

ORIGINAL RESEARCH

Quick Response Code



doi: 10.5866/4.1.757

## Evaluation of aspartate aminotransferase levels in saliva of patients with different periodontal conditions - a biochemical study

Padma R<sup>1</sup>, Usha P<sup>2</sup>, Nagasri M<sup>3</sup>, Aravind Kumar P<sup>4</sup>,  
Chetan kumar S<sup>5</sup>, Sreedhar A<sup>6</sup>, Anand Tegginamani S<sup>7</sup>

Professor & Head<sup>1</sup>

PG student<sup>2</sup>

Professor<sup>3</sup>

Reader<sup>4</sup>

Dept. of Periodontics,

St. Joseph Dental College, Eluru, Andhra Pradesh.

Reader<sup>5</sup>

Dept. of Orthodontics,

St. Joseph Dental College, Eluru, Andhra Pradesh.

Reader<sup>6</sup>

Dept. of Periodontics,

Coorg Institute of Dental Sciences,

KK Campus, Maggula, Virajpet-571218. Karnataka.

Associate Professor<sup>7</sup>

Dept of Oral Pathology

Coorg Institute of Dental Sciences, Virajpet-571218

### Article Info

Received: January 12 2012

Review Completed: February, 12, 2012

Accepted: March 15, 2012

Available Online: April, 2012

© NAD, 2012 - All rights reserved

### ABSTRACT:

Saliva can be used as diagnostic fluid in medicine and dentistry. Components of saliva proposed as disease markers include enzymes (alkaline phosphatase, esterase, aspartate aminotransferase,  $\beta$  glucuronidase), immunoglobulins (IgA, IgG) and steroid hormones (cortisol). The objective of this study is to evaluate the relationship between aspartate aminotransferase (AST) in different periodontal conditions indicated by community periodontal index treatment needs (CPITN), as salivary AST test is non-invasive and cost effective diagnostic adjunct for assessing periodontal destruction.

**Key words:** Saliva, disease markers, enzymes, aspartate aminotransferase, periodontal disease.

### INTRODUCTION

Periodontal disease is one of the common inflammatory diseases of the oral cavity with complex and multifactorial etiology which is characterised by the progressive destruction of alveolar bone and of the soft tissues surrounding the teeth. Changes in attachment levels and alveolar bone density in periodontitis are consistent with varying rates of tissue destruction with episodes followed by prolonged periods of remission.

Commonly used clinical parameters or evaluations from radiographs are considered inefficient to distinguish active periodontal sites from the inactive sites.<sup>1,2</sup> They provide only limited information about patients and sites at risk for future periodontal break down.<sup>3,4</sup>

The variability in the rate of destruction across sites and times and ellusiveness of clinical measurements, combine to make identification of current active sites difficult.<sup>5</sup> Combined analysis of

Email for correspondence:  
padmasanskriithi@gmail.com

crevicular biochemical markers, immune response and oral microbiota has been proposed as means to predict attachment loss.<sup>6,7</sup>

Biochemical diagnostic tests have been proposed to assess periodontal disease activity in addition to clinical assessment. Significant relationship between AST levels in GCF and periodontal disease have been shown in several studies.

Saliva which is used as diagnostic fluid in the field of medicine and dentistry is a complex fluid containing proteins, glycoproteins, enzymes, hormones etc exerting different functions.<sup>8</sup> The use of saliva for periodontal diagnosis has been the subject of considerable research activity<sup>9</sup> and the proposed markers for disease activity include (alkaline phosphatase,  $\hat{\alpha}$  glucuronidase and other amino peptidases), immunoglobulins (IgA, IgG), host cells (leucocytes), hormones (cortisol), ions (calcium), specific bacteria and bacterial products and volatile compounds.<sup>10</sup> The enzyme AST is a marker suggested by its successful use as diagnostic adjunct in human cardiac and hepatic tissue necrosis. Following tissue damage AST is released from injured and dead cells into the extracellular fluid and can be readily assayed in serum, tears, saliva and gingival crevicular fluid. Although some research work is in progress, the relationship between the salivary levels of AST activity and periodontal disease is not very clear.

#### **The aim of this biochemical study was:**

1. To evaluate the levels of AST in saliva in different periodontal conditions.
2. To access the relationship between salivary AST levels and the severity of periodontal disease.

#### **MATERIALS AND METHODS:**

The present study was conducted in total of 100 subjects aged between 15-54 yrs (69males and 31females) who attended the department of Periodontics for routine periodontal treatment needs

at St. Joseph dental college and hospital, Eluru, Andhra Pradesh. The selected samples were assigned into four groups of 25 subjects each based on their community periodontal index of treatment needs (CPITN) scores.

The control group included healthy subjects with CPITN Code 0 (C0). The case group consisted of subjects with CPITN Codes 1, 3 and 4. Patients presenting only bleeding on probing were considered as Code 1 (C1) group and patients with shallow pocket depth of 4 - 5mm and deep pocket of  $\cdot$ 6 mm were considered as Code 3 (C3) and Code 4 (C4) respectively.

#### **EXCLUSION CRITERIA:**

1. Subjects with code 2 classification were not included in the study because it evaluates only the presence or absence of supra and sub gingival calculus and is not necessarily associated with periodontal tissue destruction.
2. Patients with known systemic diseases.
3. Patients who had undergone periodontal therapy and had taken antibiotics 6 months prior to study.
4. Pregnant and lactating women.

An informed consent was taken from all the patients before the start of the study and the study was cleared by the ethical committee of St. Joseph's dental college, Eluru, Andhra Pradesh. The following parameters were accessed in all the patients by single examiner.

1. OHIs index (Green & Vermilion 1964).<sup>11</sup>
2. Gingival index (Loe & Sillness 1963).<sup>12</sup>
3. CPITN (WHO 1982).<sup>13</sup>
4. Probing pocket depth (PPD).
5. Periodontal disease index by Ramfjord (PDI ).<sup>14</sup>

One millilitre (ml) of non stimulated saliva was collected in a sterile test tube from the selected

subjects immediately after a single mouth rinse with 15ml of water to wash out the exfoliated cells and transferred to the laboratory for biochemical analysis of AST using IFCC (International federation of clinical chemistry) method using an auto analyzer.

### STATISTICAL ANALYSIS:

Data was presented as mean, standard deviation (SD) and 95% confidence interval (CI) of the mean difference. Comparison of clinical and biochemical parameters between the groups was carried out by using ANOVA. Pair wise comparison was done by student's unpaired t-test. Kruskal wallis test has been used to find the significance association between the groups. Correlation between the variables was carried out by using Pearson's correlation coefficient 'r'. All levels of significance was set at P value <0.05.

### RESULTS:

When the mean and SD of AST and PDI levels of the four groups were compared by Kruskal Wallis test, statistically significant results were obtained. (Table 1)

When AST levels of C4 group were compared before and after SRP therapy, there was a statistically significant reduction in mean values with P value <0.05. (Table 2)

When Karl Pearson's correlation coefficient was done for different variables like age, AST, OHIs, gingival index, probing depth and periodontal disease index (PDI) a positive correlation between variables was found which were statistically significant. All these parameters increase with increased AST levels indicating a positive correlation.

Correlation between probing depth and periodontal disease index is 0.058 which was negatively correlated in group C0. Correlation

between PD and periodontal disease index is 0.465 which was positively correlated in group C4. (Table 3)

Comparison of four groups with plaque component, calculus component, gingival component and periodontal component was done by one way ANOVA test. The results showed statistically significant difference for plaque, calculus, gingival and periodontal components with P value 0.000 at 5% level of significance. (Table 4)

### DISCUSSION:

The determination of aspartate amino transferase levels in serum has been used for many years to identify inflammatory lesions in the heart, liver, kidney and in cerebrospinal and synovial fluids for lesions in brain and joints respectively.<sup>15</sup>

The rise in gingival crevicular fluid enzyme level may be due to the cellular damage predominantly by PMN at the disease sites. Secondly, the changes in the microbial flora at the disease sites play a contributory role in determination of enzyme activity.<sup>16</sup>

In the present study which allowed the quantitative relation between AST level and CPITN groups, it was found that 56% of the subjects under C0 group showed AST levels of 15-30units/ml which explains that healthy patients have less AST levels compared to other groups.

The increasing enzyme levels from C0 group to C4 group suggest that the inflammatory condition elevates the enzyme levels, which further increases the tissue destruction. This finding is in agreement with findings from other studies of AST in the GCF,<sup>15,17,18</sup> and the study of AST in saliva.<sup>19,20</sup>

Negative correlation between probing depth and periodontal disease index (0.058) was found in group C0, which is in accordance with the previous study.<sup>21</sup>

A positive correlation was found between probing depth and periodontal disease index (0.465) in group C4. High ratio of AST positive sites in pockets with the probing depth of >6mm was found which is in accordance with the studies.<sup>21,22</sup>

This study evaluated the relationship between AST levels of saliva in different periodontal conditions followed by mechanical therapy (SRP). Improvement in clinical status was noted following periodontal therapy along with corresponding decrease in AST levels. Hence it was concluded that AST levels may be a useful adjunct in the clinical assessment of periodontal disease which is in accordance with the studies.<sup>23,24</sup>

The results of this study indicate correlation between severity of periodontal condition and salivary enzyme activity of AST. Furthermore, reports suggesting that decrease of enzyme activity after periodontal therapy are encouraging to consider the AST level assessment as an adjunct to other parameters in the management of periodontal diseases.

### CONCLUSION:

Screening of periodontal disease by measuring salivary levels AST as an adjunct with established parameters may prove to be a feasible, simple and convenient approach that does not require expert examiners. Furthermore salivary diagnostic tests can aid in screening large population. More studies are necessary to evaluate specific clinical, microbial and histological characteristics of periodontal disease which are associated with elevated levels of AST in saliva. In conclusion biochemical analysis of AST enzyme levels is expected to facilitate the diagnosis of active periodontal disease and also in evaluating the response to the employed periodontal therapy.

### REFERENCES:

1. Armitage GC. Periodontal disease: diagnosis. *Ann. Periodontol* 1996; **1**: 37-215.
2. Page R.C. Periodontal diseases: a new paradigm. *J Dent Edu* 1998; **62**: 812-821.
3. Griffiths GS, Wilton JM, Curtis MA, Maiden MF, Gillet IR, Wilson DT, Sterne JA and Johnson NW. Detection of high risk groups and individuals for periodontal disease. *J Periodontol* 1988; **15**: 403-410.
4. Greenstein G, and Caton J. Periodontal disease activity: a critical assessment. *J periodontol* 1990; **61**: 543-552.
5. Imrey PB, Crawford JM, Alves MEA, Swiggin TA, Chambers DA. A cross sectional analysis of aspartate amino transferase in human gingival crevicular fluid. *J Periodont Res* 1991; **26**: 75-84.
6. Page RC. Host response test for diagnosing periodontal disease. *J periodontol* 1992; **63**: 356-366.
7. Nakashima K, Giannopoulou C, Andersen E, Roehrich N, Brochut P, Dubrez, B. and Cimasoni G. A longitudinal study of various crevicular fluid components as markers of periodontal disease activity. *J clin periodontol* 1996; **23**: 832-838.
8. Bruno Z, Armando M, Silvia P, et al. Salivary thiols and enzyme markers of cell damage in periodontal disease. *Clin Biochem* 2007; **40**: 661-665.
9. Kaufman E, Lamster IB. Analysis of saliva for periodontal diagnosis. A review. *J clin Periodontol* 2000; **27**: 453-465.
10. Mandel ID. Markers of periodontal disease susceptibility and activity derived from saliva. In: Johnson NW. (ed.): Risk makers for oral diseases. *Periodontal diseases: markers and disease susceptibility and activity*. Cambridge University Press, 1991; **3**: 228-253.
11. Green JC, Vermillion JR. Simplified Oral hygiene Index. *J Am Dent Assoc* 1964; **68**: 7-13.
12. Loe H: The gingival Index, the plaque index and the retention index systems. *J Periodontol* 1967; **38** (Suppl): 610.

13. Soben Peter. Essentials of Preventive and community dentistry. 4<sup>th</sup> ed. Delhi, Arya (Medi) publishing house June 2009; Chapter 13. P.333-344.
14. Carranza's Clinical Periodontology. 10<sup>th</sup> edition. Missouri, Saunders 2006. Chapter 8. P.121.
15. Persson RG, and Page RC. Diagnostic characteristics of crevicular fluid aspartate (AST) levels associated with periodontal disease activity. J Clin Periodontol 1992; **19**: 43-48.
16. Chauncey HH. Salivary enzymes. J Am Dent Assoc 1961; **63**: 361-369.
17. Chambers DA, Crawford JM, Mukherjee S, and Cohen RL. Aspartate aminotransferase increase in crevicular fluid during experimental periodontitis in beagle dogs. J Periodontol 1984; **55**: 526- 530.
18. Persson GR, Alves MEAF, Chambers DA, Clark WB, Cohen RI, Crawford DA et al. A multicentre clinical trial of Periogard™ in distinguishing between diseased and healthy periodontal sites (I). Study design, methodology and therapeutic outcome. J clin periodontol 1995; **22**: 794-803.
19. Richard JO, Howard HT, Mare LN, David SR, Gurdon ID, Julio S et al. Relationship between crevicular fluid aminotransferase levels & periodontal disease progression. J Periodontol 2001; **72**: 17-24.
20. Cesco R de T, Ito IY, Albuquerque Jr. RF: Levels of aspartate aminotransferase (AST) in saliva of patients with different periodontal conditions. J Clin Periodontol 2003; **30**: 752-755.
21. Silivia EB, Salvador SL, Fogo JC, Adriana R, Marcantonio. Use of aspartate aminotransferase in diagnosing periodontal disease: A comparative study of clinical and microbiological parameters. J Oral Sci 2003; **45**: 33-38.
22. Yucekal - Turner B, Uygur C, Firatli E. Gingival crevicular fluid levels of aspartate aminotransferase, sulphide ions and N - benzoyl-DL-arginine-2-naphtylamide in diabetic patients with chronic periodontitis. J Clin Periodontol 2003; **30**: 1053-1060.
23. Shimada K, Mizuno T, Uchida T, Kato T, Ito K and Murai S. Relationship between levels of Aspartate aminotransferase in gingival crevicular fluid and conventional measures of periodontal status assessed using Pocket Watch: a cross sectional study. J Oral Sci. 1999; 41: 35-40.
24. Shimada K, Mizuno T, Ohshio K, Kamanga M, Murai S, Ito K. Analysis of aspartate transferase in gingival crevicular fluid assessed by using pocket watch™: A longitudinal study with initial therapy. J Clin Periodontol 2000; **27**: 819-823.

**TABLE 1: MEAN AND SD OF AST LEVELS OF FOUR GROUPS.**

	C0		C1		C3		C4		Kruskal Wallis test
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	P value
<b>PDI</b>	0.96	0.46	1.52	0.46	3.39	0.98	3.03	0.34	<b>0.000 S</b>
<b>AST</b>	18.08	5.09	36.56	8.4	74.4	8.8	179.48	33.13	<b>0.000 S</b>
<b>SRP/AST</b>	-	-	-	-	-	-	37.32	5.42	-

**TABLE 2: MEAN AND SD OF AST LEVELS IN C4 GROUP**

C4				
AST LEVELS		SRP/AST		P VALUE
MEAN	SD	MEAN	SD	
179.48	33.13	37.32	5.42	<b>0.000 S</b>

**TABLE 3: KARL PEARSON'S CORRELATION COEFFICIENT BETWEEN DIFFERENT VARIABLES IN C4 GROUP**

VARIABLES (C0)	AGE	AST LEVELS	OHI-S	GI	PD	RAMFJORD's PDI
<b>AGE</b>	1					
<b>AST LEVELS</b>	-0.439	1				
<b>OHI-S</b>	0.059	0.526	1			
<b>GI</b>	-0.142	-0.12	-0.183	1		
<b>PD</b>	-0.272	0.396	0.643	-0.122	1	
<b>PDI</b>	-0.342	0.109	0.384	0.134	0.465	1

**TABLE 4: COMPARISON OF FOUR GROUPS BY ONE WAY ANOVA TEST**

COMPONENTS	Source of variation	SS	Df	MS	F	P-value
<b>PLAQUE</b>	Between groups	80.61051	3	26.87017	23.21555	0.000 S
	Within groups	111.1124	96	1.157421		
	total	191.7229	99			
<b>CALCULUS</b>	Between groups	52.7556	3	17.5852	37.45118	0.000 S
	Within groups	45.0768	96	0.46955		
	total	97.8324	99			
<b>GINGIVAL</b>	Between groups	61.358	3	20.45267	30.09848	0.000 S
	Within groups	65.2344	96	0.679525		
	total	126.5924	99			
<b>PERIODONTAL</b>	Between groups	333.9896	3	111.3299	80.5342	0.000 S
	Within groups	132.7097	96	1.382392		
	total	466.6992	99			

**Gain quick access to our journal online**  
**View our journal at**  
**[www.nacd.in](http://www.nacd.in)**