ORIGINAL RESEARCH

Measurement of the electrolytes, total proteins, and salivary flow rate of Type II diabetes individuals

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ABSTRACT

Background: Hyperglycemia anomalies in the metabolism of proteins, lipids, and carbohydrates characterise diabetes mellitus (DM), a chronic metabolic disorder. It frequently causes neuropathies, microvascular, and macrovascular issues to appear. It is widely accepted that the health of oral tissues is correlated with the quantity and quality of saliva, both of which may be impacted by diabetes. **Materials and Methods**: There were 120 participants in this study, 80 of whom had Type II DM (which includes both controlled and uncontrolled diabetes), and 40 of whom did not have the disease (controls). The participants in the study, whose ages ranged from 40 to 70, comprised both sexes. Three groups were formed from the study subjects. **Results:** Based on the values of total protein, sodium, potassium, and salivary flow rate among controls, controlled diabetes, and uncontrolled diabetes, multiple comparisons between the groups were made using the analysis of variance and post hoc Tukey honestly significant difference analysis in version 16.0 of SPSS software. The values of total protein, sodium, potassium, and salivary flow rate among controls, controlled diabetes, and uncontrolled diabetes were gathered, formulated, and subjected to multiple comparisons between groups using analysis of variance and post hoc Tukey honestly significant difference analysis in Version 16.0 of the Statistical Package for the Social Sciences (SPSS), IBM Corporation, Chicago, United States of America. With results ranging from 79 mg/dL to 96 mg/dL, the average fasting blood sugar for Group 1 was 88.9 mg/dL. Conclusion: Studies with a larger sample size are necessary to determine the precise pathophysiology of controlled and uncontrolled Type II DM in terms of salivary flow rate, salivary electrolytes, and total protein.

Keywords: sodium, total protein, potassium, saliva, and salivary flow rate.

INTRODUCTION

It frequently causes neuropathies, microvascular, and macrovascular issues to appear.[1] The situation deteriorates, causing tissue or vascular damage that leads to major diabetic side effects such retinopathy, neuropathy, nephropathy, cardiovascular problems, and ulceration.[2,3] As a result, diabetes is understood to be a complex condition that has a detrimental impact

on a person's general health. Several studies have shown a connection between diabetes and a higher incidence of dental problems in persons.[4] It is most certainly the most common disorder involving the salivary glands.

It is widely accepted that the health of oral tissues is correlated with the quantity and quality of saliva, both of which may be impacted by diabetes. Many research have looked into the salivary composition of participants with various systemic illnesses.[5,6] Periodontitis and dental caries are two disorders that have long been understood to be the distinctive features of DM. The majority of diabetic patients also have xerostomia (dry mouth), which is brought on by a general decrease in salivary flow brought on by systemic dehydration and a rise in salivary glucose levels.[7] There are a number of underlying pathologies that have been linked to the increased prevalence of oral diseases in diabetics, including atherosclerosis, decreased salivary flow, and slow wound healing. More research is needed to understand how these conditions affect the composition of saliva, though.

In the current study, salivary flow rate, electrolytes, and total proteins were estimated in Type 2 diabetes patients, and a correlation between non-diabetic, controlled diabetic, and uncontrolled diabetic patients was assessed using accepted practises. It is recognised that diabetes alters the structure and functionality of saliva.

It is well recognised that the quantity and quality of saliva, both of which may be affected in diabetes, are related to the health of oral tissues. Investigations of the salivary composition of participants with different systemic disorders have been made in a number of studies.[8,9] Dental caries and periodontitis are two conditions that have long been recognised as the distinguishing characteristics of DM. Moreover, the majority of diabetic patients complain of xerostomia (dry mouth) as a result of a general decrease in salivary flow brought on by systemic dehydration and an increase in salivary glucose levels.[10] The increased prevalence of oral diseases in people with diabetes has been attributed to a number of underlying pathologies, including decreased salivary flow, sluggish wound healing, and atherosclerosis; however, more research is required to determine how these conditions affect salivary composition.

METHOD AND MATERIALS

A total of 140 participants—50 without diabetes and 90 with Type II DM, which includes both managed and uncontrolled diabetes—were included in this study (controls). The participants in the study, whose ages ranged from 40 to 70, comprised both sexes.

Three groups were formed from the study subjects. I Group: (nondiabetes)

Between 90 and 140 mg/dl of nonfasting plasma glucose were randomly measured in 50 patients in Group I, ranging in age from 40 to 70.

40 diabetics between the ages of 40 and 70 who were undergoing therapy and whose nonfasting plasma glucose levels were between 120 mg/dl and 200 mg/dl made up Group II.

group three (uncontrolled diabetes)

This group consisted of 40 patients with nonfasting plasma glucose values above 200 mg/dl in Group III, aged 40 to 70, undergoing therapy for diabetes.

INCLUSIONSTANDARDS

- IndividualswithTypeIIdiabetes
- Activeparticipation
- Sexes: both sexes.

EXCLUSIONSTANDARDS

- Individuals receiving routine care for the same systemic ailment as well as other systemic disorders
- Women who are expecting
- Those with physical and mental disabilities.

SAMPLEGATHERING

All participants were thoroughly informed about the study before providing their informed consent in their original languages, preventing language bias. Saliva was then taken from each individual after that.

Saliva was collected between 10 and 11 a.m., with participants instructed to consume breakfast no later than 8 a.m. Collecting unprovoked saliva was accomplished by spitting.

The "spit technique" was used for gathering.

[8] While sitting in the chair, the patient was instructed to lean forward. They were instructed not to talk, drink, or move their heads during the procedure. The patient was instructed to spit into a clean, graded container every minute for ten minutes. Total proteins and electrolytes like sodium and potassium were measured in 2 ml of saliva that had been collected but had not been stimulated.

Aseptic conditions were used to evaluate salivary sample. Unstimulated saliva from the subjects was collected in pre-weighed vials, which were immediately checked for volume, then maintained at 200C until required for laboratory testing. Samples were centrifuged at 6000 rpm for 10 min to remove pollutants such food particles, oral epithelial cells, and bacteria, among others, after being defrosted at room temperature.

The samples were analysed at room temperature and fed into a machine that automatically analysed them to determine the following parameters:

Potassium (K+) and sodium (Na+) concentrations in the collected saliva were measured as part of the salivary ions test. Using a Roche 9180 electrolyte analyzer, the concentrations of K+ and Na+ were determined after saliva was diluted at a ratio of either 1/100 or 1/1000.

RESULTS

The values of total protein, sodium, potassium, and salivary flow rate among controls, controlled diabetes,

and uncontrolled diabetes were gathered, formulated, and subjected to multiple comparisons between groups using analysis of variance and post hoc Tukey honestly significant difference analysis in Version 16.0 of the Statistical Package for the Social Sciences (SPSS), IBM Corporation, Chicago, United States of America.

With readings ranging from 79 mg/dL to 96 mg/dL, the average fasting blood sugar for Group 1 was 88.9 mg/dL [Table 1].

Table1: Quantitative data of fasting blood sugar, sodium, potassium, total protein levels and salivary flow rate between case and control group

	n	Mean	SD	SE
Age				
Control	50	39.81	9.71	1.39
Controlleddiabetic	50	53.00	12.71	1.86
Uncontrolleddiabetic	50	57.11	9.91	1.44
Total	150	49.61	13.21	1.18
Blood sugar				
Control	50	89.91	5.41	0.64
Controlleddiabetic	50	1.63	11.02	1.59
Uncontrolleddiabetic	50	3.31	36.31	6.51
Total	150	1.63	65.31	6.81
Sodium				
Control	50	1.34	4.61	0.03
Controlleddiabetic	50	1.63	11.21	1.65
Uncontrolleddiabetic	50	1.53	8.71	1.04
Total	150	1.53	15.02	1.26
Potassium				
Control	50	5.01	0.84	0.78
Controlleddiabetic	50	7.51	0.30	0.18
Uncontrolleddiabetic	50	7.71	0.51	0.05
Total	150	6.51	1.24	0.14
Totalprotein				
Control	50	8.21	0.79	0.16
Controlleddiabetic	50	9.25	0.53	0.08
Uncontrolleddiabetic	50	9.25	0.57	0.90
Total	150	8.68	1.13	0.12
Salivaryflow rate				
Control	50	1.05	0.24	0.09
ControlledDiabetic	50	0.61	0.13	0.03
UncontrolledDiabetic	50	0.52	0.01	0.04
Total	150	0.79	0.83	0.83

Total protein, salt, and potassium values all increased significantly between the groups of those with managed diabetes and those without, whereas salivary flow rate decreased. The significance of the values (P 0.05) was determined statistically [Table 2].

Table 2: Comparative analysis of total protein, sodium, potassium levels and salivary flow rate between controlled and uncontrolled diabetes mellitus group

Parameter	Groups(mean±SD)			*P*
	Control	Controlleddiabetic	Uncontrolleddiabetic	
Age	53.51±8.21	52.1±12.31	57.21±9.94	0.08
Blood sugar	89.2±5.31	161.21±11.31	238.23±36.31	0.00
Sodium	140.41±4.42	169.21±11.21	157.3±8.70	0.01
Potassium	5.01±0.45	7.31±0.74	7.1±0.42	0.01
Totalprotein	8.2±0.75	10.31±0.24	10.21±0.35	0.00
Salivaryflow rate	1.0±0.28	0.64±0.10	0.35±0.31	0.00

DISCUSSION

The goals of this study were to assess the total protein, electrolytes, and salivary flow rate in diabetic patients and to compare those measurements across diabetic individuals with and without controlled diabetes. The participants in the study were divided into three groups: group 1 included 40 healthy people; group 2 included 40 participants with controlled diabetes; and group 3 included 40 participants with uncontrolled

diabetes. Saliva was collected from the sample population and biochemically analysed.

In the current study, diabetes patients have higher levels of total protein than non-diabetic people (Group 3). Uncontrolled and controlled diabetic groups exhibited significantly substantial positive correlations in salivary total protein levels, according to Aratiet al.[11] and Streckfus et al.[12]his could be explained by an increase in the basement membrane's permeability, which would make it simpler and more likely for serum proteins to enter the entire saliva through the openings in the gingiva and salivary glands.

Patients with diabetes reported increased levels of salivary protein, which Mata et al.[13] connected to decreased salivary fluid flow.

We found statistically significant differences in salivary flow rate between the healthy non-diabetic group, the controlled, and the uncontrolled diabetic groups in the current study. Diabetes patients had lower salivary flow rates than the healthy participants.

The decrease in salivary flow rate that occurs in diabetes might be due to a number of causes, including fatty cell infiltration into the salivary glands, dehydration brought on by polyuria or microvascular disease, or physical alterations to the mucosal cells as a result. Aside from metabolic problems, neuropathy that affects the salivary glands, localised oral inflammation and irritation, pharmacological treatment for diabetes, or concomitant drugs, other potential causes include those that affect the metabolism. In contrast to the results of the study by Meurman et al.[14], which revealed no statistically significant differences in salivary flow rates, the results of the current inquiry were contrary to those of that study. The many environmental factors and changes in sample selection may help to explain this. In the current study, it was found that salivary potassium ion concentrations were higher in diabetic patients than in non-diabetics. Similar results were observed by Lasisi and Fasanmade,[15] Mata et al., and others.[13]

The Ben-Aryeh et al. study.[16] supports what we found as well. The decreased salivary fluid flow brought on by diabetes is most likely what causes the elevated potassium concentration in diabetic patients' saliva. This might be due to Type 2 diabetes' intact ability to secrete salivary glands. On the other hand, Streckfuset al.[12] and Marder et al.[17] observed that there is no difference in the potassium level in diabetic individuals in their studies.

Salivary sodium concentration was found to be greater in the diabetes group than the controlled group in the current study. A decrease in salivary flow rate, which raises the sodium ion concentration in diabetics' saliva, may be the root of the problem.

In Lasisi and Fasanmade's investigation, the salivary sodium level in the sample from the diabetic patient did not differ noticeably from that of the control patient.

With the exception of salivary flow rate and total protein level, electrolytes such as sodium and potassium showed a statistically significant increase in controlled diabetics compared to uncontrolled diabetics in the current study's intergroup comparison. This suggests the following as probable causes:

• Smaller sample size

• A compromised salivary flow due to poorly controlled diabetes.

• The effects of particular medications taken by research group participants for systemic problems they may not have disclosed, according to Rosamund and William's research, which leads to a modified salivary flow rate.

CONCLUSION

Hence, larger sample size research are required to completely understand the pathophysiology of managed and uncontrolled Type II DM in terms of salivary flow rate, salivary electrolytes, and total protein.

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