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Comparison of Lactate Dehydrogenase (LDH), Aspartate Aminotransferase (AST) and Alkaline Phosphatase (ALP) in Saliva of Normal, Gingivitis and Periodontitis Patients

Research Article

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Abstract

Introdction: Gingival and periodontal diseases are one of the most common oral diseases. It is a chronic, infectious, and multi-factorial disease which results in inflammation and destruction of the supporting tissues of the teeth, progressive attachment loss and bone loss. Chronic periodontitis can lead to tooth mobility, tooth loss and systemic complications. Recently, several salivary biomarkers of periodontal disease were being evaluated for disease activity status. The current study was undertaken to compare the level of salivary Lactate dehydrogenase (LDH), Aspartate aminotransferase (AST) and alkaline phosphatase (ALP) in normal, gingivitis and periodontitis patients.

Material & Methods: The totals of 45 subjects were included in the study. They were divided into three groups with 15 subjects of Normal, Gingivitis and Periodontitis patients. The saliva samples were collected and the Lactate Dehydrogenase (LDH), Aspartate Aminotransferase (ASP) and Alkaline Phosphatse (ALP) levels were measured using commercially available kits using auto-analyzer according to the manufacturer's instructions. The results obtained were statistically analyzed by multiple inter-group comparisons using SPSS software by using ANOVA and Scheffe multiple comparisons.

Results: The results of Kruskall Wallis' ANOVA showed all the three variables AST, ALP and LDH had statistically significant differences, with periodontitis patients showing the highest value for AST, ALP and LDH. The Mann Whitney U test showed that all the three variables SGOT, ALP and LDH had statistically significant difference between groups, except for ALP between gingivitis and periodontitis patients were not statistically significant.

Conclusions: The results led to a conclusion that the all the three variables AST, ALP and LDH were good markers to differentiate the normal, gingivitis and periodontitis patients except for ALP which was not significant between gingivitis and periodontitis patients.

Keywords: Aspartate Aminotransferase; Alkaline Phosphatase; Lactate Dehdrogenase; Periodontitis; Gingivitis.

Introduction

Gingival and periodontal diseases are one of the most common oral diseases. It is a chronic, infectious, and multi-factorial disease. It is caused by an interaction of dental plaque, dental calculi and their microbial invasion and interactions in periodontium and host immunological responses. The gingivitis and periodontitis result in inflammation and destruction of the supporting tissues of the teeth, progressive attachment loss and bone loss [1].

Chronic periodontitis can lead to tooth mobility, tooth loss and systemic complications. There have been reported association between systemic disorders like diabetes mellitus, dermatological disorders, birth complications (low birth weight and pre-term birth), coronary heart disease, atherosclerosis, infective endocarditits, rheumatic arthritis, pneumonia, osteoporosis, oral cancer and other disorders [2].

The conventional diagnosis of periodontal disease is determined through clinical measurements such as probing pocket depth, bleeding during probing, clinical attachment loss, plaque index, and radiographs. The disadvantages of these conventional methods of diagnosis include the need for skilled clinicians and significant time, and the inability to diagnose present disease activity [3, 4].

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In recent years, several salivary biomarkers of periodontal disease have been introduced [5, 6]. Among the salivary biomarkers, Lactate dehydrogenase (LDH), Aspartate aminotransferase (AST) and alkaline phospahatase (ALP) are associated with tissue destruction, bone resorption and inflammations of periodontal disease [7-9]. They are considered to be ideal markers of periodontal disease activity [10, 11].

With this background the present study was done to compare the level of salivary Lactate dehydrogenase (LDH), Aspartate aminotransferase (AST) and alkaline phospahatase (ALP) in normal, gingivitis and periodontitis patients.

The aim of this study was to compare the LDH, AST and ALP levels in normal, gingivitis and periodontitis patients and to identify most specific marker or combination of markers in differentiating the normal and disease status.

Material & Methods

The study was undertaken in department of dentistry, Vinayaka mission's medical college and hospital. The Institutional ethical committee approval and Informed consent was obtained before proceeding with the study. The healthy patients aged between 20 to 70 years with minimum 20 teeth were included for study.

The patient with systemic diseases, antibiotic or anti-inflammatory drug therapy in previous 3 months, periodontal treatment within past 6 months, alcohol, tobacco or drug abuse, any abnormal oral inflammation or local oral ulcer and pregnant women were excluded from the study.

A total of 45 subjects were subjected to experiment and they were divided into three groups.

1. Group 1 (n=15): The periodontally healthy subjects with absence of gingival inflammation, no bleeding on probing, no probing depth (PD) > 3 mm and no attachment level < 2mm.
2. Group 2 (n=15): The subjects suffering from chronic generalized gingivitis without clinical attachment loss. The subjects with gingival inflammation, bleeding on probing, no probing depth (PD) > 3 mm, and no attachment level > 2mm.
3. Group 3 (n=15): The subjects suffering from chronic generalized periodontitis. The subjects should have at least eight sites with PD > 4 mm and attachment level > 2 mm.

Saliva Sampling

The collection un-stimulated whole saliva sample from the test and control groups was done with strict protocol. Patients were asked to avoid eating or drinking for at least two hours prior to saliva collection. The samples were obtained between 9:00 AM and 12:00 PM. Before sampling, patients were given oral irrigation with water for one minute. Their oral cavity was examined to ensure the absence of blood and debris. About 3ml of saliva was collected in a sterile micro-tube and kept at 4°C. Laboratory analysis of each saliva sample was done on the day of collection in biochemistry lab. The Lactate Dehydrogenase (LDH), Aspartate Aminotransferase (ASP) and Alkaline Phosphatse (ALP) levels were measured using commercially available kits using auto-analyzer according to the manufacturer's instructions.

The results obtained were statistically analyzed by multiple intergroup comparisons using SPSS software by using ANOVA and Scheffe multiple comparisons. ($P < 0.001$).

Results

In our study, there were 7 males and 8 females in each group (Table 1) which shows similar gender distribution.

The mean age of group 1 normal subjects was 34.87+/- 5.489 years, group 2 gingivitis patents was 36.40 +/- 5.040 years and group 3 periodontitis patients was 38.47 +/- 3.815 years (Table 2). On comparison of mean age between group 1, group 2 and group 3 there was no statistically significant variation indicating that the groups were age matched.

In Table 3, the mean AST level in Group 1 was 26.773+/-4.286, group 2 was 39.320+/-6.248 and group 3 was 51.647+/- 9.081. On comparing AST level between groups, the values were statistically significant (P< 0.001) by using Kruskall Wallis' ANOVA. The mean ALP Level in Group 1 was 15.153+/-4.225, group 2 was 23.5+/-5.588 and group 3 was 30.027+/-8.655 with sta-

Table 1. Distribution of subjects according to gender.

GENDER	Normal	Gingivitis	Periodontitis	Total
Male	7	7	7	21
Female	8	8	8	24
Total	15	15	15	45

This table shows equal distribution of the gender in all the groups.

Table 2. Comparison of age between the groups.

Groups	N	Mean	Stddev	P-value
1. Normal	15	34.87	5.489	0.136#
2.Gingivitis	15	36.4	5.04	
3.Periodontitis	15	38.47	3.815	

# denotes statistically not significant using

Table 3. Overall comparison between the groups of the variables AST, ALP and LDH.

Variables	Groups	N	Mean	Std. Deviation	P-value
AST	1. Normal	15	26.773	4.286	<0.001*
	2.Gingivitis	15	39.32	6.248	
	3. Kruskall Wallis' ANOVA Periodontitis	15	51.647	9.081	
ALP	1. Normal	15	15.153	4.225	<0.001*
	2.Gingivitis	15	23.5	5.588	
	3.Periodontitis	15	30.027	8.655	
LDH	1. Normal	15	312.073	62.469	<0.001*
	2.Gingivitis	15	441.753	52.874	
	3.Periodontitis	15	634.067	129.514	

* denotes statistically significant using Kruskall Wallis' ANOVA

Table 4. Inter-group comparison of the variables AST, ALP and LDH.

Variables	Groups	N	Mean	Std. Deviation	1 vs 2	1 vs 3	2 vs 3
AST	1. Normal	15	26.773	4.286	<0.001*	<0.001*	<0.001*
	2.Gingivitis	15	39.32	6.248			
	3.Periodontitis	15	51.647	9.081			
ALP	1. Normal	15	15.153	4.225	<0.001*	<0.001*	0.061#
	2.Gingivitis	15	23.5	5.588			
	3.Periodontitis	15	30.027	8.655			
LDH	1. Normal	15	312.073	62.469	<0.001*	<0.001*	<0.001*
	2.Gingivitis	15	441.753	52.874			
	3.Periodontitis	15	634.067	129.514			

* denotes statistically significant using Man Whitney U test
#denotes statistically not significant using Mann Whitney U test

tistically significant difference (P<0.001) on comparison. The mean LDH level in Group1 was 312.073+/-62.469, group 2 was 441.753+/-52.874 and group 3 was 634.067+/-129.514. The statistical comparison of LDH level between these groups were significant (P <0.001).

The Table 4 revealsInter-group comparison of the variables AST, ALP and LDH level by Man Whitney U test. It shows that all the three variables SGOT, ALP and LDH have statistically significant difference (P< 0.001) between groups, except for ALP where difference between Gingivitis and Periodontitis was not statistically significant.

Discussion

Gingivitis and periodontitis are one of the most common, chronic, infectious and multi-factorial oral diseases resulting in inflammation and destruction of the supporting tissues of the teeth, progressive attachment loss, bone loss, teeth mobility and its loss [1, 2]. In recent years, several salivary biomarkers are being studied for diagnosis. Assessment the salivary biomarkers level have advantages as it is simple, time saving and reduces the need for skilled personal3. It also helps in monitoring treatment prognosis and evaluation of ongoing disease activity.

In the present study we compared and evaluated the level of salivary aspartate aminotranferase (AST), alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) in normal, gingivitis and periodontitis patients. There was a statistical significant difference in level of AST, ALP and LDH between all the groups by Kruskall Wallis' ANOVA test. The inter-group comparison by Man Whitney U test revealed statistical significant difference between each group with levels of AST, ALP and LDH except between group 2 and group 3 with level of ALP.

Yoshiaki Nomura et al [11] in 2006 studied various salivary enzymes in normal and periodontitis patients and found out that there was a statistical significant difference in LDH followed by AST, there was no statistical significance with ALP. TodorovicTatana et al [6] in a similar study reported a significant difference in level of LDH, AST and ALP between normal and periodontitis patients before and after treatment.

In 2006 Totan A et al [9] observed a significant difference in level of AST and ALP between normal and periodontitits patients. Deepika V et al [4] in casual observation found that increased AST and ALP levels between normal and periodontitis patients. Kudvaet al10 in 2014 found significant difference in the level of AST between gingivitis and periodontitis patients before and after treatment. Desai S et al [3] reported a significant level of ALP in

normal and chronic periodontitis patients.

Janet Moradi Haghgoo et al[7] observed significant level of LDH difference among normal and periodontitis patients. Havleet al8 reported a significant level of difference in LDH among normal and periodontitis in pre and post treatment patients.

The present study yielded similar results compared to previous studies [3-11] which involved either single or multiple biochemical parameters in mostly normal and periodontitis patients. It differed from other studies in inclusion of gingivitis patient group and in differentiating the gingivitis and periodontitis patients with ALP level. The difference in ALP levels may be due to the fact that there was no comparison made between gingivitis and periodontitis in previous studies. The ALP may be the initial marker to be raised in gingivitis and may remain constant as disease progresses. The level of LDH was comparatively higher in periodontitis group than other markers; it may reflect the underlying tissue damage better than others.

So, in this study the salivary level of LDH, AST and ALP were significant in differentiating the normal versus gingivitis versus periodontitis patients, except in ALP with gingivitis versus periodontitis patients.

Conclusion

Within the limitations of this study, we could conclude that the salivary AST, ALP and LDH level may be used as an adjuvant diagnostic method to differentiate the normal, gingivitis and periodontitis patients. This could be used in mass screening and home based self-diagnostic indicator which has to be followed by clinical diagnosis. Further studies are needed to evaluate the role of these biochemical markers in assessing the gingival and periodontal health status.

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