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Original Article

Salivary glucose levels and oral candidal carriage in Type 2 diabetics

Amritaksha Bhattacharyya [a], Shaleen Chandra [b], Anil Singh [c], Vineet Raj [d], Bhavana Gupta [b,*]

[a] Department of Oral Pathology, Maharana Pratap Dental College, Kanpur, U.P., India
[b] Department of Oral Pathology, King George's Medical University, Lucknow, India
[c] Department of Oral Pathology, Saraswati Dental College, Lucknow, India
[d] Department of Oral Pathology, Chandra Dental College and Hospital, Lucknow, India

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ABSTRACT

Background: To assess the correlation between salivary glucose and blood glucose levels in diabetics and non diabetics and to study the association between salivary glucose levels and oral candidal carriage in patients with Type 2 diabetes mellitus.
Material and method: The study sample was divided into two groups, control and study group. The study group was again divided into two separate groups controlled diabetics and uncontrolled diabetics. Blood and saliva samples (for fasting and postprandial) were taken from each individual.
Results: The salivary glucose levels, highly correlated with blood glucose levels in both diabetic as well as non diabetics subjects. Salivary candidal carriage was more in oral cavity of Type 2 diabetic subjects than control subjects.
Conclusion: Saliva has the potential to be used as a noninvasive tool to monitor glycemic status of diabetic patients.

1. Introduction

Diabetes mellitus (DM) is a complex multi-systemic metabolic disorder characterized by a relative or absolute insufficiency of insulin secretion and/or concomitant resistance to metabolic action of insulin on target tissues.[1] Type 2 diabetes is a global, the International Diabetes Federation (IDF) states that diabetes has affected at least 382 million people worldwide in 2013, which is estimated to rise to 592 million by 2035.[2,3] Fungal infections of oral mucosal surfaces and removable prostheses are more commonly found in diabetics and higher salivary glucose concentration may be associated with increased oral candidal carriage in diabetics.[4] It is becoming increasingly apparent to investigators and clinicians that saliva has many diagnostic uses and is valuable in the young, the old and infirm, and in large-scale screening and epidemiological studies.[5] Salivary glucose concentrations may also be used as a non invasive tool to monitor glycemic control in diabetics.[4] The aim of this study was to assess the correlation between blood glucose levels and salivary glucose levels in order to determine if salivary glucose levels could be used as a noninvasive tool for monitoring glycemic status in diabetics and also to explore the correlation between salivary glucose levels and oral candidal carriage.

2. Material and methods

The study was conducted at the Department of Oral Pathology & Microbiology and Department of General Pathology & Microbiology of our college. Consent was obtained from every individual participating in study and the study was approved by ethical committee of the institution. The subjects were divided into 3 groups – Sashikumar and Kannan.[5]

Group 1 (control group, $n = 34$) – non diabetics (ND)
Group 2 (study group, $n = 97$) – diabetics.
Group 2 was further sub-divided into two sub-groups:
Group 2a ($N = 49$) – controlled diabetics (CD)
Group 2b ($N = 48$) – uncontrolled diabetics (UD)

The inclusion criteria for **non-diabetics (ND)** were that only those subjects with no history of diabetes and with fasting blood glucose levels <120 mg/dl and post prandial blood glucose levels

* Corresponding author at: SR-I, KGMU, C-2/600, Sector-C, Jankipuram, Lucknow, U.P., India.
E-mail addresses: dramritakshabhattacharyya@gmail.com (A. Bhattacharyya), shal_nam@hotmail.com (S. Chandra), dranilsingh@yahoo.com (A. Singh), veneetraj@gmail.com (V. Raj), drbhavanagupta@gmail.com (B. Gupta).

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<200 mg/dl, measured at least twice in last 6 months (including current measurements) were considered along with those who had reported for voluntary routine blood examination as a part of routine medical checkup. For **controlled diabetics** (CD), only those subjects were considered with a history of diabetes and currently undergoing treatment, with fasting blood glucose levels <120 mg/dl and post prandial blood glucose levels <200 mg/d, measured at least twice in last 6 months (including current measurements). Secondly, the subjects who reported for voluntary blood examination as a part of routine checkup/prescribed by a physician. For **uncontrolled diabetics (UD)** subjects with a history of diabetes and currently undergoing treatment, with fasting blood glucose levels >120 mg/dl or post prandial blood glucose levels >200 mg/dl measured at least twice in last 6 months (including current measurements) and subjects who reported for voluntary blood examination as a part of routine medical checkup/prescribed by a physician. The exclusion criteria were patients with any kind of tobacco habits, patients suffering from any salivary gland disorders, patients having a history of/or undergoing chemotherapy or radiotherapy, patients with history of any chronic systemic diseases or undergoing long term medication for chronic conditions other than diabetes mellitus, patient currently on any antibiotic medication or having a history of use of any such medications in past 3 months, patients wearing any type of orthodontic appliance or removable dental prosthesis (Figs. 1–6).

3. Assessment of glucose levels

3.1. Collection of samples

(1) Blood: Under aseptic conditions, 2 ml of patient's intravenous blood was obtained from median cubital vein of forearm into a blood collection tube (Bio In Vitro Diagnostics Pvt. Ltd., Gujarat) containing sodium fluoride and EDTA.
(2) Saliva: Two salivary samples were collected from each subject for assessment of SGL. Fasting samples were collected in the morning (between 8 AM–10 AM) after an overnight fasting of at least 8 h. Post prandial samples were taken in between 1.5 h and 2 h after meal. Unstimulated salivary samples were collected in all instances.

3.2. Method of collection of salivary sample

Approximately 2 ml of unstimulated whole saliva was collected from each subjects in a sterile graduated tube by spitting method as proposed by Navazesh et al.,[5] over a period of 5 min. Saliva was collected in resting position between 8.00 AM and 10.30 AM after rinsing with distilled water into a blood collection tube (Bio In Vitro Diagnostics Pvt. Ltd., Gujarat) containing sodium fluoride and EDTA (Ethylenediamenetetraacetic acid). Subjects were asked to sit on a chair with head tilted forward and instructed not to speak, swallow, or do any head movements during the procedure. Subjects were instructed to accumulate the saliva in the floor of the mouth and then spit in a sterile collection tube every minute for five minutes. The collected sample was processed immediately with a time lag of no more than 30 min.

Fig. 1. Salivary rinse collected in a sterile sample collection container (approx. 10 ml).

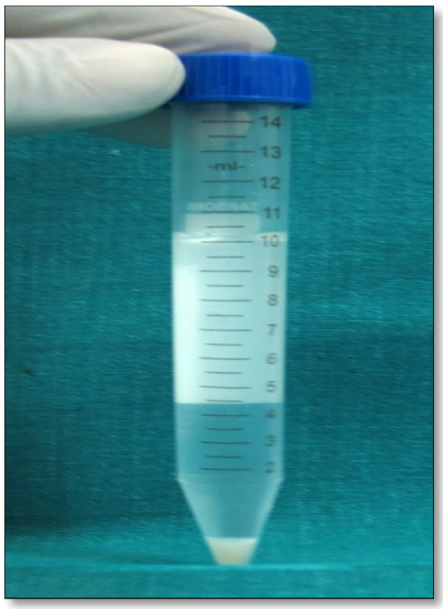

Fig. 2. Salivary sample after centrifuge.

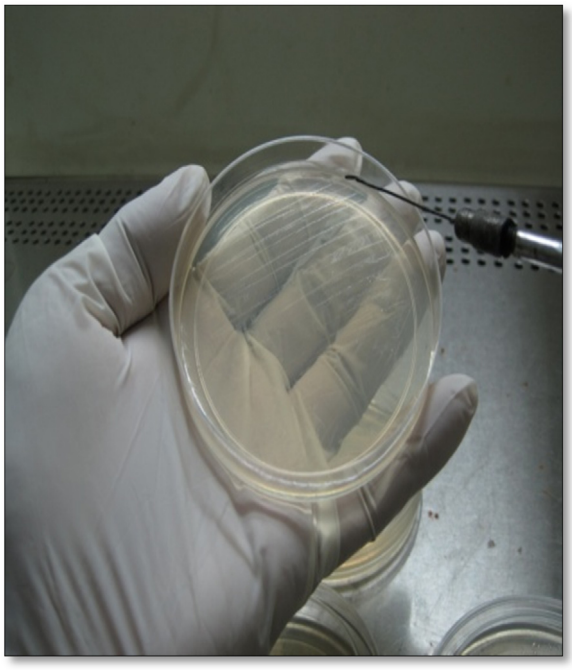

Fig. 3. Streaking of sample using a sterile inoculation loop.