Salivary Glucose as a Diagnostic Marker for Diabetes Mellitus

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Komal Smriti, BDS, MDS[1], Keerthilatha M. Pai, BDS, MDS[1], Vineetha Ravindranath, BDS, MDS[1], Srikanth Gadicherla, BDS, MDS[2], and Kalyana Chakravarthy Pentapati, BDS, MDS[3]

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Early screening of diabetes mellitus (DM) is essential for improved prognosis and effective delay of clinical complications and has been suggested as an important strategy to lower the incidence of this disease worldwide.[1] Blood testing remains the standard for screening, monitoring, and diagnosis of DM, while being invasive and painful. But these techniques are inconvenient and perturb daily life, cause anxiety, and are difficult to do in long-term diabetics due to development of finger calluses, poor peripheral circulation, risk of infection, and need for skilled manpower.

Recently, many studies have focused on the development of saliva-based tests for screening and monitoring systemic diseases, including DM.[2-6] Saliva testing could potentially bypass the issues associated with blood tests with some distinctive advantages which would be particularly useful in the young, in the elderly, and for large-scale screening or epidemiological interventions. However, the effectiveness of saliva-based tests is still under debate. Our study was done to compare fasting salivary glucose (FSG) levels in diabetic and nondiabetic individuals and to evaluate normal cutoff of FSG levels.

A total of 60 subjects known to have DM who were on medication, 60 subjects who were freshly diagnosed DM not under medication, and 60 controls (nondiabetic individuals) were included in the study. An informed consent was obtained from each subject. Subjects with xerostomia, salivary gland disorders, oral lesions with bleeding, or any other systemic illness were excluded from the study. Fasting blood glucose (FBG) was determined in all the subjects. Unstimulated whole saliva was collected in the morning after drawing the blood and salivary glucose was estimated by glucose oxidase-peroxidase method.

There was significant difference in the mean salivary glucose levels among the 3 study groups ($P < .001$). Post hoc analysis showed that the mean FSG was highest in diabetics not under medication (11.68 ± 1.97 mg/dl) followed by diabetics on medication (9.68 ± 2.48 mg/dl) with least being in controls (6.50 ± 0.47 mg/dl). There was significant positive strong correlation between FSG and FBG in diabetics not under medication ($r = .941$, $P < .001$), diabetics on medication ($r = .981$, $P < .001$), and controls ($r = .937$, $P < .001$). ROC curves were plotted by calculating the sensitivity and specificity of salivary glucose in predicting the diagnosis of diabetes status. The area under the curve was 0.998 and was above the reference line, which suggests that the curve predicted individuals with disease. Optimal cutoff point was considered to be 7.05, with sensitivity of 99.1 and specificity of 93.7%. No studies previously have reported optimal cutoff point for salivary glucose concentration. Hence it can be extrapolated that individuals having salivary glucose level above 7.05 mg/dl may have uncontrolled DM. Thus in the present study, glucose was detectable in saliva in both diabetic and nondiabetic individuals. There was a positive correlation between FBG and FSG. Hence salivary glucose appears to be an indicator of blood glucose concentration. Nevertheless, further studies on larger populations and in different geographic areas are needed to establish FSG estimation as a diagnostic as well as monitoring tool for DM.

Abbreviations

DM, diabetes mellitus; FBG, fasting blood glucose; FSG, fasting salivary glucose; ROC, receiver operating characteristic.

Declaration of Conflicting Interests

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[1]Department of Oral Medicine and Radiology, Manipal College of Dental Sciences, Manipal University, Manipal, Karnataka, India
[2]Department of Oral and Maxillofacial Surgery, Manipal College of Dental Sciences, Manipal University, Manipal, Karnataka, India
[3]Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal University, Manipal, Karnataka, India

Corresponding Author:
Kalyana Chakravarthy Pentapati, BDS, MDS, Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal University, Manipal 576104, Karnataka, India.
Email: drkalyan81@gmail.com

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