

Salivary glucose concentration in patients with angular cheilitis

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Abstract

Angular Cheilitis is the term used for an infection involving the lip commissures and cracked skin at the angles of the mouth. High salivary concentration of glucose predispose to infection in the angles of the mouth. Thus this study was conducted to find out how many patients with angular cheilitis were having an increase in salivary glucose level. Twenty-nine patients (16 females and 13 males) between the age of 31-68 years with angular cheilitis were used in this study. Salivary glucose concentration was measured for each patients. The patients with angular cheilitis had higher salivary glucose level ($0.96 \text{ mmol/L} \pm 0.21$), than control subjects ($0.64 \text{ mmol/L} \pm 0.13$) with significant differences ($p < 0.05$) by t-test in comparison between two groups. Angular cheilitis patients older than 50 years old recorded higher salivary glucose level ($0.87 \text{ mmol/L} \pm 0.14$) when they compare with the control subjects who were older than 50 years old ($0.59 \text{ mmol/L} \pm 0.08$). The differences between them are significant differences ($p < 0.05$) by using T- test. The mean values of salivary glucose level for female angular cheilitis patients ($0.90 \text{ mmol/L} \pm 0.14$), were higher than male angular cheilitis patients ($0.85 \text{ mmol/L} \pm 0.10$). The results indicated significant differences ($p < 0.05$) by t-test when compared with mean values of female and male control subjects ($0.67 \text{ mmol/L} \pm 0.09$, and $0.61 \text{ mmol/L} \pm 0.09$, respectively). Angular cheilitis patients wearing prosthetic appliances recorded higher mean values of salivary glucose level ($0.83 \text{ mmol/L} \pm 0.19$), than angular cheilitis patients, who do not wearing prosthetic appliances ($0.76 \text{ mmol/L} \pm 0.11$). Further study was needed to determine the salivary flow rate of patients with angular cheilitis.

Introduction

Oral candidiasis is a common opportunistic infection of the oral cavity caused by an overgrowth of *Candida* species, the commonest being *Candida albicans*. The incidence varies depending on age and certain predisposing factors. There are three broad groupings consisting of acute candidiasis, chronic candidiasis, and angular cheilitis. Risk factors include impaired salivary gland function, drugs, dentures, high carbohydrate diet, and extremes of life, smoking, diabetes mellitus, Cushing's syndrome, malignancies, and immunosuppressive conditions (1).

Angular cheilitis is an erythematous fissuring at one or both corners of the mouth and is usually associated with an intraoral candidal infection. Other organisms implicated are staphylococci and streptococci. In the case of staphylococci the reservoir is usually the anterior region of the nostrils and spread to the angles of the mouth has been confirmed by phage typing. Facial wrinkling at the

corners of the mouth and along the nasolabial fold especially in older people leads to a chronically moist environment that predisposes to this lesion. This wrinkling is worse in long term denture wearers because there is resorption of bone on which the dentures rest leading to a reduction in height of the lower face when the mouth is closed. Other factors implicated in the etiology of this condition are iron deficiency anemia and vitamin B12 deficiency (2).

Candida is a fungus and was first isolated in 1844 from the sputum of a tuberculous patient, and also they can metabolize glucose under both aerobic and anaerobic conditions. Temperature influences their growth with higher temperatures such as 37°C that are present in their potential host, promoting the growth of pseudohyphae. They have been isolated from animals and environmental sources. They can be found on or in the human body with the gastrointestinal tract, the vagina, and skin being the most common sites and *C. albicans*

being the commonest species isolated from these sites (3).

Subjects and Methods

Twenty-nine patients (16 females and 13 males) between the ages of 31-68 years with angular cheilitis were referred to teaching hospital and private dental clinic in Tikrit city. The study of the samples was between March and June 2008. Medical history was taken for each patient for the presence of any systemic disease. Intra and extra oral examinations were done for each patient by using dental light, mirror, probe and tweezers.

A total of 29 samples of saliva were taken from different cases of angular cheilitis as experimental group (Group A) for salivary glucose estimation, and 23 samples of saliva from normal individuals as matched control (Group B) to estimate salivary glucose level by enzymatic method (glucose-oxidase method- Srinivasan et al, 2003) {4}.

Results

Twenty-nine patients (16 females and 13 males) between the age of 31-68 years with a mean age of (38.43) years. Each was with angular cheilitis. Twelve patients were denture wearers (41.38 %), others were not. The concentration of salivary glucose and variable study are:

The relation of salivary glucose level to all experimental and control groups are as shown in this paragraph. The mean values of salivary glucose level for angular cheilitis patients (group A) are equal to (0.96 mmol / L $\pm$ 0.21), while for control subjects (group B) are equal to (0.64 mmol/L $\pm$ 0.13). The result revealed significant differences ($p < 0.05$) by t-test in comparison with mean values of salivary glucose level for both groups A & B. The patients with angular cheilitis had higher salivary glucose level than control subjects as seen in (table 1). While the relation of salivary glucose level to age, the mean values of salivary glucose level for angular cheilitis patients older than 50 years old are equal to (0.87 mmol/L $\pm$ 0.14), while for angular cheilitis patients younger than 50 years old are equal to (0.72 mmol/L $\pm$ 0.12), in comparison with control subjects older and younger than 50 years old who had mean salivary glucose level are

equal to (0.59 mmol/L $\pm$ 0.08, and 0.51 mmol/L $\pm$ 0.05, respectively), with significant differences ($p < 0.05$) by t-test when compared between angular cheilitis patients and control subjects, but within angular cheilitis patients, no significant differences were found among them as shown in table (1).

Moreover, the mean values of salivary glucose level for female angular cheilitis patients are equal to (0.90 mmol/L $\pm$ 0.14), while for male angular cheilitis patients are equal to (0.85 mmol/L $\pm$ 0.10). The results indicated significant differences ($p < 0.05$) by t-test in comparison with mean values of female and male control subjects (0.67 mmol/L $\pm$ 0.09, and 0.61 mmol/L $\pm$ 0.09, respectively). The female had higher salivary glucose level than male but no significant difference was found among angular cheilitis patients as illustrated in table (1).

Furthermore, the relation of salivary glucose level to wearing of fixed and removable prosthetic appliances.

Angular cheilitis patients that wearing prosthetic appliances recorded the higher mean values of salivary glucose level (0.83 mmol/L $\pm$ 0.19), than angular cheilitis patients, who do not wearing prosthetic appliances (0.76 mmol/L $\pm$ 0.11) but no significant differences were found when compared among the angular cheilitis patients wearers and not wearers of prosthetic appliances as illustrated in table (1).

Discussion

The variation regarding the salivary glucose level in patients with angular cheilitis may be related to impaired salivary gland functions, to advance of age, to gender, wearing fixed and removable appliances, which considered as additional local causative and predisposing factors that lead to angular cheilitis.

In this study, the results revealed that the age range of patients with angular cheilitis was of (31-68) years which is a wide range because in each group of age there is a possibility to be affected with angular cheilitis if the causative and predisposing factors were presents. Quantity of saliva was decreased in older subjects than younger

subjects; this reduction was due to a decrease in salivary flow rate that leads to increase in salivary total protein concentration and to differences in salivary glucose levels between angular cheilitis patients and control subjects). These findings are similar with the findings reported by (Morgan, 2001).

Twelve patients (%) were denture wearers; the reason for the presence of angular cheilitis in those patients is that denture may have both direct and indirect etiological significance.

Directly, over-closure, decrease in vertical dimension, poor lip-support and denture stomatitis will predispose for an infection of the angles of the mouth. Indirectly, poor functioning dentures may direct the patients' choice of food to deficient diet, which may result in a state of nutritional deficiency. Saliva under the dentures was more concentrated with increased of its viscosity and density as reported by (Webb, et al, 1998; Samaranayake, et. al. 2006; Ariyawardana, et. al 2007).

Females were affected with angular cheilitis more than males, because the physical and chemical properties of saliva such as flow rate which is more prominent decreased in females than males, pH, velocity, viscosity are more affected and dependent on saliva composition, and hormonal disturbances. These findings are in agreement with the results of other investigators (Axell, 1990; and Taghreed F.Z, 2008).

The results of our study are in agreement with the findings of (Lale Karaagaciloglu, 2007 and Darwazeh A, 1999), whom found that increased glucose concentration in saliva of patients with angular cheilitis due to impaired salivary gland function can predispose to oral candidiasis. Secretion of saliva causes a dilutional effect and removes organisms from the mucosa. Antimicrobial proteins in the saliva such as lactoferrin, sialoperoxidase, lysozyme, histidine-rich polypeptides, and specific anticandida antibodies, interact with the oral mucosa and prevent overgrowth of candida.

Therefore conditions such as Sjögren's syndrome, radiotherapy of the head and neck, or drugs that reduce salivary secretions can lead to an increased risk of oral candidiasis.

References

1. Cawson RA, Binnine WH, Barrett AW, Wright J 2001 Oral disease, 3rd Edn. Mosby-Wolfe, London.
2. Maijala M, R Rautemaa, A Järvensivu, M Richardson, T Salo, L Tjäderhane. (2007) *Candida albicans* does not invade carious human dentine. *Oral Diseases* 13:3, 279–284
3. Lehmann PF. Fungal structure and morphology. *Medical Mycology* 1998; 4:57–8.
4. Srinivasan V, Pamula VK, Pollack MG, Fair RB. A digital microfluidic biosensor for multianalyte detection. *Technical digest IEEE MEMS* 2003, pp: 327–30.
5. Taghreed FZ. Angular cheilitis and iron deficiency anemia. *MDJ* 2008; 5(1), 37–41.
6. Axell T: A prevalence study of oral mucosal lesions in an adult Swedish population. *Odontol Revy* 1990; 27 suppl 36.
7. Morgan R, Tsang J, Harrington N, et al. Survey of hospital doctor's attitudes and knowledge of oral conditions in older patients. *Postgrad Med J* 2001;77:392–4.
8. Webb, B. C., C. J. Thomas, M. D. Willcox, D. W. Harty, and K. W. Knox. 1998. *Candida*-associated denture stomatitis. Aetiology and management: a review. Part 1. Factors influencing distribution of *Candida* species in the oral cavity. *Aust Dent J.* 43:45–50.
9. Samaranayake L.P., A. Hughes, D. A. Weetman, T. W. MacFarlane (2006) Growth and acid production of *Candida* species in human saliva supplemented with glucose *Journal of Oral Pathology & Medicine* 15 (5) , 251–254.
10. Ariyawardana A, Panagoda G. J., Fernando H. N., Ellepola A. N. B., Tilakaratne T. W. and Samaranayake L. P. (2007) Oral submucous fibrosis and oral yeast carriage – a case control study in Sri Lankan patients. *Mycoses* 50:2, 116–120.
11. Lale Karaagaciloglu, Gulsen Can, Burak Yilmaz, Nilgun Ayhan, Olcay Semiz, Hakan Levent. (2007) The adherence of *Candida albicans* to acrylic resin reinforced with different fibers. *Journal of Materials Science Materials in Medicine* ,
12. Darwazeh A. M, MacFarlane T. W, McCuish A. and Lamey P. G. (1999) Mixed salivary glucose levels and candidal carriage in patients with diabetes mellitus. *Journal of Oral Pathology & Medicine* 20:6, 280–283.

Table (1): The comparison between angular cheilitis patients and control subjects subgroups concerning the salivary glucose level according to the age, gender and wearing dentures.

Factor	Study & control groups	Salivary glucose level				
		Mean	SD	SE	t- test	Sig.
General	Group A	0.96	0.21	0.012	-2.35	0.05
	Group B	0.64	0.13	0.009		
Age	Group A	0.87	0.14	0.03	-3.50	0.05
	Group B	0.72	0.12	0.01		
Gender	Group A (Female)	0.90	0.14	0.039	-1.58	0.05
	Group B (males)	0.67	0.09	0.017		
	Group A (Males)	0.85	0.10	0.008	-2.25	0.05
	Group B (Females)	0.61	0.09	0.034		
Wearing dentures	Group A	0.83	0.19	0.029	-1.76	Ns
	Group B	0.76	0.11	0.012		