

Relation between Salivary Amylase and BMI in Children with Tonsillitis

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Abstract: *Background:* Tonsillitis is an infection of the tonsils, which are glands on either side of the back of the throat. The tonsils are part of the immune system, which protects and helps the body to fight infections. Tonsillitis is very common and can occur at any age. It is most common in children and young adults. The important cause of the tonsillitis is bacterial and viral causes, the most common cause of acute tonsillitis is bacterial. There are numerous defense proteins present in saliva. Amylase is a highly abundant protein in saliva. The body mass index (BMI) is a widely used tool to evaluate overweight and obesity based on two anthropometric parameters, height and weight. The aim of the study: to show if there is any relationship between salivary amylase and body mass index and tonsillitis in children. *Material and methods:* Forty four patients with tonsillitis and fourteen healthy control children were enrolled in this study. The patients were diagnosed clinically by specialist. With age range (20-69) years for both groups. Salivary α -amylase and peroxidase were measured by colorimetric method. And calculate the body mass index by divided the weight of child on the height. *Results:* salivary amylase among patients with tonsillitis is higher than that in saliva of healthy control. Also the results of the present study revealed that there are differences in concentration of amylase among three sub groups of tonsillitis patients (normal BMI, under BMI and over BMI). The salivary concentration of amylase among male in tonsillitis patients group is higher than that in female. *Conclusion:* increase oral immune activity against pathogens that causes tonsillitis in children.

Keywords: tonsillitis, salivary amylase, body mass index.

1. Introduction

Tonsillitis is one of the upper respiratory diseases, a disorder in which the tonsils are inflamed, occurring predominantly in the younger age group (5-15 year) ⁽¹⁾. Tonsils are part of the secondary lymphatic organs in the human body, including the lymph nodes, spleen and thymus glands, involved in the maturation and development of the lymphocytes ⁽²⁾. There are many times when children and adults experience recurrent infections that result in enlarged, diseased tonsils. For them a tonsillectomy may be necessary. This may be indicated if they obstruct the airway or interfere with swallowing ⁽³⁾. Infection of the tonsils is most frequent in childhood in the age group of 5 to 15 years presumably because immunity to common organisms has not been established ⁽⁴⁾. Initial viral infection may predispose to super-infection with bacteria, or viruses alone may be responsible for tonsillitis in children on many occasions ⁽⁵⁾. The body mass index (BMI) is a widely used tool to evaluate overweight and obesity based on two anthropometric parameters, height and weight:

$BMI = \text{weight} / \text{height}$

Where weight is measured in kilograms, and height in meters ⁽⁶⁾. Obesity is characterized by low-grade systemic inflammation, with higher expression of inflammatory markers such as C-reactive protein (CRP) and interleukin (IL) 6 in obese than in underweight individuals ⁽⁷⁾. There are numerous defense proteins present in saliva. Amylase is a highly abundant protein in saliva. The most widely-known function of amylase is its endoglycosidase activity, but in addition to this, amylase also takes part in acquired pellicle formation on tooth surfaces. It performs a direct inhibitory

effect on the growth of certain bacteria and also binds to bacteria lipopolysaccharide, a bacterial surface structure and bacterial toxin, which are responsible in many cases for tissue destructive inflammatory reactions ⁽⁸⁾. So the aim of this study was to show if there is any relationship between salivary amylase and body mass index and tonsillitis in children.

2. Materials and methods

Forty four patients with tonsillitis were enrolled in this study with age range (20-69) years. The patients were diagnosed clinically by specialist. They were attendance to the Baghdad Teaching Hospital seeking for treatment. The control group consist of 14 participants and they were in healthy conditions (not suffering from systemic diseases and not taking any medication), with age range from (20- 69) years. Three ml of unstimulated (resting) whole saliva samples were collected under resting conditions between 9.0-12.0 A.M. Patients were asked to rinse their mouth with water and to generate saliva in their mouth and drool into a wide test tube. After that the saliva was centrifuged at (3000 rpm) for 10 minutes. The resulting supernatant was stored at - 20 °C in polyethylene tubes until assayed. Salivary α -amylase and peroxidase were measured by colorimetric method, and performed as recommended in leaflet with kits (Spinreact, Spain). And calculate the body mass index by divided the weight of child on the height.

3. Results

This study revealed that the distribution of the total sample (44 patients and 14 control) regarding nutrition status BMI was 34 normal weight (16 boys and 18 girls), 12 over weight

(5 boys and 7 girls) and 12 underweight (7 boys and 5 girls) as show in table 1.

Table 1: Distribution of the total sample

Nutritional status BMI	Gender		total
	Boys	Girls	
Normal weight	16	18	34
Overweight	5	7	12
Under weight	7	5	12
Total	28	30	58

In table 2, figure 1 found the mean of salivary amylase among patients with tonsillitis is higher than that in saliva of healthy control.

Table 2: Descriptive statistics for the two studied groups (tonsillitis patients and healthy control subjects) in Amylase activity

	N	Minimum	Maximum	Mean	Std. Deviation
Patients	44	124.10	1323.73	574.20	390.89
Healthy	14	165.47	1116.90	481.55	227.01

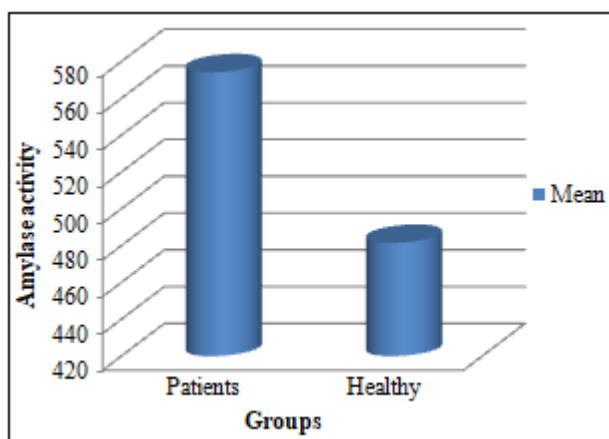


Figure 1: The difference between the two studied groups in Amylase activity

Also the results of the present study revealed that there is differences in concentration of amylase among three sub groups of tonsillitis patients (normal BMI, under BMI and over BMI) since the mean of this enzyme in normal BMI is lower than that in under and over BMI meanwhile its concentration among under BMI is higher than that among over BMI) as show in table 3, figure 2.

Table 3: Mean and SD of Amylase activity for normal, under and over BMI and comparison between them in tonsillitis patients group only

	Descriptive			ANOVA		
	N	Mean	±SD	F	df	Sig.
Normal	34	473.102	308.872	3.574	2	0.035
Under	12	779.047	376.622			
Over	12	506.742	408.415			
Total	58	543.361	360.163			

In addition to that the current study show that the salivary concentration of amylase among male in tonsillitis patients group is higher than that in female as revealed in table 4.

Table 4: Mean and SD of Amylase activity and Significance level between male and female in tonsillitis patients group only

	Descriptive				ANOVA		
	N	Percent %	Mean	±SD	T	df	Sig.
Males	28	48%	608.642	366.568	1.343	56	0.185
Females	30	52%	482.432	349.144			

4. Discussion

Tonsillitis is inflammation of tonsils, a common clinical condition caused by either bacteria or viral infection. It affects significant percentage of population more so in children. The results of Vijayashree 2014⁽⁹⁾ show The bacteriological studies indicated the occurrence of predominant bacteria β - haemolytic Streptococci (51.4%), followed by coagulase positive Staphylococci (12.5%) and Pnemococci (9.7%) and only one case of presence of Corynebacterium diphtheria was observed. This study reveal that there is increase in salivary amylase activity in children with tonsillitis in compession to healthy children that's mean the antibacterial role of this enzyme as a defense mechanism of this salivary enzyme. Amylase binds bacterial lipopolysaccharide (LPS)⁽¹⁰⁾. a bacterial surface structure and bacterial toxin, responsible, in many cases, for tissue destructive inflammatory reactions. Amylase may also exert virus inhibitory properties⁽¹¹⁾. It is because α -amylase may have both protective and detrimental properties⁽¹²⁾ α -amylase can interact with various viridans streptococci to facilitate their clearance from the oral cavity⁽¹³⁾ However, α -amylases adsorbed to the tooth surface can promote adherence of these bacteria and also digest dietary starch to maltose that can be used by the bacteria to produce acid⁽¹⁴⁾. All these studies proved there is meaningful explanation for this increase in salivary amylase activity and agree with the results of this study. The distribution of tonsillitis was more in males patients (48%) compared to female patients (52%). As for as socioeconomic condition concerned. probably because number of patients admitted were more than male children patients. For the relationship of body mass index with tonsillitis, there was no other study like this study to make comparison with it. But the finding of this study shows that there is significant difference between three groups of BMI in salivary amylase activity which may related to immune response of the body.

5. Conclusion

There is increase in salivary amylase activity in children with tonsillitis that proved the immune activity of this enzyme in saliva. Also the activity of this enzyme differs with BMI.

References

- [1] Mandell GL, Douglas GR, Bennett JE. 2000. Principles and Practice of Infectious Disease. 5th ed. Philadelphia: Churchill Livingstone, pp:5.
- [2] Alatas N.; Baba F.,(2008) . Proliferating active cells, lymphocyte subsets, and dendritic cells in recurrent tonsillitis: their effect on hypertrophy, Arch Otolaryngol Head Neck Surg.

- [3] Dell' Aringa A. R., Juarez A. J., Melo C., Nnrđi J. CKobari, K., Perches Filho R. M. (2005). Histological of analysis tonsillectomy and adenoidectomy specimens – Januar2001 to May 2003, Rev Bras Otorrinolaring (Engl Ed),71(1):18–2.
- [4] Sun J, Keh-Gong W, Hwang B. Evaluation of the etiologic agents for acute suppurative tonsillitis in children. Zhonguayi Xue Za Zhi (Taipei) 2002;65(5):212-7.
- [5] Everett MT. The cause of tonsillitis. Practitioner 1979;223:253-259.
- [6] World Health Organization (2000) Obesity: Preventing and managing the global epidemic. Report of a WHO Consultation. World Health Organization Technical Report, Series 894, 1-253.
- [7] Wang CC, Goalstone ML, Draznin B. Molecular mechanisms of insulin resistance that impact cardiovascular biology. Diabetes. 2004 Nov;53(11):2735-40.
- [8] Fábíán TK, Hermann P, Beck A, Frejérđy P, Fábíán G. Salivary defense proteins: their network and role in innate and acquired oral immunity. Int J Mol Sci. 2012;13:4295–4320.
- [9] Vijayashree MS, Viswanatha B, Sambamurthy BN., Clinical and Bacteriological Study of Acute Tonsillitis. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 13, Issue 1 Ver. X. (Feb. 2014), PP 37-43.
- [10] Choi S, Baik JE, Jeon JH, Cho K, Seo DG, Kum KY, Yun CH, Han SH Identification of Porphyromonasgingivalis lipopolysaccharide-binding proteins in human saliva. MolImmunol. 2011 Sep; 48(15-16):2207-13. [PubMed] [Ref list].
- [11] Sato K, Tokuhisa S, Inaba Y., Effect of enzymes on the growth of human and animal rotaviruses. J Vet Med Sci. 1995 Jun; 57(3):569-70. [PubMed] [Ref list]
- [12] Levine MJ. Development of artificial salivas. Crit Rev Oral Biol Med 1993;4:279-286.
- [13] Scannapieco FA, Bergy EJ, Reddy MS, Levine MJ. Characterization of the salivary α -amylase binding to Streptococcus sanguis. Infect Immun 1989;57:2853-2863.
- [14] Scannapieco FA, Torres G, Levine MJ. Salivary α - amylase: role in dental plaque and caries formation. Crit Rev Oral Biol Med 1993;4:301-307.