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# Flow Rates of Resting whole Saliva of Diabetic Patients in Relation to Age and Gender

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**Key words**
flow rates, saliva, diabetes mellitus.

## Abstract

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia, present with symptoms such as thirst, polyuria, and weight loss. The oral complications associated with this disease include dry mouth due to decrease in salivary flow and enlargement of the salivary glands.

Cross sectional study conducted to estimate flow rates of resting whole saliva in 150 subjects (100 diabetic patients of both types I & II as experimental group, and 50 subjects as control group) which correlated with age and gender.

The subjects were divided into three main groups: control group and two diabetic groups according to the types of diabetes mellitus( I & II).

Unstimulated saliva were collected, and salivary flow rate was measured by establishing the time factor (5 minutes), after estimating the volume of collected saliva the salivary flow rate was calculate as ml/min.

Results indicated that poorly controlled diabetic patients had more diminished salivary flow rate when compared with good controlled diabetic and non-diabetic subjects. Female diabetic patients older than 45 years, revealed a lowered salivary flow rate when compared with male diabetic patients younger than 45 years.

## Introduction

Diabetes mellitus (DM) is a chronic metabolic and systemic disorder that affects more than 100 million people worldwide. It is the sixth leading underlying cause of death in the world [(1)] . The average flow rate of unstimulated whole saliva in healthy adults is about 0.3 ml/min with an extreme variation between individuals range (0.08 - 1.85 ml/min) [(2)]. All studies take place on the flow rate in diabetic patient showed that it was decreased when compared with that in normal subject, dry mouth or xerostomia is commonly reported as oral symptom of diabetes mellitus [(3)] . Ciglar *et al* concluded that dry mouth in diabetic patients may occur due to pronounced polyuria in non-regulated and inadequately regulated cases, and also found a significant decrease in the amount of stimulated saliva in type 1 diabetics. In all diabetic patients, a significantly decreased salivary flow was recorded as compared to normal subjects[(4)]. This study aimed to determined the effect of diabetic mellitus on flow rates of resting whole saliva which correlated with age and gender.

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## Patients and Method

**Subjects**

The sample consist of 150 subjects, the age ranged (22 – 64 years) of both sexes (50 % males & 50 % females). 100 were diabetic patients which refereed to Dental Teaching Hospital of Dentistry College/Tikrit University and Private Dental Clinic in Tikrit city which medically confirmed diagnoses, they compare with 50 subjects as control group.The subjects were divided into three main groups:

**1.** Group A: control group include 50 healthy subjects (50 % males & 50 % females).

**2.** Group B: Insulin Dependent Diabetes Mellitus (IDDM) group, includes 50 patients (25 males & 25 females). This group subdivided into:-

**a.** Subgroup B1: Good controlled diabetic patients, includes 25 (13 males & 12 females) controlled at least three months and more.

**b.** Subgroup B2: Poorly controlled diabetic patients, includes 25 (12 males & 13 females) patients.

**3.** Group C: Diabetic with Non-Insulin Dependent Diabetes Mellitus (NIDDM) group, includes 50 (25 males & 25 females) patients. This group also subdivided into two subgroups according to control status:-

**a.** Subgroup C1: Good controlled includes 25 (13 males & 12 females) patients with good control at least three months and more.

**b.** Subgroup C 2: Poorly controlled, includes 25 (12 males & 13 females) patients.

**A questionnaire were Designed and Included the Followings**

Name, age, gender, their dental and medical histories, type of diabetes and treatments taken , blood glucose level, duration of the disease and further complications associated with diabetes.

**Sample Collection**

Whole unstimulated saliva was collected for 5 minutes in test tube, with the patient sitting quietly in restful and quiet circumstances between 9.00 - 12.00 Am. Each patient was instructed to wash and rinse his mouth by 25 ml of distilled water several times to insure the removal of any possible food debris and contaminating materials[5]. Immediately after collection of saliva, the salivary flow rate in ml/min was measured after assessing the volume of saliva.

**Statistical Analysis**

The statistical analysis of data has done by using Student t-test.

## Results

**1. The Sample**

Table (1) explained the number and percentage of diabetic patients type I and type II that suffering and not suffering from dry mouth compared with non-diabetic individuals who are feeling and do not feeling dry mouth.

**2. The Relation of Salivary Flow Rate to Age**

The mean values of salivary flow rate of diabetic patients IDDM and NIDDM older than 45 years are ($0.20 \pm 0.14$ and $0.23 \pm 0.10$; respectively),while for diabetic patients IDDM and NIDDM younger than 45 years are ($0.39 \pm 0.09$ and $0.41 \pm 0.08$ respectively), in comparison with control subjects older and younger than 45 years who had mean salivary flow rate were ($0.52 \pm 0.16$; and $0.54 \pm 0.17$). The results revealed significant differences ($p < 0.05$) using t-test when comparison between diabetic and control patients take place in both groups as shown in table (2).

**3. The Relation of Salivary Flow Rate to Gender**

The mean values of salivary flow rate for female IDDM and NIDDM patients were ($0.29 \pm 0.14$ and $0.26 \pm 0.17$, respectively) while for male were ($0.31 \pm 0.19$ and $0.34 \pm 0.18$, respectively). The results indicated significant differences ($p < 0.05$) in flow rates by using t-test in female and male in comparison with control group

(0.47 ± 0.04; and 0.49 ± 0.10, respectively). Within diabetic groups, the female had lower salivary flow rate than male but this difference statistically not significant (p>0.05) as shown in table (3).

## Discussion

**1. Salivary Flow Rate and Age**

According to the mean values of salivary flow rates of all groups, diabetic patients type I & type II older than 45 years had decreased salivary flow rate than diabetic patients type 1 & type 2 younger than 45 years and when compared with control subjects older and younger than 45 years as shown in table (3). These findings may due to diabetes mellitus causes enlargement of salivary glands, decrease in the number of acinar structure, and hypertrophy. All these changes may lead to malfunctions of salivary glands and may affect on salivary production [(6)]. Dryness of the mouth is found frequently in older people in conjunction with pathologic states such as diabetes mellitus and renal diseases or drug induced changes. Healthy people continue to have normal salivary flow rate. Xerostomia is not a result of aging but is associated with certain diseases and medications [(7)]. Some researchers suggest that unstimulated salivary flow is related to age. It has also been suggested that there are some age-related alterations in salivary function[(8,9,10)]. While other reports seems that old age does not cause diminished salivary flow[(11,12)]. Our results are in agreement with the findings reported by Gibbon[(13)] who found that xerostomia becomes more common as patients become older; With aging, the salivary systems become less resistant to insult, this may be partly because cells that secrete saliva are gradually replaced by fibrous and adipose tissues. Consequently salivary output can be reduced by as much as 30%-40%. Further, increased prevalence of chronic medical conditions with aging leads to increase in the numbers of medications taken. Because of these factors, approximately 25% of the elderly suffer from xerostomia. however, also it may be a symptom of an underlying disease such as diabetes mellitus or drug side effect [(14,15)].

**2. Salivary Flow Rate and Gender**

In this study reduced salivary flow rates in both diabetic patients type 1 & type 2 , for females and for males when compared with females and males in control group (0.47 ml/min ± 0.04 and 0.49 ml/min ± 0.10, respectively).These results are in agreement with the results reported by Dawes[(16)], who explained his findings that may due to polyuria, salivary glands malfunctions, different size of salivary glands and medication. This study it noticed that the secretion of males is more abundant than in females, the same as found by Parvinen [(17)] who mentioned that in menopause, many women seem to suffer from dry mouth, which then ameliorates in older age. The findings of this study are also in agreement with the results reported by Meurman[(18)], who found that women had lower mean values of saliva flow rate (0.20-0.40 ml/min) than men (0.40 ml/min - 0.80 ml/min). In this study, the differences between the sexes were statistically significant ($p < 0.001$) by t-test in all age groups in medicated and unmedicated patients. The medicated patients had a slightly lower mean flow rates than unmedicated ones, the difference being statistically significant in patients aged over 60 years ($p < 0.01$) and in men aged over 60 years ($p < 0.05$). Multiple systemic diseases such as diabetes mellitus and renal failure, special behaviors and finally medications have been reported to cause dry mouth and/or salivary gland hypo function[(19,20,21)].

## Conclusion

Concerning the age factor the salivary flow rates of diabetic patients type I & II older than 45 years had decreased than diabetic patients of both types younger than 45 years and when compared with control subjects both older and younger than 45 years. Concerning the gender, the salivary flow rates of females diabetic patients type I & II had decreased when compared with male diabetic patients of both types and male of control subjects.

Table (1)**:-** Distribution of diabetic and non-diabetic patients according to the dry mouth.

| Group | Dry mouth | |
|---|---|---|
| | Yes (%) | No (%) |
| Type I | 38 ( 76 % ) | 12 ( 24 % ) |
| Type II | 34 ( 68 % ) | 16 ( 32 % ) |
| control group | 18 ( 36 % ) | 32 ( 64 % ) |

Table (2):- The mean, SD, of the salivary flow rate of the diabetic and control patients according to the age.

| Para-meter | Age | Diabetic groups | | Control group | t test of IDDM vs control group | S | t test of NIDDM vs control group | S |
|---|---|---|---|---|---|---|---|---|
| | | IDDM | NIDDM | | | | | |
| | | Mean & SD | Mean & SD | Mean & SD | | | | |
| Saliva flow | < 45 | 0.20 ± 0.14 | 0.23 ± 0.10 | 0.52 ± 0.16 | 2.17 | P<0.05 | 2.23 | P<0.05 |
| | > 45 | 0.39 ± 0.09 | 0.41 ± 0.08 | 0.54 ± 0.17 | | | | |
| t-value < 45 vs > 45 | | P<0.05 | P<0.05 | P<0.05 | | | | |

Table (3):- The mean, SD, of the salivary flow rate of the diabetic and control patients according to the gender.

| Para-meter | Gender | Diabetic groups | | Control group | t test of IDDM vs control group | S | t test of NIDDM vs control group | S |
|---|---|---|---|---|---|---|---|---|
| | | IDDM | NIDDM | | | | | |
| | | Mean & S | Mean & S | Mean & S | | | | |
| Saliva flow | F | 0.29 ± 0.14 | 0.26 ± 0.17 | 0.47 ± 0.04 | 1.45 | P<0.05 | 1.67 | P<0.05 |
| | M | 0.31 ± 0.19 | 0.34 ± 0.18 | 0.49 ± 0.10 | | | | |
| t-value male vs female | | Ns | Ns | Ns | | | | |

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