Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Salivary Constituents in Diabetes Mellitus

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Received: February 2020
Accepted: February 2020

ABSTRACT

Background: Saliva is a non-invasive tool. It is a simple and now recently being used in diagnostics for tests and evaluation since it doesn't have to be taken utmost care during transportation or storage unlike blood. Objective: The objective of this study was to evaluate the biochemical constituents of saliva among patients of diabetes mellitus. Design: This was a hospital based prospective observational study. Duration: One year i.e. from June 2017 to June 2018. Setting: Department of dentistry. Participants: 50 patients with a previous diagnosis of diabetes mellitus were included in the study. **Methods**: After obtaining consent, all the patients underwent detailed history taking and a thorough oral clinical examination. Unstimulated whole saliva was collected in the fasting state. Glucose, urea, calcium, total protein and amylase were determined by a colorimetric method. Data were presented in the form of statistical Tables and charts. SPSS software version 20 was used for statistical analysis. **Results**: Glucose, Calcium and Urea were higher in the diabetic cohort whereas relatively higher levels of protein and amylase were recorded among the non-diabetic group. **Conclusion**: Significant variations were observed in salivary biochemical parameters between diabetics and non-diabetics.

Keywords: Salivary, Constituents, Diabetes mellitus, Biochemical.

INTRODUCTION

Diabetes has become a worldwide common global health issue. It has been one of the main reasons for death and disability in addition to significant social repercussions. This is a chronic disease affecting an increasing number of people from different countries at different stages of social and economic growth. Diabetes is classified into four types of diabetes: type 1, arising from the death of β cells, which usually results in complete deficiency of insulin and diabetes of type 2 arising from a progressive insulin-related resistance defect. Many different forms of diabetes are caused by other factors including gestational diabetes mellitus.

Saliva is a special fluid essential for an oral cavity to function normally. Saliva is the main defensive in the mouth containing informative components that can be used to diagnose human disease. Systemic diseases such as diabetes impair the role of the salivary glands and thus affect the amount and consistency of saliva produced. Changes in the chemical components and physical properties of saliva can be used as diagnostic parameters and therefore, saliva testing can be added to the arsenal of additional tests. Saliva has several benefits over serum, including its quick and non-invasive extraction and convenient processing, transport and handling. The wide array of components in saliva allow for diagnosis, prognosis and monitoring of human diseases including autoimmune diseases and inherited or congenital diseases, diabetes, infections, caries, cancer, cardiovascular diseases, cancer and periodontal disease among others. In addition to protecting the integrity of oral tissues, the various components in the saliva offer clues to local and systemic diseases and conditions. Salivary glucose was chosen to measure blood glucose as it is the ultra filter of the blood. Glucose is one of the blood components that can be distributed throughout the epithelium of the gland in proportion to its blood concentration.

The goal of the research was to evaluate the biochemical and immunological profile of saliva in patients with diabetic influence, and identify changes to the levels of salivary glucose and evaluate the correlation between salivary glucose and blood glucose in patients with diabetic diseases, taking into consideration the total IgA production and the concentration specific IgA anti-insulin and anti-Streptococcus mutants.

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MATERIALS AND METHODS

Place Of Study: Department of dentistry
Type of Study: This was a hospital based prospective observational study.
Sample Collection: **Sample size:** 50 Patients

Sampling Methods: Consecutive Sampling.

Inclusion Criteria:
Patients older than 18 years and with a previous diagnosis of diabetes mellitus were included in the study.

Exclusion Criteria:
Patients with other systemic condition or under any medications, Patients under radiotherapy, Patients who had consumed alcohol or smoked during last 24 hours and Pregnant women were excluded from the study.

Statistical Analysis: Data were presented in the form of statistical Tables and charts. SPSS software version 20 was used for statistical analysis.
Ethical Approval: Approval was taken from the Institutional Ethics Committee prior to commencement of the study.

RESULTS

In the present study, 50 subjects (30 diabetic cases and 30 controls) were enrolled in the study

Parameter	Control	Diabetic	p value
Glucose (mg/dL)	4.33 ± 0.29	17.31 ± 2.05*	<0.001**
Urea (mg/dL)	16 ±1	26 ± 1	0.0001
Calcium (mg/dL)	6.39 ± 0.5	4.22 ± 0.12*	0.000
Total protein (mg/dL)	6.65 ± 0.84	6.35 ± 0.76	0.000*
Potassium (mEq/L)	20.84 ± 0.71	25.95 ± 1.56*	0.001
Amylase (AU/dL)	0.3 ± 0.1	0.2 ± 0.1	0.003

NS: p >0.05; Not Significant; *p<0.05; Significant; **p<0.001; Highly Significant

The diabetic patients were divided into two subgroups according to the use or not of insulin. The results showed significant differences between control group and diabetics group. The study results showed significantly increased levels of salivary glucose, total proteins, sodium and potassium and decreased levels of calcium in diabetics (p<0.0001). A statistically significant decrease was noticed in the salivary amylase concentrations in diabetics (p<0.0001).

DISCUSSION

Diabetes is one of the most common diseases in the world. Blood is used for diagnostic purposes as biological body fluid. Medical instruments for the assessment of blood glucose level (BGL) are available on the market. A non-invasive procedure to determine the level of glucose without taking blood is necessary.

The ultra filtrates of blood are saliva. Which is playing a major role in the oral cavity homeostasis as it stabilizes the oral cavity ecosystem and therefore is a brilliant marker for the prompt discovery of the disease which leads to better treatment, glucose level estimate, Risk estimation and is a quick noninvasive blood and urine test alternative.
Whole saliva can be obtained non-invasively by individuals with limited training. No special equipment is required to collect it. Diagnosis of a disease by analyzing saliva is potentially of benefit for kids and elderly adults, since fluid collection in comparison with blood collection is associated with fewer compliance problems. In addition, saliva analysis appears to be an economic approach in the screening of large populations. The most popular study of whole saliva is, however, used to test systemic disruptions through salivary tests. - systemic disorders directly or indirectly affect the salivary glands and they can influence both the quantity and composition of the saliva produced. These changes in characteristic conditions may help to identify these diseases and detect them early, such as T2DM. Saliva has been recently used to diagnose a variety of diseases, since a therapeutic tool is easy to access, accurate and non-invasive.[1]
The conditions of the saliva are changed by biochemical, nutritional and neurologic misnormalities, human dehydration and medicines such as anticholinergics, diuretics, antihistamines, anti-hypertensive's, etc. Micro vascular complications are associated with diabetes, including autonomous neuropathy, two of which can affect salivary secretions.[2]
In this study, the salivary glucose level was significantly elevated in diabetics. This could be attributed to the altered glucose homeostasis. High salivary glucose level is a consequence of high plasma glucose level which diffuses in saliva, according to Lasisi et al., Increased salivary glucose is attributed to the fact that glucose is a small molecule that easily diffuses through semi-permeable membranes.[3] Thus, large amounts of glucose become available to saliva when blood glucose levels are elevated, as in diabetes.
It was stated by Chatterton RT et al., that salivary glands act as filters of blood glucose that would be altered by hormonal or neural regulations.[4] Many other authors have also found higher glucose salivary levels in diabetic patients than in non-diabetics.[5] Lopez et al., in their study, also observed that diabetic saliva glucose values were higher than those of the controls and also a negative correlation was found between salivary glucose levels and the glycaemic status and Hb A1 c levels of the subject.[6]
The study results were also in agreement with those of Karjalainen et al., who also reported that the

elevated salivary glucose levels in diabetics decreased after starting with insulin treatment 7. On the contrary, Sharon et al., did not report any difference in salivary glucose levels.[8]

Sharon et al (1985),[10] Ben-Aryeh et al (1988),[11] Ben-Aryeh et al (1993),[12] and Yavuzyilmaz et al (1996),[13] analyzed whole saliva, and found significantly higher potassium levels in Diabetic groups (Group-I and II) compared to non-Diabetic group. Sharon et al (1985).[10] When Mander (1975),[14] and Streckfus et al (1994),[15] analyzed individual gland saliva, they found no significant difference between Controls andDiabetics. Ben-Aryeh et al (1988),[16] in their study showed significant higher concentration of potassium in Diabetic group compared to Control group when parotid saliva was analyzed.

Marder A.Z. et al (1975),[17] attempted to explain the higher concentration of potassium in whole saliva of Diabetics by different factors such as peripheral vascular damage which had much higher potassium levels in Diabetics than Controls and elevated conductibility of the acinic cell membrane to potassium.

CONCLUSION

This research and many other studies show saliva can be used as adjuvant diagnostic tool to blood to determine type 2 diabetes mellitus as a safe non-invasive method. Saliva also finds great advantage over blood in case of children, elderly, critically ill and debilitated patients. More experiments should be carried out on bigger samples with more clinical studies and in-depth evaluations of the electrolyte imbalances which differ from one experiment to the next. In order to make saliva a dependable resource, this should be combined with oral manifestances and other co morbidities. The standardized procedure of salivary glucose estimation for DM may herald a new era in non-invasive method of diagnosis.

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How to cite this article: Priya NP. Salivary Constituents in Diabetes Mellitus. Ann. Int. Med. Den. Res. 2020; 6(2):DE10-DE12.

Source of Support: Nil, **Conflict of Interest:** None declared