

Gingival Crevicular Blood in the Diagnosis of Blood Glucose Level

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ABSTRACT

Introduction: The etiopathogenesis of diabetes mellitus is multi-factorial & complex and appears to involve interactions of various immunological, genetic and environmental factors¹. The Diabetes mellitus is associated with increased blood glucose level. It represent one of the major chronic health problem faced by the society today². The aim of this study is to evaluate a quick, safe, noninvasive and painless method to screen for diabetes during regular clinical examination using self-monitoring glucometer.

Material and Methods: 35 cases who were reported to Primary health centre, sahdei buzurg for hematological examination were selected for the study. Probing of gingival sulcus was done using William's WHO probe. Blood oozing from the sulcus was collected on the strip provided by the glucometer and blood glucose level was recorded. For control, finger prick capillary blood was collected and blood glucose level was analyzed. Statistical analysis was done using Pearson's Correlation Coefficient.

Result: The result revealed strong correlation between gingival crevicular blood and peripheral capillary measured blood glucose level.

Conclusion: Gingival crevicular blood collected during clinical examination may be an excellent painless source of blood for glucometric analysis.

Keywords: Diabetes, Glucometer, Gingival Crevicular Blood, Finger Prick Blood.

INTRODUCTION

The etiopathogenesis of diabetes mellitus is multi-factorial & complex and appears to involve interactions of various immunological, genetic and environmental factors.¹ The Diabetes mellitus is associated with increased blood glucose level. It represent one of the major chronic health problem faced by the society today.² Uncontrolled diabetes is associated with number of multisystemic disorders including retinopathy, nephropathy, neuropathy, micro and macro vascular diseases and altered wound healing. Intraorally it manifest as gingivitis, periodontitis, candidiasis, halitosis and ulcers.³ It remains undiagnosed in more than half of the cases. WHO has estimated that by the year 2025 there will be 333 million cases of diabetes. According to International Diabetes Federation 77 million cases of diabetes will be present in India by 2025.³

Epidemiological studies have shown that prevalence of Diabetes was double in patient suffering from periodontitis compared to periodontally healthy individuals.⁴ Patients with diabetes, especially those with poor metabolic control have increased prevalence and severity of periodontitis which led to the designation of periodontal disease as

the "sixth complication of diabetes."⁵ Considerable effort has been made in the past few years to develop painless and noninvasive methods to measure blood glucose. Glucometers are commonly used by diabetic patients for monitoring of blood glucose levels at home.⁶ Ample extravasated blood is produced during diagnostic procedures in patients with periodontal inflammation. Routine probing during a periodontal examination is more familiar to the practitioner and less traumatic compared to a finger-puncture with a sharp lancet.⁷ These devices may actually allow for painless testing of blood oozing from the gingival crevices of patients with periodontal problem during routine periodontal examination and could be a simple and relatively inexpensive in-office screening device for any patient suspected to have diabetes.⁸ It is possible that gingival blood from probing may be excellent source for glucometric analysis using portable glucose self-monitoring device.⁹ The aim of the present study was to evaluate a quick, safe, noninvasive and painless method to screen for diabetes during regular clinical examination using self-monitoring glucometer.

MATERIAL AND METHODS

Study group included 35 patient reported to Primary health centre, sahdei buzurg for routine haematological examination. Routine intraoral examination was done. Periodontal probing was done using William's Periodontal Probe (Figure 1). Maxillary central incisor was selected for collecting the blood oozing from the sulcus after probing (Figure 2). Maxillary central incisor was selected as it was easy to collect blood from it and to maintain the uniformity. Self-monitoring glucometer was used for analysing glucose level. Blood was collected directly on the strip provided by the manufacturer (Figure 3). These areas were isolated with cotton rolls to prevent saliva contamination and dried with compressed air. Blood glucose level was analysed using self-monitoring glucometer according to manufacturer's

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recommendations. Capillary fingerstick blood glucose (CFBG) was assessed using the same glucose self-monitoring device, using a disposable sterile lancet to take a sample from the right index finger (Figure 4 & 5). Reading were recorded and statistical analysis was done.

STATISTICAL ANALYSIS

Statistical analysis was performed by SPSS 15.0. Statistical test used was Pearson Product Moment Correlation.

RESULTS

35 patients (20 male and 15 female) took part in the study. The mean age of the study subject was 43 years. Mean gingival blood glucose (GBGL) levels and finger prick blood glucose (CBGL) derived from all samples were 102.17 mg/dl and 103.94 mg/dl respectively (TABLE 1). The result of our study revealed a strong correlation (r^2 0.9514, p ,0.0001) between gingival crevicular and peripheral capillary measured blood glucose. There were

no significant (p ,0.05) differences between capillary and crevicular blood glucose even with increasing blood glucose level.



Figure-1: William's Periodontal Probe



Figure-2: Blood oozing from the sulcus after probing



Figure-3: Collecting gingival sulcus blood for glucose analysis



Figure-4: Finger prick

Sample no.	Sex	Age (years)	GCBG (mg/dl)	FPBG (mg/dl)
1	F	38	124	126
2	M	41	110	107
3	F	51	127	125
4	M	46	87	89
5	M	39	106	102
6	M	32	88	85
7	F	54	69	67
8	F	42	180	185
9	M	48	92	99
10	F	39	97	96
11	M	43	92	95
12	M	55	168	172
13	F	36	112	114
14	M	52	78	81
15	F	47	98	96
16	M	29	118	111
17	M	38	142	143
18	F	46	87	89
19	F	48	92	95
20	M	39	86	88
21	M	65	165	166
22	F	30	90	92
23	M	52	93	93
24	M	43	57	89
25	F	48	69	71
26	M	45	89	91
27	F	42	84	88
28	M	50	98	96
29	F	45	112	115
30	F	28	94	96
31	M	30	102	105
32	M	42	87	88
33	F	38	90	92
35	M	30	110	112
35	M	54	80	79

Table-1: Comparison of blood glucose values obtained by Gingival crevicular blood sampling and finger prick method



Figure-5: Collecting finger prick blood for glucose analysis

DISCUSSION

India has nearly 33 million diabetic subjects today with an overall prevalence rate of 4.3%. 11 Type 2 DM i.e. NIDDM constitutes nearly 90% of diabetic population in any country, with a prevalence of 2.4% in rural population and 11.6% in urban population.¹⁰ It has been estimated that about one third of type 2 cases are undiagnosed, and undiagnosed type 2 diabetes mellitus screening is highly recommended.¹¹ Various studies prove that periodontal therapy exerts beneficial effects on diabetes mellitus control.¹² Diabetes mellitus and periodontitis seem to interact in a bi-directional manner.¹³ It can be assumed that the dental practitioner and especially the periodontists are extremely likely to encounter an increasing number of undiagnosed diabetes patients with periodontitis. Long term complications that are responsible for high morbidity and mortality of diabetic patients can be prevented by early diagnosis of diabetes. Screening for diabetes should start at a younger age and be repeated every 3 years in persons without risk factors, and earlier and more often in those with risk factors for diabetes.¹⁴

Gingival blood glucose levels collected during routine periodontal examination may be an excellent source of blood, safe, easy to perform and comfortable to the patient. With regard to the development of painless and non invasive methods to measure blood glucose, considerable effort has been made in the past few years (Kost et al. 2000).¹⁵ However, until now, none are in routine clinical practice (Klonoff 1997).¹⁶ Even in the case of very low gingival crevicular bleeding, a glucose measurement is possible with the use of self monitoring device, due to the low amount of blood (3 μ ml) necessary to perform the analysis. Moreover, the technique described is more familiar and less traumatic to the patient than a finger puncture.

The present study is in agreement with study done by Parker et al (1993) which also demonstrated a strong correlation between gingival crevicular and fingerstick capillary blood. In a study done by Harmanpreet Kaur et al (2013), shows strong correlation between gingival crevicular blood, finger prick blood and intravenous blood.¹⁷ 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.

In a study done by Shetty et al (2013), capillary tube was used for collection of blood from sulcus, which increases the chance of contamination.¹⁸ In present study blood was collected directly on to glucometer thus reducing chance of contamination. Highly significant correlations ($r=0.9934$, $p<0.001$) were found between GBGL and CBGL consistent with many studies.¹⁹

There are very few studies done for screening Diabetes mellitus using gingival crevicular blood in India where the incidence rate of DM is increasing at an alarming rate. Hence if the dentist participate in the challenge of identifying undiagnosed diabetes by the routine screening of patient especially those with pronounced gingival inflammation, it would really prove beneficial for mankind.²⁰

CONCLUSION

The results of present study indicate that gingival crevicular blood collected during clinical examination may be an excellent source of blood for glucometric analysis. In addition, the technique described is safe, easy to perform and comfortable for the patient and might therefore help to increase the frequency of diabetes screening in dental offices, dental camps and paediatric dental care. Though capillary/venous blood samples used for diabetes mellitus screening is gold standard, the gingival crevicular blood may prove to be promising approach for routine dental office screening for diabetes mellitus in periodontal patients.

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