

Biomarker- A natural boon for the artificial burden

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Abstract

Aim: The present research aimed at assessing the relation between salivary LDH and periodontal status of the individual among people residing in Madurai.

Materials and Methods: A cross sectional study was undertaken to assess and compare the periodontal status and lactate dehydrogenase level among the people residing in Madurai city. The total study subjects were 75. The sample size was calculated from the results of pilot study. The duration of the study was 1 month which was conducted in May 2018. The subjects were included after obtaining the informed consent. The study subjects were randomly selected among the residents of Madurai city. The subjects aged 18 – 60 years were included in the study.

Results: In the present study about 74% of the subjects have poor periodontal status and 26% had good periodontal status. According to the LDH value obtained in the present study 66% of the subjects had high level and 34% had normal level. Among those 75 subjects 25 were smokers, 25 were passive smokers and 25 were healthy people without any oral habits.

Conclusion: The present study is an evidence that the level of salivary enzyme LDH are raised in the condition such as periodontitis.

Keywords: Periodontitis, Salivary lactate dehydrogenase, Biomarker, Smoker.

Introduction

Smoking had been a humans habit for almost four centuries. At the first time, Columbus brought tobacco to Europe which he got from America. From Europe, smoking was spread throughout the world by Portuguese and Spanish and became an epidemic throughout the world. But recent studies found that smoking had a detrimental effect to general health as well as oral health. One of the oral disease which is caused due to smoking was Periodontitis.¹

Periodontitis is defined as an inflammatory disease of the supporting tissues of the teeth caused by specific microorganism or groups of specific microorganisms, resulting in progressive destruction of periodontal ligament and alveolar bone with pocket formation, recession, or both. Periodontal disease occurs when bacterial toxins and enzymes destroy the supporting tissues of teeth and bone. Plaque, attached to the teeth, may form hard deposits called calculus or tar within 48 hours. It is easily happened in smokers. Once the calculus has been attached to the teeth, it will not be easily cleaned with regular tooth brushing.²

Periodontal diseases are considered to be one of the most common and worldwide oral pathologies. Severe chronic periodontitis is seen 5-20% of the adult population. Periodontal diseases may affect the quality of life in adults and are associated with both oral and systemic health. A large portion of periodontal pathologies are affected by a variety of factors, including genetic, socioeconomic status, smoking, oral hygiene and lifestyle.³

Many studies regarding the association between smoking and periodontal disease had stated that increased pocket depth measurements, attachment loss and alveolar bone loss are more prevalent in smokers than non-smokers. Severe rate of periodontal disease might be due to greater amounts of plaque accumulation in smokers when compared to non-smokers. More than four thousand toxins are present

in tobacco smoke which includes substances like carbon monoxide, oxidating radicals, carcinogens like nitrosamines and addictive psycho-active substances like nicotine which are detrimental to health. Smoking causes increased amount of bone loss, refractory periodontitis and also affects the outcome of periodontal therapy. The association of smoking with periodontal disease called more attention in the last 10-15 years. Smoking, is reported as major and environmental risk factor for periodontitis.³ Locally, vasoconstructive effect of nicotine in cigarette on the blood vessels causes slow down of gingival blood flow and possibly decrease in number of cells, the amount of oxygen and other blood contents coming to gingiva and decrease in the ability to remove tissue degradation products hence, some of the enzymes were used as the Biomarkers for periodontal disease. Among these biomarkers, lactate dehydrogenase is a cytoplasmic enzyme that can be found in the cells of almost all body tissues, it could be released in the extracellular environment from necrotic cells, as a result of periodontal destruction leading to cell injury and cell death. From there, it could enter into the GCF and saliva therefore, lactate dehydrogenase may be used as a marker for the diagnosis of periodontal disease. To measure the periodontal disease clinically a scoring criteria is used one of which is index. Several index systems were identified for the determination of the severity and necessary treatment of periodontal diseases.³ CPITN, one of these index, is widely used in order to predict the condition and requirements of the treatment of periodontal diseases. The present research aimed at assessing the relation between salivary LDH and periodontal status of the individual among people residing in Madurai.

Materials and Methods

A Cross sectional study was undertaken to assess and compare the periodontal status and lactate dehydrogenase

level among the people residing in Madurai city. The total study subjects were 75. The sample size was calculated from the results of pilot study. The duration of the study was 1 month which was conducted in May 2018. The subjects were included after obtaining the informed consent. The study subjects were randomly selected among the residents of Madurai city. The subjects aged 18 – 60 years were included in the study. They were clinically assessed for oral mucosal lesions only those who did not have any oral mucosal lesion were included. In the present study the subjects who has systemic disease and those who were on medications were excluded. The ethical clearance was obtained from the Institutional Review Board Best Dental Science College, Madurai (BDSC2542018). Demographic details were collected from each subject through structured interview in the local language (Tamil) and collected data was recorded by the principal investigator. The subjects were assured about the confidentiality of the information. The details regarding Age, Gender, Address, Education, Occupation, Oral habits were recorded. Intraoral examination has been done and CPITN was recorded for all the subjects. The saliva was collected from each subject using a sterile container and transported to the laboratory for assessing the level of LDH. The patient was asked not to consume any food 2 hours prior to the collection of saliva. Following a thorough mouth rinse using distilled water, saliva was collected by drooling method, 1ml of collected saliva was stored in plastic vials and transported to laboratory through frozen bag and analysis was carried out within 24 hours using LDH kit.⁴

Results and Discussion

The total study subjects were 75. The age of the study participants ranged from 18 to 60 years. The mean age group among active smokers, was 41.5 years, for passive smokers was 37.0 and for healthy controls was 36.4. In the present study about 74% of the subjects have poor periodontal status and 26% had good periodontal status. According to the LDH value obtained in the present study 66% of the subjects had high level and 34% had normal level. Among those 75 subjects 25 were smokers, 25 were passive smokers and 25 were healthy people without any oral habits. All the smokers were males. In passive smokers 6 were males and 19 were females whereas in healthy people 14 were males and 11 were females. Among smokers and passive smokers almost all have poor periodontal status and 8% of healthy people had poor periodontal status. The correlation between LDH and CPITN was found to be positively correlated with the p value of 0.01 which shows significant correlation.

Table 1: Periodontal status and LDH level of the study subjects

Study subjects (75)	Abnormal	Normal
Periodontal status	74%	26%
LDH level (Normal range- 207 U/L - 414 U/L)	456	230
Smokers	33%	0%
Passive smokers	33%	0%
Healthy people	8%	26%

Table 2: Correlation between the LDH value and CPITN scores of the study subjects.

Number of study subjects	Correlation between LDH and CPITN scores	'p' value
75	0.826	0.01* (Significant)

*Correlation is significant at the 0.01 level

The use of biomarkers as a diagnostic tool during dental examinations could be helpful in early diagnosis of periodontal disease. Additionally, screening periodontal disease in large populations by the means of index may provide the measurement of periodontal status so that the risk for periodontal disease among the active and passive smokers can be predicted. During recent decades detecting biomarkers for diagnosis of periodontal disease has attracted attention. Periodontal disease biomarkers are substances that could be produced during the host's defensive responses against bacterial invasion, reflect inflammation, or be released from cell death as a result of tissue destruction due to periodontal disease. The diagnostic efficacy of various biomarkers of periodontal disease has been demonstrated in previous studies. It is believed that blood is the gold standard source for detecting biomarkers but the present study is an evident that saliva is also a reliable sample for the intracellular enzymes such a LDH.⁵

Lactate dehydrogenase (LDH) is a omnipresent enzyme which plays a remarkable role in the clinical findings of pathologic processes. Salivary LDH was found to be the most applicable enzyme for the screening of periodontitis. Studies showed that increased LDH activity in the saliva of patients with increased probing depth than in individuals with healthy periodontium.⁶

The present research aimed at assessing the relation between salivary LDH and periodontal status of the individual among people residing in Madurai. The LDH level was analysed in the saliva of the subjects since it is non-invasive method of collecting the samples.

The present research was the first Indian study at assessing the salivary LDH and periodontal status of the individual among people residing in Madurai. In the current research we have analysed LDH value using automated analyzer, spectrophotometer or photometer with cell holder thermostat able at 25, 30 or 37°C and able to read at 340 nm. The reagents used for analysis were Reagent A: Tris 100 mmol/L, pyruvate 2.75 mmol/L, sodium chloride 222 mmol/L, pH 7.2 and Reagent B: NADH 1.55 mmol/L, sodium azide 9.5 g/L (Biosystems – Reagents and Equipments). The reference value for LDH according to the method we used was 207 U/L -414 U/L.¹¹ In the present study drooling method was used to collect the unstimulated saliva in contrast to the spit method employed in other studies.^{4,8,10,9} As the latter method dilutes the saliva due to activation of masticatory muscles which makes detection of the biomarker difficult. The CPITN index was used to evaluate the periodontal status since this index will not cause large difference between practitioners and it is applied easily.³

Literature review comparing the salivary LDH and CPITN index were not found hence the comparison was less for the present research. In the present study about 74% of the subjects have poor periodontal status and 26% had good periodontal status among them 66% of the subjects had high level of LDH and 34% had normal level of LDH. Among these subjects majority of them were smokers and passive smokers. These results prove that the periodontal disease brings about higher LDH level and it can be used as a biomarker for the risk subjects such as smokers who were prone to get periodontal disease. Many studies done by Amanthi Ganapathi et al,⁶ Sarita Dabra et al,⁷ Janet et al⁵ and Abhinav et al¹² also concluded that LDH can be used as the biomarker for periodontal disease but the present research segregated the smokers and passive smokers and also proved that the passive smokers were also equally affected by periodontal disease. The higher level of LDH among smokers was due to the local tissue damage in oral cavity due to cigarette smoke. Lactate dehydrogenase activity is mainly due to genomic changes during tissue destruction transformation. Increased LDH levels are due to increased mitotic index and more lactic acid production by cells due to breakdown of glycoprotein. Value of LDH elevates in conditions such as in early stage of tissue damage in oral mucosa hence this findings can be used for benefit of the patient in predicting risk for periodontal disease even before obvious clinical signs emerge. LDH level is increased in both serum and saliva during the destructive changes of the tissue. LDH is predominantly found in saliva than serum. Consequently, LDH concentration in saliva as an expression of cellular necrosis can be considered to be a specific indicator for lesions affecting the integrity of the oral mucosa.¹³

This study hence proved that effect LDH are higher among people with higher CPITN scores. LDH assessment can be used as a biomarker for the periodontal disease, the generalisability was limited due to short duration and small sample size. Even though the present research has some limitations this study gives a clear view that the passive smokers also equally affected regarding the general health as well as in the oral health.

Conclusion

The present study is an evidence that the level of salivary enzyme LDH are raised in the condition such as periodontitis. This research also proved that passive smokers were also at risk to acquire periodontal disease. The study not only used the biomarker it also evaluated through the index CPITN where the periodontal status can be measured in quantity which gives the clear view on the periodontal status.

Conflict of Interest: None.

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