and length of life. Among the various systemic factors that are thought to play a role in the initiation and progression of periodontal disease, DM has been shown to exhibit a bidirectional relationship. This interrelationship between DM and periodontitis has been studied for many years, emphasizing their role in the periodontal disease. Predictions show that 70% of those affected belong to the developing countries and diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. The prevalence of DM is more than twice as high in patients with periodontitis when compared with periodontally healthy subjects. A large number of patients seeking dental treatment are unaware of their undiagnosed DM, and thus, the dentist may increase his importance as a member of the health team by participating in the search for undiagnosed asymptomatic DM patients. Diabetes mellitus is associated with a wide range of complications, such as retinopathy, nephropathy, neuropathy, micro- and macrovascular diseases, altered wound healing, and periodontitis. Moreover, diabetes and periodontitis seem to interact in a bidirectional manner. It is a responsibility of dental practitioners to screen for undiagnosed cases which may influence the dental treatment or the general well-being of their patients. Thus, monitoring their blood glucose during the dental visit may be a better alternative. The monitoring of blood glucose levels using glucometers is in common use by the diabetic patients. This procedure or method being simple, reliable in terms of accuracy, and also being relatively inexpensive serves as an in-office screening device for patients suspected to have diabetes as well as monitor the blood sugar levels of patients with diabetes. Hence, this study was aimed at assessing the reliability of a glucose self-monitoring device for testing the blood glucose level in GCB in comparison with standard laboratory venous blood glucose measurement in diabetic patients (Figs 1 and 2). Therefore, the aim of the study was to compare whether blood oozing from gingival crevice during routine periodontal examination can be used for determining the glucose levels (Fig. 3).
MATERIALS AND METHODS

The subjects were selected from the outpatient department of periodontology and implantology at the Institute of Dental Sciences, Bareilly, Uttar Pradesh, India. The study was conducted after obtaining ethical clearance by institutional ethical committee. The written informed consent was obtained from each individual after explaining to them the procedure in detail in their vernacular language. A total number 60 patients were selected and samples of GCB and IVB were collected. Prior to the collection of samples, the probing pocket depth was measured. From each patient, blood sample from the two sites, i.e., GCB and IVB, was analyzed for blood glucose values (Graph 1).

SAMPLE COLLECTION

Gingival Crevicular Blood Collection

Samples of GCB were obtained at random from diabetic patients with chronic periodontitis. Each patient was examined intraorally for the visual signs of gingival inflammation. A University of North Carolina (UNC) 15 probe was used for probing the gingival sulcus. The area which showed profuse bleeding points amongst maxillary anterior teeth were selected for blood sampling. The upper front teeth, irrespective of their probing depths, were chosen for glucose measurements, as they offer ideal access for GCB. For each measurement, only one site with bleeding on probing was randomly selected and proper isolation was maintained. Every attempt was made to obtain the blood sample on a strip by a clean catch without contact with gingival or periodontal tissues. The interdental papilla either between incisors or between incisors and canines was probed with the UNC-15 probe. As soon as the probe was removed, a gingival crevice was observed for bleeding. At this stage, the test end of the strip (already mounted on the glucose-monitoring device) was touched to the bleeding site to obtain the blood sample on the test strip by a clean catch without contacting the gingival or palatal tissues. The test strip (Finetest™; InfopiaCo.Ltd; Korea) was held until the instrument beeped giving the blood glucose measurements in mg/dL.
Intravenous Blood Collection

The IVB was drawn from the patient’s antecubital fossa, preferably of the nondominant arm. The flexor surface of the patient’s nondominant arm was wiped with spirit and the spirit was allowed to evaporate. Using a disposable syringe, 0.5 mL of venous blood was drawn from the antecubital fossa into the syringe and the blood sample was sent to the laboratory for the measurement of blood glucose levels using a reference glucose analyzer.

RESULTS

A study population included a total of 60 patients with DM. There were 27 male and 33 female patients in the study. The mean age of the patients was 48.4 ± 12.16 years. Table 1 shows that the mean intravenous value (mg/dL) in diabetic was 246.8 ± 97.8 and the GCB value (mg/dL) was 195.3 ± 64.3. There was an extremely significant difference in the intravenous values (mg/dL) and GCB value (mg/dL) in diabetic patients with chronic periodontitis (p = 0.0009). A statistical analysis of the data was done using independent Student’s t-test; p < 0.05 was considered statistically significant. The data were compiled using Microsoft Excel sheet (Windows 2007).

DISCUSSION

The periodontists are likely to encounter an increasing number of patients with undiagnosed DM. The early diagnosis of diabetes might help to prevent its long-term complications that are responsible for the high morbidity and mortality of diabetic patients. For this, there should be screening of patients who are diabetic or nondiabetic. There is a two-way correlation between diabetes and periodontitis. On the one hand, poorly controlled diabetes increases the risk for developing destructive periodontitis and impairs the treatment outcome. On the other, chronic inflammatory periodontal disease considerably complicates diabetic control. Although certain microorganisms in dental plaque are considered the main cause of destructive periodontitis, dentists, especially periodontists, play an important role in the screening of DM. As the patients come to a dental clinic for regular dental check-up, the periodontal probing leads to oozing of blood that can be used for testing of DM. Moreover, the technique described is more familiar and less traumatic to the patients than the intravenous method. In the present study, there was a significant difference between GCB and intravenous values, indicating that both cannot be considered as an alternative to each other. Any stimulation, such as trauma, salivation, mastication, and inflammation, alters the reading of GCB. Gingivitis and periodontitis produce higher gingival crevicular fluid. Thus, there being always a possibility of mixing of GCB with gingival crevicular fluid, and later having own glucose, the sugar content cannot be assessed correctly. As the periodontal treatment is a long-term one that would often continue for years, a single blood glucose test would not be sufficient for periodontal management and moreover, consultation with a diabetic physician would routinely yield a single blood glucose test result. The impairment of the metabolic control in non-insulin-dependent DM seems to be associated with advanced periodontitis and therefore, requiring a regular periodontal surveillance. In the present study, the intravenous method showed consistently higher values compared with GCB glucose. Our results are similar to those of Muller and Behbehani who concluded that there is no usefulness of GCB, as bleeding on probing was not sufficient in every third case. Kandwal and Batra also concluded that the GCB for testing blood glucose during routine periodontal examination was not that useful. In contrast to our study, Parker et al, examined diabetic patients with unknown periodontal status where a very strong correlation was observed between gingival crevicular, finger-prick capillary, and IVB glucose measurements. In another study by Beikler et al, a pronounced association was observed between GCB and finger-prick capillary measured blood glucose when diabetic and non-diabetic patients with moderate-to-advanced periodontitis were examined. In the study by Gaikwad, similar findings were reported. There was also a similar profile between GCB and Finger Prick Blood studied by Kaur et al. In contrast to our study, Shetty et al, and Kaur et al, examined diabetic patients and found a very strong correlation between GCB and IVB glucose measurement. On an overall basis, it can be concluded that our studies and those reported by others have some resemblances, but have differences as far as the specific details are concerned, which are critical for deriving a generalized conclusion. This study therefore, provides an approach to correlate periodontitis vs the metabolic status vis-à-vis diabetes, which may have a profound role to play in the presentation and molecular regulation of the disease itself.

CONCLUSION

The present study proves that glucometer (ACCU-CHEK) is not an authentic chair-side method of assessment of diabetic patients using GCB. However, further studies
Comparative Evaluation of Blood Glucose Level

should include large sample sizes and improvised methods which more accurately can identify and measure the GCB glucose measurements using small amount of blood, thus assisting in the early detection of DM.

REFERENCES