

# Evaluation of Salivary Albumin in Type II Diabetes Mellitus

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## ABSTRACT

**Introduction:** Type II Diabetes mellitus is an endocrine disease characterized by a short fall in the production of insulin with consequent alteration of process of assimilation, metabolism and balance of blood glucose concentration. Albumin is the most osmotically active and abundant serum protein. It is regarded as a serum ultra-filtrate to the oral cavity and it may diffuse into the mucosal secretions due to disturbances in mucosal integrity. Hence, presence of albumin in saliva can be used to diagnose type II diabetes mellitus. Study aimed to assess if salivary albumin levels can be used as a potential marker in Type II diabetes mellitus.

**Material and Methods:** Study comprised of 15 cases of type II diabetes mellitus patients and 15 healthy individuals as controls inclusive of both the genders. The salivary albumin levels were estimated by bromocresol green dye method.

**Results:** Higher mean salivary albumin levels was observed in Type II DM when compared to controls. The mean difference was found to be statistically significant.

**Conclusion:** Salivary albumin levels can be used as one of the potential markers in type II diabetes mellitus.

**Keywords:** Advanced Glycation End Products, Diabetes Mellitus, Oral Mucosal Integrity, Salivary Albumin

## INTRODUCTION

Type II Diabetes mellitus is an endocrine disease characterized by a short fall in the production of insulin with consequent alteration of process of assimilation, metabolism and balance of blood glucose concentration which when left untreated can lead to serious complications.<sup>1</sup> Diabetes has generalised effect on the body including oral mucosa.

Early diagnosis of diabetes play a significant role in successful clinical treatment. Monitoring individuals with diabetes involve repeated evaluation of glucose levels. Regular pricking becomes quite cumbersome and painful which reduces the compliance. Thus there is a splurge of interest in non-invasive diagnostic method which necessitates the need for other bodily fluids.<sup>1</sup>

Saliva is an accessible clinical sample that has been in the spotlight of the researchers' attention due to its possession of different enzymes, molecules and distinctive function in the diagnosis and treatment of various diseases.<sup>2</sup>

Saliva is an organic bio- fluid, with complex composition and specific roles for monitoring health and disease states of an individual.<sup>3</sup> In type II DM, due to hyperglycemia, the advanced glycation end products (AGEs) cause changes in the microvasculature, basal membrane of salivary glands and oral mucosal tissues. This leads to easier diffusion of proteins from serum to saliva and also to gingival crevicular fluid.<sup>4</sup>

Salivary proteins are more sensitive and specific indicators for certain oral diseases. Albumin is the most osmotically active and abundant serum protein, accounting for more than 50% of all plasma proteins.<sup>4</sup> It is regarded as a serum ultra-filtrate to

the oral cavity and it may diffuse into the mucosal secretions due to disturbances in mucosal integrity which could contribute to mucosal disease.<sup>5,6</sup> Saliva offers a distinctive advantage over serum in estimation of albumin levels as it is non-invasive, easy to collect, expertise not required and cost effective.

In light of the above context, this study was undertaken to evaluate the salivary albumin levels in type II diabetes mellitus. Study aims and objectives were to estimate the levels of salivary albumin in healthy controls and type II diabetes mellitus, to compare the levels of salivary albumin between healthy controls and type II diabetes mellitus and to assess if salivary albumin levels can be used as a potential marker in Type II diabetes mellitus.

## MATERIAL AND METHODS

This study consisted of 15 cases of selected type II DM and 15 healthy individuals with the age range between 30 – 65years inclusive of both the genders who reported to the Department of Oral Medicine and Radiology, M.R.Ambedkar Dental College Hospital and B.R.Ambedkar Medical College and Hospital, Bangalore. This study was approved by the Ethical Review Board of M.R.Ambedkar Dental College and Hospital, Bangalore.

The selected subjects were grouped into 2 Groups, Group I included 15 cases of healthy individuals as Controls and Group II included 15 cases of Type II Diabetes mellitus as study subjects.

### Inclusion criteria

1. Patients who were diagnosed as Type II Diabetes mellitus with no other systemic disease.
2. Healthy subjects with blood glucose within normal level for controls.

### Exclusion criteria

1. Pregnancy.
2. Patients with salivary gland disorders and on treatment for salivary gland diseases.
3. Patients who had undergone surgery of the salivary glands.
4. Patients who had been exposed to chemotherapy/radiation for head and neck.

### Methodology

Diabetic patients were confirmed with HbA1c levels (> 6.4%)

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and controls were confirmed with fasting blood glucose levels (< 110mg/dl). After an informed consent, detailed case history was taken and the subjects were subjected to the procedure to be carried out on them. The patients were asked to rinse the mouth thoroughly with water and fasting saliva was collected by instructing them to spit the unstimulated saliva, pooled in the mouth into the sterile plastic container for a period of 5 minutes. Around 2ml of saliva was collected and stored in the ice pack container. The collected samples were transported to the lab where it was centrifuged at 3000rpm for 15 minutes to get supernatant of the saliva and salivary albumin levels were estimated by Bromocresol green dye method using an AutoAnalyzer.

**STATISTICAL ANALYSIS**

Statistical analysis was done with the help of SPSS version 21. Salivary albumin values were recorded and the obtained values were subjected to statistical analysis (Mann-Whitney test).

**RESULTS**

In the present study, the mean age in group II was 53.13 years [Table 1]. Less difference was observed in regard with gender distribution [Table 2]. Higher mean salivary albumin levels were observed in group II when compared with group I. The observed difference in mean salivary albumin was found to be statistically significant ( $P < 0.001$ ) [Table 3].

**DISCUSSION**

Diabetes mellitus (DM) is characterized by chronic hyperglycemia and impaired carbohydrate, lipid and protein metabolism caused by complete or partial insufficiency of insulin secretion and/or insulin action.<sup>7</sup>

Type II diabetes mellitus, which constitutes more than 95% of the diabetic populations has an insidious onset with a long, latent, asymptomatic phase.<sup>8</sup> It has been reported that 41 million diabetic patients are found in India.<sup>9</sup>

Salivary diagnostics is an emerging field that has progressed through several important developments in the past decade.

Salivary gland function, molecular levels and salivary enzymes

experience changes in diabetic patients.<sup>2</sup> The constituents of saliva not only maintain the oral health but also play a vital role in the diagnosis of various diseases.<sup>6</sup>

In general, Albumin is the most osmotically active plasma protein whose major function is general binding and transportation of protein. This protein is regarded as a serum ultra-filtrate to the oral cavity and it may diffuse into the mucosal secretions and thus found in saliva.<sup>5,6</sup> The presence of salivary albumin can contribute to the diagnosis of diabetes mellitus.

In the present study, the mean age in group II was 53.13 years. Less difference was observed in regard with gender distribution. This may be due to the fact that diabetes has no gender predilection.

The mean salivary albumin level in group I was found to be 0.01 mg/dl and in group II was 0.09 mg/dl. On comparing, the levels were observed to be high in group II [Table 3].

This observed difference was found to be highly statistically significant ( $P < 0.001$ ) [Table 3].

This could be due to diabetic membranopathy, causing leakage of albumin across the basement membrane into the salivary secretion.<sup>4</sup> Expression of salivary albumin, symbolizes loss of integrity of oral mucosa thereby making the site vulnerable to oral diseases which may lead to future complications in diabetes mellitus.

Our findings are consistent with studies conducted by Vaziri PB et al<sup>5</sup> and Ahmed MAA et al<sup>10</sup> who also found increased salivary albumin levels in type II diabetes mellitus.

There are certain limitations of saliva that need to be addressed. Saliva does not reflect the real concentration of all parameters from blood. There is a problem with extremely high viscosity of saliva due to the existing mucopolysaccharides and mucoproteins which can interfere with the analytical procedure.<sup>3</sup>

**CONCLUSION**

Saliva as a diagnostic clinical medium has become a more attractive option because of its ability to mirror both oral and systemic health conditions. The expression of salivary albumin suggests hyperglycaemia and symbolizes the loss of integrity of oral mucosa thus contributing to the vulnerability of the site to oral diseases. Thus, evaluation of salivary albumin levels can play a significant role in describing and further understanding of oral mucosal diseases.

Salivary albumin levels portrays to be a potential marker in type II diabetes mellitus which can be used in screening large populations at community level, health care programs and in epidemiological studies.

It is suggested that, one should add new dimensions and lay the foundation in making use of saliva profile because it has the potential to display substances existing in human serum.

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Group	n	Mean Age	Std. Deviation	Std. Error of Mean
Group I	15	46.80	8.00	2.07
Group II	15	53.13	7.53	1.94

**Table-1:** The mean age in group I and group II was 46.80 and 53.13 years respectively

Gender	Group I		Group II	
	N	%	N	%
Male	9	60%	7	47%
Female	6	40%	8	53%
Total	15	100%	15	100%

**Table-2:** Group I consisted of 9 males and 6 females and group II consisted of 7 males and 8 females

Group	n	Mean	Std. Deviation	Std. Error of Mean	Mean Difference	Z	P-Value
Group I	15	0.01	0.04	0.01	0.08	-4.318	<0.001*
Group II	15	0.09	0.03	0.01			

**Table-3:** Comparison of salivary albumin levels between the two groups

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