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# SALIVARY FLOW RATE AND ELECTROLYTES IN YOUNG MALE SAUDIS

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## ABSTRACT

The saliva comprises health benefits and its output, composition and flow rate are helpful in understanding the clinical disorders. In the present study, the salivary flow rate (SFR) and electrolyte estimation in unstimulated saliva (USS) and stimulated saliva (SS) were carried out in young male Saudis (n: 124) (Makkah, KSA) showing presence of oral dryness (ODP; n:48; 38.71 %) and absence of oral dryness (ODA; n:76; 61.29 %). The results showed significant variations for SFR in USS (p= 0.0187) and SS (p=0.0462). The salivary sodium, potassium and calcium were determined. However, except calcium levels both in USS (p=0.0155) and SS (p=0.0049), no any significant change in other electrolytes could be found. In view of the significant alterations in SFR and salivary calcium levels in USS and SS in ODP and ODA, it is suggested to the clinicians to pay much attention on the diagnostic value of salivary flow rate and composition.

**Keywords:** Stimulated and unstimulated saliva, salivary flow rate, electrolytes, oral dryness

## INTRODUCTION

The saliva comprises health benefits and its output, composition and flow rate are helpful in understanding the clinical disorders (Dodds *et al*., 2005). It plays a prominent role in the lubrication of the alimentary tract bolus, buffering and repairing the oral mucosa, protection against the microorganisms and other oral functions. However, very little has been studied about the alteration in the quantity or quality of saliva (Humphrey and Williamson, 2001).

The composition of saliva may play an important role in the perception of food ingredients and liking (Neyraud *et al*., 2011). Saliva baths the taste receptors and has aroma and taste compounds that are released when food is eaten (Neyraud *et al*., 2011). Increase or decrease in mastication might affect saliva output and may influence in certain medical conditions, such as diabetes mellitus (Dodds *et al*., 2005).

It has been found that the salivary proteins provide lubricative, digestive and antimicrobial functions and hence, provide a barrier between oral soft tissues and toxins (Edgar and O'Mullane, 1996). Furthermore, these proteins help modulating the salivary calcium (Edgar and O'Mullane, 1996). Saliva is considered as an increasingly useful auxiliary means of diagnosis (de Almeida *et al*., 2008). Systemic illnesses are diagnosed by sialometry and sialochemistry for monitoring general health. There are several systemic diseases e.g. coeliac disease (CD) that impair the salivary flow and composition that in turn may cause pathological conditions (Lenander-Lumikari *et al*., 2000). Saliva is a useful tool in the diagnosis of some physiological and pathological alterations in body functions and in understanding important and interesting aspects of trace metal metabolism (Olmez *et al*., 1988). There are several factors that can influence salivary secretions and composition. Hence, this requires the collection of standardized saliva that may reflect the real functioning of salivary glands and play role in monitoring the health (de Almeida *et al*., 2008a).

The unstimulated salivary flow rate in the general population (Humphrey and Williamson, 2001) and in children and adults has extensively been done (Navazesh *et al*., 1992; Bretz *etal*., 2001; Humphrey and Williamson, 2001; Dezan *et al*., 2002; Fenoll-Palomares *et al*., 2004; Rotteveel *et al*., 2004; Ono *et al*., 2006). It has been studied that the resting salivary flow rate increases throughout childhood and it may reflect a developmental process. A decrease during aging may be interpretted as a consequence of parenchymal atrophy (Ben-Aryeh *et al*., 1990; Fenoll-Palomares *et al*., 2004).

The concentration of various constituents of saliva is markedly influenced by change in salivary flow rate (Brawley, 1935; Granick and Hanna, 1992; Deburgh-Norman *et al*., 1995). Concentration of various components of saliva is markedly influenced by variations in flow rate (Granick and Hanna, 1992; Deburgh-Norman *et al*., 1995). For example, when the flow rate of saliva increases above the unstimulated rate, potassium and calcium decrease in adults (Granick and Hanna, 1992). At higher flow rates, potassium does not change in adults (Granick and Hanna, 1992). It has been reported that the potassium ion is not altered by flow rate in children aged 6-10 years (Siqueira *et al*., 2004). Calcium in male subjects was determined in the unstimulated saliva (Agha-Hosseini *et al*., 2006). Furthermore, the stimulated salivary flow rate decreases in xerostomia (de Almeida *et al*., 2008b).

Dry lip was noticed in 37.5 % subjects and was found related to low resting or unstimulated salivary flow rate (Farsi et al., 2007). The salivary flow rate found decreased in subjects complaining dry mouth has a great clinical importance since this reduction in flow rate of saliva might be related to various salivary functions (Farsi *et al*., 2007). Hence, the required supply of saliva and normal salivary flow and functions are essential for the normal human health (Humphrey and Williamson, 2001).

## MATERIALS AND METHODS

The subjects in the area of Makkah, Kingdom of Saudi Arabia (KSA) showing presence of oral dryness (ODP) or absence of oral dryness (ODA) were consulted for the present study. The oral dryness (OD) in the present study comprised mainly the lip dryness and was considered as mouth dryness. The total number of subjects and their mean age is given in Table 1. The average age in both groups (those showing ODP (n: 48; 38.71 %) and those showing ODA (n: 76; 61.29 %) was similar (p=0.8224).

Table 1. Subjects showing the presence or absence of oral dryness.

| **No and age of subjects** | | **Oral dryness** | |
|---|---|---|---|
| | | Present | Absent |
| Subjects | No | 48 | 76 |
| | % | 38.71 | 61.29 |
| Age (years) | Mean | 25.85 | 26.02 |
| *NS | SD | 2.34 | 4.89 |

*NS : non-significant ( p=0.8224)

The saliva from both groups in unstimulated condition (USC) was collected in milliliters for five minutes duration and evaluated as ml/min. The collection of saliva in stimulated condition (SC) was also carried out. Chewing the paraffin-wax was used for collecting the samples of stimulated saliva (SS). The stimulated saliva (SS) and unstimulated saliva (USS) were collected during 9-10 am. Salivary flow rate (saliva in ml/min; SFR) was evaluated in both conditions. Saliva was then centrifuged and electrolytes (sodium, potassium and calcium) were measured by routine kit methods. The values were denoted as mean ± SEM or SD. The analyzed data is given in Table 1-3 and shown diagrammatically in Fig 1-4. Statistical analysis of the data for SFR and electrolytes was done simply by employing students' unpaired t-test using SPSS program, and values of 'p' were evaluated.

## RESULTS AND DISCUSSION

Randomly selected healthy subjects revealed that 39% of them were having ODP. Whereas, remaining 61 % subjects showed ODA. The mean ± SEM values for SFR in the physiological conditions of USS and SS are given in Table 2 and shown in Fig.1 and 2. The results showed significant variations for SFR (p= 0.0187) in USS and SS (p=0.0462).

Table 2. Salivary flow rate and oral dryness in young male Saudis.

| **Physiological conditions** | | **SFR (ml/min)** | | **Significance** |
|---|---|---|---|---|
| | | ODP (n:48) | ODA (n:76) | (p) |
| USS | Mean | 0.66 | 0.75 | 0.0187 |
| | SEM | 0.0346 | 0.0206 | |
| SS | Mean | 1.47 | 1.58 | 0.0462 |
| | SEM | 0.0419 | 0.0344 | |

USS: unstimulated saliva, SS: stimulated saliva, SFR: salivary flow rate, ODP: oral dryness present; ODA: oral dryness absent; n: number of subjects

Table 3 provides information about the average values (mean ± SEM) for electrolytes (sodium, potassium and calcium). However, except calcium levels both in USS (p=0.0155) and SS (p=0.0049), no any other change was found significant (Table 3; Fig 3 and 4). However, the average values for all parameters whether in USS or SS were found decreased in ODA compared to ODP (Table 3). In certain evaluations, these decrements were quite considerable and closer to the significance levels designated in the present data e.g. the sodium and potassium levels in USS showed the p value around 0.07.

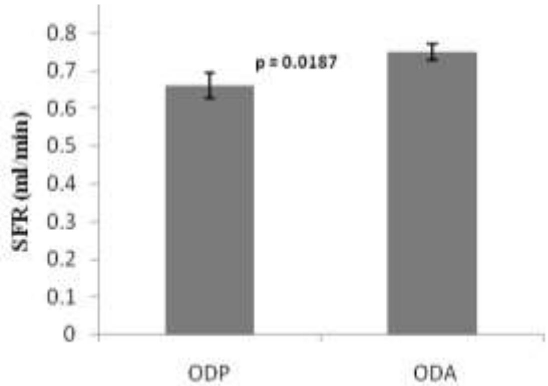


**Fig.1. Unstimulated salivary flow rate and oral dryness in young male Saudis.** (SFR: saliva flow rate; ODP: oral dryness present; ODA: oral dryness absent)

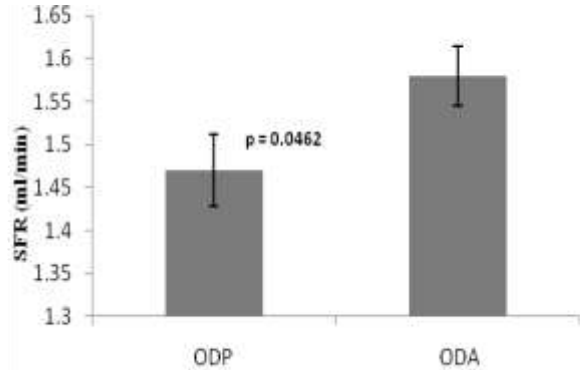


**Fig.2. Stimulated salivary flow rate and oral dryness in young male Saudis.** (SFR: saliva flow rate; ODP: oral dryness present; ODA: oral dryness absent)

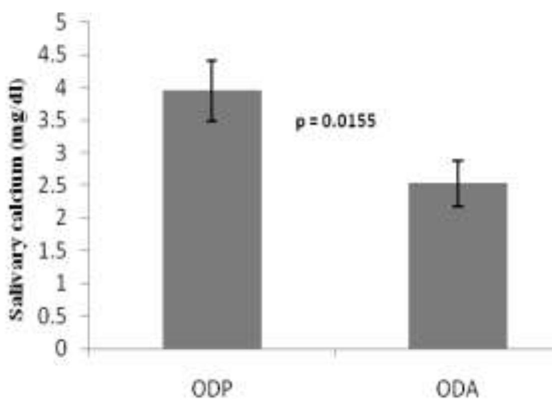


**Fig.3. Unstimulated salivary calcium and oral dryness in young male Saudis.** (SFR: saliva flow rate; ODP: oral dryness present; ODA: oral dryness absent)

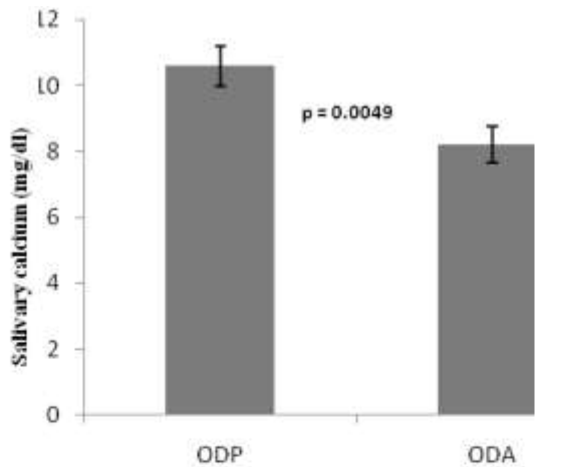


**Fig.4. Stimulated salivary calcium and oral dryness in young male Saudis.** (SFR: saliva flow rate; ODP: oral dryness present; ODA: oral dryness absent)

Table 3. Salivary electrolytes and oral dryness in young male Saudis.

| **Salivary measurements** | **Physiological conditions** | | **Oral dryness** | | **Significance (p)** |
|---|---|---|---|---|---|
| | | | Present (n:48) | Absent (n:76) | |
| Sodium (mmol/l) | USS | Mean | 10.76 | 8.26 | 0.0699 |
| | | SEM | 1.11 | 0.83 | |
| | SS | Mean | 17.63 | 16.00 | 0.0927 |
| | | SEM | 0.75 | 0.60 | |
| Potassium (mmol/l) | USS | Mean | 22.43 | 18.63 | 0.0656 |
| | | SEM | 1.64 | 1.25 | |
| | SS | Mean | 88.37 | 75.09 | 0.0819 |
| | | SEM | 7.56 | 3.67 | |
| Calcium (mg/dl) | USS | Mean | 3.95 | 2.53 | 0.0155 |
| | | SEM | 0.46 | 0.35 | |
| | SS | Mean | 10.6 | 8.21 | 0.0049 |
| | | SEM | 0.61 | 0.54 | |

USS: unstimulated saliva, SS: stimulated saliva, SEM: standard error of mean, SFR: salivary flow rate, n: number of subjects

The present report provides a variety of investigations that were not known in the specific population of KSA. However, either such studies were not carried out for various populations world over, or results are very controversial. The third reason of these discrepancies might had been due to not carrying out controlled studies, e.g. not considering age, sex etc and clinical conditions wherein studies were carried out.

The results obtained for salivary flow rate in the present study are in the range assessed by other workers (Humphrey and Williamson, 2001; Navazesh *et al*., 1992; Bretz *et al*., 2001; Dezan *et al*., 2002; Fenoll-Palomares *et al*., 2004; Rotteveel *et al*., 2004; Ono *et al*., 2006). However, the present results show higher values of SFR.

The alterations found in the saliva composition in the present study resemble with the reports of others (Brawley, 1935; Granick and Hanna, 1992; Deburgh-Norman *et al*., 1995). The significant values for salivary calcium in stimulated and unstimulated conditions in subjects showing oral dryness and those not showing oral dryness are quite similar to Agha-Hosseini *et al*. (2006) and Farsi *et al*. (2007). Farsi et al. (2007) found dry lip in 37.5 % subjects whereas the current report shows 38.71 % that are quite similar in prevalence. The salivary flow rate found decreased in subjects complaining dry mouth has a great clinical importance since this reduction in flow rate of saliva might be related to various salivary functions as have been noticed by Farsi *et al*. (2007). As suggested by Humphrey and Williamson (2001), much has been written on salivary hypofunction but clinicians still do not value the several benefits of saliva until quantities are decreased. This emphasizes that much attention is needed to be given on the diagnostic value of salivary composition.

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