

Salivary AST, ALP and CK Levels in Patients with Periodontitis.

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Abstract

Aim:-

The aim of the study is to assay the Salivary AST,ALP and CK levels in patients with periodontitis.

Objective:-

The main objective is to study the ALP , AST ,CK levels in patients affected with periodontitis. The disease has a direct effect in its levels which in turn leads to various complications.

Materials and methods:-

The study involves the estimation of the salivaryAST,ALP ,CK levels in patients with periodontitis.

Background:-

Alkaline phosphatase (ALP) is a protein found in all body tissues. Tissues with higher amounts of ALP include the liver, bile ducts, and bone. AST is an enzyme found in high amounts in liver, heart, and muscle cells. It is also found in lesser amounts in other tissues. Creatine kinase (CK), is present in various tissues and cells. CK catalyses the conversion of creatine and consumes ATP to create phosphocreatine and ADP. ALP ,AST and CK are stored in specific granules and secretory vesicles of the neutrophils and is mainly released during their migration to the site of infection. It is also present in bacteria within dental plaque. Intracellular enzymes are increasingly released from the damaged cells of periodontal tissues into the gingival crevicular fluid and saliva. Relation between the enzymes and periodontitis is evaluated in this study.

INTRODUCTION:-

Periodontal disease is one of the common inflammatory diseases which is multifactorial in origin. Periodontitis is an inflammatory disease which affects the periodontium, i.e., the tissues surrounding and supporting the teeth.(1). Periodontitis is caused by microorganisms that adhere to and grow on the tooth's surfaces.(2) Usually periodontitis is diagnosed by probing the soft gum tissues and by making use of radiographs. Periodontal probing may be inaccurate in recording the true pocket depth. (3) Periodontal diagnostic procedures play a significant role in providing the clinicians useful information regarding the type, location, and severity of the disease which serve as a basis for treatment planning and provide essential data during periodontal maintenance and disease-monitoring phases of treatment. (4) Traditional diagnostic procedures were sufficient only to assess the disease history and not the current disease status. Advances in diagnostic research in oral and periodontal disease are moving toward methods whereby periodontal risk can be identified using biochemical markers.[5]. Biochemical markers play an important role in the detection of inflammatory changes in short period of time. Saliva has been used as a diagnostic fluid in dentistry. Salivary components for periodontal diagnosis include enzymes and immunoglobulins, hormones of host origin, bacteria and bacterial products, ions, and volatile compounds. (6) Intracellular enzymes are increasingly released from the damaged cells of periodontal tissues into the gingival crevicular fluid (GCF) and saliva. Several enzymes that are evaluated for the early diagnosis of periodontal disease are aspartate and alanine aminotransferase (AST, ALP) creatine kinase (CK) and

gamma glutamyl transferase (GGT).(7). Salivary diagnostics is an emerging field that has progressed through several important developments in the past decade, including the publication of the human salivary proteome.(8) It is postulated that ALP could serve as a prognostic predictor, as an adjunct to the routine methods used for determination of the disease activity and has a direct influence on the diagnosis, therapy, and prognosis of periodontitis. (9) ALP is a calcium- and phosphate-binding protein and a phosphor-hydrolytic enzyme. It is a membrane-bound glycoprotein produced by many cells such as polymorphonuclear leukocytes (PMNLs), osteoblasts, macrophages, and fibroblasts within the area of the periodontium and gingival crevice. [10]. ALP is considered to be an important indicator of osteoblastic activity. ALP is detected in the parotid, submandibular, and minor salivary glands, as well as in desquamated epithelial cells, leukocytes, and bacteria from dental plaque. The presence of ALP in the saliva is usually indicative of inflammation and destruction of the periodontal tissues. The level of ALP is positively correlated with the severity of the periodontal disease.[11] Aspartate amino transferase (AST) is normally found in red blood cells, liver, heart, muscle tissue, pancreas, and kidneys. AST formerly was called serum glutamic oxaloacetic transaminase (SGOT). Low levels of AST are normally found in the blood. When body tissue or an organ such as the heart or liver is diseased or damaged, additional AST is released into the bloodstream. The amount of AST in the blood is directly related to the extent of the tissue damage. After severe damage, AST levels rise in 6 to 10 hours and remain high for about 4 days. Creatine kinase (CK) also known as creatine phosphokinase (CPK) or phospho-creatine kinase

is an enzyme expressed by various tissues and cell types. CK catalyses the conversion of creatine.[12]

MATERIALS AND METHOD:-

Patient selection included 15 persons, of both sexes, aged 25 – 60,with periodontal disease, and 15 healthy adult volunteers. Pregnant and lactating females, post-menopausal females and others on oestrogen therapy were excluded. No history of antibiotic, antimicrobial, and/or anti-inflammatory drug usage for last 6 months and any systemic diseases, which could influence the development, course and prognosis of periodontal disease and/or periodontal therapy.

All subjects were of good general health with no history of systemic disease . A complete periodontal examination, which included: gingival index (GI), bleeding on probing (BOP), probing depth (PD) were done.Samples of a unstimulated, mixed saliva were taken directly after mouth cleansing and were collected in sterile test tubes.(13) AST catalyses the transfer of the amino group from L-aspartate to U-ketoglutarate to yield oxaloacetate and L-glutamate.Alkaline phosphatases (ALP) are a group of enzymes that split off a terminal phosphate group from an organic ester in alkaline solution.Kinetic method recommended by International Federation of Clinical Chemistry is used for ALP. CK reagent is used to measure the CK activity by an enzymatic rate method.1,2,3,4 In the reaction creatine kinase catalyzes the transfer of a phosphate group from the creatine phosphate substrate to adenosine diphosphate (ADP).

RESULT AND DISCUSSION:-

The obtained results have shown that the activity of examined enzymes in saliva of the patients with periodontal disease was significantly higher in relation to the control group.

FIG-1:- Level of Alkaline phosphatase in healthy controls and periodontitis patients.

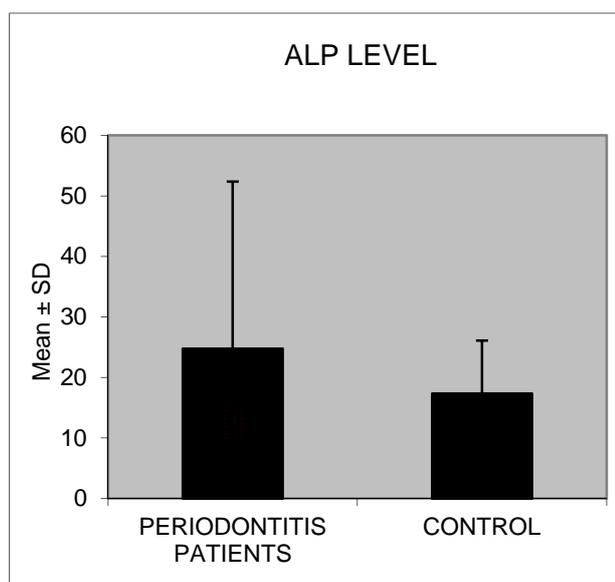


FIG-2:- Level of Aspartate amino transferase in healthy controls and periodontitis patients.

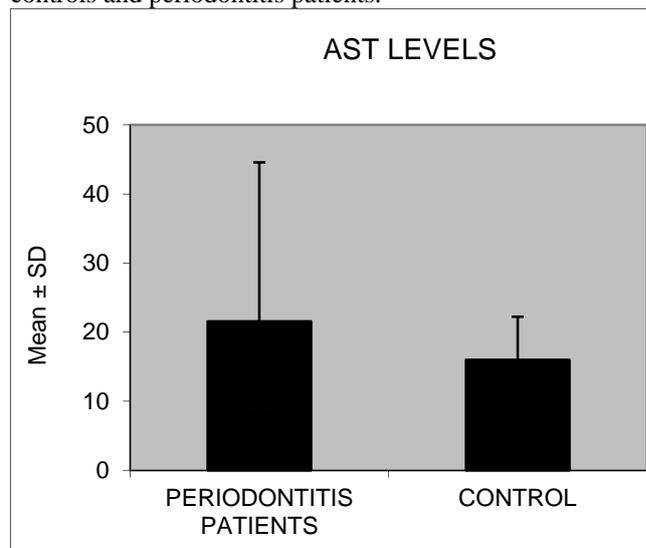
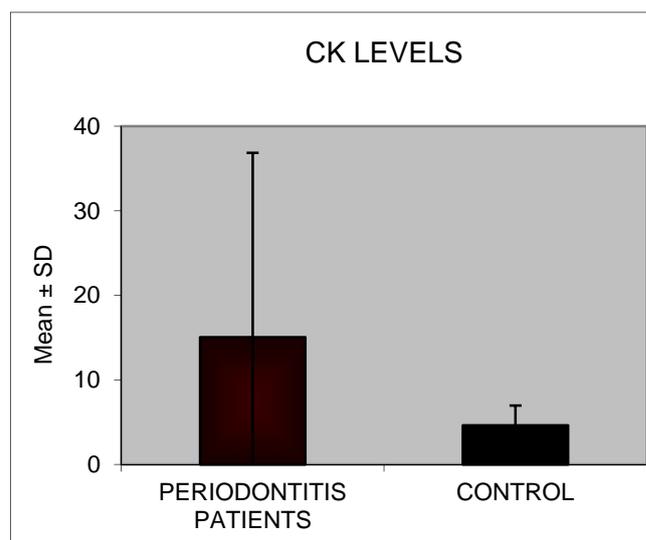


FIG-3:- Level of Creatine kinase in healthy control and periodontitis patients.



DISCUSSION

Diagnostic laboratory tests of saliva are routinely used in evaluation of many systemic disorders. Diagnosis of periodontal disease relies primarily on clinical and radiographical parameters. But these parameters provide only limited information about sites at risk for future periodontal breakdown. Numerous bio markers in saliva have been proposed as a diagnostic tests for periodontal disease such as intracellular enzymes (CK, AST, ALP,). In healthy persons, their activities are within normal level. In periodontitis the cells become damaged, due to oedema or destruction of a cellular membrane, as a result of which there is an increased release into the gingival crevicular fluid and saliva where their activity can be measured. Due to this, these enzymes can be biochemical markers of the functional condition of periodontal tissues.(14)

Previous studies have mainly investigated the activities of these enzymes in gingival crevicular fluid, which has a

much closer contact with the periodontal tissues, and due to this, it surely reflects the occurrences in them much better. However, the problem with the gingival crevicular fluid is that the technique of collecting it is rather complicated, and as a routine procedure, which possibly may be established, it will be hardly feasible in practice.(15)

CK,AST, ALP are indicators of a higher level of cellular damage and their increased activity in gingival crevicular fluid and saliva is a consequence of their increased release from the damaged cells of soft tissues of periodontium and a reflection of metabolic changes in the inflamed gingiva (16)

Other studies reached similar results, although most of them related to testing the activities of these enzymes in the gingival crevicular fluid but not in saliva of oral cavity. The major number of studies were focused on AST activity. Only a few papers have focused on the activity of these enzymes in saliva in relation to gingivitis and periodontal disease.(17)An aspartate aminotransferase (AST) test measures the amount of this enzyme in the blood. AST is normally found in red blood cells, liver, heart, muscle tissue, pancreas, and kidneys. AST formerly was called serum glutamic oxaloacetic transaminase (SGOT).

Low levels of AST are normally found in the blood. When body tissue or an organ such as the heart or liver is diseased or damaged, additional AST is released into the bloodstream. The amount of AST in the blood is directly related to the extent of the tissue damage. After severe damage, AST levels rise in 6 to 10 hours and remain high for about 4 days.

ALP is an intracellular enzyme present in most of tissues and organs, particularly in bones. Their increased activity in saliva is probably the consequence of destructive processes in the alveolar bone in advanced stages of development of periodontal disease what was proved by some former research works. Some studies have shown a remarkably increased activity of ALP in the acute phase of periodontal disease, and after the periodontal therapy, the activity of these enzymes restored to the value as found with the healthy persons (18)

Creatine kinase is an enzyme found in the heart, brain, skeletal muscle, and other tissues. Increased amounts of CK are released into the blood when there is muscle damage. The small amount of CK that is normally in the blood comes primarily from skeletal muscles.

CONCLUSION:-

More research may be required to study the mechanism of action of salivary enzymes in periodontal disease which provides new opportunities in diagnosis and treatment protocol.

REFERENCES

1. Malamud D. Saliva as a diagnostic fluid. *Br Med J* 1992; 305:207-18. 2.
2. Numabe Y, Hisano A, Kamoi K, Yoshie H, Ito K, Kurihara H. Analysis of saliva for periodontal diagnosis and monitoring. *Periodontology* 2004;40:115-9.
3. Kaufman E, Lamster IB. Analysis of saliva for periodontal diagnosis. *J Clin Periodontol* 2000;27:453-65.
4. Ozmeric N. Advances in periodontal disease markers. *Clin Chim Acta* 2004;343:1-16.
5. Alonso de la Peña V, Diz Dios P, Lojo Rocamonde S, Tojo Sierra R, Rodriguez-Segade. A standardised protocol for the quantification of lactate dehydrogenase activity. *Journal of Indian Society of Periodontology Medknow Publications Gingival crevicular fluid alkaline phosphatase as a potential diagnostic marker of periodontal disease*
6. Shu L, Guan SM, Fu SM, Guo T, Cao M, Ding Y. Estrogen Modulates Cytokine Expression in Human Periodontal Ligament Cells. *J Dent Res.* 2008;87:142-7. [PubMed]
7. American Academy of Periodontology. Position Paper: Diagnosis of periodontal diseases. *J Periodontol.* 2003;74:1237-47. [PubMed]
8. Armitage GC. The complete periodontal examination. *Periodontol* 2000. 2004;34:22-33. [PubMed]
9. etal Sanikop, Suvarna Patil, and Pallavi .
10. McCauley LK, Nohutcu RM. Mediators of periodontal osseous destruction and remodeling: Principles and implications for diagnosis and therapy. *J Periodontol.* 2002; 73(11): 1377-91.
11. Lisgarten MA. Periodontal probing: What does it mean? *J Clin Periodontol.* 1980; 7:165-76.
12. Reddy MS. The use of periodontal probes and radiographs in clinical trials of diagnostic tests. *Ann Periodontol.* 1997; 2: 113-122.
13. Kinney JS, Ramseier CA, Giannobile WV. Oral fluid based biomarkers of alveolar bone loss in periodontitis. *Ann N Y Acad Sci.* 2007; 1098: 230-51.
14. Mandel ID. The diagnostic uses of saliva. *J Oral Pathol Med.* 1990; 19:119-25.
15. Kaufman E, Lamster IB. Analysis of saliva for periodontal diagnosis- a review. *J Clin Periodontol.* 2000; 27:453-65.
16. Offenbacher S. Periodontal diseases: Pathogenesis. *Ann Periodontol.* 1996;11:821-78. [PubMed]
17. Zappa U. Histology of the periodontal lesion: Implications for diagnosis. *Periodontol* 2000. 1995;7:22-38. [PubMed]
18. Waerhaug J. Gingival pocket Anatomy, pathology, deepening and elimination. *Odontol Tidskr.* 1952;60(Suppl 1):1-186. [PubMed]
19. Shu L, Guan SM, Fu SM, Guo T, Cao M, Ding Y. Estrogen Modulates Cytokine Expression in Human Periodontal Ligament Cells. *J Dent Res* 2008;87:142-7. Back to cited text no. 1 [PUBMED]
20. American Academy of Periodontology. Position Paper: Diagnosis of periodontal diseases. *J Periodontol* 2003;74:1237-47. Back to cited text no. 2
21. Armitage GC. The complete periodontal examination. *Periodontol* 2000 2004;34:22-33. Back to cited text no. 3
22. M, Kinney J, Kim AS, Giannobile WV. Diagnostic Biomarkers for Oral and Periodontal Diseases. *Dent Clin N Am* 2005;49:551-71. Back to cited text no. 4
23. Todorovic T, Dozic I, Vicente-Barrero M, Ljuskovic B, Pejovic J, Marjanovic M, et al. Salivary enzymes and periodontal disease. *Med Oral Patol Oral Cir Bucal* 2006;11: E115-9. Back to cited text no. 5 [PUBMED]