

Salivary IgA Concentration and Oral Parameters in Early Onset Type I Diabetic Patient

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Abstract

Background: Diabetes mellitus is a metabolic disorder of multiple etiology. Effect of disease include long- term damage, dysfunction and failure of various organs in addition to oral complication

Objectives: This study was conducted to evaluate the oral parameters (flow rate, pH, IgA concentration), in addition to the gingival condition (GI) of both study and control groups

Patients and Methods: The study included 25 children, suffering from type I diabetes mellitus (IDDM); their ages range was from (5-13) years, compared with the control group of healthy children matching with age and sex

Results : The present study has shown that the individuals with IDDM have significant reduction in salivary flow rate; pH .while GI has higher significance in IDDM individuals in comparison to control group.

salivary IgA recorded a higher as significant concentration among the IDDM children as compared to the healthy children

Conclusion : It is concluded that higher salivary IgA concentration and gingivitis can attribute to their low salivary flow rate, pH in IDDM child.

Therefore, special preventive program recommended with special protocol to the management of the IDDM in the community

Key word: Salivary IgA. Diabetic child, flow rate. pH .gingivitis

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Introduction

Many definitions were found but the most dependent one was given by WHO in 1999 in which the term Diabetes mellitus describes metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbance of carbohydrates, fat, protein metabolism resulting from defects in insulin secretion, insulin action, or both. Type I is Diabetes mellitus (formerly known as insulin-dependent IDDM) in which the pancreas fails to produce the insulin, which is essential for survival. This form develops most frequently in children and adolescent, but it is increasingly noted later in life¹. The oral and dental health manifestations for both type I and II diabetes may include, moderate and severe gingivitis, chronic periodontitis (which may lead to increase tooth mobility and tooth loss), increase dental caries, heavy accumulation of soft deposits and calculus, dry mouth and angular cheilitis, oral candidiasis, burning tongue, altered taste sensation, delay wound healing and bad odor from the oral cavity, diminished salivary flow and salivary gland enlargement^{2,3}.

Most studies and result on salivary flow rate in IDDM has significant lower salivary secretion rate and it is about 0.7 ± 0.4 ml/min while it is 1.2 ± 0.4 ml/min in control person⁴.

Secretory IgA is found in secretions like saliva, and it's different from serum, IgA in respect to its molecular structure, serum IgA occurs mostly in classical monomer form characteristic of other immunoglobulin classes like IgG, IgE and IgD⁵, while salivary IgA consists of a dimer. Its molecular weight is about 390,000 Dalton which has sedimentation coefficient of 11S, while serum IgA is 7S molecule⁶.

IgA of the whole saliva represents the summation of IgA of the major and minor salivary gland in addition to serum IgA from gingival fluid. It is reported by (Camling et al, 1987), that minor salivary gland contributes 30% -35% of the total salivary IgA in whole saliva⁷. The concentration of salivary IgA increases in a variety of clinical situation such as oral mucous ulceration including neoplastic ulcer, and periodontal disease. It decreases during some normal functions such as eating and drinking, it can increase or decrease during menstrual cycle⁸. IgA also acts antimicrobial action because saliva contains in addition to IgA, lysozyme, lactoferritin and lactoperoxidase⁹.

In Iraq, many study were conducted exploring the occurrence and severity of oral disease as dental caries and periodontal disease in diabetes^{10,11}, and there are only a few studies relating salivary composition with oral problem in diabetes¹². However, the present study was conducted to investigate the change in salivary flow rate and pH in stimulated saliva and to measure the change in the level of certain salivary oral immune system like IgA in diabetes with and their relation to gingival health condition.

Patients and Methods

The study included of 25 children (14 females and 11 males), suffering from type I diabetes mellitus (IDDM); their ages rang from (5-13) years, All of them were been selected from the Iraqi National Diabetic Center. They took insulin for treatment and they were mostly from Baghdad city. Another 25 normal healthy persons (15 females and 10 males) were used as control group; they were selected from any sign and symptom of IDDM or other systemic disease.

The un-stimulated Saliva from each subject had been collected under standard condition following instruction cited by Thylstrup and fejerskov, each individual was seated on dental chair with head bent forward to horizontal position .Saliva draining in to disposable cup with the moth slightly opened, the time of collection was five minutes. Then the volumes were placed in screw-capped bottle.

After the collection and disappearance of salivary foam within less than 15 minutes, the pH of saliva was measured immediately by using a digital pH meter.

Salivary volume was estimated with measuring cylinder, and the rate of secretion was expressed as milliliter per minute (ml/min)¹³, each salivary sample was centrifugal at 5000 r.p.m. for 10 minutes and the supernatant of saliva is stored frozen at -20 degrees in polyethylene tubes for the subsequent analysis of IgA consternation by single radial immunodiffusion technique¹⁴.

After saliva collection, the gingival condition was assessed by using the criteria of gingival index system(GI)¹⁵

Data were reported and analyzed with (SSP)system version 15 ,which

analyzed mean value, standard deviation and study (t-test) and p value.

Spearman's and parson's correlation were applied to see if there is any correlation coefficient between variable

Results

Fifty individuals are involved in the present study with an age 5-13 years old .half of sample ,25 of patients with IDDM (14 females and 11 males)form the study group while the control group consists from 25 people (15 females 10 males) .

Salivary flow rate (ml/min) and pH presented by mean and standard deviation for both study and control group were illustrated in table (1-1). salivary flow rate and pH mean of IDDM revealed a lower values than control group ,However difference were statically significant between two group

Table (1-2) shows the mean and standard deviation of salivary IgA concentration in mg/dl and gingival index(GI) in IDDM group showed the higher value compared with control group. Statically significant differences were noticed.

Table (1): Salivary flow rate and pH among the study (IDDM) and control group

	NO	Sex	Study(IDDM) Mean ±SD	Control Mean ± SD	t-test
Flow rate	25	Mixed	0.664 ± 0.115	0.80 ±0.1414	0.107*
pH	25	mixed	6.812 ± 0.420	7.011 ± 0.316	0.529*

Table (2): Salivary immunoglobulin (IgA) And GI index among the study (IDDM) and control group

	NO	Sex	Study(IDDM) Mean ±SD	Control Mean ± SD	t-test
Gingival index(GI)	25	Mixed	1.236 ±0.180	1.191 ±0.126	2.31*
IgA	25	mixed	21.009 ± 0.535	19.876 ±2.343	1.89*

At table (3) demonstrates the correlation coefficient between salivary IgA with pH, flow rate and G I, a strong negative significant correlation was

recorded with flow rate of the study group while non significant correlation were recorded in all variable of the control group.

Table (3): Correlation coefficient between salivary IgA and oral variable (pH, flow rate and GI among the study and control group

Group	Oral variable	Salivary IgA	
		r	p
Study(IDDM)	PH	0.132	0.363
	Flow rate	-0.034	0.75*
	GI	-0.170	0.30
Control	pH	0.31	0.60
	flow rate	-0.169	0.04
	GI	0.165	0.24

* Significant

Discussion

At the time of examination and saliva collection at patients had well-balanced diabetes although many of them had previous experienced periods with poor metabolic control of the disease. In the present study, no effort to relate the clinical oral status to the metabolic state of the disease was made.

The standard condition of saliva sample collection utilized in the study i.e one hour after breakfast is to get rid of the diurnal effect on the salivary

composition¹⁶, and to let return to fasting level¹⁷.

Hyposalivation as reported by present study among IDDM. Moreover, this finding goes with that reported by other studies who found decrease in saliva in the diabetic patient^{18,19}, while other reports indicated the same rate flow or no significant difference found²⁰.

There is significant lower salivary pH in IDDM patient may be due to the lower salivary flow rate, and more acidic pH will result²¹.

Salivary IgA is the only immunoglobulin class that is actively secreted into the oral cavity²².

Thus, the Concentration of IgA in IDDM patient was significant higher than the normal group. It might be due to reduced salivary flow, stress, hormonal disturbance and increased microorganism activity.

These results were in agreement with Maria A. et al and Iughetti et al.^{19,23}, and disagree with Ben-Aryeh et al.¹⁸, who found on significant difference between two groups

Salivary flow rate is considered an important factor affecting the level of salivary immunoglobulin^{19,20}, what confirmed this result, in the present study is the negative correlation seen between salivary IgA with flow rate, which was significant in IDDM group. This observation was also reported by other who concluded that, whenever the flow rate of saliva decrease, salivary immunoglobulin increased¹⁸, Diabetic patient usually altered salivary secretion that can cause disorders of hard and soft tissue of the mouth leading to cariogenic and gingival lesion.¹²

Reference

1. WHO,: Diabetes prevention and control, world health organization regional office, Far East and Mediterranean. 1999
- 2-Lalla E, Cheng B, Lal S, et al: Diabetes mellitus promotes periodontal destruction in children. *J Clin Periodontol* ;34(4):294-298,(2007).
- 3-Lalla E, Cheng B, Lal S, et al: Diabetes related parameter and periodontal condition in children. *J Clin Periodontol* ;42(4):345-349,(2007).
- 4-Orovio, M. Rosa, O. Denta! and Salivary feature of diabetes mellitus (IDDM) and control in assoc. *Dental Res.*93:246. (1994).
5. Thylstrup, A. and Fejerskov, O.: caries immunology in: *Textbook of cariology* .Munksgaard Copenhagen. PP. 167-180. (1986).
- 6- Tomasi, T.B. Jr.: The secretory immune system. in: *Basic clinical immunology* .sites, D.P. Wells, J.V. (ed), Lange medical publication, Los Altos. PP. 198-207, (1982).
- 7- Camiling, E., Gahnberg, L. and Krasse, B.: the relationship between IgA antibodies to streptococcus mutans antigens in human saliva and breast milk and the numbers of endogenous oral streptococcus mutans. *Arch. Oral. Boil.*32:21-25.(1987).

- 8- Grundbacher, J.F.: Variation in the levels of immunoglobulin A, G, and E in human saliva. *Arch Oral Biol.* 33:121-126. (1988).
- 9- Mancini G., Carbonara A, and Heremans J.P: immuno chemical quantization of antigens by single radial immunodiffusion. *Immunochemistry:* 2:235-239, (1965).
- 10- AL-Dahan Z: Oral health status among IDDM on population group of teenagers in Baghdad-Iraq. A master thesis, college of dentistry, University of Baghdad (1991)
11. AL-Sagri; Oral health status of Iraq diabetic patient salivary and microbial analysis .A Ph.D Thesis, College of Dentistry, University of Baghdad, (2005).
- 12 .Foad S.A.: Proinflammatory cytokines inflammatory markers, some biochemical parameter and oral indices in type 1 diabetes children and adolescents. Ph.D Thesis, College of Dentistry, University of Baghdad, (2005).
13. Tenovuo J., and Lagerlof F: Saliva In :Text book of clinical cariology. 2nd edition Editors Thylstrup A And Fejerskov O. Chapter 2 Munksgaard Copenhagen Denmark: pp 17-43, (1994).
- 14- Mancini G., Carbonara AO, Heremans: Immunochemical quantitation of antigens by single radial immunodiffusion in immunocjemistry, 2:235-39 (cited by Goodman and Parslow 1994). (1965).
- 15- Loe H and silness J: Periodental disease in pegnancy .*Acta Odenta .Scand.*, 21:533-51, (1963).
- 16- Eisebrand L.L. Variation in the PH of saliva of five individual .*J.Dent.Res* 22:1-6, (1943).
- 17- Jenkins G.N.: Saliva in :the physiology and biochemistry of the mouth. oxford pp.284-359. (1978).
- 18- Ben aryeh H, Cohen M, Kanter Y, Szargel R, Laufer D: Oral health and saliva composition in diabetic complication. *Jan .Mar.* 7 (1):57-62. (1993).
- 19- Maria A. Belazi, Assimina Galli-Tsinopoulou, Drakoulis Drakoulakos, Alexandra Fleva and panayiotis H. Papanayiotou: Salivary alteration in insulin dependent diabetes mellitus, *international journal of pediatric dentistry* volume 8 issue :page 29-March 1998
- 20- Tenovuo J, Lehton OP, viikari J, Largava H, Vilja P and Tuohima P: Immunological and innate antimicrobial factors in whole saliva of patient with IDDM *J.Dent .Res.* Vol.65, 62-66, (1986).
- 21- VanHoute J (1994): Role of microorganism in caries etiology. *J.dent.Res.* 73(3):672-81
- 22- Everhart, D.L., Bamgboye, P.O. and Schwartz, M. S.: Salivary immunoglobulin and caries experience. *J.Dent.Res.* 62:242-43, (1982).
- 23- Iughetti et al : Iughetti- L, Mario R. Bertolan. MF, Brenas Coni. S, J. Pediatric-endocrinemental. 1999 Sep-Oct: 12(5):603-41.
- 24- Roitt IM and lehner T: Immunological of oral disease black well SP Oxford P 51:363-70.
- 24- Maria Elena Lopez; Maria Eugenia Colloca ; Rafael Gustavo Paez; Judit Nora Schallmach ; Myriam Adriana Koss ; Amalia Chervonagura (2003) : Salivary characteristic of diabetic children, *Braz.Dent.J.* Vol.14, No 1 Ribeiro Preto June 2003, (1980).
- 25- Maria Elena Lopez; Maria Eugenia Colloca ; Rafael Gustavo Paez; Judit Nora Schallmach ; Myriam Adriana Koss ; Amalia Chervonagura: Salivary characteristic of diabetic children, (2003).