

Salivary TNF- α and Alkaline Phosphatase in Relation to Gingival Health Condition According to Nutritional Status among a Group of School Children

Zainab Jum'a Ja'far¹, Aseel Haidar Al-Asadi², Suha Talal Abd³

¹B.D.S, MSc, Lecturer, College of Dentistry, University of Baghdad, Department of Pediatric Dentistry

²B.D.S, MSc., Assistant Professor, College of Dentistry, University of Baghdad, Department of Pediatric Dentistry

³B.D.S, MSc., Assistant Lecturer, College of Dentistry, University of Baghdad, Department of Basic Sciences

Abstract: *This study was planned to determine gingival health condition among children in relation to the salivary ALP and TNF- α . The sample consisted of (103) healthy school children aged 6-8 years from Baghdad city, those children were divided according to their nutritional status and their gingival health condition was inspected using plaque index (PII) and gingival index (GI). Unstimulated salivary sample was taken from a subsample selected randomly to determine the level of ALP and TNF- α . The results showed that 43 children were overweight whereas those who had normal weight were 60 children. Most of the study sample had mild type of gingivitis, however, comparison of plaque index and gingival index in different nutritional status groups revealed no significant difference. Although correlation of PII with TNF- α revealed negative weak non-significant relation in the normal weight group, a positive weak non-significant relation in the overweight group was present. On the other hand, correlation of the PII with alkaline phosphatase revealed negative weak non-significant relation in both normal weight and overweight children. On conclusion: there were non-significant relation among the gingival health condition with TNF- α and ALP among different nutritional status groups of children.*

Keywords: Saliva, TNF- α , ALP, GI, PII, gingiva, children

1. Introduction

Saliva, with its complicated mixture, is essential and so important for the maintenance and protection of the oral as well as the systemic health of the body, (1) meanwhile saliva composition may be altered and affected by any change occurred systemically (2) and this in turn has gained a particular attention to use saliva as an alternative to the blood for the diagnosis and the prognosis determination of certain diseases since its biomarkers can provide adequate clinical information (3,4).

Tumor necrosis factor alpha (TNF- α) is one of the low-molecular weight cytokines from the family of cell-to-cell mediators that has a fundamental role in controlling the inflammatory reactions as well as regulating the immune response of the body. (3) Pathological conditions may result from TNF excessive production and improper function. (5)

The results of some recent studies related the progression of periodontal diseases to the damage effect exerted by the inflammatory cytokines (in which TNF- α is one of them). TNF- α has a strong stimulation effects on the osteoclasts (proliferation, differentiation and activation) that may explain its effect related to bone resorption. It also induce the mesenchymal cells to produce proteases like matrix metalloproteinase (MMP) which is responsible for connective tissue destruction. (6,7)

Alkaline phosphatase (ALP) is one of the intracellular enzymes, mainly released from granules in the polymorphnuclear leukocytes, that involved in cells metabolic processes and it is usually found in all the tissues of the body particularly in the liver, kidney and bones.(1,3,8)

As reported by many studies, during the progression of the periodontal diseases there is a highly significant rise in salivary ALP (1,9-12) therefore when ALP level in saliva is increased, it indicates an underlying inflammatory reactions and presence of cellular damage, however, its increasing level may result from increasing of their release from the destructive cells present within the soft tissues of the periodontium which reflects the metabolic changes occurred during the gingival inflammation (1,4,5).

One of the most common periodontal problems among children that is usually associated with plaque accumulation is gingivitis which is a reversible form of inflammation affecting the teeth surrounding tissues(13). Predisposing factors such as food impaction (which is usually related to improper oral hygiene), cariogenic bacteria, mouth breathing and malalignment of teeth are reasonable to make the individual more prone to such a type of periodontal disease. (13,14)

Oral health problems may be exacerbated by the local impact of diet and nutrition and there is no doubt that nutrition during early childhood has a profound role on the child's health (15,16) as it affects the optimum growth and functions of the body organs as well as the efficiency of the immune system which in turn influence the well growth and development of the body (including the development of teeth) that will be reflected on the child's health later on. (17)

As mentioned by many studies, the mean of plaque index as well as the prevalence and severity of gingivitis was higher within the overweight children (18-21).

Volume 6 Issue 7, July 2017

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

As there is no previous Iraqi study concerning gingival health condition among children in relation to the salivary ALP and TNF- α and to get more information about the impact of nutrition on this relation, it was planned to conduct this study.

2. Materials and Method

Total sample of (103) healthy school children were selected for this study, their age was 6-8 years, from Baghdad city. Gingival health condition was inspected by plaque index (PI) as reported by Sillness and L  e, 1964⁽²²⁾, gingival index (GI) as reported by L  e and Sillness, 1963⁽²³⁾. Unstimulated salivary sample was taken from a subsample selected randomly from the total sample, following the criteria suggested by Fejerskov and Thylstrup, 1994⁽²⁴⁾.

TNF- α was detected by ELISA kit at 570 nm wave length. The principle of detection was by using double-sandwich Elisa technique. Figure 1 shows the standard curve of TNF- α of salivary sample.

The laboratory analysis for salivary alkaline phosphatase was determined spectrophotometrically using the kit of Human Company, Germany according to the recommendation of the German Clinical Chemistry Association.⁽²⁵⁾

Statistical analysis was performed using SPSS version 13.

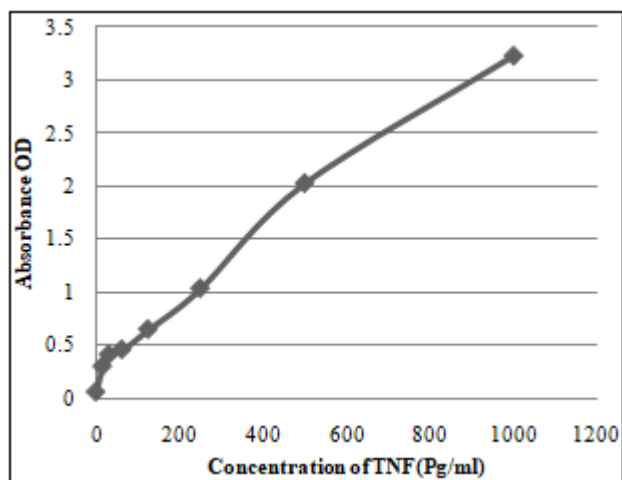


Figure 1: Standard curve of TNF- α

3. Results

The distribution of the total sample (130 children) is demonstrated by Table 1, sorted by gender and nutritional status.

Table 1: Distribution of the total sample

Nutritional status	Gender		total
	Boys	Girls	
Normal weight	34	26	60
Overweight	21	22	43
total	55	48	103

Comparison of plaque index and gingival index in different nutritional status groups revealed no significant difference (Table 2)

Table 2: t-test according to plaque index and gingival index between nutritional status groups

	Nutritional status						t	Sig.
	Normal weight			Overweight				
	N	mean	SE	N	mean	SE		
PI	60	1.591	0.07132	43	1.579	0.7847	0.107	0.915
GI	60	0.8525	0.03809	43	0.8512	0.04793	0.022	0.982

Majority of patients had mild type of gingivitis (91) than moderate gingivitis (11) or severe type of gingival inflammation (no one) in both normal weight (60) and overweight group (43), (Table 3).

Table 3: Severity of gingival inflammation in both normal weight and overweight groups

severity	Nutrition status		Total
	normal	overweight	
mild	53	38	91
moderate	6	5	11
Total	60	43	103

Correlation of PI with TNF revealed negative weak non-significant relation in the normal weight group, while a positive weak non-significant relation in the overweight group. On the other hand, correlation of the PI with alkaline phosphatase revealed negative weak non-significant relation in both normal weight and overweight children (Table 4).

Table 4: Correlation of PI with TNF and alkaline phosphatase in both nutritional status groups

	Nutritional status			
	Normal weight		Overweight	
	r	Sig.	r	Sig.
TNF	-0.197	0.346	0.123	0.662
ALP	-0.036	0.795	-0.215	0.183

Correlation of GI with TNF and alkaline phosphatase revealed negative weak non-significant relation in both normal weight and overweight groups (Table 5).

Table 5: Correlation of GI with TNF and alkaline phosphatase in both nutritional status groups

	Nutritional status			
	Normal weight		Overweight	
	r	Sig.	r	Sig.
TNF	-0.165	0.431	-0.055	0.844
ALP	-0.151	0.271	-0.161	0.322

Correlation of BMI with TNF revealed positive weak non-significant relation in the normal weight group, while a negative weak non-significant relation in the overweight group. In contrast, correlation of the BMI with alkaline phosphatase revealed negative weak non-significant relation in normal weight group, but positive weak non-significant relation in overweight children, (Table 6).

Table 6: Correlation of BMI with TNF and alkaline phosphatase in both nutritional status groups

	Nutritional status			
	Normal weight		Overweight	
	r	Sig.	r	Sig.
TNF	0.296	0.150	-0.081	0.775
ALP	-0.124	0.368	0.066	0.688

4. Discussion

In this study, For determination of the nutritional status of the study sample, all the school children (103 child) randomly selected from Baghdad, were classified into two groups according to their BMI, as it is an easy and inexpensive method to be used^(15,17, 26) by using a specific chart which is the (CDC growth charts) 60 child were categorized under the nutritional status of normal weight whereas 43 child were found to be overweight, as shown in Table1.

During childhood, gingivitis considered to be the most prevalent type of periodontal problems that may start and could be progressed in its severity with age⁽²⁶⁾. Heterogeneousness in the results of many studies was found concerning the relation between the oral health of children and their nutritional status which could be attributed the variation found between them in the size and age of the sample as well as their society which in turn can affect the dietary habits⁽²⁷⁾. The data of the present study showed that the majority of the sample had mild type of gingivitis, as demonstrated in Table 3, and there were non-significant differences in both the meangingival index as well as the mean plaque index between the overweight and the normal weight children (Table 2). These results come in accordance with that found by other researchers^(15, 16, 28, 29).

In spite of the presence of many studies dealing with the association present between the increasing periodontal problems with the increasing of the body weight in adults, little was found to study this relation in children⁽³⁰⁾. While there is no previous obvious studies concerning the correlation between the nutritional status of children to the level of TNF- α and ALP in their saliva, the data of the present study revealed that there was negative weak relation between TNF- α and BMI in the overweight group, in the other hand, correlation of the BMI with alkaline phosphatase revealed positive weak relation in overweight children, however, the results were statistically non-significant.

On conclusion: there were non-significant relation among the gingival health condition with TNF- α and AIP among different nutritional status groups of children.

References

- [1] Patel RM, Varma S, Suragimath G, Zope S. Estimation and Comparison of Salivary Calcium, Phosphorous, Alkaline Phosphatase and pH Levels in Periodontal Health and Disease: A Cross-sectional Biochemical Study. *Journal of Clinical and Diagnostic Research* 2016; 10(7): ZC58-ZC61.
- [2] Desai GS, Mathews ST. Saliva as a non-invasive diagnostic tool for inflammation and insulin-resistance. *World J Diabetes*. 2014; 5(6): 730-738.
- [3] Abd ST. Salivary TNF- α and ALP related to the gender of children. *IJABR*. 2017; 7 (1):1-4.
- [4] Khiste SV., Ranganath V, Nichani AS, Rajani V. Critical analysis of biomarkers in the current periodontal practice. *J Indian Soc Periodontol*. 2011; 15:104-10.

- [5] Yousefimanesh H, Maryam R, Mahmoud J, Mehri GB, Mohsen T. Evaluation of salivary tumornecrosis factor-alpha in patients with the chronic periodontitis: A case-control study. *Journal of Indian Society of Periodontology* 2013; 17(6): 737-740.
- [6] Steenport M, Khan KM, Du B, Barnhard SE, Dannenberg AJ, Falcone DJ. Matrix metalloproteinase (MMP)-1 and MMP-3 induce macrophage MMP-9: Evidence for the role of TNF-alpha and cyclooxygenase-2. *J Immunol* 2009; 183:8119-27.
- [7] Morgan TG, Rowan AD, Dickinson SC, Jones D, Hollander AP, Deehan D, et al. Human nasal cartilage responds to oncostatin M in combination with interleukin 1 or tumour necrosis factor alpha by the release of collagen fragments via collagenases. *Ann Rheum Dis* 2006; 65:184-90.
- [8] Kishore PK, Yuvarajparmar, Satishkumar S. Evaluating the levels of salivary enzymes as biochemical markers in periodontal disease. *International J. of Healthcare and Biomedical Research*. 2014; 2(3):170-174.
- [9] Todorovic T, Dozic I, Barrero MV, Ljuskovic B, Pejovic J, Marjanovic M, Knezevic M. Salivary enzymes and periodontal disease. *Med Oral Patol Oral Cir Bucal* 2006; 11:115-9.
- [10] Dabra S, China K, Kaushik A. Salivary enzymes as diagnostic markers for detection of gingival /periodontal disease and their correlation with the severity of the disease. *J Indian Soc Periodontol* 2012; 16:358-64.
- [11] Luke R, Khan SN, Iqbal PS, Soman RR, Chakkarayan J, Krishnan V. Estimation of Specific Salivary Enzymatic Biomarkers in Individuals with Gingivitis and Chronic Periodontitis: A Clinical and Biochemical Study. *Journal of International Oral Health* 2015; 7(9):54-57.
- [12] Ja'far ZJ. Gingival health condition in relation to salivary alkaline phosphatase and secretor status AB blood type among a group of primary school children. 2016; 15(4): 96-100.
- [13] Hiremath V, Mishra N, Patil AG, Sheetal A, Kumar S. Prevalence of gingivitis among children living in Bhopal. *J Oral Health Comm Dent* 2012; 6(3): 118-20.
- [14] Jahanimoghadam F and Shamsaddin H. The prevalence and risk factors of gingivitis in a population of 6-year-old children in Iran. *J Oral Health Oral Epidemiol* 2016; 5(3):129-133.
- [15] Chaloob EK and Qasim AA. Nutritional status in relation to oral health status among patients attending dental hospital. *J Bagh College Dentistry* 2013; 25 (Special Issue 1):114-119.
- [16] Alsadi AAA, Diab BS. Oral health condition among overweight children aged 6-11 year old in Baghdad/Iraq. *J Bagh College Dentistry* 2009; 21(2): 100-104.
- [17] Sharma K, Kaura H. Oral health in relation to nutritional status, age and sex among 14-18 years children of Naraingarh. *Braz Dent Sci*. 2015; 18(3): 68-76.
- [18] Chapper A, Munch A, Schermann C. The gingival bleeding and periodontal disease with the BMI. *Brazil Oral Res* 2005; 19(2):83-7.
- [19] Sarlati F, Akhondi N, Etehad T. The Relationship between obesity and periodontal status. *Azad University of Iran. Int Dent J* 2008; 58(1): 36-40.
- [20] Franchini R, Petri A, Migliario M, Rimondini L. Poor oral hygiene and gingivitis are associated with obesity

- and overweight status in paediatric subjects J Clin Periodontol 2011; 38: 1021–1028.
- [21] Mode´er, T., Blomberg, C., Wondimu, B., Lindberg, T. Y. & Marcus, C. Association between obesity and periodontal risk indicators in adolescents. International Journal of Pediatric Obesity. 2010; 6, e264–e270.
- [22] Silness J, Løe H. Periodontal disease in pregnancy II correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964; 22: 121-35.
- [23] Løe H, Silness J. periodontal disease in pregnancy. Acta Odontol Scand 1963; 21: 533-51.
- [24] Fejerskov O, Thylstrup A. The oral environment and introduction. Textbook of Clinical Cariology 2nd edit. Munksgaard. Copenhagen 1994; p: 13-17.
- [25] AL-Rubaei EAS, Abd ST, Kadim NM. The Effect of Titanium Dioxide Nanoparticles on Salivary Alkaline Phosphatase Activity. European Journal of Molecular Biotechnology, 2015; 10(4): 188-196.
- [26] Komiya H, Masubuchi Y, Mori Y, Tajima N. The validity of body mass index criteria in obese school aged children. Tohoku J Exp Med 2008; 214(1): 27-37.
- [27] Ferraz EG, Silva LR, Sarmiento VA, et al. Association between childhood obesity and oral hygiene status. Nutr Hosp. 2014;30:253–259.
- [28] Diab BS. Nutritional status in relation to oral health condition among 6-10 years primary school children in the middle region of Iraq. PhD thesis, College of Dentistry. University of Baghdad, 2003.
- [29] Droosh MK. Protein- Energy Malnutrition in Relation to oral health condition Among 6 and 9 years old primary school children in Sulaimania city in Iraq. Master thesis submitted to the College of Dentistry, University of Baghdad 2007.
- [30] Katz J, Bimstein E. Pediatric obesity and periodontal disease: A systematic review of the literature. Quintessence International. 2011; 42:595–599.